ENABLING ACCESS TO EDUCATION IN THE 21ST CENTURY: IS ONLINE LEARNING THE SOLUTION FOR PUBLIC PRIMARY, SECONDARY, AND TERTIARY SCHOOLS IN JAMAICA?

Dissertation Manuscript

Submitted to Unicaf University in Zambia in partial fulfillment of the requirements for the degree of

Doctor of Philosophy (PhD) in Education

By Dacia Smith

April, 2024

Approval of the Thesis

ENABLING ACCESS TO EDUCATION IN THE 21ST CENTURY: IS ONLINE LEARNING THE SOLUTION FOR PUBLIC PRIMARY, SECONDARY, AND TERTIARY SCHOOLS IN JAMAICA?

This Thesis by Dacia Smith has been approved by the committee members below, who recommend it be accepted by the faculty of Unicaf University in Zambia in partial fulfillment of requirements for the degree of

Doctor of Philosophy (PhD) in Education

Thesis Committee:

Dr Tanya Marie Hathaway, Supervisor

Dr Elena Papadopoulou, Chair

Dr Evgenia Theodotou, External examiner

Dr Joyce Wangui Gitau, Internal examiner

Abstract

ENABLING ACCESS TO EDUCATION IN THE 21ST CENTURY: IS ONLINE LEARNING THE SOLUTION FOR PUBLIC PRIMARY, SECONDARY, AND TERTIARY SCHOOLS IN JAMAICA?

Dacia Smith

Unicaf University in Zambia

Education is seen by most people as a necessary economic strategy for any nation and is crucial for human survival (Awgichew & Ademe, 2022; Halili, 2019). Therefore, to develop and sustain this reality leaders worldwide have sought innovative ways to provide more options for education (Focacci & Perez, 2022; Kang, 2021). Unreservedly, this will require an exploration of the integration of information and communications technology (ICT) tools that may provide options for learners to access instructional programs (Muller & Mildenberger, 2021; Panigrahi et al., 2018). Hence, the study used a mixed-methods research approach and a concurrent nested research design guided by the pragmatism ideology to uncover the feasibility of enabling access to education in the 21st century and whether online learning is a solution for public primary, secondary, and tertiary schools in Jamaica. Furthermore, a sample population was recruited from the Jamaican public educational institutions and Ministry of Education offices among 15- to 65-year-olds. The study employed online surveys and unstructured interviews for the primary research and a review of archived reports about the issue for the secondary research. The descriptive, correlational, content, and comparative analyses were used, which indicated the willingness to learn online, and that online learning can successfully increase and improve learning especially at the tertiary education level. Juxtapose to this, there are problems with access to online learning and the need for more support systems at all levels of education. In addition, the study has clearly shown the usefulness of online learning if the recommended corrective measures are intentionally implemented with respect to improvements and expansion of online classes. Most importantly, the findings can provide guidelines relative to further implementation of ICT infrastructure, the development of online instruction, and the identification of other pertinent community partners.

Declaration

I hereby declare that this thesis has been composed solely by myself under the guidance of my supervisor Dr. Tanya M. Hathaway following enrollment in the Doctor of Philosophy degree at Unicaf University in Zambia, and that it has not been submitted, in whole or in part, in any previous application for a degree. Except where stated otherwise by reference or acknowledgement, the work presented is entirely my own.

I was made privy to the university's School of Doctoral Research department; Unicaf Research Ethics Committee (UREC) guidelines and therefore have accepted and followed carefully the ethical guidelines mandated for the study procedures as they relate to human participants. I ensured the acquisition of the relevant permission from the related gatekeepers and have recognized my responsibility and the anonymity and autonomy of each participant in the study.

Copyright

This work will be made available under the Creative Commons By NC-ND: that is, the users of the information contained in this report may copy and distribute it in an unadapted format to support commercial and non-commercial ventures, however, credit must be given to the author.

Dedication

This report is dedicated to all learners, educators, educational leaders and policy makers but especially to Public Education Department in Jamaica. It is a guide for making informed educational decisions in chartering successful actions plans for adaptation and engagement in online teaching and learning in lieu of the information and digital age expectations.

Acknowledgments

I would like to thank Unicaf University in Zambia for affording me the opportunity through the provision of a partial scholarship to undertake this study.

Additionally, I want to extend a thank you to my supervisor Dr. Tanya M. Hathaway for the assistance provided to me which was instrumental to the successful completion of the thesis. Your coaching and timely feedback were conversant and skillfully guided me to achieve the various study targets necessary for a viable research.

To the respondents who agreed to participate in the study I extend my gratitude to your willingness for champion the search for new knowledge to improve the progress of education directed towards the preparation of learners to adapt and excel in the information and digital age.

To the Ministry of Education, and Youth in Jamaica and the various principals of the participating schools, thank you for granting me permission to conduct the study. Also, for the support the ministry made possible through the various public institutions and ministry of education offices during my data collection exercises.

Finally, my thanks go out to my colleagues, friends and family members who have supported and assisted me towards the fulfilment of the research procedures and completion of my thesis report.

Table of Contents

List of Tables xi

List of Figures xv

List of Abbreviations xviii

CHAPTER 1: RESEARCH PROPOSAL 1

Introduction 1

Statement of the Problem 8

Purpose of the Study, Research Aims, and Objectives 11

Nature and Significance of the Study 14

Research Questions and Research Hypotheses 18

CHAPTER 2: LITERATURE REVIEW 21

Introduction 21

Theoretical and Conceptual Framework 24

Online Learning and Engaged Learners 42

The Role of Online Learning in Widening Access to Education 54

Attitudes Towards Online Learning 70

Education's Engagement in Online Learning in Jamaica 82

Factors Impeding Inclusive Online Learning 96

Online Learning Contribution in Achieving Jamaica's Education Goal 108

Summary 125

CHAPTER 3: RESEARCH METHODOLOGY 134

Introduction 134

Research Paradigm 137

Research Approach and Design 140
Population and Sample of the Research Study 160
Materials/Instrumentation of the Research Tools 171
Operational Definitions of Variables 178
Study Procedures and Ethical Assurances 187
Data Collection and Analysis 192
Summary 204
CHAPTER 4. DISCUSSION OF RESEARCH FINDINGS 207
Introduction 207
Trustworthiness of Data 209
Reliability and Validity of the Quantitative Data 213
Results 224
Evaluation of Findings 285
Summary 307
CHAPTER 5: IMPLICATIONS, RECOMMENDATIONS, AND CONCLUSIONS 313
Introduction 313
Implications 316
Recommendations for Application 334
Recommendations for Future Research 344
Conclusions 353
REFERENCES 365
APPENDICES 469
Appendix A. PEP Score Ranges by Subject 469

Appendix B1. Qualitatitive Data Analysis Codes..... 470

Appendix B2. Qualitatitive Memoing Writing Excerpt…… 464

Appendix C. Interview Schedule..... 473

Appendix D1. Group 2 Questionnaire..... 477

Appendix D2. Aged 19-to-65 Years Questionnaire…… 473

Appendix D3. The Opinionnaire……...479

Appendix D4. Interview Guide……..483

Appendix D5. The Checklist…….489

Appendix E. Approval from UREC to Conduct the Study…..……500

Appendix F1. Responses to the Opinionnaire from the Student Groups…..493

Appendix F2. Responses to the Opinionnaire from the Adult Groups……..494

Appendix G1. Cronbach's Alpha Reliability Rating……. 503

Appendix G2. Cronbach's Alpha Reliability Rating for Total Items……496

Appendix H. Convergent and Discriminant Validity Test……..……..505

Appendix I. Exploratory Factor Analysis ValidityTests……509

Appendix J. Predictive Validity Test……...514

Appendix K. Pearson and Spearman's Coefficient Values……517

Appendix L. Cronbach's Alpha Values…….518

Appendix M. Cross-tabulation Analysis Results for RQ 2…….512

List of Tables

Table 2.1 Key Terms 23

Table 2.2 Research Questions and Hypotheses 32

Table 2.3 Recent Research Which Emphasizes the Value of Online Education……...41

Table 2.4 Research Into Engagement of Learners During Online Learning……46

Table 2.5 Research Providing Evidence of Performance Indicators in Online learning.50

Table 2.6 Research Highlighting Some Limitations to Online Learning……..…..54

Table 2.7 Tablets in School Initial Project Jamaica 93

Table 2.8 Online Learning Programs 111

Table 2.9 Reviewed Studies Related to Engagement and Impediments 127

Table 2.10 Analysis of Literature Reviewed 130

Table 3.1 Grounded theory Methods 147

Table 3. 2 The Stages of the Research Process 160

Table 3.3 Cluster Sampling Results Per Parish and Counties 164

Table 3.4 Online Survey Response Results 166

Table 3.5 Total Participant's for the Interviews 168

Table 3. 6 5-point Likert Scale Questionnaire Excerpt 174

Table 3.7 An Excerpt of an Item Included on the Questionnaire 175

Table 3.8 Guidelines of the Interview Guide 177

Table 3.9 Partial and Conditional Correlational Formulas 182

Table 3.10 Measurements of Central Tendency 183

Table 3.11 Measures of Variability 184

Table 3.12 Operational Variables for the Quantitative Research..... 185

Table 3.13 Ethical Principles that Guided the Research Process..... 191

Table 3.14 Data Codes 194

Table 3.15 Spearman's rank Strength of the Relationship Among Variables 197

Table 4. 1 Respondents per Grouping Interviewed 215

Table 4. 2 Reliability Test of Inter-items in the Survey Questionnaires..... 219

Table 4. 3 Pearson's Item Statistic Rating for the Adult Questionnaire..... 223

Table 4. 4 Spearman's Item Statistic Rating for the Adult Questionnaire..... 215

Table 4.5 Total Respondents in the Qualitative Study……218

Table 4. 6 Descriptive Statistics: Results Related to Demography..... 220

Table 4. 7 Descriptive Statistics: Results Related to Demography..... 220

Table 4.8 Descriptive Analysis: 19-to-65-Year-Old for RQ 1 225

Table 4. 9 Descriptive Analysis: 15-to-18-Year-Old and Opinionnaire for RQ 1 228

Table 4. 10 Correlational Analysis: 15-to-18-Year-Old and Opinionnaire for RQ 1..... 230

Table 4. 11 Correlational Analysis: 19-to-65-Year-Old for RQ 1..... 232

Table 4. 12 Constant Comparative Analysis Results: RQ 1 234

Table 4.13 Content Analysis: Word Averages Results for RQ 1..... 237

Table 4. 14 Students and Institution's Attittude towards Online Learning: RQ 2..... 241

Table 4. 15 Descriptive Analysis: 19-to-65-Year-Old for RQ 2 245

Table 4. 16 Correlational Analysis: 15-to-18-Year-Old and Opinionnaire for RQ 2..... 247

Table 4. 17 Correlational Analysis: 19-to-65-Year-Old for RQ 2..... 249

Table 4. 18 Constant Comparative Analysis Results: RQ 2 251

Table 4. 19 Content Analysis: Word Averages Results for RQ 2..... 255

Table 4. 20 Descriptive Analysis: 15-to-18-Year-Old and Opinionnaire for RQ 3 258

Table 4. 21 Descriptive Analysis: 19-to-65-Year-Old for RQ 3 260

Table 4. 22 Correlational Analysis: 15-to-18-Year-Old and Opinionnaire for RQ 3..... 263

Table 4. 23 Correlational Analysis: 19-to-65-Year-Old for RQ 3..... 265

Table 4. 24 Constant Comparative Analysis Results: RQ 3 267

Table 4. 25 Content Analysis: Word Averages Results for RQ 3..... 270

Table 4. 26 Descriptive Analysis: 15-to-18-Year-Old and Opinionnaire for RQ 4 273

Table 4. 27 Descriptive Analysis: 19-to-65-Year-Old for RQ 4 275

Table 4. 28 Correlational Analysis: 15-to-18-Year-Old and Opinionnaire for RQ 4..... 277

Table 4. 29 Correlational Analysis: 19-to-65-Year-Old for RQ 4..... 279

Table 4. 30 Constant Comparative Analysis Results: RQ 4 281

Table 4. 31 Content Analysis: Word Averages Results for RQ 4..... 284

Table 4. 32 Overall Correlational Analysis Results:RQ 1 289

Table 4. 33 Overall Correlational Analysis Results:RQ 2 295

Table 4. 34 Overall Correlational Analysis Results:RQ 3 299

Table 4. 35 Overall Correlational Analysis Results:RQ 4 304

Table 5. 1 Results Relating to Each Research Question and Hypotheses 356

Table G1. Cronbach's Alpha Reliability Rating..... 503

Table G2. Cronbach's Alpha Reliability Rating for Total Items 504

Table H1. Convergent and Discriminant Validity Test: Pearson 505

Table H2. Convergent and Discriminant Validity Test: Spearman…….499

Table I1. KMO Results and Bartlett's Test..... 509

Table I2. Exploratory Factor Analysis: Convergent and Discriminant Validity Test... 502

Table I3. Communalities Factor Loading Results..... 511

Table I4. Factor Analysis Test: Variance Spread 512

Table I5. Factor Loading and Sample Size Threshold..... 513

Table J1. Predictive Validity Test of the 5-point Likert Scale Items..... 514

Table K1. Pearson's Correlational Coefficient Values..... 517

Table K2. Spearman's Correlational Coefficient Ranked Values..... 517

Table L1. Cronbach's Alpha Ranked Values..... 518

Table M1. Cross-tabulation Analysis Results: RQ 2..... 512

List of Figures

Figure 1.1 Key Themes and the Theoretical and Conceptual Framework 12

Figure 1.2 Aims and Objectives of the Study 13

Figure 1.3 Variables Contributing to the Effective use of Online Learning 13

Figure 1. 4 Elements Relative to the Development of the Research Questions 20

Figure 2.1 Theoretical and Conceptual Framework that Guided the Study……..26

Figure 2.2 Benefits of Online Learning in Primary Education 61

Figure 2.3 Online Learning and Soft Skills Development 66

Figure 2.4 Impediments to Online Learning in Secondary Education 66

Figure 2.5 Benefits of Online Learning in Tertiary Education 69

Figure 2.6 Elements Contributing to Successes in Online Learning 72

Figure 2.7 Learner's Expectations During Online Learning 75

Figure 2.8 Historical Moments in the Use of Online Education 110

Figure 2.9 Technology and its Role in Vocational Skill Training 118

Figure 3.1 Abduction Paradigm Application in the Study 139

Figure 3.2 Links Between the Paradigms and the Research Designs 139

Figure 3.3 The Secondary Research Transmission During the Study 144

Figure 3.4 Data Collection Method Used During the Primary Research 150

Figure 3.5 Qualitative Data Analysis Stages During the Study 156

Figure 3.6 The Overall Research Design 157

Figure 3.7 A Description of the Counties of Jamaica 164

Figure 3.8 The Sampling Design Used with the Study 170

Figure 3.9 A Positive Relationship Depiction of Pearson's Coefficient 180

Figure 3.10 A Negative Relationship Depiction of Pearson's Coefficient 181

Figure 3.11 A Zero Relationship Depiction of Pearson's Coefficient 181

Figure 3.12 Pearson's Coefficient Value at Each Range 196

Figure 3.13 The Grounded theory Analysis Steps 202

Figure 3.14 Data Analysis of Archive Reports 204

Figure 4. 1 Cronbach and Meehl's Validity Test for Research 216

Figure 4.2 Demographic Variables in the Quantitative Primary Research 221

Figure 4.3 19-to-65-Year-Old Results from the Survey: RQ 1… ……..226

Figure 4. 4 15-to-18-Year-Old and Opinionnaire Results from the Survey: RQ 1..... 227

Figure 4. 5 Content Analysis: Word Cloud Results for RQ 1..... 236

Figure 4. 6 Content Analysis: Tree Map Results for RQ 1 237

Figure 4. 7 15-to-18-Year-Old and Opinionnaire Results from Students: RQ 2..... 240

Figure 4. 8 Results from the Opinionnaire from Institutions: RQ 2..... 242

Figure 4. 9 19-to-65-Year-Old Survey Results from Students: RQ 2..... 243

Figure 4. 10 19-to-65-Year-Old Survey Results from Institutions: RQ 2..... 244

Figure 4. 11 Content Analysis: Word Cloud Results: RQ 2..... 253

Figure 4. 12 Content Analysis: Tree Map Results: RQ 2 254

Figure 4.13 15-to-18-Year-Old and Opinionnaire Results: RQ 3..... 259

Figure 4. 14 19-to-65-Year-Old Survey Results: RQ 3..... 261

Figure 4. 15 Content Analysis: Word Cloud Results: RQ 3..... 269

Figure 4. 16 Content Analysis: Tree Map Results: RQ 3 270

Figure 4. 17 15-to-18-Year-Old and Opinionnaire Results: RQ 4..... 272

Figure 4. 18 19-to-65-Year-Old Survey Results: RQ 4..... 274

Figure 4. 19 Content Analysis: Word Cloud Results: RQ 4..... 283

Figure 5. 1 Implications for Practice..... 319

Figure 5. 2 Main Aims of the Study..... 354

List of Abbreviations

Acronyms	Meaning
AECT	Association for Educational Communication Technology
AERA	American Educational Research Association
CAP	Career Advancement Program
CaPRI	Caribbean Policy Research institute
C-CETT	Caribbean Centre for Excellence in Teacher training
CEF	Caribbean Education Foundation
CGT	Constructionist Grounded theory
COIL	Collaboration Organization and Leadership
COL	Commonwealth of Learning
COVID-19	Coronavirus (COVID-19) Pandemic
CPD	Continuing Professional Development
CSEC	Caribbean Secondary Education Council
CXC	Caribbean Examination Council
DLIP	Digital Literacy Intervention Program
EEH	Expanding Education Horizons
EET	Education Transformation Team
ESP	Primary Education Support Project
GATTS	General Agreement on Trade and Services
GoJ	Government of Jamaica

GT	Grounded theory
HEART TRUST/NSTA	Human Employment and Resource Training Trust/National Service Training Agency
IBM SPSS	Statistical Package for the Social Sciences
ICT	Information and Communications Technology
IP	Internet Protocol
JIS	Jamaica Information Service
JMD	Jamaican Dollar
JTAC	Jamaica Telecommunications Advisory
JETC	Jamaica Education Transformation Commission
LIME	Landline, Internet, Mobile, Entertainment
LMS	Learning Management System
MIT	Massachusetts Institute of Technology
MoEY	Ministry of Education and Youth
MOOC	Massive Open Online Courses
n	*The number of cases (found in a subsample)*
N	The total number of cases
NEI	National Education Inspectorate
OECD	Organization for Economic Co-operation and Development
OU	Open University UK
PEP	Primary Exit Profile
PIOJ	Planning Institute of Jamaica

SD	Standard Deviation
SDG4	Sustainable Development Goal 4
SPSS	Statistical Software for the Social Sciences
STATIN	Statistical Institute of Jamaica
TIS	Tablets in Schools
TVET	Technical and Vocational Education Training
UAF	Universal Access Fund
UK	United Kingdom
UNDP	United Nations Development Program
UNEP	United nations Environment Program
UNESCO	United Nations Educational, Scientific, and Cultural Organization
UNFPA	United Nations Population Fund
UNHCR	United Nations High Commissioner for Refugees
UNICEF	United Nations Children Emergency Fund
UNJ	Universitas Negri Jamaica
UREC	Unicaf Research Ethics Committee
USA	United States of America
USAID	United States Agency for International Development
USD	United States Dollar
USF	Universal Service Fund
USP	Universal Service Provision

Utech	University of Technology, Jamaica
UWI	University of the West Indies
VLE	Virtual Learning Environment
WTO	World Trade Organization

CHAPTER 1: RESEARCH PROPOSAL

1.1 Introduction

John Dewey stated that “If we teach today as we taught yesterday, we rob our children of tomorrow” (as cited in Goodreads, 2020, pp. 9). Education has been promoted as the foundation of any society’s progress and sustainability; that is passing on information, expertise, values and attitudes that are essential for growth and development (Gobby & Millei, 2017; Jennings, 2018). Subsequently, it is vital to create innovative ways to increase access to educational programs; and adapt various delivery modes for learners to access learning that supersedes the traditional classroom setting.

Almeida and Simoes (2019b), Bartley-Bryan (2017), Miranda et al. (2021) and Patel and Patel (2017) shared this notion that the adaptation of different learning modalities has led to the development of the innovative use of the computer. As a result, the advancement of smart technologies has been used in restructuring instruction methods, by way of online learning through shared networks and technological resources globally. Dhawn (2020) and Heng and Sol’s (2021) studies also emphasized the clarification and definition of online learning to embody learning using content and people powered by the Internet, which can be the open school concept, instructor-guided learning, or course content developed to offer learning without an instructor, both made available via the Internet. Almaiah et al. (2020) and Burkle and Cobo (2018) further affirmed that the employment of these technologies can be used to increase access to teaching and learning by digitizing instructional techniques and modes.

Consequently, considering recent developments in technology, the exploration of the integration of ICT tools in educational programs may be able to provide access to the

learner for participation in skills training and academic programs, regardless of situational factors, which is critical in education. Although Tadesse and Muluye's (2020) study reported that attempts have been made to reform access to instruction using ICT systems, adoption is limited for countries like Ethiopia where 80% lack access to electricity and the Internet. Alenezi, (2019) and Dotterer et al. (2016) added to the argument that there was an exclusive implementation of online learning in some schools; rather than an inclusive application within education sectors in many countries worldwide. This was accounted for as an impediment and is a by-product of various situational constraints that culminate in serious educational challenges.

Central to these findings, are recent educational responses to the COVID-19 pandemic are an example, as instruction within traditional classrooms became taxing (Basilaia & Kvavadze, 2020; Kanwar & Daniel, 2020; Nambiar, 2020). Home's (2020) study also highlighted that the existing online learning systems have brought into sharp relief the digital divide between various social groupings in many countries. Moore et al.'s (2018) study asserted that the focus was on the difference between members of the public equipped with access to and information about technology, compared with those without this opportunity. Similarly, the Jamaica Education Transformation Commission (2021) reported that as it relates to access to education, digital inequality is widespread in Jamaica. The report further noted that access to education was segregated into two groups, one group for students of the high socio-economic status and the other for learners of lower socio-economic status. The later is said to be failing in high percentages.

By way of another example, 80% of students' learning has been negatively impacted in minority groups (Abascal et al., 2016; Malhotra et al., 2018; Van Lancker &

Parolin, 2020). Additionally, Trust-West (2020) cited California in the United States of America (USA) as reporting that 50% of low-income families and 1 in 6 students are unable to participate in online learning because of the absence of the Internet at home. Ali (2020a) and Daly et al. (2020) warned in their study that the emergence of these inequalities has heightened urgency for the employment of ICT tools more comprehensively as a solution to providing a platform for entrance into online instructional courses. On the other hand, there is an increased use of mobile telephones globally which has provided more access to online learning to students (Latif et al., 2019). Additionally, the growing employment of learning management systems (LMS) and virtual learning environments (VLE) for accessing education has accelerated tremendously (Khlaisang & SongKram, 2017). Hence, this research proposes the inclusive use of online learning across public primary, secondary, and tertiary schools in Jamaica, as a means of increasing access to education.

There are about 15% of the countries in the Caribbean that speak English (KeyCaribe, 2023). Jamaica has the greatest population of English speakers, and the population is the third largest (United Nations, 2023c). The education system in Jamaica has (*n* = 999) public institutions and (*n* = 595) private institutions (Statistical Institute of Jamaica, 2017). The cost of education for individual learners is high for low-income families, as the minimum wage is between $9,000 and $13,000 Jamaican dollars (Patterson, 2019a; Williams, 2023). Additionally, pre-primary education may cost parents $8 000 to $30,000 per child; primary education $15,000 per child; secondary education $30,000 to $70,000 Jamaican dollars per child; and higher education fees in the six-figure range (Carter, 2015) despite education being subsidized by the government. The result is that a number of students are failing to finish secondary school as in recent years about

70% left without credentials. This learning loss at the secondary level of education is a pivot from the 59% and 45% of primary school students failing to attain proficiency in mathematics and English respectively. In addition, the poor economic performance of the country has spiraled into social ills that impact learner's ability to have consistent access to education (The Jamaica Education Transformation Commission, 2021). At the tertiary education level, a mere 27% enrollments were mostly due to low socio-economic status. Jamaica has also been described by organizations like the World Bank as having unsatisfactory performance rates despite the high enrollment in education. This has culminated in a diminishing Human Development Index level for the country (Hylton & Hylton-Frazer, 2022; The Jamaica Education Transformation Commission, 2021; The Ministry of Education and Youth, 2022f). Bourne and Owen-Wright's (2018b) study had also earlier found that about 75% of secondary institutions islandwide were not proficient.

Moreover, there have been some great strides made by the education system in Jamaica. However, comparatively there are also some difficulties, such as the fact that a number of students do not complete secondary school (Bleeker & Crowder, 2020b; Bourne & Owen-Wright, 2018b; The Jamaica Education Transformation Commission, 2021). In addition, there are marked differences related to the achievement of female students versus that of male students where two thirds of males fail mathematics and are half illiterate by the end of primary school. In a recent publication by the Planning and Development Division, the Ministry of Education and Youth (2022f) and the Jamaica Education Transformation Commission (2021), reported that there was a marginal attainment of the various educational goals in the classrooms and in national examinations. Furthermore, the division reports a misalignment between the types of

workers the Jamaican education system produces in comparison to the needs of the Jamaican labour force. The report asserts that there is a learning gap of four and a half years after an adjustment for quality learning relative to the primary and secondary levels. The minimal learning achievement is indicative of some structural difficulties plaguing the Jamaican education sector.

After a detailed examination of some of the structural and literacy problems facing the education sector in Jamaica, the Ministry of Education and Youth (2017) reported that initiatives were geared towards injecting funding in public schools to provide more access to ICT in learning. A program has been initiated to ensure that incoming trainee teachers are competent in instructional technology. Furthermore, according to the Ministry of Education and Youth (2023g) the current Minister of Education is charging teachers in Jamaica to use technology in the classroom more deliberately. In addition to this, projections were made for more investment by the Government of Jamaica (GoJ) into ICT for education to enhance learning.

Furthermore, the Jamaica Information Service (2021c) has divulged that in 2019 the Primary Exit Profile Examinations results showed that 40% of students were proficient in mathematics, 55% in language arts, 49% in science, and 63% in social sciences. A comparison to the 2022 results shows that 45.9% of students are proficient in mathematics, 33.9% in science, 37.2% in social sciences, and 62.7% in language arts. Although, at the beginning and developing levels there was 49.2% for mathematics, 46.2% science, 46.7% social studies, and 22.9% language arts (See Appendix A). Additional analysis of students' achievements reported that 45% of boys and 56% of girls are proficient in mathematics.

There were more males at the beginner and developing levels than females. Blackman's (2021) study also cited boys being more at risk for learning losses than girls.

Moreover, the Ministry of Education and Youth (2022f) reported that in 2021, language arts results showed that males 68.5% and females 86% were at proficient levels while at the beginning and developing levels 31.5% for boys and only 14% girls. On the other hand, the secondary exit examination for public schools, the Caribbean Secondary Examination Council (CSEC) reported 2021 results in mathematics 34.8% and language arts 71.1% (Ministry of Education & Youth and Information, 2021c).

Furthermore, Jamica's school attendance data at the secondary level age 12-to-18 years-old, reveals a mere 75% up from 67% in 2020, and higher education approximately 27% in comparison to the United States and Canada (89% and 84% respectively) (Jamaica Education Transformation Commission, 2021; OECD, 2020b). However, the primary school's attendance rate is much better, at 97% on average (World Education News Review, 2019; World Health Organization, 2018). The Ministry of Education and Youth (2023g) has cited a post-pandemic absenteeism problem in Jamaican public schools. The current Minister of Education warns that learning losses will be ineffable if this problem is not corrected.

In addition, the Ministry of Education and Youth (2022e) and the Jamaica Education Transformation Commission (2021) have sought as part of the Jamaican 2030 Goals initiative to improve the education sector in Jamaica. Most importantly, a proposal has been put forward to use intentional and deliberate reforms that will increase and improve performance and attendance at the secondary level of education, especially for underserved students. One hundred and fifty-nine million dollars have been invested into

the Jamaica Education Transformation Program to increase access to quality education (Ministry of Education and Youth, 2023g). Additionally, the aim is also to increase access to quality education through the creation of STEM schools in collaboration with the National STEM Education Report, the British Council, the National Education Trust, and a UK-based STEMunity.

Central to the need for educational reforms in Jamaica, programs have been piloted through online learning initiatives at all levels of schooling through the E-Learning Jamaica Limited organization (e-Learning Jamaica Limited, 2020), developed by the Ministry of Energy, Mining, and Technology which oversees island wide online learning. There is evidence that ICT infrastructure has been implemented in some areas. Furthermore, the government of Jamaica (GoJ) has invested and will inject more funding into ICT for education to enhance learning. However, a lack of comprehensive access to online learning platforms and the necessary infrastructure to support this mode of learning is still not reached. Therefore, in the current study students and education leaders were recruited as respondents and participants from the primary, secondary, and tertiary levels of education. The respondents and participants provided data relative to each level of education about the feasibility and success for online learning at the various school levels.

In conclusion, an urgent need exists to shed light on the need to provide equitable distribution of opportunities for learners' access to online instruction across public primary to tertiary education. Studies by Bleeker and Crowder (2020b), Blackman (2021), and Tinidigarukayo (2014) have shown that ICT for education strategies in Jamaica is mainly available in urban areas. There are approximately 44.6% of Jamaica's population living in rural areas where online learning has proven to be challenging. This is despite the

initiatives in ICT as far back as 2011 by way of the National Education Strategic Plan for the development and implementation of ICT for learning policy. Comparatively, before the emergence of the COVID-19 pandemic intentional action plans were put in place to improve connectivity to the Internet in Jamaica. Online learning in Jamaica is currently delivered through offline servers, the adoption of a learning management system (LMS), and Google Suites for education learning. To this end, policies were created and disseminated to the various schools and teacher training to offer online instruction and e-resources is still ongoing.

1.2 Statement of the Problem

Most learners in Jamaica are enrolled in public schools (STATIN, 2017a). As a result, there is a problem with access to education and training in the public education sector. This has far reaching effects on the progress and sustainability of the Jamaican economy (Dodman, 2021). Unreservedly, this problem cannot be left unattended, intentional and deliberate educational reforms are imperative for its elimination or reduction. Concurrently, this may minimize some of the social problems that are derailing the economic progress of Jamaica in securing the highest standard of living for Jamaicans (Jamaica Education Transformation Commission, 2021).

Bleeker and Crowder (2020b), Blackman (2021), and Almaiah et al.'s (2020) studies have also affirmed that there is a problem in connecting learners to more opportunities for accessing training and educational programs in public schools across primary to tertiary education in Jamaica. The Jamaica Education Transformation Commission (2021) also reported the same problems. Some evidence of this problem presented in the number of youths aged 15-29, which represents 29% of the Jamaican population and 42% of the

working population with a high level of unemployment and underemployment owing to, in part, a lack of formal training.

There are also 18% of youths not registered at the secondary level which has an enrollment rate of 75%. A tragedy was created at the primary level of education where about 59% and 45% of the learners fail mathematics and language arts respectively. The National Education Inspectorate has also deemed only 55% of schools in Jamaica proficient. This is further compounded by Jamaica's underperforming economy leading to several social problems that impact access to education in public schools.

Additionally, the emergence of the COVID-19 pandemic for immediate improvements in online learning, has provided an opportunity for the continued use of online learning in public schools. Equally important, is the widespread use and access to mobile technology which has further enhanced the feasibility of successful online learning (Correa et al., 2018; Harris et al., 2020; Nikolopoulou et al., 2020). Although, the attendance data has indicated that there is still a problem with access to the Internet, only 74.8%, representing (n = 997) of the (N = 1,332) public primary and secondary schools have access to the Internet (Jamaica Education Transformation Commission, 2021). This has highlighted the gaps related to connectivity across Jamaica. Hence Jamaica is still behind other countries as it relates to ICT for education and the digitalization of its learning process (Jamaica Education Transformation Commission, 2021; Ministry of Education and Youth, 2023g). However, this problem with access to the Internet has been steadily improved through the new implementation of ICT infrastructure and programs that offer free access to the Internet and devices (Jamaica Information Service, 2019b; the Ministry of Education and Youth, 2023).

Furthermore, this lack of access to training and education can also be traced to teacher shortages at all levels of education (Cross et al., 2011; Gulpers, 2013; Thompson et al., 2023). These are profound impediments, despite the adaptation of several educational reforms such as the Task Force for Education (2004), the Early Childhood Commission (2003), and the Expanding Education Horizons (2008). There is still a problem in Jamaica of the social exclusion of marginalized groups, students from lower socio-economic status, residents in rural areas, and working adults who lack access to public education and the Internet (Jamaica Education Transformation Commission, 2021; Malhotra et al., 2018; Nkula & Krauss, 2014).

Magnified by the exclusive offering of online learning in some schools. An example of this is the national e-learning project for high schools limited by connectivity issues (Charlton-Laing & Grant, 2012); and the Tablets in School Program (TIS) which is constrained by a lack of adequate funding (Kelly-Williams et al., 2017) across public schools. Many learners in Jamaica across public primary, secondary, and tertiary institutions are excluded from education (Crawley et al., 2020; Hibbert, 2020). Additionally, some schools are responding arbitrarily instead of strategically to emerging online learning demands (Crawford et al., 2020; Mohan et al., 2020).

This issue has been impeding the economic progress in Jamaica, which the European Union (EU) has deemed instrumental for an economy to develop the ability to compete in the global marketplace. The results are school dropouts, rural-urban migration, less productive human capital, and other social problems in Jamaica (Jamaica Education Transformation Commission, 2021; Ministry of Education and Youth, 2017b; Tinidigarukayo, 2014). These developments indicate the need for more access for learners

ranging from the primary to the tertiary level of education, online learning may be a possible solution for Jamaica.

1.3 Purpose of the Study, Research Aims, and Objectives

1.3.1 Purpose of Study

The primary purpose of this study is to determine the usefulness of online learning in widening access across public primary, secondary, and tertiary education and to measure the extent of the participation of these learners and institutions in online education. A secondary purpose is to deduce the effectiveness of online learning in engaging learners across public primary, secondary, and tertiary education in Jamaica and to determine the factors impeding instructional approaches through online learning.

The study will highlight the value of ICT tools in connecting and engaging learners effectively towards the achievement of academic performance and skill acquisition, through online learning. United Nations (2015a) and Casanova and Price (2018) support the notion that the effective use of ICT tools is the key to attaining economic prosperity globally

1.3.2 Aims and Objectives of the Study

Accordingly, the overarching aim of the study is (1) to conduct an investigation into ICT's use for widening access to online learning; and (2) to gather valid and reliable data to reveal the connections between ICT tools and their impact on widening learners' access to training and educational programs in Jamaica (see Figure 1.1). A secondary aim is to establish the value of ICT tools in engaging learners and identify some challenges faced with these systems in virtual classrooms across Jamaica (see Figure 1.2). Therefore, the specific objectives of the study are to:

1. Measure the effectiveness of online learning in widening access to public education in Jamaica.
2. Examine the difference in attitude between learners and education leaders in these institutions towards online learning within the Jamaican public education system.
3. Evaluate the effectiveness of online learning classrooms in providing quality training and education.
4. Identify factors that hinder the comprehensive utilization of online learning in providing access to public education throughout Jamaica.

Figure **1.1**

A Conceptual Analysis for Expanding Access to Education with the Use of Online Learning.

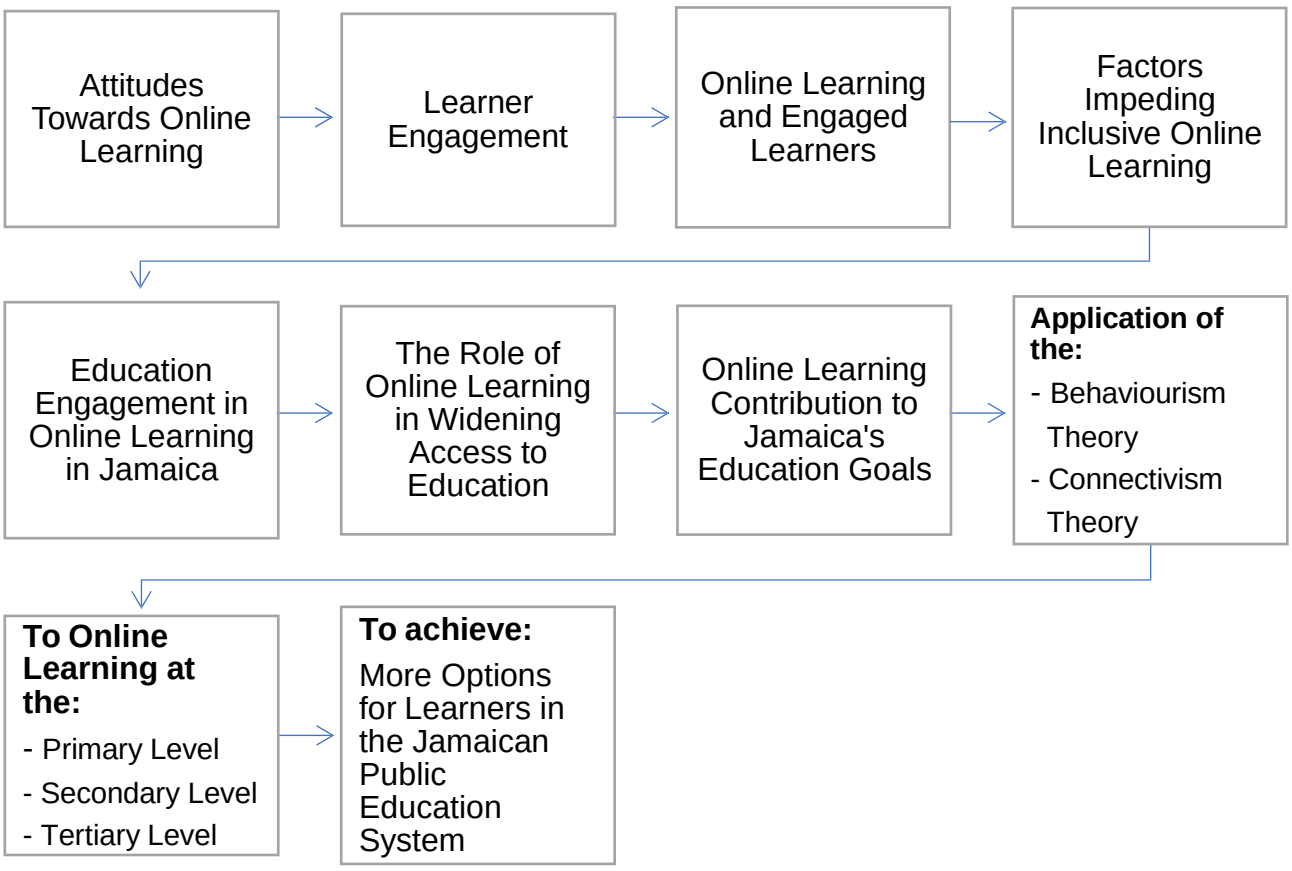


Figure 1.2

Depicting the Aims and Objectives of the Study.

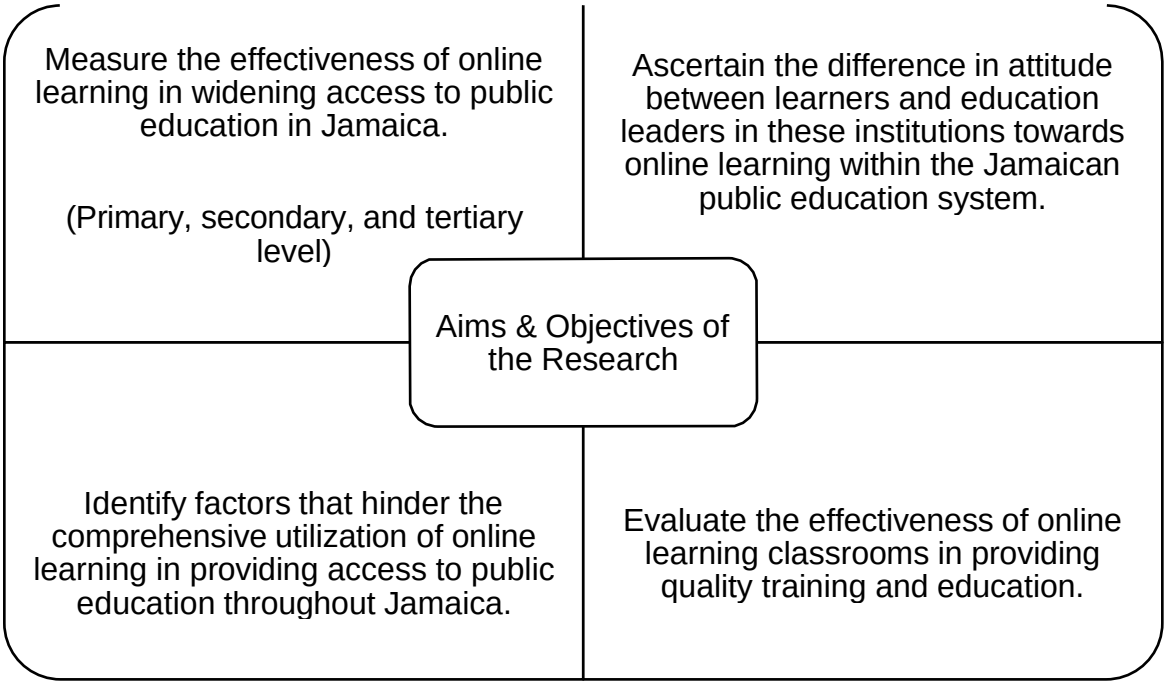
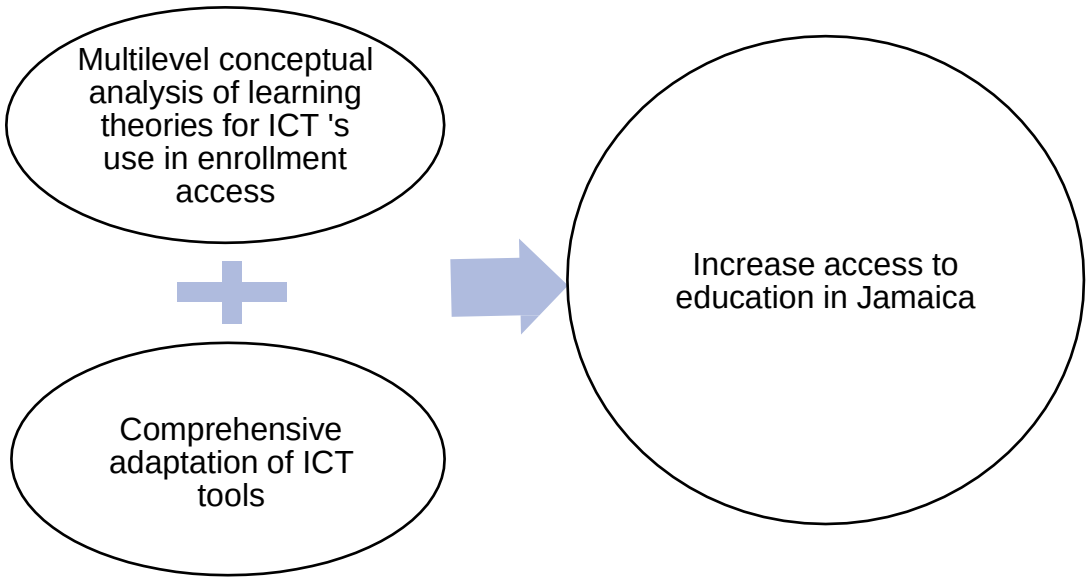


Figure 1.3

Variables Contributing to the Effective Use of ICT Tools in Jamaica



1.4 Nature and Significance of the Study

1.4.1 Nature of the Study

As illustrated in the preceding sections, although ICT usage has grown over the years much research is needed to advise feasible ways of mobilizing its use towards greater utilization of its many benefits in education (Akinde & Adetimirin, 2017; Gil-Flores et al., 2017; Kelly-Williams et al., 2017). Casanova et al.'s (2018) study supported the notion that to advance ICT tools for the achievement of a comprehensive offering of online learning, policymakers in their respective countries should develop an effective action plan that details the implementation as well as regular maintenance and upgrading of the technologies. Bhattacharjee and Deb (2016) and Ghavifekr and Rosdy (2015b) confirmed that the application of ICT to online learning has grown considerably; however, there are still areas in its implementation and use that require revision in order to unlock its full innovation for online learning. Subsequently, Anderson (2018b) and the Jamaica Education Transformation Commission (2021) cited that an in-depth examination is needed to ascertain ICT's distinct advantage for online learning at all levels of education and the problems associated with its application. By way of example, Hernandez's (2017) study urges the need to bridge the gap connected to the digital divide in Jamaica and to make online learning accessible nationally.

The current study has further illuminated the advantages and disadvantages linked to a comprehensive use of ICT tools in increasing access to learning through online instruction. The researcher has conducted mixed-methods research, specifically concurrent nested design, on a sample of Jamaica's population of public educational institutions and Ministry of Education offices. The quantitative primary research used the

descriptive and correlational research designs along with questionnaires for online surveys and IBM SPSS Modeler application software to analyse the data. On the other hand, the qualitative primary research utilized the grounded theory design –Charmaz technique administered through semi-structured interviews with an interview guide and the NVIVO 12 software application used for analysis of the data. The respondents were selected through the use of simple random, cluster, snowball, and self-selection sampling methods. The secondary research used a checklist and content analysis to undertake an in-depth examination.

Taherdoost's (2016a) study corroborated that large populations can be sampled initially using regional division selections with the use a simple random sampling method. Elfil and Negida (2017) and Setia's (2016) studies reported that this method identifies respondents by partitioning the population into geographic locations to form clusters. Consequently, for the current study the sampling method used as it relates to the quantitative primary research design employed a simple random sampling method to select (n = 7) of the (N = 14) parishes in Jamaica. Following this, the cluster sampling method was used to develop a number system to randomly choose public schools and Ministry of Education offices from the clusters. Each public school and Ministry of Education office was chosen per a prescribed number interval to form the final clusters for the study. The process continues with the self-selection sampling method for recruiting the respondents for the surveys.

Rahman's (2016) study deems the inclusion of the quantitative research designs as a part of the mixed-methods approach for the study; as the act of isolating the investigator from the study variables. This has permitted the verification of the data using statistical

measurements. Apuke (2017) asserted that measuring the elements related to the issue using quantitative methods is useful in verifying data where mathematical techniques are used both at the collection and analysis stages. Simms et al's. (2019), study affirmed that the use of measurement scales between 4-7, usually provides the ideal measurement of the study variables compared to the use of a lower number option. Therefore, the investigation has collected data using the online survey approach, employing questionnaires developed with 5-point Likert scale items to achieve a clear measurement of the problem. The questionnaires were used as part of the primary research with participants at the primary, secondary, tertiary, and Ministry of Education offices. In addition, for the qualitative primary research of the study snowball and self-selection sampling methods were applied to the final cluster when recruiting participants. Furthermore, secondary research was conducted using archived documents related to online learning.

1.4.2 Significance of the Study

UNESCO's (2017b) report indicated that internationally, ICT has been recognized as a resourceful strategy for expanding access to learning. The report further encouraged their member countries to embrace the advantage it affords in instruction facilitation. In support of the UNESCO ICT goals, 'Leveraging ICT to Achieve Education 2030'; several schools in Jamaica were introduced to online learning. The COVID-19 pandemic has further prompted the growing urgency for reform in developing countries like Jamaica, to reorganize and advance the modes of instruction to attain a comprehensive inclusion of its citizens and residents (Chawinga, 2016). Accordingly, the study has found that the reform of the modes of learning may assist learning losses at all levels of education, for at-

risk youths and persons with disabilities, reduce school dropout rates, provide skills training for persons in remote areas of Jamaica, and expand continuing education opportunities for working adults.

The study has provided information that may be used to improve education leader's management of schools, develop more qualified teachers, benchmark lesson planning create more engaged lessons within the classrooms, and provide greater access to learners at the pedagogical and andragogical levels of education (Secore, 2017) simultaneously. To this end the study has addressed and introduced feasible implementation options for online learning across primary, secondary, and tertiary education in Jamaica. Furthermore, the study has highlighted an urgency for the improvement and expansion of school support systems, a more equitable access to Internet connectivity in certain areas, and ICT training for all stakeholders. Adam and Tatnall (2017) and Boisselle's (2014) studies have confirmed that research into the use of online learning to provide greater access to training and education can improve school management's effectiveness.

In addition, another finding from the study emphasized the application of the connectivism learning theory whicht affords learners exposure to multiple learning resources (Corbett & Spinello, 2020). Moreover, the study also found value in the employment of the behaviourism learning theory as a guide in implementing online learning. This was found useful in providing students with opportunities for self-paced learning in response to specific educational needs at the primary, secondary, and tertiary levels, Stewart (2021) corroborates this notion. Unreservedly, the findings from the research have produced useful information about the value of ICT tools in increasing entry

for learners into education and training programs across primary to tertiary level education. The study further validates the effectiveness of online learning through the combination of both e-learning and virtual learning for engaging students in quality training and education. Most importantly, educational leaders and policymakers who are responsible for adjusting instructional strategies and modes may use the information as a guide in arriving at pertinent action plans and efficient ways for the implementation, control, and monitoring of strategies for the achievement of an inclusive provision of online learning access nationally. Pandolfini's (2016) and Shvshkinas's (2018) studies have corroborated the usefulness of research in guiding the direction of school reforms related to online learning.

Equally important, the study has provided information about the reliability of ICT tools in powering online learning initiatives that can complement the traditional classroom; help reduce social problems like crime and violence. Pointedly, the study's findings have provided evidence showing online learning initiatives that may provide an alternative way to acquire skills and educate learners. This approach is endorsed by Alaziz (2017) and Chinapah and Odero's (2016) studies which also confirmed the value of the use of online learning to better meet the needs of learners and the workforce.

1.5 Research Questions and Research Hypotheses

1.5.1 Research Questions

Korstjens and Moser's (2017) study cautioned that research questions should encompass the entire issue under investigation. Patino et al.'s (2016) study also further emphasized the need for the research questions to delved into the 'what' and 'how' concerns related to the problem. Therefore, the study is guided by four research questions,

which are wide-ranging and seek to respond to the problem (what) and the purpose (how) of the research, (see Figure 1.3: Figure 1.4). These are as follows:

- Research Question 1: What is the relationship between online learning and increased access to training and education among learners?
- Research Question 2: What are the differences in attitudes between learners and public education Institution leaders toward online learning within Jamaica?
- Research Question 3: Is there a relationship between online learning Classrooms and quality training and education?
- Research Question 4: What is the relationship between impeding factors and the comprehensive use of online learning for accessing education?

1.5.2 Hypotheses

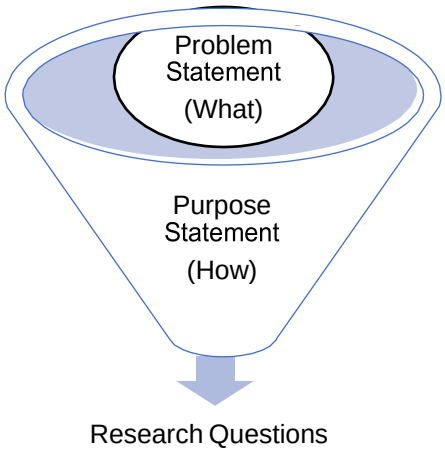
The researcher will use the mixed methods approach to describe patterns between online learning classroom availability (variable 1) and its impact on access to education and training (variable 2) by hypothesizing whether:

- Null Hypothesis 1: Online learning will not increase access to training and education in Jamaica.
- Alternative Hypothesis 1: Online learning can increase access to training and education in Jamaica.
- Null Hypothesis 2: There are no differences in attitude among learners and public education institution leaders toward online learning within Jamaica.

- Alternative Hypothesis 2**:** There are differences in the attitude among learners and public education institution leaders toward online learning within Jamaica.
- Null Hypothesis 3**:** Online learning classrooms may not offer quality training and education.
- Alternative Hypothesis 3**:** Online learning classrooms may offer quality training and education.
- Null Hypothesis 4: Impeding factors are not responsible for the lack of comprehensive usage of online learning in Jamaica's public education.
- Alternative Hypothesis 4: Impeding factors are responsible for the lack of comprehensive usage of online learning in Jamaica's public education system.

Figure 1. 4

The Elements Which Contribute to the Development of the Research Questions



CHAPTER 2: LITERATURE REVIEW

2.1 Introduction

The 2020-2021 COVID-19 pandemic has triggered considerable attention to technology-mediated access to education in Jamaica. Accordingly, this chapter reviews the existing literature and assesses the value of ICT in increasing learner's access to and enrollment in educational and training programs in Jamaica. At the institutional level, a review of studies is used to shed light on the extent to which ICT can be used to increase participation in education in Jamaica. Previous research is consulted to deduce ICT's effectiveness in engaging learners at the classroom level and to determine the factors impeding its adoption in pedagogical methodologies for online learning.

The chapter starts by presenting the theoretical and conceptual frameworks that underpin the researcher's thinking and perspective when reviewing studies. The theoretical and conceptual frameworks guide the literature review process and are discussed at length; through six related themes; (1) online learning and engaged learners; (2) the role of online learning in widening access to education; (3) attitudes towards online learning; (4) education's engagement in online learning in Jamaic; (5) factors impeding inclusive online learning; and (6) online learning's contribution into achieving educational goals in Jamaica.

The study's secondary research needs were addressed through the interrogation of several databases and search engines which were used to ensure a thorough examination of previous research findings and to provide valid and reliable information that could either prove or disprove the assumptions purported by the research questions and hypotheses. A considerable amount of literature has been published about the

problem under study. Therefore, a wide cross-section of peer-reviewed, archived reports and data were studied as part of the literature review. These were accessed from databases such as Google Scholar, Eric, Online Journal of Education, ProQuest, Science Direct, newspaper articles (The Gleaner Jamaica, The Observer Jamaica), reports from government departments (Ministry of Education, and Youth Jamaica (MoEY), United States of America (USA) education system, Jamaica Information Service (JIS), The Statistical Institute of Jamaica (STATIN), organizational records (University of Technology Jamaica, HEART TRUST/NTA), Jamaica National Library, books, archived data and reports from renown organizations for the promotion of education (UNESCO; OECD; COLl; United Nations).

The literature selected was published between 2015 and 2023 along with a few older pieces to contribute contextual data from earlier years. Subsequently, several key terms were used in identifying relevant information (see Table 2.1).

Table 2.1

Some Key Terms Used in the Selection of the Literature for Review Regarding Each Theme Discussed and Evaluated.

	Theoretical and Conceptual Framework	Theme 1	Theme 2	Theme 3	Theme 4	Theme 5	Theme 6
Key Terms	**Education system**	Online learning in engaging learners	Online learning	Attitudes towards online learning	Policies for online education	Education for all	Online learning in meeting education's aims.
Key Terms	**Types of institutions**	Traditional versus online learning in engaging learners	Online learning and increased enrollment	Learner's views about online education	Infrastructure for online learning	Inclusion through online learning	Skills training using online mode.
Key Terms	**Behaviourist view for Instruction and learning.**	Factors influencing engaged learners in classrooms	Online learning in elementary schools	The viewpoint of teachers relating to virtual/online learning	Costs to implement online education.	Factors retarding online learning success	CPD over online learning platforms.
Key Terms	**The connectivist ideology for Schooling**	Virtual learners' performance rates	Online learning in secondary level schooling	Schools' position as it relates to virtual and online learning	Online education funding in Jamaica	variables thwarting online education success in Jamaica	Extending participation in learning employing virtual classrooms.
Key Terms	**Theory**	Contributors for and against online learning successes.	Online learning at the tertiary level	Online learning used within organizations globally	Challenges with online funding, policies, and infrastructure.	elements hindering online education success globally.	Online learning toward achieving education goals worldwide.

2.2 Theoretical and Conceptual Framework

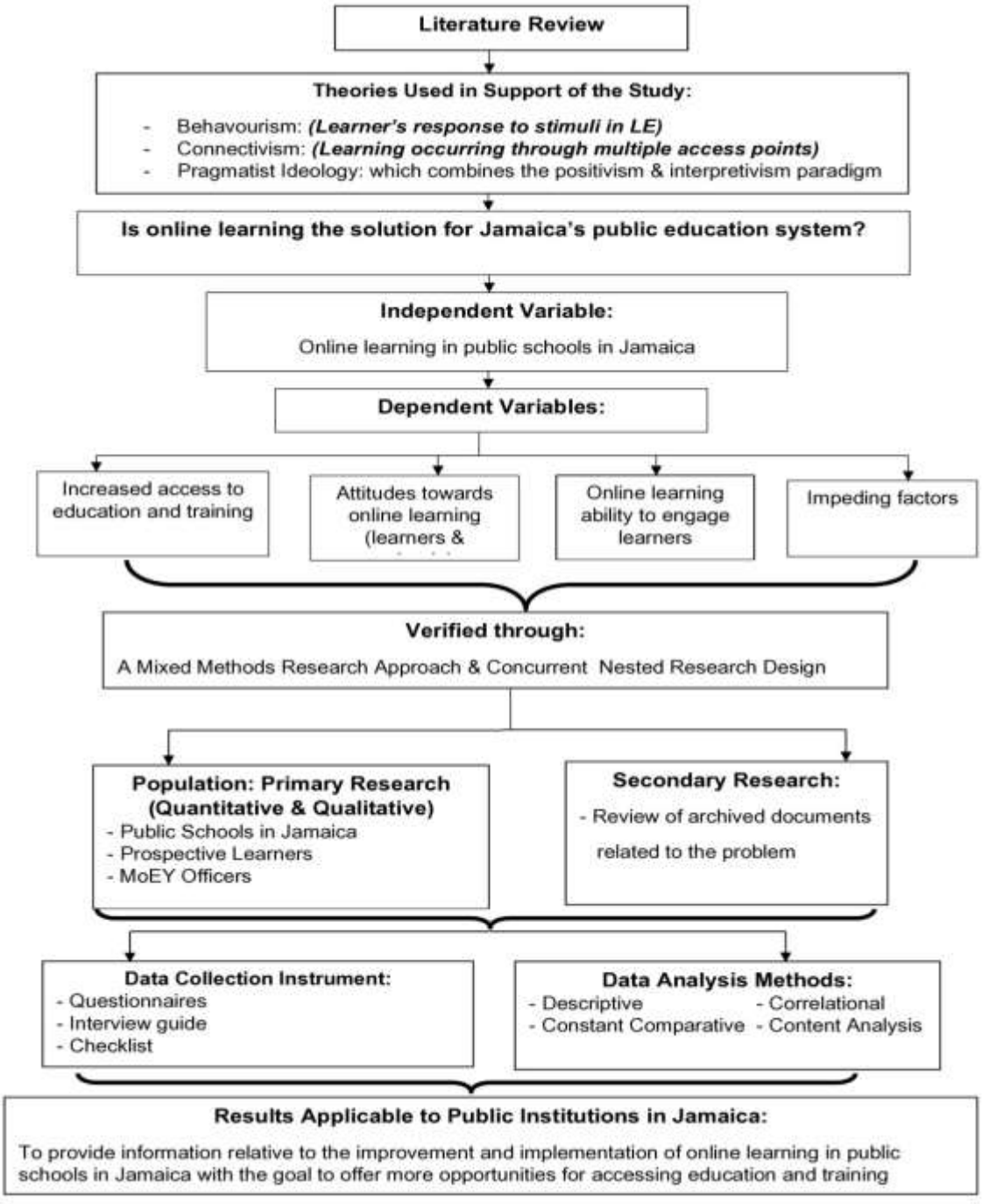
A theory establishes a link between several elements within a situation using information that is known or based on reasonable speculations; but is useless if not verified (Bagozzi, 1982; Locke, 2007; Miller-McLemore, 2016; Thomas, 1997). Theory can reveal the way an individual discerns reality (Abend, 2008), through deduction and induction (Locke, 2007; Rasmussen, 2017). Yet, a theoretical framework goes a step further by providing the blueprint that guides the researcher through the systematic procedure necessary to validate the need for the study. Therefore, it legitimizes the purpose and significance of the research and steers the development of the research questions, to adequately delve into the phenomenon of study. Consequently, the theoretical framework should be visible at every stage of the research process, specifically dictating the literature review, methodology, and analysis targeted for the investigation (Grant & Osanloo, 2014; Lederman & Lederman, 2015). Furthermore, a theoretical framework will influence the choice of epistemological paradigm and ideology used in the search for knowledge (Grant & Osanloo, 2014). Most importantly, the theoretical framework was constructed from the theories related to the study and the relevant industry field in which it can be applied.

In this study, the researcher constructed a multi-theoretical framework that applies the behaviourist and connectivist theories to the phenomenon of study and is framed within both the positivism and interpretivism philosophies directed towards an overall pragmatism paradigm approach (see Figure 2.1). The behaviourism theory will be used to reveal truths embedded in quantitative data and statistical outputs, based on what can be observed in the real world (public institutions in Jamaica). Looking at the relationships among the variables, validated through logical decision-making and gathered from deduction based

on observation in the real world (Taylor & Medina, 2013). Additionally, the behaviourism theory was used to steer the positivist lens for the study by establishing and measuring the scope of the issue by way of statistical collection, analysis, interpretation, and presentation of the data (Picciano, 2017). This was used to ascertain the learner's response to the various learning stimuli inputted in the online learning environment. Furthermore, the behaviourism theory provided a pivot for understanding how learning can be promoted and advanced using online learning classrooms.

Figure 2.1

Theoretical and Conceptual Framework that Guided the Study



Murtonen et al. (2017) describe behaviourism theory when used in education as a tool used to define learning outcomes within a learning environment that is prescribed and directed towards achieving set learning targets. Sidney (2015) further posits that these targeted behaviours are confirmed by the display of compliance or non-compliance with these prescribed objectives. Masethe et al. (2017) add to the behaviourism requirement by emphasizing that learners are expected to respond to the set objectives, followed up with an evaluation using statistical measurement to ascertain achievement levels. However, Sidney (2015) highlighted that expected behaviours are rewarded or reinforced, while negative ones are discouraged through the administration of corrective measures after careful evaluations. Yusra et al's (2022) study affirmed that the behaviourist learning theory ideology believes that learning is possible depending on the stimulus injected in the learning environment and the quality of the response exhibited by the learners which is measurable. Therefore, learning is identified through an assumed change in behaviour that can be quantified.

On the other hand, the connectivism theory ideology within the conceptual framework, has championed the belief that learning is directly impacted by collaboration between learners and practitioners through networked information resources (Goldie, 2016). Therefore, the connectivism theory was used to buffer the shortfall of the behaviourism theory which does not take into consideration the psychosocial behaviours of stakeholders in the learning environment. Additionally, the connectivism theory epistomelogical underpinning was also unlocked here to permit the voice of the persons affected by the problem, using induction to test the accuracy of the study hypotheses for

further hypotheses and theory development. Moreover, epistemology is described as the mechanisms used to create knowledge and its reliability (Al-Ababneh, 2020).

Central to the underpinnings of the connectivism theory principles, recent studies like MacLellan (2022) acknowledge that the connectivism learning theory is represented as a shifting of instructional practices to include the perspectives of practitioners and learners. Most importantly, the connectivism learning theory highlights the change in how learning can take place and be measured. Deviating from a purely rigid statistical measurement to include a more synergetic approach that includes more collaborative measurements. The connectivism theory premised that learning can be found in diverse opinions, by connecting nodes or sources of knowledge. This can be made possible through machine learning, and by nurturing and maintaining the connections necessary for continuous education via online learning (variable 1) which is intentionally directed towards increasing access to education (variable 2).

Dziubaniuk et al. (2023) further emphasized that the connectivism learning theory is ideal for measuring the effectiveness of benchmarked educational resources in assisting schools to achieve targeted educational goals. Therefore, it may be applied to determining the feasibility of online learning successes within public schools in Jamaica. Specifically, the connectivism theory has provided confirmation as to whether collaboration among many learning points impacts increased access to schooling. Kilag et al. (2023) also support the idea that the inclusion of connectivism learning theory ideologies has guided the identification of whether ICT for education has created relevant links for improving access to learning.

To sum up, ideally, the behaviourism theory will help the researcher to determine the relationship between the elements presented by the variables (online learning and increased access to schooling), proven against evidence gained through objective methods used through the positivism lens (Harvey, 2007). While the connectivism learning theory has provided the perspective of the persons affected by the issue relative to the use of multiple learning nodes and their continuous maintenance. Additionally, how these learning connections impact effective learning is linked to online learning (variable 1) and increased access to education (variable 2).

The multiple theoretical and conceptual frameworks were constructed with the use of positivism and interpretivism ideologies to forge the pragmatism view, converging into a synergetic cohesion of behaviourism and connectivism theories. These two theories were used to form the multi-theoretical framework which seeks to establish the relatedness and/or the existence of the issues raised by the study. Kaushik and Walsh (2019) and Maarouf (2019) support this notion that pragmatism within the conceptual framework brings together the findings from both the quantitative and qualitative data guided by both the positivism and interpretivism views to draw by way of abductive reasoning a determination of the most reliable conclusions from the study (see Figure 2.1).

2.2.1 ector Description

The literature reviewed shows that knowledge has become a commodity in the information age and is used to support the business plans of many firms. Therefore, this research responds to this development and examines the increasing access to enrollment within the education sector with the use of online learning as a strategy for providing the skills demanded by the current workforce. A review of the current education sector shows

that it encompasses both public or not-for-profit institutions and private or for-profit institutions. Verger et al. (2017) estimated the spending on the education industry worldwide at a value of $4.9 trillion and investment in education at $2 billion US dollars. OECD (2022c) accounted further that in 2019 the average spending on learners from elementary up to higher education amounted to $12,000 US dollars. These institutions would take the form of elementary, secondary, community colleges, vocational centres, universities, and ministries of education departments to name a few.

The role of the education system is to produce skilled persons to meet the demands of the workforce and sector, which has three vital elements, (1) the consumers (students), (2) the institutions, and (3) the education professionals (Pat Research, 2020). However, despite efforts globally there is still high unemployment and inadequate funding to realize educational goals, which are essential to survival in the global market (Keep, 2012). Despite the fact that education has been evolving over the years, the newest addition, open education (Palvia et al., 2018; Weller & Jordan, 2018) has been made possible by online learning.

2.2.2 of the Behaviorism Theory within the Framework

The theoretical framework has used behaviorism theory to respond to research questions 1 and 2 (see Table 2.2). Specifically, determining whether online learning can address the learning needs of students; providing learning that allows the transfer and acquisition of knowledge and skills (Ally, 2008). Yusra et al.'s (2022) study also corroborated that with the behaviourist learning theory as the guide for ascertaining learning, a change in behaviour is observed indicative of prescribed conditions. This is made possible depending on the stimulus introduced and the desired characteristics of the

reaction from the learners. Consequently, to illustrate the behaviourist premise, it will be applied to determine whether the online learning content is scholarly and relevant for the acquisition of knowledge with the provision of the right stimulus and conditions (Leeder, 2022). It has emphasized whether assessment is fit for purpose and directed towards the learner's benefit (Ally, 2008; Bose, 2018).

Bradley et al. (2017), Ozerbas and Erdogan (2016), and Yilmaz (2016) evidenced in several studies, that good behavioral proficiency can be cultivated through the self-efficacy element within online courses. Additionally, the behaviorism school of thought promotes that the learner can become more engaged if schools' models consistent teaching, learning and schoolwide accessibility and accommodation of learning (Moosa, 2020). Knox et al.'s (2020) study further suggests that the design of effective courses will appeal to learners and help them develop an appreciation for online learning. In addition, recent research by Kennedy and Nagarjuna (2020) and Parveen and Zamir (2020) has also established that well organized online learning environments create greater success for online students.

Table 2.2

The Research Questions and Hypotheses Transmission in the Theoretical Framework

Theory	Research Questions Addressed	Hypotheses: True or False	Paradigms	
Behaviourism	a) What is the relationship between online learning and increased access to training and education among learners? b) What are the differences in attitudes between learners and public education institution leaders toward online learning within Jamaica?	a) H_0: Online learning will not increase access to training and education in Jamaica. H_a: Online learning can increase access to training and education in Jamaica. b) H_0: There are no differences in attitude among learners and public education institution leaders toward online learning within Jamaica. H_a: There are differences in attitudes among learners and public education institution leaders toward online learning within Jamaica.	**Positivism**	**Pragmatism**
Connectivism	a) Is there a relationship between online learning classrooms and quality training and education? b) What is the relationship between impeding factors and the comprehensive use of online learning for accessing education?	a) H_0: Online learning classrooms may not offer quality training and education. H_a: Online learning classrooms may offer quality training and education. b) H_0: Impeding factors are not responsible for the lack of comprehensive usage of online learning in Jamaica's public education system. H_a: Impeding factors are responsible for the lack of comprehensive usage of online learning in Jamaica's public education system.	**Interpretivism**	

2.2.3 of the Connectivism Theory within the Framework

Similarly, the integration of the connectivism views in the theoretical framework was to address research questions 3 and 4 (see Table 2.2). Bose's (2018) study asserted that connectivism provides a lens for examining whether the organization of lessons and resources for online learning, complements or supersedes the value of face-to-face learning. Bell (2011), Foroughi (2015) and Goldie's (2016) studies supported that the guiding doctrine of the connectivism theory alludes to learning established through linking knowledge resources, technologies and the development of alliances. Also benchmarking information with current trends in society to promote lifelong learning.

Ally (2008), Dziubaniuk et al. (2023), and Kilag et al. (2023) affirmed that the connectivist theory will be ideal for the study in terms of providing relevant context and content for online learning, for learners to readily apply to their personal and vocational needs. Therefore, the concurrent use of the connectivism philosophy, that is, exposure to multiple learning contexts (MacLellan, 2022) coupled with the behaviourist theory where a desired change in behavior is hinged upon the learning environment, objective assessments, incentives, and consequences (Shi, 2022); could indicate how students' and instructors' behaviors should be aligned towards online learning successes. Simultaneously it was directed towards the usage of e-resources and the acceptance of online teaching and learning. This can illuminate the connections between online learning and increased access to training and educational programs in Jamaica.

The connectivism theory has helped to inform the principles underlying the data collection and analysis methods for this study to verify benchmarked practices for online learning among practitioners and learners. Dziubaniuk et al. (2023) and Voskogluo (2022a)

studies have supported that the connectivism learning theory can be used to reveal the strategies relevant for application during teaching practice to develop lessons suitable for online learning and the learners. Considering that the interaction between the online learner and the technology powering the lesson, should be harmonized and cohesive, to achieve the learning goals. Resoundingly, the connectivism theory will help to measure the ability of lesson designs in the online mode of learning to adopt and change with the current demands of the digital revolution and, at the same time provide learners with a reliable way of learning (Omodan, 2023).

This is illustrated by Shrivastava (2018), in his examination of online learning as a tool to improve opportunities for learners to enroll in education courses. He used connectivism theory to analyse networked technology for collaborative learning in various cultural group settings. Shrivastava argues that the connectivism theory may be used to direct the learning environment, if the four steps are followed; (1) establish nodes, (2) create networks, (3) be results driven and tailored to respond to student's needs, and (4) utilize technology. However, he recommended that other theories may be needed to compliment the findings if online learning is to achieve its full potential in teaching and learning.

MacLellan's (2022) study also presents the connectivism learning theory as a learning tool suited for ensuring the learning needs of learners towards competencies demanded from a workforce situated in the digital age. This learning theory acknowledges the need for a shift or reform of teaching and learning practices and a change in the way teaching practitioners are trained. Connectivism learning theory emphasizes that learning has shifted from an individual perspective to a collaborative technique that relies on a more

diverse use of teaching resources and materials. The collaboration among various communities of learners sets the tone for students to become lifelong learners, a necessity for the information and digital age.

Dziubaniuk et al. (2023) also recognize that the connectivism theory of learning is a valuable design tool to help organize the large and changing information pools that schools are expected to interface with for acquiring sustainable education goals at the various levels of education. Additionally, the connectivism learning theory if used to design curriculums or courses can promote more positive awareness among learners about the importance of skill and knowledge acquisition at each education level. Kilag et al. (2023) affirmed further in their study that the connectivism theory of learning is essential in the teaching and learning environment to facilitate schooling, that is, technologies using alliances and collaborative connections are essential for effectively guiding the improvement of students' achievements.

Finally, the connectivism theory was used to establish whether there is a relationship between online learning content delivery through multiple learning nodes and learner engagement. Additionally, whether there are hindrances to the progress of online learning in Jamaican public schools. This was achieved through theory generation, that is, the employment of people's views who are affected by the problem under study to develop theories relative to the interpretation of the problem, why the problem exists, and probable solutions (Lefevre et al., 2019). This approach is illustrated by Bell (2011) who used a connectivism framework to analyse open online learning courses and learners' interactions with various technologies for connecting learning resources without the presence of teachers. However, there are some limitations to this approach, as it relates to concrete

evidence that learning can be derived from technologies only. Foroughi (2015) also raised arguments about the inequality of student readiness to successfully take on their own learning using connectivism ideals. Despite these limitations, Goldie (2016) noted that connectivism is valuable in highlighting the reliability of learning through network technology and e-resources.

In summary, the theoretical framework proposed in this study outlines the theories and philosophical ideologies that guide the research. Wacker (1998) corroborated that the theoretical framework will unveil clear procedures with respect to the methodology, in this instance the concurrent nested mixed methods research approach. Most importantly the research design is selected to match the approach, descriptive and correlational designs for the quantitative primary research and the grounded theory for the qualitative primary research. Also, the theoretical framework as it is framed, is suited for the data collection (online survey, interviews, and reviewing archived data), and analysis methods (correlational, cross-tabulation, measures of central tendency and variability, constant comparative analysis and content analysis). Sunday (2017) and Korey (2013) emphasized that the theoretical framework fashions the hypotheses highlighting various aspects of the issue under study. Wacker (1998) on the other hand, unreservedly, deemed the theoretical framework a system prescribed to guide the study, and was developed with suitable theories, paired with the appropriate paradigms.

2.3 Online Learning Values in Education

Information and the digital age mark the evolution of teaching practice and the introduction of online learning. Recent studies such as Kentnor's (2015) study have revealed that about 65% of educational leaders view online learning as vital to school

goals; resulting from the rapid improvements in technology that impact education everywhere (p. 30). Complementary to this, Anderson T.'s (2016) study highlighted a shift in the role of the teacher from developing skills and imparting knowledge, to being the facilitator in the learning setting within both face-to-face and online classrooms.

Notably, the evolution of the industrial age into the quaternary age, which is characterized by knowledge exchange and digital connectedness has transformed the world into a global marketplace with fierce competition from all contenders (Constantinides et al., 2018). Francescucci and Rohani's (2018) study declared that the two eras brought with them, demands on the education industry to produce a workforce to ably meet the skills needed to work in an ever-changing technologically driven environment. The result of this is a networked and competitive global market among countries which requires innovation in the revision of educational practices, at all levels of the educational system.

UNESCO (2015a) accounted for online learning as one such response to the attainment of the newly developed education goals, that will realize the skills necessary to create the sustainability of economies for future generations. Dhawan (2020) and Mayer's (2018) studies affirmed that it presents a situation where students are given the opportunity to study synchronously and asynchronously using electronic devices connected to the World Wide Web to facilitate entry into these classrooms. Hence, McDaniels et al.'s (2016) study supports the notion that the synchronous aspect of online learning places the learner in direct contact with the tutors and classmates through the virtual classroom environment. Keles and Ozel's (2016) study further asserted that it provides virtual teaching occurring at agreed-upon time spaces, while asynchronous learning encompasses the use of self-

study coupled with learning opportunities with the tutor and peers through social media, blogs, emails, LMS, and VLE.

Palvia et al. (2018) and Yuselturk and Bulut's (2009) studies declared that the idea of online learning was born from the traditional distance education courses conducted through the mail and later with media, like recordings and scheduled online meetings. Huda et al. (2018) further contend that the development of technology through artificial intelligence, which provides smart technology for education like the LMS, VLEs, and interactive education programs (padlet, canva, educaplay, quizlet, kahoot), made it possible to enrich students' learning within the online mode. Researchers such as Knox et al. (2020) and Mayer (2018) have also argued that the successes within online learning can be attributed to the adherence to the behaviourism ideology in ensuring that the online classroom content is interestin and the assessment and feedback are readily available. The application of the behaviorism ideology engendered learners' attitudes in acceptance of the value of learning online by highlighting learner benefits.

Other studies have suggested that the use of connectivism theory and its philosophical approaches has paved the way for learners and teaching practitioners to explore and apply multiple contexts for teaching and learning supported by technology (Aldahdouh et al., 2015; Goldie, 2016; Siemens, 2017). Kizito's (2016) study shows by way of an example where learning is made possible using social interaction online, utilizing one of the connectivism premises of promoting lifelong learning, in the form of self-paced and self-directed learning. Subsequent studies like Tularam and Machisella (2018), disclosed that the learning designs for classrooms have been changed to facilitate face-to-face, synchronous, and asynchronous learning.

Dhawan (2020) adds to the argument by corroborating that the asynchronous mode of learning engages students in self-paced learning using e-resources, to be accessed over agreed-upon learning platforms like the LMS or VLE. In addition, Alves et al. (2017), Ahmady et al. (2020), and Dung (2020) described virtual learning as quite similar but differing in respect of how it is used during the learning process. It refers to the deliberate provision of learning in a virtual space for disseminating and developing content for specific courses. Furthermore, virtual learning resembles traditional classroom characteristics, only now in an online format. Therefore, prudence presupposes that there is a need to address the demands of the competitive global marketplace among countries. Moreover, to forge an economically sound future, educational leaders globally recognized the need to mandate inclusive access to education at all levels within the system (Bourne & Owen-Wright, 2018b; Dube, 2020; Huda et al., 2018; Morris F., 2020; Sanchez-Gordon & Lujan-Mora, 2016; Walton, 2018). The evidence in recent research suggests that ICT integration within the education system is the most viable solution for achieving this goal (Huda et al., 2018; Mayer, 2018).

Tareen and Haand (2020) asserted that the widespread use of online learning today helped to close the gap between learners and access to education, irrespective of location or economic status. Arguably, the subsequent introduction of online learning offered an alternative method of providing access to training and education (Gillet-Swan, 2017). Sweany's (2020) study also disclosed that online education has increased learner access to schooling, as evidenced in research. Furthermore, it was discovered that over 30% of learners are participating in online learning in the United States of America (USA) and 15% of that group study all courses within the virtual classrooms.

Dhawan (2020) postulated that online learning has revealed many benefits to the education system in the form of teaching and learning without time constraints, opportunities to enroll many students, and better use of all resources towards schoolwide goals. This has become a reality since learning online has been advocated as more convenient and advantageous than face-to-face learning in the wake of learners', personal and vocational responsibilities. Palvia et al.'s (2018) study sequenced the adaptation of online learning introduction in four stages, namely, (1) networked aided distance instruction, (2) schools introducing LMS to complement traditional learning, (3) the development of MOOCs globally to support lifelong learning, and (4) increased access to education that resulted in larger numbers of learners opting for online learning compared to the traditional mode of education.

Furthermore, Goldie's (2016) and Utecht and Keller's (2019) studies have confirmed that the innovative prospect of learning online can realize many benefits through the application of the connectivist theory. This is achievable by providing opportunities for learners to acquire and improve their knowledge and skills in multiple contexts. For example, curation software, the use of discussion rooms connecting learners to information resource persons through learning communities, virtual reality technology to provide hands-on experience while studying and incorporating visual and audio media platforms to engage students to name a few.

However, some researchers such as Gillet-Swan (2017) and Gonzalez (2018) are of the opinion that although online learning is valuable it is too focused on access to information resources rather than learning which may result in some learners feeling exiled from the learning process. Gillet-Swan (2017) and Tularam and Machisella (2018) have

also identified several drawbacks in the form of the need for Internet access, frequent technical support, the need of devices to connect to various learning networks, and the training of teachers and students in using the rapidly changing technology to support education in schools. Notably, most of the recent studies have championed online learning as an integral option for education and training in the digital era (see Table 2.3).

Table 2.3

Recent Research Which Emphasizes the Value of Online Education

Research	Context	Setting	Methodological Approaches
Kentnor (2015)	**Online Learning Value in Education:** ▪ Online learning increased usage ▪ Connectivism's views application to lesson designs and execution ▪ Connectivism's views application for the digital age ▪ Impact of technology on academic outcomes ▪ Research informed strategies applied to the development of online lessons ▪ Increased access to education for everyone ▪ Online learning design	Distance education and online learning in the United States	Desk research
Goldie (2016)		Medical education – UK	Desk research
Kizito (2016)		African Higher Education – Africa	Desk research
Palvia et al. (2018)		Online education in North America, Europe, South America, Asia, Asia-Pacific, & Africa	Editorial
Tang and Patrick (2018)		Technology and interactive social media - USA – Secondary Education	Quantitative Research
Seraji et al. (2019)		Blended learning research in Iran	Critical Review
Sweany (2020)		Online courses - Texas – USA	Desk Research
Utecht and Keller (2019)		Connectivism learning theory in Classrooms - K-12 & Tertiary Education	Qualitative Research
Dhawan (2020)		Online learning in schools - India	Desk Research

2.3.1 Learner Engagement

Balliu and Belshi (2017) and Tularam and Machisella's (2018) studies described the traditional face-to-face mode of learning as placing the teacher at the center of the learning environment, and the students to be taught within a physical classroom space. This mode of teaching is practiced at various grade levels from kindergarten to the tertiary level. Balliu and Belshi (2017) further explained that in this mode, the learning process has been associated with the utilization of a range of physical instructional materials controlled by the teacher.

These materials include, the blackboard and chalk, the whiteboard and markers, teacher made posters, the radio, television, projector, and books to name a few. In contrast, the learning materials for the students include notebooks, rulers, calculators, pens, and pencils. More recently, theorists, educators, and learners have been critical of this traditional teaching mode and instructional practices. Khalaf and Zin (2018), Tularam and Machisella (2018), and Voskogluo and Salem (2020b) have raised questions about the effectiveness of the traditional mode of teaching and learning in engaging students in critical thinking. Additionally, traditional learning can ensure the retention of content in the long term, as a preface for the transfer of knowledge, and skills in the workplace.

Recent research has examined the concept of learner engagement and its contribution to achieving educational goals. Rajabalee and Santally's (2020) study affirmed that learner engagement represents a vital component of the learning environment. Therefore, it is important to measure the effectiveness of the teaching methods and modality being employed to determine the degree of learner engagement. The study further establishes that learner engagement can be described as the

commitment of the learner to adopt acceptable behaviours and effect personal intrinsic motivation to learn and acquire skills directed towards knowledge improvement and application to the real world. Furthermore, learner engagement refers to a learner's ability and motivation to become engaged and interact with the class content, instructors and other learners.

Halverson and Graham's (2019) study also corroborate that learner engagement combines the learner's ability to commandeer both their academic and social emotional skills in the completion of tasks, which are introduced in the learning environment. The study emphasized that learner engagement asserts the ability to produce acceptable academic performance, feel a sense of learner satisfaction, and feel a sense of belonging because of interactions with the learning environment. Additionally, learner engagement is recognized in the educational field as "an educational bottom line" (Coates, 2006, p. 36) and "the holy grail of learning" (Sinatra et al., 2015, p. 1).

Padgett et al. (2019) further assert that learner engagement is seen as the foundation of high rates of learner performance and mediates between how motivated learners are in completing class or course activities, that is learners are actively involved in their own learning. This is shown through cognition, motivation, and academic performance achievements.

Bond's (2020) study results reiterate the need to design learning environments to facilitate learner engagement through remodeling of the classroom and supporting the learner in achieving academic and personal goals. The study also cautioned that if students are not engaged it could result in learner dropouts. Therefore, learner engagement is essential in education as it is the foundation that enables high performance

rates, aids student retention, and increases willingness to learn. Furthermore, learner engagement is crucial in answering research question 3 Is there a relationship between online learning classrooms and quality training and education?

Paulenson and McCormick (2020) also confirmed learner engagement as directly connected to the learner's academic achievement, matriculation into tertiary education, critical thinking, and empowerment. Sari (2020) explored the patterns of learner engagement and categorize them into completer, nearly there, mid-way dropout, and sampler groups. The current study looked at the "completer group" in determining the efficacy of online learning for Jamaican public schools. The completer group can be subdivided into keen completers and on time or late completers. The keen completers cover most of the tasks while the late completers finish the tasks, but assignments are handed in late.

Consequently, researchers and educational theorists of connectivism, heutagogy, and threshold concepts, Anderson T. (2016), Dziuban et al. (2018a), Seraji et al. (2019) and Tularam and Machisella (2018) have indicated that the traditional mode of teaching should be complemented with technology for education, in a blended mode that utilizes both face-to-face, and online asynchronous, and synchronous learning, to ensure effective learner engagement. Therefore, in response to the criticisms of the traditional mode of teaching, (Anikina & Yakimenko, 2015; Dhawan, 2020; Hashim, 2018) reported that teaching practices have, evolved to integrate technology in education to complement the traditional classroom instructional materials, as well as using learning activity platforms and programs.

Furthermore, Alcacer et al. (2016), Hashim (2018), and Khan and Majeed's (2020) studies have reported that the advent of the information age has accelerated the integration of ICT into the learning environment. Tang and Patrick's (2018) study affirmed the widespread use of technology for education in the form of smart boards, computer assisted learning, presentation software, e-resources, the Internet, and educational games over many networks. This has been closely followed by the emergence of the digital age of artificial intelligence which led to the development of smart technologies (Butler-Adam, 2018; Knox et al., 2020). These resources may improve learner engagement in the classroom.

Hashim (2018) and Mayer's (2018) studies asserted that these smart technologies have been deemed unbelievably valuable in assisting the teaching and learning process, with the linking of ICT infrastructures to provide educational networks; powered over the Internet and the Worldwide Web. Most importantly, Dhawan's (2020) and Gonzalez's (2018) studies corroborated those stakeholders within the educational industry worldwide have seen both opportunity and benefit in creating teaching and learning platforms, such as, learning management systems (LMS) and virtual learning environments (VLEs). Some of these LMS and VLEs include brands like Blackboard, WebCT, Edmodo, Schoology, 1on1, Moodle, etcetera to support online and virtual learning. In summary, a significant amount of research has foregrounded online learning's versatility in engaging the learner. This feature of the online learning modality has been evidenced across several countries (see Table 2.4).

Table 2.4

Research Highlighting the Engagement of Learners During Online Learning

Research	Context	Setting	Methodological Approaches
Sari (2020)	**Learner engagement:** ▪ Flipped learning and engagement ▪ Online learner engagement ▪ Engagement in online Language classes ▪ Engagement in online Humanities and Technical Studies classes	Engagement in online Language courses - Indonesia	Mixed Methods Research
Bond (2020)		Flipped learning - USA and Asia	Desk Research
Paulenson and McCormick (2020)		Online learner engagement- USA	Quantitative Research
Halverson and Graham (2019)		Learner engagement - USA	Desk Research
Larionova et al. (2018)		Russia – Tertiary Education	Quantiative Research
Sweany (2020)		Texas - USA	Desk Research

2.3.2 Learners Through Online Learning

Larionova et al. (2018) pointed out in their study that online learning can take several forms, namely, classes housed fully online, e-resources for various class access points, synchronous, and asynchronous online classes. Further to this, the online learning mode is versatile, in that, it can offer both synchronous and asynchronous learning for students. These features can elicit greater engagement in learners during the teaching and learning process. Francescucci and Rohani (2018) characterized student engagement as the commitment students exhibit towards their learning, both personally and emotionally, in attaining academic excellence. Thus, Chaudhuri (2019) and Ng (2018) further corroborated that more deliberate engagement of students may rely on the creation of a

twenty-first century learning environment that empowers learners to be resilient in curating and using knowledge and to reinvent themselves, in response to the constantly changing environmental demands.

Subsequently, orchestrating an effective teaching method that will engage learners will depend on the following elements, students' attitudes towards education, social interactions within the classroom amongst peers and instructors, and the empowerment of students to solve complex problems (Dewan et al., 2019). Additionally, Moosa (2020) supports that for students to be engaged, the optimal learning environment must be created by schools with the modeling of consistent operating activities, prescribed for both teachers and students, to unveil favourable performance outcomes.

Most importantly, online learning has been used to enrich the content to be covered by allowing learners to engage with peers, tutors, and e-resources. Additionally, Huda et al. (2018) postulated that it can be used by educators to address the learning needs of their students through a differentiated learning approach evident in the design of the curriculum, lessons, and activities. Moreover, Moosa (2020) and Tandi et al.'s (2020) studies confirmed that online learning affords the instructor a chance to include in courses or lessons, various types and learning levels for lesson activities which are viewed as essential for engaging students in education.

Equally important, is Huda et al.'s (2018) and Sweany's (2020) assertion that online learning promotes the development of critical thinking skills through reflections supported by various teaching strategies like podcasting, email, blogging, journal writing, social learning, and participation in posting lesson reflections on course discussion boards, enhancing and improving learner outcomes. In Sweany's (2020) study, the evidence

suggests that these online teaching and learning strategies help students develop high self-esteem, culminating in high achieving students. Another essential point raised by Arghode et al. (2017) and Picciano (2017) that the way behaviorism theory guides educators in accomplishing this, is through creating online learning structures to accommodate repetitive practice in technological techniques that assist organizational skills, and share examples of successful behaviors, that result in online learning student successes. Additionally, the utilization of video tutorials, game activities, interactive quizzes, and feedback using blogs and discussion boards represents ways in which the behaviorism ideology can be applicable in online learning.

Correspondingly, Moosa (2020) accounted for the reporting feature incorporated in online learning systems that allows for readily available and timely evaluation of students' progress and feedback as valuable. Especially, as it serves this teaching technique by capping greater participation from learners. The relationship has been evidenced in Alves et al.'s (2017) study where 71% of instructors agree online learning is valuable in achieving high performance rates from learners. Additionally, Francescucci and Rohani's (2018) research which was conducted in North America, cites online learning as a major factor influencing an increase in enrollment during 2016 for schooling of over 6 million learners, or approximately 32% of those engaged in an online classroom. This was achieved despite the incidence of hinderances involving mechanical and system problems which Dhawan (2020) and Gillet-Swan's (2017) studies identified as impediments to the online learning process.

2.3.3 ne Learning and its Influence on Learner Performance

Habibi et al.'s (2018) affirmed that the use of VLEs by schools for online learning has enhanced students' learning, because of the variety of features that are provided and the different learning activities that suit a variety of learning needs within the classroom. Waheed et al. (2020) exemplified in their study the use of data mining in measuring learners' performance who were using VLEs. The study, which employed a sample size of (*N* = 32,593) learners, enabled researchers to predict students' achievement or under achievement. This was used to provide information to institutions about the learners which would guide the introduction of interventions where necessary or to learn from the factors that contribute to successful student performance.

Similarly, Al-Azawei and Al-Masoudy, (2020a) asserted that some factors that may determine the level of performance by students will include administrative support, assessment techniques, course design, and how learners are engaged during learning (p. 72). This is corroborated by Rienties and Toetenel's (2016) study that the learning design for online education has been deemed one of the main elements contributing to learners' success in online learning. Alves et al.'s (2017) study also accounted for the fact that VLEs make possible the creation and sharing of information, interaction, and evaluation of the educational process. These online learning platforms (VLEs) are endorsed as reliable and valid avenues, as usage statistics show schools in Portugal ranging at 90% usage, instructors utilizing VLEs amounted to 85%, and learners' usage boasts 83%.

Furthermore, Francescucci and Rohani's (2018) and Toyne et al.'s (2019) studies confirm that the success of students studying online has its basis in the use of a VLE for learning. This belief was also evidenced in several recent studies (see Table 2.5).

Additionally, both studies discovered that online learning was rated at the same high quality as that enjoyed by students exposed to face-to-face learning. The studies further evidence that learners in virtual and traditional classrooms did not show a marked difference in performance level. It was concluded that the accomplishment of students in schools is not dependent on whether they study online or face-to-face but rather on the quality of the learning environment. White et al. (2018) in their study that blended learning indicates greater student success than face-to-face learning. Additionally, Moosa's (2020) study also corroborates that the effectiveness with which instructors can manipulate online teaching techniques will determine the level of student success in mastering the objectives set forth within each lesson.

Table 2.5

Research Providing Evidence of Performance Indicators in Online learning

Research	Context	Setting	Methodological Approaches
Tandi et al. (2020)	**Online education and learner performance:** ▪ Engaging students in online learning ▪ Student performance in online learning ▪ Online communities for education ▪ VLEs and students' performance	Student engagement in online learning – Nigeria	Quantitative Research
Alves et al. (2017)		Student performance in online learning – Portugal	Quantitative Research
Habibi et al. (2018)		Online communities – Indonesia	Qualitative Research
Waheed et al. (2020)		Students' performance on VLEs – Saudi Arabia	Quantitative Research
Al-Azawei and Al-Masoudy (2020a)		Predicting performance on VLEs - Britain	Quantitative Research

2.3.4 ors that Affect the Success of Online Learning

It has been illustrated in the discourse contained in the preceding paragraphs that online learning is a valuable tool to support the learning process at every level of education. However, Sweany (2020) confirmed that despite these attributes it has been hampered by several impeding factors such as learner isolation and its impact on motivation. There is also concern about the difficulties many students and institutions encounter with connecting to a dependable Internet service, and a lack of infrastructure and devices. El Turk and Cherney's (2016) and O'Doherty et al.'s (2018) studies have supported the premise that the online learning environment as accessed by the students in their various locales revealed several problems. For example, disturbance of students's lessons while attending online classes by family members interferes with academic achievement. Tandi et al.'s (2020) study presents evidence of this during the COVID-19 pandemic, where learners engaging in online lessons were frequently expected by parents to babysit siblings and carry out household chores, simply because they were at home. This disregard for the learning space students require is affecting the success rate of online pedagogy. Another issue unearthed by the study about online learning among students is the inability to practice prudence in organizing their workspace and learning habits while participating in online learning.

Vishkaie's (2020) study disclosed that a major challenge encountered was the digital divide among learners which is a persistent problem. This has been experienced by online education and must be overcome if it is to be implemented at all levels of the education system. The digital divide describes the ability of learners to readily access the

Internet while possessing the required technical skills, and devices necessary to take advantage of learning online. Additionally, Palvia et al. (2018) described the digital divide as also incorporating whether schools have been outfitted with the necessary ICT infrastructure, trained staff, policies to direct online learning, and 21st century educational management skills to support students' learning needs online. Sweany's (2020) study reported that deliberate action plans are needed to safeguard against impeding factors related to online learning by ensuring that three variables are present in the online learning environment. These include: (1) access to instructors, (2) consideration of learner needs when designing online lessons, and (3) social interaction during the online learning experience. Therefore, the connectivity issues plaguing public schools in Jamaica especially in rural areas; must be carefully assessed in order to apply a workable solution relative to ensuring access to online classes for the ultimate benefit of the learners.

In conclusion, online learning encompasses synchronous, asynchronous, and virtual teaching and learning. This is made possible through innovation in technology for education which is assisting teaching professionals to better engage, improve performance gains and increase access to schooling globally. Furthermore, the flexibility that online learning affords learners has led to its widespread and consistent use in education and increased enrollment, especially in higher education over the last decade (Daniel, 2016; Stone et al., 2016c). However, there is a need for research to explore how it can be used to provide comprehensive usage nationally from the primary to the tertiary level of education in Jamaican public schools. Correspondingly, Holmes et al. (2019) and Roll and Wylie (2016) affirmed that in the information and digital ages the introduction of artificial intelligence, has made possible smart technologies for use in education. The advancement

in technology for education has further mandated the revision and reorganization of teaching practice to meet the demands of the ever-changing workforce. Furthermore, it is seen as a way of responding to fierce competition within the global marketplace. Regardless, research is lacking as to the best solution for online learning implementation relative to the cultural norms and school level in Jamaica.

Yet again, El Turk and Cherney's (2016) and O'Doherty et al.'s (2018) studies found that despite the value that online teaching and learning brings to the education sector there are several barriers to its full implementation. These impediments against inclusive online learning include a lack of a comprehensive allocation of ICT infrastructure, especially in developing countries. These claims were supported by various researchers in the past (see Table 2.6). Hence, a feasibility study is necessary to determine the implementation and maintenance of the ICT infrastructure, considering the location and the individual needs of each public school in Jamaica. Additionally, Vishkaie's (2020) study also alluded to the digital divide within society which foregrounds the individual's inability to access and use technologies, which is inadequate. Also, many learners who want to participate in online learning have challenges with device ownership and lack of Internet access. Undeterred by these setbacks online learning is the new normal for teaching and learning, especially with the emergence of the COVID-19 pandemic (Chen et al., 2020). Online learning has been advocated as the solution to increasing access to education for all and a way to eradicate illiteracy globally.

Table 2.6

Research Highlighting Some Limitations to Online Learning

Research	Context	Setting	Methodological Approaches
Gonzalez (2018)	**Limitations of online learning:** ▪ Challenges with online learning ▪ Barriers to online learning ▪ Traditional vs online learning	Traditional vs online learning – Ireland	Quantitative Research
Gillet-Swan (2017)		The challenges of online learning – Australia	Desk Research
El Turk and Cherney (2016)		Online education barriers - USA	Quantitative Research

2.4 The Role of Online Learning in Widening Access to Education

2.4.1 Introduction of Online Learning in Schools

Jennings (2017) and the OECD (2020b) declared that in the education system in the Caribbean challenges are frequently encountered in providing quality learning equitably for all learners. Also, access to education is one of the obstacles that must be overcome. A similar dilemma has been experienced across many countries such as Australia, Iceland, India, China, Africa, and the USA in making available access to learning for learners who are challenged by many barriers such as living distances from schools, personal responsibilities (parents), time constraints in enrolling for courses (job responsibilities), lack of devices and a reliable Internet connection (Buchanan et al., 2019; Gilbert, 2015; Jakobsdottir & Jakobsdottir, 2018; UNICEF, 2020a), and insufficient resources within the schools to educate all willing participants or a lack of institutions in certain areas to provide specialized training (Chatelier & Voicu, 2018).

Lydgaard (2020) and Stone et al.'s (2019b) studies postulated that technology for education is advocated as an answer to many of these educational issues in providing

flexible study schedules, engaging learners, and providing online learning that can be accessed irrespective of location. Buyukbaykal (2015) and Kovacs et al.'s (2015) studies argue that this raises the need for these technologies to not only cater to just the audio and visual channels of communication but to include the olfactory and haptic media to capture, engage, and motivate students to become higher achievers. Kovacs et al. (2015) further elaborated that olfactory technology would offer virtual reality, gamification, videos, and social media (interactive platforms) to better respond to the learning styles of students and their diverse learning modes. While haptic technologies allow learners to have direct experiences with learning resources by manipulating objects through sensory responses (camera movement, touch, feel, zoom, move or rotate objects) they transform the learning environment into an interesting and resourceful space for the learner to develop knowledge and skills.

Bhattacharjee and Deb (2016) characterized this shift toward smart technologies as an acceleration of the expansion of the online teaching and learning concept, which is now a reality in most nations globally. The shift in education systems worldwide to adapt to online learning is seen as a vital resource to combat unforeseeable situations that can impede the traditional learning of students. A clear example of this is the COVID-19 pandemic, which has raged across the globe and made it almost impossible to conduct school normally for a time.

Additionally, Kingsbury's (2021) study supports the inclusion of an online format in schooling along with the face-to-face model of instruction, which provides ease of transition between the different modes of learning in the event of situational educational factors. This is evidenced within the OECD countries that have education success due to access to

educational resources through online learning, which is revealing higher performance rates than schools without this resource (OECD, 2020b). For example, in countries such as the USA with blended learning initiatives, Jamaica's e-Ljamprogram for high school students via the 'Notesmaster' hub improves Caribbean Council Examination (CXC) passes (Hendrikz, 2018; Powell et al., 2015b).

Kentnor (2015) reported that the introduction of online learning began in the late 1990s, as an improvement to the popular distance learning offered since the early 1800s. It encompasses the deliberate use of technologies to teach and train learners either asynchronously or synchronously where a minimum of 80% of the course is conveyed via an online format. Camilleri and Camilleri (2017) highlighted that once the benefits and value of online learning were realized from the first piloted ventures, it unleashed a wealth of innovative technologies to develop and sustain the implementation of online learning as a norm within education systems worldwide.

The inception and development of LMS, and VLE, the promotion of open education using Massive Open Online Courses (MOOCs), the inclusion of social media, and other audio platforms have also been used to revolutionize 21st century teaching and learning. Subsequently, making possible online learning to effectively provide access to learners everywhere (Buyukbaykal, 2015; Camilleri & Camilleri, 2017). This has concurrently made available multiple ways of acquiring knowledge from a diverse collection of educational resources available at the fingertips of both students and teaching practitioners alike.

Additionally, Buyukbaykal (2015) charged that the demands from an ever-changing information and digital driven society for a more skilled labour force have led to the charge of embedding online learning not only within the tertiary level of education where it was

first introduced, but also at the secondary and primary levels of education. The widespread use of online learning was progressed with the intention that no learner would be disenfranchised because of a lack of access to training and education programs. Furthermore, many of the other sectors within the economy have recognized the benefits of adapting online learning for their employees. This includes benefits such as equipping them with up-to-date skills needed for the job.

In medicine Tang B. et al. (2018) and Waseh and Dicker (2019) championed online learning as very important at the core of assisting medical professionals in their training and practice for troubleshooting and solving problems. This situation was made possible as a result of real time interaction with experts around the world through online collaboration. Correspondingly, UNESCO (2021h) has accounted for the onset of the COVID-19 pandemic by highlighting the versatility of online learning in ensuring that education is continuous irrespective of time, distance, and situational learning circumstances.

Bhattacharjee and Deb (2016) equate the promotion of ICT usage through the length and breadth of many countries to having laid the foundation and provided the necessary infrastructure (networked equipment, telecommunications services, computing, facilities, electricity, technological platforms, content platforms, and communication and information technology services) to host online learning and to expand its usage from a few institutions, to most, offering online learning as a way to increase access to schooling.

Furthermore, Anderson T. (2016) and Picciano (2017) asserted that the development and widespread use of online learning in increasing access to training and education have prompted researchers to articulate new theories of learning. These

theories include the connectivism theory, online collaborative learning, and community of inquiry which may guide the effective transformation of teaching and learning from a purely traditional focus on learner needs. A theory focused on all aspects of online learning is still a work in progress as researchers are still revising these theories to respond to new discoveries about the complexities of virtual classrooms.

Nowadays, learning has been revolutionized into a choice of a purely online learning environment or a blended learning choice, which combines both online and face-to-face learning modes. Education barriers have been broken down by the inclusive use of online learning around the world. One of the major benefits is its ability to educate learners irrespective of borders, culture, time, and distance. The essential prerequisite is to enable learners to connect to the Internet. Research by Nguyen (2015) indicates a 92% reliability rating for online learning in competently educating students and a mere 3% disagreeing.

2.4.2 ne Learning in Primary Schools

Household access to the Internet has been increasing globally. A snapshot of the situation reveals that the percentage of the global population with regular connection to the Internet is as follows, 93.4% in North America, 70.1% in Australia, Europe 89.2%, Africa 23.2%, Asia 67%, Latin America and the Caribbean 80.5%, the Middle East 77.1%, and the overall world Internet penetration is 67.9% (Internet World Stats, 2023b). Comparatively, OECD countries like Jamaica only account for 65% of learners attending schools with digitized learning (OECD, 2020b). However, the numbers shown for the USA, Australia, and the UK point to the feasibility of online learning in providing more access to education for primary school-aged children. Furthermore, Buchanan et al. (2019) and Forbes (2019) reported that most children aged five to twelve own or have access to a

smart phone, tablet, or laptop in most countries, which means that they have some technological skills to operate them, providing ease of use for inclusion in online learning.

Williams (2023) also contends that the Ministry of Education and Youth (MoEY), Jamaica supports mixed mode teaching and learning, that is, the combination of online learning and the traditional mode of instruction. MoEY declared that online learning will provide greater access to learners for schooling and improve the classroom experience. To this end, over 216 institutions in Jamaica have been improved and implemented. The education sector in Jamaica has also been projected to become fully digitized by 2025. In addition, Patterson (2022b) in an article disclosed that the introduction of the LMS (1on1) has approximately 250,000 students engaged in online learning in Jamaica and the Caribbean region.

Equally important, Thomas (2022) further reported in an article that the Prime Minister of Jamaica, Andrew Holness has emphasized the urgency for the Jamaican education system to be reformed to meet the recent projected digitization of many future jobs. The Unicef (2023c) report has also indicated that at the primary level of education in Jamaica there is still a 1% out of-school rate. Amid the projected introduction and continued usage of online learning to increase greater access to education, some researchers have warned of the drawbacks for primary school learners. Forbes (2019) and Gleason and Von Gillern's (2018) studies cited concerns pertaining to the safety of minors while online and medical ills that could result from the extended use of devices, such as damage to the eyes, wrists, and lack of sleep).

On the other hand, research is showing countries like New Zealand and North America to have action plans for dealing with these safety issues (Gleason & Von Gillern,

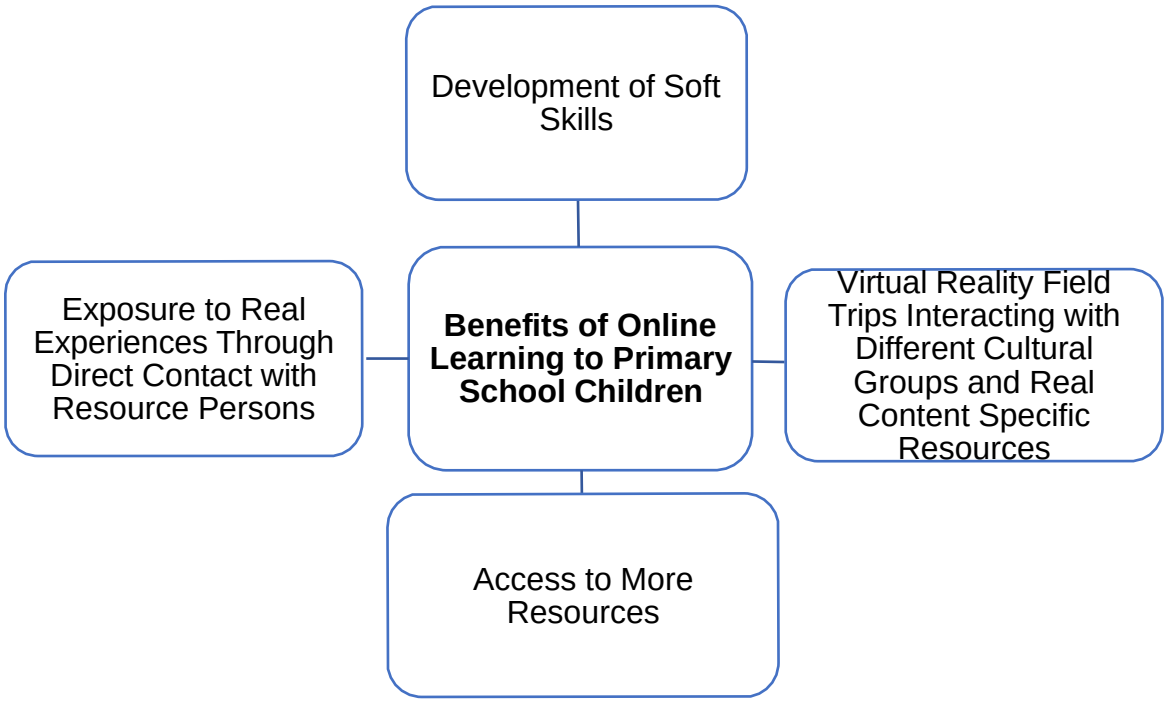
2018). Forbes (2019) further asserted that these countries are using technology for learning along with safety measures and the allocation of contingencies for continuous skills training. Additionally, proper infrastructure has reached 98% households for hosting online learning environments for primary school students. Yet Aliyyah et al. (2020) and Forbes (2019) also postulated that in some countries, a lack of reliable Internet service available to households is of grave concern, although this can be remedied by offline initiatives for access provided by respective Ministries of Education. This is evidenced in countries within the OECD group, where less than 44% of students have the opportunity to use devices to access learning outside of the classroom due to a lack of a reliable Internet connection at home (OECD, 2020b).

In contrast, countries in the OECD group with schools connected to online resources are realizing higher student performance rates in reading (OECD, 2020b). Jakobsdottir and Jakobsdottir (2018) confirmed that a similar situation exists in Iceland where online learning has been made compulsory to facilitate the ‘No child left behind’ agenda, boasting approximately 80% of schools nationwide that access education online. Most importantly, online learning can be an additional vessel that provides students aged 5 to 12 with numerous learning experiences that would not be available in their immediate surroundings. Learners at the primary level who engage in online learning could be exposed to real experiences through direct contact with resource persons. Alizadeh (2019), Buchanan et al. (2019) and Forbes (2019) corroborate that this is achieved by using virtual reality field trips interact with different cultural groups and real content-specific resources. A valuable prerequisite for the creation of ‘hands on’ learning with multiple and

relevant contexts that postulates the behaviourism and connectivism ideologies for learning (see Figure 2.2)

Figure 2.2

Benefits of Online Learning at the Primary Level of Education.



The parents of elementary school children are also placing great value on the online learning experience for their children (Forbes, 2019; Jakobsdottir & Jakobsdottir, 2018). Correspondingly, Egan and Tiernan (2022) and Aliyyah et al. (2020) confirmed in their study that there is the opportunity for students at this level to develop skills including forming networks, alliances, expert technological skills, and good communication skills. Undoubtedly, providing continuous preparation for the 21st century workforce in which information and knowledge are constantly changing, is in response to the demands of the digital society globally. Online learning can offer primary school students living in rural areas access to resources not available within their locale.

Social media, blogging, and online journaling can provide authentic ways for elementary students to develop critical thinking skills through collaborative learning within online networks where feedback and assistance are readily available (Aliyyah et al., 2020; Ghavifekr & Mahmood, 2017a; Jakobsdottir & Jakobsdottir, 2018). Buchanan et al. (2019) emphasized the value of authentic learning, which is more possible in online learning as it links learners to real-life examples of the content being learned.

2.4.3 ne Learning in Secondary Schools

UNICEF (2023c) reported that the global attendance at secondary schools, worldwide ranges from 52% to 65% for lower and upper secondary institutions respectively. The report also noted that learners of lower socio-economic status have a greater percentage of attendance issues than those of higher socio-economic status. This indicates a need to fill the gap regarding access to education of approximately 35% at the secondary level. Furthermore, internationally only about 70% of lower secondary school students graduate. Additionally, a larger number of female learners access upper secondary education. This gender gap suggests the need for intentional interventions to increase access to secondary schools for males. In addition to this, the OECD (2023c) report corroborates the results from the Program for International Student Assessment (PISA) that females' achievement rates are greater than males.

Florian and Zimmerman's (2015) study had previously uncovered that access to education offered within secondary schools is sometimes offered in varying quality and the variety of courses offered may differ. Gilbert (2015) and Kizilcec et al.'s (2017) studies accounted for this problem as a result of a lack of resources, gender stereotyping, the economic status of learners, and an inadequate supply of teachers in some locations,

mainly due to inadequate funding for education. Florian and Zimmerman (2015) and Jakobsdottir and Jakobsdottir's (2018) studies reported that many countries that are faced with this problem have adopted online learning at this level of education. These countries see online learning as a solution. Therefore, learners who were excluded from taking advantage of certain courses can now attend online classes irrespective of time and distance (Ghavifekr & Mahmood, 2017a; Nguyen, 2015).

Central to the problem of access to education, many renowned organizations like UNICEF have recognized the importance of online learning and mandated that provision for students to access online instruction is paramount at all levels of education globally (UNICEF, 2020a). UNICEF's Education 2030 Framework of Action and SDG4 has further outlined through the Education Strategy 2019-2030 'Every Child Learns' three benchmarks for ensuring access to education. These include: (1) equitable access to learning opportunities; (2) improved learning and skills for all; and (3) improved learning and protection for children in emergencies and fragile contexts (UNDP, 2017a).

Dubyna et al. (2022) also asserted that a major trend common to most economies worldwide is digitization geared towards transforming daily tasks within each sector of an economy. A notion that is also supported by European Union initiatives. Digitization has been lauded to promote economic growth in relation to resource management. Therefore, at the secondary level of education, some countries, like New Zealand, China, and the United States of America, to name but a few, are making it mandatory for secondary school children to take a minimum of one class online (Gilbert, 2015; Jakobsdottir & Jakobsdottir, 2018; Sureddi et al., 2020).

In the USA many parents are seeing the benefits of students taking courses online as 73% of them have consented to have their children attend classes virtually (Kingsbury, 2021). Similarly, as with primary education, the widespread access to Internet connections and devices, means more and more secondary institutions are offering online classes. The benefit to students is favorable, as many learners are able to progress ahead of their class level through self-directed learning (Salimi & Safarzadeh, 2019), complete extra credit for college admittance, and take advantage of courses that were not offered in their traditional secondary schools (Gilbert, 2015; Jakobsdottir & Jakobsdottir, 2018; Nguyen, 2015).

Education ministries can also use online learning as a strategy to maxime the utility of their resources, so that all students can benefit, including those with disabilities (Forbes, 2019; Gilbert, 2015; Jakobsdottir & Jakobsdottir, 2018; Nguyen, 2015). UNICEF reports that 20% of students worldwide are not enrolled in schools (UNICEF, 2020a). Therefore, the flexibility that online learning presents can decrease student dropout rates among high school students and increase graduation rates as learners are provided the opportunity to learn outside of classroom hours (Florian & Zimmerman, 2015; Gilbert, 2015). The ability to connect with experts and real-life examples within the courses being studied can aid retention and the transfer of skills and knowledge. Furthermore, the collaborative way of learning that is afforded secondary students can prepare them with communication, teamwork, and other valuable skills needed within the workforce (see Figure 2.3) (Florian & Zimmerman, 2015; Trucano, 2005).

This view is also supported in Kingsbury's (2021) study which found that online learning promotes active learning. Evidence gathered from a group of parents showed that 69.4% share that collaborative activities have been more engaging; while 86.4% believe

their children learn much more daily than teaching activities during traditional classes. Additionally, Cook and Babon (2017) support the use of online quizzes as a tool for engaging students in active learning.

Gilbert (2015) and the OECD (2020b) have reported that there are some hurdles encountered at the secondary level of education with the implementation of online learning. Some setbacks revealed were connectivity problems, lack of funding, maintenance issues, inadequate technological skills, and not enough devices (see Figure 2.4). Another drawback experienced with online classes is that some students' feel exiled or isolated, which may lead to dropouts.

Additionally, Hernandez (2017) chronicles the digital divide which exists among various social classes within society as a major problem. UNICEF has further highlighted this issue as needing urgent attention especially since the COVID-19 pandemic and has called for all stakeholders across the world to lend a hand in the reimagining of pedagogy. Unreservedly, an effort is being made to get every student connected to learning via the online mode, a projection that may result in expenditures of $474.5 billion USD within the next nine years (UNICEF, 2020a). The OECD (2023d) also reported that of the (*N* = 27) member countries, (*n* = 17) have continued online learning. While another (*n* = 13) countries have action plans to improve digital training for students and teachers.

Figure 2.3

Development of Soft Skills for Students Engaging in Online Learning

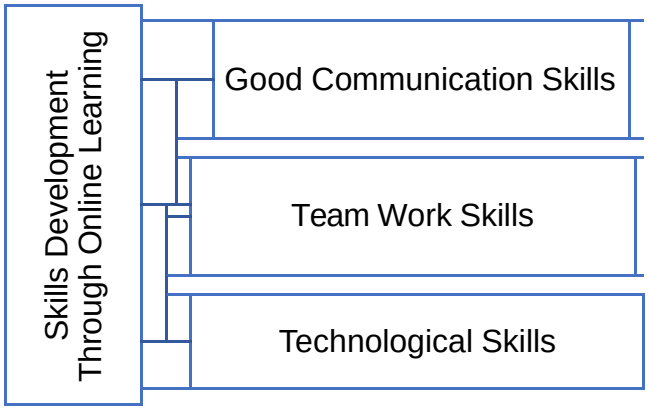
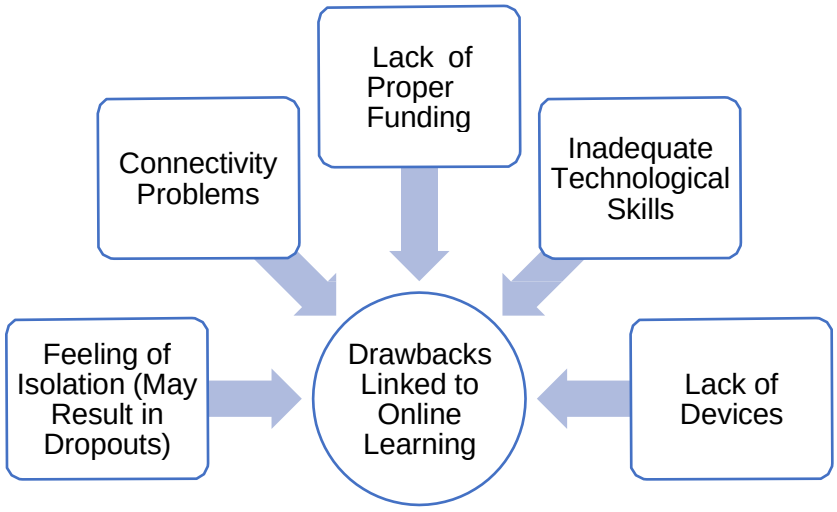


Figure 2.4

Drawbacks Encountered at the Secondary Level With the Use of Online Learning



2.4.4 ne Learning in Tertiary Institutions

People living in remote or rural areas are most affected by a lack of access to tertiary level education worldwide (Maila & Ross, 2018). Kirkpatrick et al.'s (2020) research has uncovered that about 70% of these people are below educational standards; 53% is a representation of the population globally. Kano (2017) and Maila and Ross's (2018) study asserted that poverty and overpopulation within schools are other barriers that prevent

individuals from enrolling in tertiary institutions and are discussed extensively around the world. Education at the tertiary level is seen as an influential element for countries to gain an advantageous position in the global marketplace (Chachashvili-Bolotin et al., 2016; Dawkins et al., 2019; Kano, 2017; Ortiz et al., 2019). Therefore, if access is restricted, only a small portion of the population will have the opportunity to attend, which may culminate in many social ills a result that can be devastating to any economy (Chachashvili-Bolotin et al., 2016).

Deming et al. (2015) and Kano's (2017) study suggest that a viable solution to the problem of access at the tertiary level of education is the adoption of online learning which could greatly improve learner's chances of attending a tertiary institution. Hence in Kentnor's (2015) study, it was discovered that online learning is most commonly used by higher education institutions and has earned the respect of both public and private institutions. Kano's (2017) study also cautions that, despite the adaptability of online learning for solving the problem of access to education, proper funding, and distribution of necessary infrastructure are vital for its success.

Modestino (2016) and Terry's (2016) studies have noted that in the USA, the demand for skilled labour within the workforce was not adequately manned by the number of tertiary education graduates up to the 1980s and early 2000s, cost being one of the leading reasons. However, Deming et al. (2015) and Palvia et al. (2018) cited that the introduction of online learning has substantially reduced these costs and provided an alternative for producing more skilled individuals for the economy. Online learning is now commonplace in many countries, is essential to a strategic goal within tertiary institutions and is supported by approximately 69% of educational leaders. Though historically, only

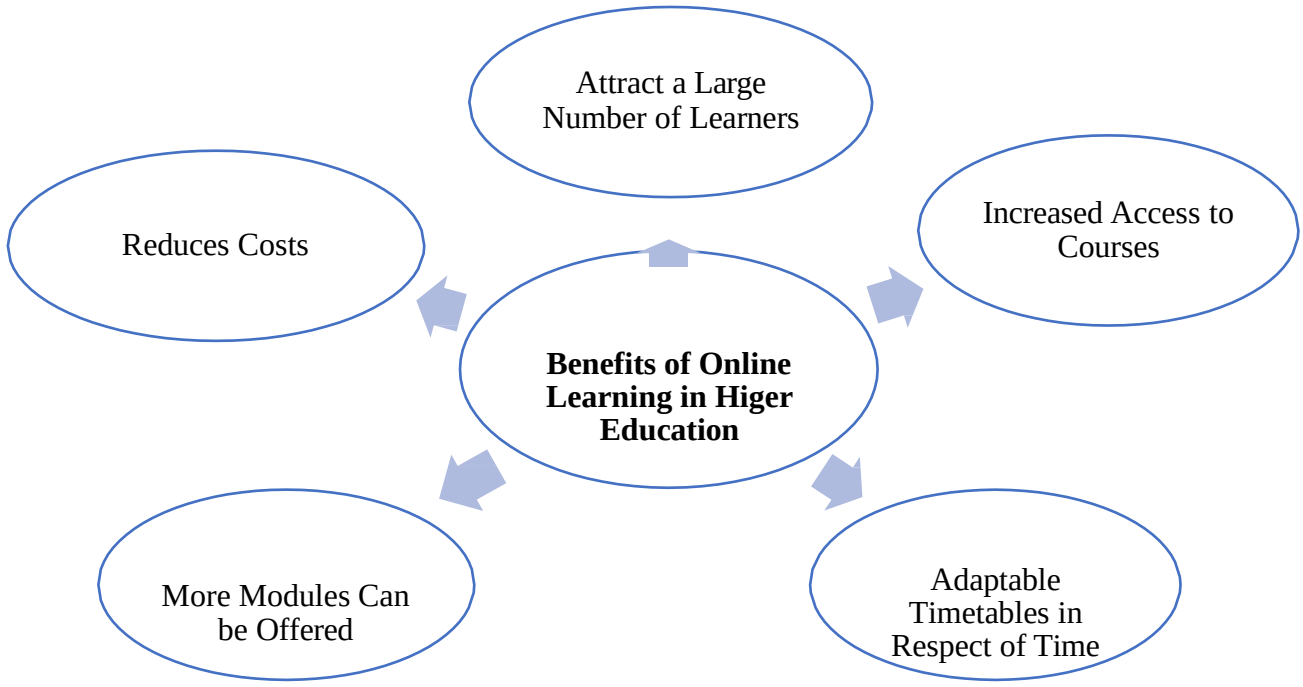
about 33% of learners were registered in online courses within the USA by early 2000s, this increased to 89% by the mid-2000s (Andrade, 2015; Kentnor, 2015; Sun & Chen, 2016).

Kauffman's (2015) qualitative study conducted with tertiary level instructors revealed that 51% of teaching practitioners backed online learning as legitimate as face-to-face, with 14% advocating that it was of higher caliber than traditional learning. The OECD (2023e) has also reported that tertiary education increased by 48% for 25–34-year-olds in 2021 which is an improvement from 27% in 2000. Advanced adult education internationally shows Korea and Canada with the highest percentages, 69.3% and 64.4% respectively. However, women accounted for 57% of tertiary-educated adults compared to 43% of men. There is also a gap to be filled in the tertiary education completion rate, as only about 39% undergraduate learners finish their degrees. As it relates to undergraduate students, the male's completion rate is 11% lower than that of the female.

Andrade (2015) and Sun and Chen (2016) postulated that the main reasons uncovered for the use of online learning by tertiary institutions revealed problems in HE of timetables adaptability to time constraints (68%), increased access to courses (67%), providing a greater volume of modules (46%), and attracting greater numbers of college and university learners (45%) (see Figure 2.5).

Figure 2.5

Some Benefits of Online Learning at the Tertiary Level of Education.



Online learning is vital in HE for increasing learners' access and is notably beneficial to working adults, and school dropouts seeking to continue their education (Andrade, 2015; James et al., 2016; Terro et al., 2021). Tate and Warshauer's (2022) study reported that about 6.7 million learners engage in online learning with one third only attending online classes. The study further highlighted that 97% of colleges offer online instruction. Seventy-four percent of those students surveyed accounted for online education opportunities as making it possible to attain a degree. It also disclosed that colleges experienced a 10% drop in the registration rate for traditional classes a problem related to inequity from the gaps in affordability between lower- and upper-class learners. The data further showed a drop by higher-poverty institutions of 32.6% in comparison to learners in low-poverty schools. Although James et al. (2016) deemed the success of students in

online courses to not show any significant difference from those participating in the traditional mode of learning which makes online learning a reliable method for learning.

2.5 Attitudes Towards Online Learning.

The introduction of online learning within the education system has been employed to rethink the approach to how content is presented to learners and to effect improvements in learner engagement, and access to schooling (Henriksen et al., 2016; Powell et al., 2015b). Yet it has been widely debated that the inclusion of technology in the learning process is insufficient to guarantee quality teaching and learning (Furdu et al., 2017; Hamad, 2017). It is argued that there should be deliberate steps taken to ensure that teachers are trained and provided continuous professional development (CPD) in the use and application of technology for education (Montrieux et al., 2015).

Berry's (2018) qualitative study of thirteen instructors illustrates this approach, concluding that CPD in technology competence and pedagogical skills designed for online learning is essential for faculty acknowledgement of the benefits of online learning. Furthermore, three targets have been identified as crucial to improvements to the education process: technologies, innovative teaching practices, and the positive attitudes of all stakeholders (Montrieux et al., 2015).

Subsequently, online learning is one such enhancement to education that incorporates the use of technologies and is increasing globally. For example, in the USA there were about 71% of schools using distance learning as far back as 2015 (Allen & Seaman, 2015). Similar occurrences of the use of online learning have been documented for Turkey, where (Horzum, 2017) study reported that colleges and universities use of

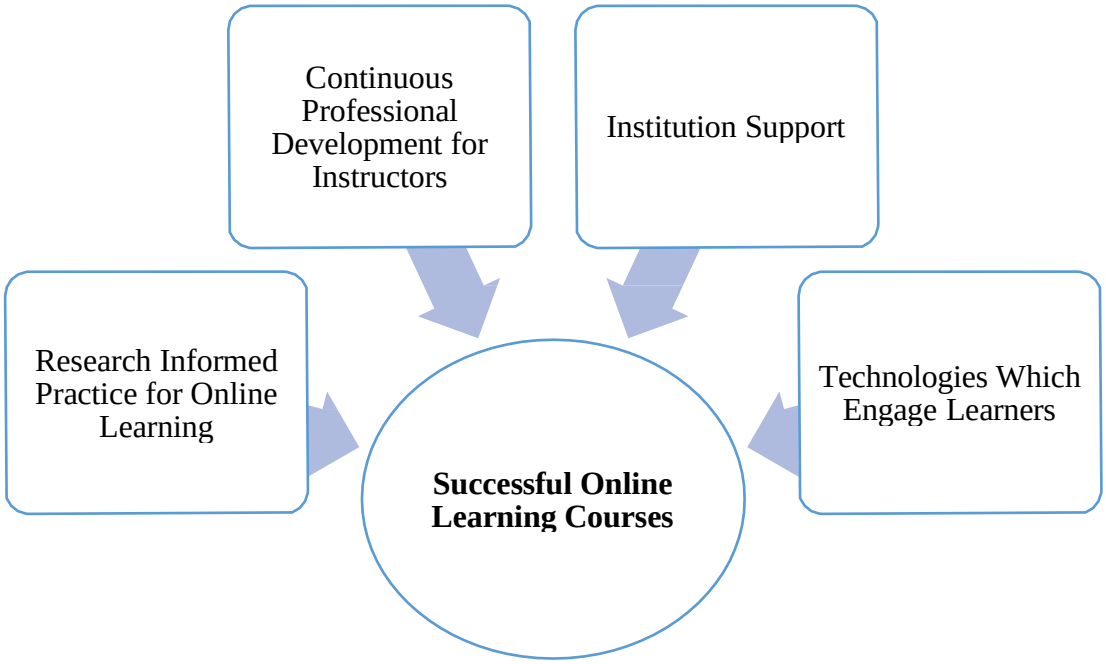
online education grew from 10% in 1997 to 80% in 2001. Furthermore, companies in Turkey also offer online programs and report a growth of 35% between 1997 and 2001.

However, many recent studies have disclosed that the success of online learning depends, to a great extent, on how stakeholders perceive new innovations in the learning process. This is championed as essential to the progress realized and level of performance obtained from its implementation (Bolliger & Martin, 2018; Jones & Blankenship, 2017; Montrieux et al., 2015; Perry & Steck, 2019). Accordingly, the attitudes of stakeholders must be ascertained before the full implementation of online learning; (see Figure 2.6) as teachers especially should be exposed to opportunities for upgrading their skill set in both technological literacy and research informed practice skills (Horzum, 2017; Oke & Fernandes, 2020; Nancy et al., 2016; Picciano, 2015; Wasserman & Migdal, 2019). These skills are vital within the online learning environment to dictate the level of success that technology innovation for education will produce in the short and long run (Gay, 2016a; Montrieux et al., 2015).

As the literature indicates, the acquisition of technological skills promotes multiuse towards student's learning, as well as professional development in skill sets such as computer literacy, curation tools for learning and multiple resource sources (Anderson, 2018; Montrieux et al., 2015). Therefore, the success of implementing online learning for increased access to learning will receive greater acceptance by teachers and other stakeholders if they have been active in incorporating it as an educational tool in their schools and classrooms (Joo et al., 2018; Montrieux et al., 2015; Tondeur et al., 2018). Most importantly the attitudes of teachers, students and institutions towards online learning are paramount for a smooth implementation process.

Figure 2.6

Elements Necessary for the Successful Implementation and Success of Online Courses



2.5.1 arners' Perception

Learners have been reported to be receptive to online learning as they find this type of learning to be engaging, (see Figure 2.7) providing access to a wide variety of resources, offering flexible timetables, and increase connectedness to classes irrespective of location (Camilleri & Camilleri, 2017; Martin & Bolliger, 2018a; Montrieux et al., 2015). Moreover, learners are being cultured in the use of technology for informal learning. Bhagat et al. (2016) and Van Popta et al. (2017) illustrated in their studies conducted in Taiwan among learners at various levels of the education system, that about 89% of participants had access to devices and 98% subscribed to social media. Fifty one percent had access to the Internet for approximately five hours per day on average. These statistics indicate an aggregate score of 61% of learners with high technological skill levels and receptiveness

to online learning. This is hinged on the premise that teachers give regular feedback and cultivate students' confidence, through effective lesson designs that meet learner's expectations.

Another study of students' perceptions towards online learning in Iraq used three elements for examination, (1) different ways students learn, (2) the impact on males versus females, and (3) learner's ability for independent or self-paced learning which showed positive responses from students for online learning. The study revealed that the learning styles of students did not greatly affect their use of or satisfaction with online learning. It further concluded that differences in gender had little impact on learner's satisfaction with online learning (Al-Azawei & Lundqvist, 2015b). Juxtaposed this with studies conducted in the USA with graduate students studying online, which revealed that learners exhibited positive feedback towards online learning. This was attributed to excellent course designs, regular interactions with teachers, and communication among learners during asynchronous learning online (Gray & Diloreto, 2016; Martin et al., 2019b; Nguyen et al., 2021).

As previously reported in the literature, the demand for online learning by students is on the rise. Dziuban et al. (2015b) and Selvakumar and Maran's (2019) longitudinal studies also evidenced this in research conducted by the University of Central Florida among learners. These learners were studying online in a diverse sample population ranging from millennials, females, and single students with jobs and working 10 hours weekly. Yet the students were able to maintain a grade point average of 3.0 and above. From the survey conducted it is clear that students are satisfied with the learning experiences provided in their online courses. A total of 94% felt that the courses were

engaging and 66% attributed online courses to their opportunity to take advantage of multiple resource sources, and information to complement their learning.

However, further studies by Kuong (2015), Martin et al. (2019b) and Masino (2015) conducted in the USA among university students, showed that a lack of interaction in the virtual classroom setting, mitigates against learners' satisfaction with online learning. Therefore, frequent communication within online courses is important for the promotion of the learners' acceptance of online learning. Accordingly, if learning designs are developed with an online learning perspective, they become more appealing to learners. It is suggested that technologies be used to improve engagement which may in turn increase enrollment in these courses. Most importantly, the technology used should be geared towards creating quality communication, in different ways for students to interact with their peers and instructors, and provide avenues for learning goal achievement.

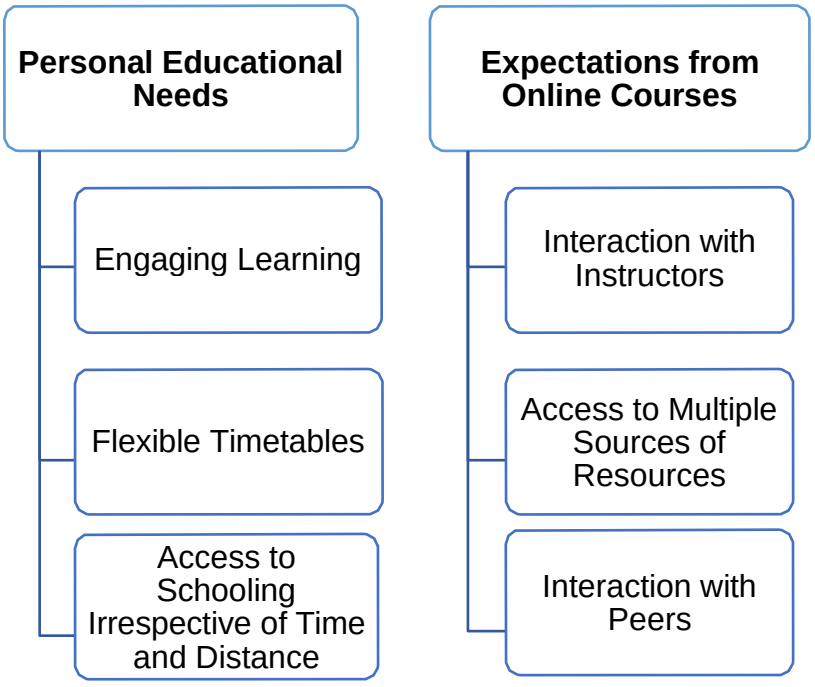
In contrast, Hofmeister and Pilz's (2020) study which was conducted with vocational education teachers in Poland, Italy, and the USA who were being trained online for professional development, showed that they preferred self-paced provision of the courses rather than a restricted virtual mode. Xing et al. (2018) conducted a study carried out in Shanghai within the medical field, with 534 nurses in hospitals within both cities and rural areas. It was revealed that there is a demand for online learning in order for nurses, especially in rural areas, to enroll in further education courses to improve their practice of medicine. The investigation uncovered that of the sample population 98% could access a device and the Internet at home, but only approximately 39% were able to access the Internet at work. Considering this situation there is a need to increase access to learning on the job for these practitioners through online learning. The study results indicate that

providing access to devices and the Internet increases nurse's appreciation and demand for online learning. Additional salient discoveries among the sample are that nurses in rural areas had a better attitude toward online learning than those in the cities.

Similar responses to online learning are seen in companies that have adopted online learning to train employees on-the-job. Purcarea et al.'s (2018) study of Romanian companies, cited that those employees were satisfied that the online training and that their skill development needs were met. The employees are advocating for the need for further expanded course offerings through online training programs that companies utilize.

Figure 2.7

Learners' Perceptions of Personal Learning Needs and Online Learning Expectations



2.5.2 ors' Perception

The introduction of technology and, in this instance, the success of online learning are hinged, to a large extent on instructors' attitudes towards this mode of instruction. This

suggests the need for technologically skilled staff and an open mind to the versatility that online learning brings to the learning environment (Camilleri & Camilleri, 2017; Gay, 2016a; Montrieux et al., 2015). Hofmeister and Pilz's (2020) research conducted with 74 instructors from across Poland, Germany, and Italy regarding teachers' attitudes towards online learning, reported that most had computers and knew how to use them for education, however, teachers were less inclined to learning online. This was attributed to inadequate experience with online instruction. The teachers further advocated that online learning is a necessity and expressed a desire for its widespread use in their practice and professional development.

Additionally, research is reporting that the number one reason why instructors are motivated to teach in online classes is that it provides them with flexible teaching timetables. The other benefits include the opportunity online learning provides teachers in responding to the learning needs of their learners, the acquisition of technological skills, and helping more students to be able to enroll in formal education. Although a few of the instructors surveyed shared that there were challenges with compensation, effective course designs, and connectivity problems. Despite these shortcomings, they are still in favour of increased online learning (Masino, 2015; Shea, 2019). To add to this point, Shreaves (2020) in a recent study conducted in the USA with 320 online instructors to determine their attitudes towards online learning, found several reasons instructors are receptive and give support to this mode of learning. These include: (1) if the design of courses matches the values that guide their practice (76%), (2) the level of students' self-efficacy (72%), (3) policies are put in place to guide the practice of online learning (57%), and (4) adequate resources are provided for teachers (56%).

Furthermore, Martin et al. (2019b) conducted a survey with the Association for Educational Communication Technology (AECT), the American Educational Research Association (AERA), the Online Teaching and Learning Special Interest Group, and one of the southeastern public university's teaching staff in the USA. It revealed that faculty attitudes towards online learning were rated the highest in terms of contributing to positive attitudes. This is a result of the learning design, which provided opportunities for the instructors to interact with learners and support learner-learner interactions in real time. The instructors ranked their attitude towards online learning as far better than how well they could practice teaching in the online mode. However, their ability to manage time effectively was compared to their attitude towards online learning, and time management was ranked higher than their attitude.

Similarly, Simister (2017) conducted a study with staff who have been participating in online teaching and learning in Ohio, in the USA, among ten tertiary level institutions. The study cited that instructors' positive attitudes toward online learning were dependent on the level of interaction between lecturers and, learners, and peer-to-peer communication during the modules taught. Also, the techniques used with the technologies in commanding students' engagement, coupled with the support for online learning from the school's leadership team further increase appreciation for online education among instructors. Correspondingly, in other studies, conducted in the UK and Jamaica, lecturers from 31 courses reported that their willingness to provide online instruction is mostly hinged on their online learning ability to offer opportunities to improve their practice and student learning. Additionally, the degree of agreement between instructor values and the course

designs, and opportunities for participating in CPD to upgrade the skillset for teaching an effective online course (Anderson, 2018; Richardson et al., 2020).

Additionally, Mellieon's (2016) study revealed that instructors agree that online learning is worthwhile and invaluable when it is used to access education vital for learners. Especially those who would otherwise be excluded as a result of personal and location constraints. However, Allen and Seaman (2015) in their study revealed that about 68% of education leaders support the need for self-efficacy training in order for the online learning process to succeed.

2.5.3 tutions' Perceptions

Online learning has the support for revolutionizing learning, schools have recognized its value and are using this as a strategic goal for meeting the national objectives for education (Kentnor, 2015; Powell et al., 2015a; Susilawati & Supriyatno, 2020). The support of an institution's leadership is necessary for the ongoing revision and upgrading of online learning tools, skills, and reliable access to the Internet (Berry, 2018; Camilleri & Camilleri, 2017). Furthermore, institutions are using online learning to reduce the costs for students, which in turn has led to increasing enrollment numbers, leading to greater profits in for-profit tertiary institutions in the USA. Downes' (2019) study examined possible correlations between learning technologies and lowered prices for tertiary education and found evidence that supports the view that online learning helps institutions to reduce costs. There was a marked decrease in tuition prices after 2006, which marked the end of the 50% rule for learners to receive financial aid in the USA. The abolition of this rule resulted in an 8% reduction in tuition costs for students, and by 2013 it had increased to a 34% reduction in tuition fees for online learning.

The ability of these universities to lower the cost of learning is attributed to the advancement of technology, that is the ability to share resources more efficiently across the college campuses online. The study also reports an increase in online learning within public higher education schools which is also supported by Deming et al. (2015). The cost lowering effect of online learning is further corroborated by companies using online learning to train employees and reporting massive cost cuts in respect of training expenditures (Purcarea et al., 2018).

Further studies into the cost effectiveness of online learning revealed that colleges and universities sought to use online learning as a strategic goal for increasing student enrollment and responding to the emerging demand as a result of the digital age. Innovation by way of education is offered using smart technologies and networks. Additionally, online education institutions has benefited from increased profits and the average cost of operations have realized a notable reduction (Allen & Seaman, 2015; Nguyen et al., 2021; Taft et al., 2019). Correspondingly, institutions have formed alliances with respected organizations like Collaboration Organization Innovation and Leadership (COIL) for direction on best practices for online learning modalities. This was done by forming networks with other higher education professionals, students, and schools (Iuspa, 2019). Moreover, approximately 74% of education leaders believe online learning is equal to or supersedes that of traditional learning in terms of responding to the learner and societal needs (Allen & Seaman, 2015).

2.5.4 arners and Institution's Perceptions in Jamaica

Gay's (2016a) study indicates that Jamaica was rated (n = 62) among universities in e-readiness, infrastructure, funding for online learning, and technical skills. While

Trinidad and Barbados were (*n* = 51) and (*n* = 43) respectfully across (*N* = 142) countries. From a sample population of (*N* = 220) instructors 91% (*n* = 200) had capability for e-readiness but scored lower percentage rates in terms of pedagogical and lifestyle readiness. There was also a challenge of a lack of support for lecturers, in a timely manner during online course delivery. This problem requires attention to effect greater success for online education among universities. Overall, the study underlined the importance of instructor's contribution to the online learning process and advocated for CPD and evaluation of teacher's competency for functioning effectively in an online learning environment, especially in developing countries like Jamaica.

Seminal contributions have been made by online learning in Jamaica and can be traced to 2008, where Blackboard was used to improve the online learning offering by the University of the West Indies (UWI) in an effort to give learners across the Caribbean access to higher education, irrespective of their geographical location (Anderson, 2018; Griffith, 2018). This was introduced through the UWI open campuses dispersed throughout several Caribbean countries. The Blackboard platform was introduced to solve dissatisfaction voiced by learners within the UWI online learning courses. UWI responded by providing technology to better engage online students as well as investing in the upgrade of instructor's skillsets through necessary CPD courses, to better facilitate the online learning process (Masino, 2015).

A recent study by Craig and Harindranath (2015) conducted in Jamaica, within a university with (*n* = 84) educational leaders and (*n* = 78) faculty members located across several of its campuses dispersed throughout the country reports the successes of online learning. The research revealed that learners were satisfied with the instructional

techniques and emphasized that their learning goals were met. Seventy five percent of the students, credit this to the instructor's support through their frequency of interactions with students during online courses. This research evidenced the need for faculty acceptance of online learning, which is essential to its success as a learning tool. Another revelation was that online learning has improved the administrative arm of the institution by providing more efficient systems for timetabling, recording grades, billing, human resources, and making students and lecturers accountable in their respective roles.

Further developments in online learning in Jamaica unveiled an initiative by UWI that started in 2014. The university experimented with online learning through the School of Education with graduate learners using the Zoom platform to provide access for working teachers to engage in continuing education for the development of their practice. It was offered through the university's open campus located within several Commonwealth Caribbean islands. These online learning courses are promoted by several researchers as a strategy to reduce costs and increase student enrollment in higher education (Deming et al., 2015). In this instance, of the (n = 19) learners enrolled in the online pilot program in the study, only (n = 15) were able to take advantage as the course was very costly, much more than its face-to-face version.

Additionally, the program faced challenges resulting from the low number of student enrollments. Despite these challenges learner attitudes towards the program were positive in respect of satisfaction with their learning goals. Nonetheless, technical support for the program was deemed unfavourable. Notwithstanding the challenges, the institution's perception was positive towards the online learning program. This was attributed to the

revelations from the study that will facilitate further expansion into the online learning modality for education for those who are disenfranchised (Griffith, 2018).

Yet again, research affirms that in Jamaica more and more colleges and universities are seeing the benefit of online education and also that this mode of instruction can be used to anchor the institution's goals and service the learners' needs for the job market in the 21st century. Complimentary to this, the Universitas Negri Jamaica (UNJ), offering courses in Jamaica, provided its undergraduate pharmacy course fully online to respond to the needs of learners. The program was a success as students were satisfied with the learning and orientation techniques employed by lecturers and the school. Faculty were provided CPD for effective online instruction skills, and the institution sought their input in the decision-making process. The administrative arm of the institution arranged support for the course through the inclusion of an e-learning technical department (Anderson, 2018).

2.6 Education's Engagement in Online Learning in Jamaica

Globally, economic prosperity is now largely dependent on how well countries respond by empowering their citizens, with knowledge and skills that are valuable, for effective competition, in the current information and digital age (Abdullah et al., 2017; Belcastro, 2015; Bexheti & Mustafi, 2015; Deming et al., 2015). Jamaica is no different in this respect, as there is a need to provide opportunities for citizens and residents (Trines, 2019). Therefore, emphasis should be placed on the ultimate goal, which is to mobilize people to become innovative giants in their respective abilities to promote economic development. A feat that can be attained by offering access to education for all despite time, distance, and social standing (Knight & Rapley, 2007). However, Jamaica is plagued

by low attendance rates for learners at primary and secondary education levesl, 58% from low socio-economic backgrounds within rural areas; in comparison to 89.7% of learners in the middle to upper classes (Trines, 2019; UNDP, 2021b).

Jamaica's response to globalization has revealed the blatant gaps in the achievement of one school compared to another (Bent-Cunningham & Allida, 2017; Feraria, 2016; Trines, 2019). For example, following a 2007 evaluation of several schools in Jamaica by the Ministry of Education and Youth, it was found that at the Caribbean Examination Council level, one school may have a 10% pass rate in a particular subject while another may have a pass rate of 98% for the same subject (Knight & Rapley, 2007). Similarly, in another study the researchers revealed illiteracy rates among graduates of 26% and 35% at the primary and secondary school exit levels, respectively (Bent-Cunningham & Allida, 2017). Again, these differences are a result of shortcomings at all levels of the education system, such as poor attendance, a lack of accountability for education policy enforcement, and a lack of learning resources (Caribbean Education Foundation (CEF), 2021; Knight & Rapley, 2007).

Therefore, reform is needed to position Jamaica's education goals within the benchmarked objectives, of the global mandate for skills requirements and acquisition methods for learners (Caribbean Policy Research Institute, 2021). Educational reform is advocated worldwide, and benchmarked policies for education are approved by agencies such as Programs of International Student Assessment (PISA) together with the United Nations Children Fund and the Organization for Economic Co-operation and Development (OECD) (Belcastro, 2015). Notably, a global mandate was enforced for education advocated through a conference hosted in joint collaboration among organizations

including UNESCO, UNICEF, the World Bank, UNFPA, UNDP, UN Women, and UNHCR in 2015, which pronounced the adoption of the Declaration for Education 2030 (UNESCO, 2015). However, in Jamaica, the current situation has revealed several deficiencies within the education system in the form of school dropouts, failure, and a lack of behavioural and innovative teaching strategies that allow learners to harness their knowledge and skills in a productive manner. To a great extent, education provision is still largely influenced by a grid lock in the traditional mode of teaching and learning (Caribbean Education Foundation (CEF), 2021; Kelly-Williams, 2017; UNICEF, 2021b; UNESCO, 2015a).

One solution to the problems facing education in Jamaica is the provision of computers and access to the World Wide Web, targeted from the lower levels of education upwards (Bent-Cunningham & Allida, 2017). Hence the implementation of an inclusive online learning scheme for all learners, irrespective of education level can help Jamaica achieve its education goals (Caribbean Policy Research Institute, 2021; Knight & Rapley, 2007). Accordingly, there is a need to develop and implement policies to guide online education.

2.6.1 icies for Online Learning

As far back as 2001, the Jamaican government, after realizing many challenges facing the education system, commissioned committees such as the Primary Education Support Project (ESP), the Government of Jamaica Task Force on Education Reform (2004), the Education Transformation Team (ETT) (2005), the Expanding Educational Horizons (EEH) (2008) (Ministry of Education Jamaica, 2012a), and the National Education Inspectorate (NEI), to convene with a focus on developing action plans for implementing educational reform (CaPRI, 2021). There were two main objectives of these task forces, for educational reform in Jamaica, firstly: to ensure that each learner was

provided with every opportunity to utilize and maximize their ability, through augmenting a student-centred learning setting supported by current technologies geared towards enhancing education. A response to the ‘Education for All by 2015’ worldwide stance led by UNESCO. This was to be achieved with the help of 21st century trained teachers, who were ably skilled in their practice. Secondly and most importantly, access to education would be equally afforded to all learners up to secondary level education. Accordingly, the goal was to develop a workforce of competent, ethical, and deliberately trained Jamaicans to position the country to be competitive in the global marketplace (Ministry of Education and Youth Jamaica, 2021d).

Complimentary to this, around the mid-2000s the government of Jamaica (GoJ) commissioned a detailed development plan to support the realization of the goal of attaining developed country status by the year 2030. In keeping with this objective, and the commissioned guidelines of Sustainable Development Goal 4 (SDG4) ‘quality and equal education for all’, the Planning Institute of Jamaica was charged with forming a task force, which culminated in approximately 31 specialized teams focused on achieving the GoJ’s goal. The ICT team was one of those formed to facilitate this goal attainment and to achieve the aims set out in the ‘17 global Sustainable Development Goals (SDGs) in keeping with the creation of world reforms by 2030 (UNESCO, 2021g).

The aims of the ICT national team were guided by the following targets: (1) curating innovation for ICT objectives for Jamaican society; (2) the formation of sub-groups geared towards ICT objectives within various sectors of the economy of Jamaica; (3) supporting research and development to respond to best practices for ICT inclusion within the Jamaican economy; and (4) designing a course of action or procedures for the introduction

of an ICT plan for Jamaica (Government of Jamaica, 2018; Jamaica Information Service, 2021c; STATIN, 2017b).

Most importantly the ICT plan for Jamaica was based on innovation towards the usage of technology and utilization in enhancing or complementing various ministries within the nation. The Ministry of Education and Youth was one of the main targets, with the aim of interconnecting with other government ministries. Additionally, the ICT innovation procedures would focus on e-inclusion, education and training, building proper infrastructure, establishing reliable networks, developing an e-business and commerce structure, e-government, cultural content and creativity, establishing research and development, policy and a legal model (Government of Jamaica, 2018; Jamaica Information Service, 2019b; STATIN, 2017b).

Accordingly, evidence suggests that the enactment of the ICT policy has revolutionized access to technological devices and the widespread use of the World Wide Web in personal activities, industry, and education (Vision 2030 Jamaica, 2009). However, the role of ICT for education is underscored by the need for its inclusive use in all areas of learning and nationally available reliable hosting networks. The policy's main objective is to establish an action plan that reengineers teacher training and continuous professional development to be suited for 21st century societal demands. The expectations from the policy for education are to offer support through networks in ensuring the highest caliber of education within Jamaica (Onyefulu & Roofe, 2019a; Vision 2030 Jamaica, 2009). Therefore, the use of online learning at all levels of education and training would be a strategic step in the right direction toward achieving these goals.

Hence the creation and sustenance of several projects geared towards the attainment of these objectives; through programs anchored as far back as 2005 with the formation of the e-Learning Jamaica Company. The company was formed out of the establishment of the ICT taskforce unit in collaboration with the Ministry of Education and Youth, Jamaica, to introduce online initiatives in conjunction with other government ministries. These partnerships would advocate the implementation of the benefits of technology for teaching and learning (Ministry of Science & Energy and Technology, 2019). It was established in line with the expectations mandated by the United Nations Millennium Development Goals (MDGs), to achieve equality of resources within secondary schools in Jamaica (Hughes, 2021). Additionally, the fostering of ICT innovation is expected to improve the performances of learners, assist institutions in meeting educational goals mandated by the GoJ, and also favourably position Jamaica to meet the demands of global competition via online learning, afforded to all learners nationally (Ministry of Science & Energy and Technology, 2019).

To establish the extent to which the educational reform in 2003 achieved its goals, an Educational Transformation Team (ETT) was convened in 2005 to reinforce the implementation of those educational objectives (Ministry of Education and Youth Jamaica, 2021d). Furthermore, in 2007 the Jamaican Minister of Education proposed an e-learning policy for the introduction of ICT to be implemented. The policy proposal advocated that: (1) all schools in the public education system in Jamaica would have an education management information system; (2) e-learning projects would support schools' academic programs which started in Jamaica in 2006 with a focus on secondary students; and (3) the formation of alliances with partners worldwide for support in providing access to

technology for learners (Jamaica Information Service, 2008a; Ministry of Science & Energy and Technology, 2019).

The Minister further emphasized that the goals of the ICT policy for education were not limited to simply exposing learners to a device; but to developing a culture of acceptance for technologies for consumption as well as becoming producers of technology through the promotion of ease of usage, its utility, and amicable user perceptions (Siegel et al., 2017; Taherdoost, 2018c). Additionally, the policy also aimed at closing the gap that is the digital divide among various groupings nationally (Jamaica Information Service, 2021c). Subsequently, the proposed policy for ICT in education will assist Jamaica in achieving UNESCO's 2000-2009 education goals by providing equal access to education for all learners irrespective of status and location by 2015. In the same way, a mandate through the Belen Framework for Action (BFA) will respond to deficiencies in continuing education for adults (Ministry of Education and Youth Jamaica, 2021d; UNESCO, 2021g).

Complimentary to this, between 2010 and 2013 a United States Agency for International Development (USAID) funded project Expanding Educational Horizons (EEH) and the Caribbean Centre for Excellence in Teacher Training (C-CETT), was launched to address the improvement of teacher training through the support of contemporary technological inclusion in education to support under-achieving schools, especially in the core subjects of numeracy and literacy (Ministry of Education and Youth Jamaica, 2021c). Jamaica signed agreements with the General Agreements on Trade and Services (GATS) and the World Trade Organization (WTO) which increased learners' ability to access tertiary education freely across country borders, made possible via online learning (Ministry of Education and Youth Jamaica, 2017b). Jamaica's ICT policy is

charged to enhance curricula to attain the highest performance rates from students, by detailing how technologies used in learning can be effectively integrated within teaching practice and student's learning activities.

In keeping with the illustrated mandate for online learning in Jamaica, the University of the West Indies (UWI) began offering online learning in 2008 through its distance education branch. The policy developed by UWI for online learning emphasized accessibility, student-centred learning, agility, and excellent tertiary education for all learners wanting to reach actualization in their skills and knowledge. Equally important, UWI used online learning to expand access to the university through the creation of networks internationally and within the Caribbean region (Thurab-Nkhosi, 2018; University of the West Indies Open Campus, 2021).

2.6.2 frastructure for Online Learning

The GoJ views ICT as a strategic engine for driving economic growth and development. The conventional infrastructure of ICT in the country included the telephone, radio, and television carried over cable networks. However, rapid advancement in technology has greatly changed this landscape to include the now sophisticated Internet Protocol (IP) mechanism that can be reached regardless of time and distance. The ICT infrastructure in Jamaica began its reorganization in 1980, culminating in a deliberate move to emancipate the telecommunications sector from restrictions that were fully realized in 1999 with the establishment of the Telecommunications Act in 2000. Subsequently, further reform continued in 2001 through the work of the Jamaica Telecommunications Advisory Council (JTAC). Additionally, between 2004 and 2006

marked improvements were made to the ICT infrastructure through the elimination of the monopoly on telecommunications.

Further investments were ploughed into the ICT reform, showing a yearly expenditure of approximately $80.9 million USD towards ICT infrastructure. Presently, the island of Jamaica has 100% access to the telephone service (Information and Telecommunications Department Office of the Prime Minister, 2011). Though, despite the reforms illustrated above, Jamaica is still seeking a more robust ICT infrastructure in line with the Vision 2030 goals (Vision 2030, 2021), in order to position the country for sustainable development through the support of ICT-networked platforms. This plan to implement and improve the ICT infrastructure started in 2006 when the Planning Institute of Jamaica (PIOJ) was tasked with developing a plan for ICT infrastructure in Jamaica (Vision 2030, 2021). The plan was introduced in 2007 with the collaboration of several companies and other stakeholders. One such company is Digicel, a telecommunications company that offers ICT services to both sectors (private and public) (Vision 2030, 2021). At the time, the economy was hindered by a lack of adequate ICT infrastructure to develop and grow, as was the case with other countries in the global competitive marketplace.

Digicel then formed alliances with companies such as Cisco Systems, Broadsoft, Asigra and via the takeover of a company called Netxar Technologies. This put the company in a position to forge competent and reliable ICT infrastructure within Jamaica (Government of Jamaica, 2021). Correspondingly, LIME which is another telecommunications company with many years of operations in Jamaica was also committed to assisting the GoJ in ensuring that all students had access to the Internet and a device to supplement learning across Jamaica (Government of Jamaica, 2021). The

move by LIME has helped Jamaica overcome the many obstacles to offering education to all learners nationally. A reoccurring challenge is access to education for all learners, which has been compounded by overcrowding and a lack of adequate resources (Ministry of Education and Youth Jamaica, 2021d). Online learning could be the answer to this particular problem. Under the ICT policy initiatives, a part of the infrastructural plans sought to implement, initially, at least 10 devices for each pre-primary school, and primary and secondary institutions were slated for 35 computers and other hardware peripherals.

Additionally, in 2008 the GoJ launched an e-learning project for schools across Jamaica by establishing infrastructure using the most up-to-date technology in collaboration with the Ministry of Energy, Mining and Telecommunications, and the Education and e-Learning Jamaica Company Limited. The platform for this venture initially served approximately 11,000 educators within 186 institutions. Technology training and certification sessions were hosted for teachers and e-resources were provided. A respected telecommunications company attached to the Spectrum Management Authority was contracted to oversee the implementation and maintenance of the e-learning platform, along with the e-Learning Jamaica Company Limited. Computers, laboratories, media equipment, and networks were part of the system.

Correspondingly, a broadband framework system was implemented for schools around the island to access the Internet. It was an investment instituted for the attainment of the ultimate goal, which is the Jamaican education system offering inclusive learning to all students with the aid of online learning made possible by way of ICT infrastructure (Jamaica Information Service, 2019b).

The literature indicates that further efforts were made to increase awareness and improve investment in the ICT infrastructure for education. The GoJ instituted a program called ‘Tablets in Schools (TIS)’ which was designed to bolster the education system through virtual learning. Later in 2014, findings revealed that the Ministry of Education, and Youth, the Universal Service Fund, and E-Learning Jamaica Company implemented the TIS program. The initial rollout targeted 38 institutions around Jamaica. Equally important is the sample for the pilot phase of the TIS initiative, which includes selected institutions from every sector under the supervision of the Ministry of Education, and Youth. The selected schools were from the elementary, junior high, senior high, special education, and tertiary levels, which were apportioned respectively; 47.4%, 15.8%, 31.6%, and 2.6% (Eason & Lamoni, 2015; Onyefulu et al., 2016b) (see Table 2.7). Most importantly, one of the main goals of the program was to integrate ICT tools to supplement the national curriculum within the education system; by providing standardized e-resources aligned with the syllabi, and to efficiently provide professional development for teachers while training and in their daily practice (e-Ljam, 2021).

Table 2.7

*Tablet in School (TIS) Initial Project in Jamaica (*Onyefulu et al., 2016b).

Region	Infant/Basic	Primary	All-Age & Junior High	High school/Academy	Special Education	Teachers' Colleges	Total
Kingston	2	5	2	2	-	-	11
Port Antonio	1	1	-	-	-	-	2
Brown's Town	1	2	1	1	-	-	5
Montego Bay	-	1	2	5	-	1	9
Mandeville	1	1	1	1	-	-	4
Old Harbour	1	2	-	3	1	-	7
Total	6	12	6	12	1	1	38

To further illustrate the GoJ commitment to providing access to online learning in 2020 as a strategy to respond to the COVID-19 pandemic, another e-learning platform was introduced in collaboration with 1on1 Educational Services Limited (providing a learning management system) and FLOW (a top Internet service provider in Jamaica) to ensure that learning across the island's education was not significantly interrupted. The infrastructure offered to the education system in Jamaica by the alliance secured virtual classes publicly, afforded instructors a space to teach their individual classes, and equipped teachers and students with resources in line with the Caribbean Secondary Examination Council (CSEC) and other syllabi offered within the school system. An equally important addition to online learning is the platform offered by FLOW Jamaica Limited via

their study portal, developed specifically to sustain learners impacted by unforeseen interruptions to their education (Government of Jamaica, 2020; Ministry of Education and Youth, 2021d).

The commitment of the GoJ was further demonstrated with the development of the agency the Universal Service Fund (USF) which is affiliated with the Ministry of Science, Energy and Technology. It was authorized in 2005 to provide access to ICT platforms to promote growth and development in the country. The USF has been providing free public access points to the Internet within communities across Jamaica (Universal Service Fund, 2021). Additionally, it has provided schools with devices and computer laboratories for students and instructors to connect to online learning environments (Ferguson, 2021b). Subsequently, the USF agency has installed Wi-Fi portals for the public, amounting to 13 such points around Jamaica, and there are plans to increase that number by the end of 2021. More importantly USF is planning to launch a project mandated to establish approximately 189 hotspots in residential areas across the island in the immediate future (Universal Service Fund, 2021b). Therefore, adequate funding is essential for projected online learning improvements across the island.

2.6.3 or Online Learning

Funding for education is crucial to its quality and opportunities for learners to gain access to schooling. Therefore, globally countries have invested heavily in the education sector, based on the firm objective of amassing a productive workforce, positioned to compete effectively to meet the demands within the fiercely competitive information and digitized society (Abdullah et al., 2017; Bexheti & Mustafi, 2015). The OECD (2023e) reported that the average cost of education in its member countries for tertiary-level

education is approximately $17,600, secondary-level $11,400, and for primary-level $9,900 US dollars. The USA also deemed adequate funding to be the main driver for correcting educational deficiencies amongst learners and increasing the number of highly skilled workers needed for its labour force (Deming et al., 2015).

In Jamaica, the overall funding for education comes from the national budget each year (6.5%) and further subsidies from private and international partnerships. The education sector in Jamaica is allocated the largest amount of money annually. The total expenditure spent per elementary student was $1,329 and a further $1,527 US dollars have been allotted for high school learners (Caribbean Policy Research Institute, 2021). The use of an EMIS within all schools and the creation of a reliable ICT infrastructure demand a sizeable amount of funding to procure hardware, networks, software and other related technologies, as well as the costs of expertise to develop and maintain this venture.

The Ministry of Education will need around $10.8 million in Jamaican dollars for the planning stage of the ICT for education introduction. While $1 million will be reserved for maintenance annually, it will be supplemented by contributions of approximately $2.5 million from donors. Therefore, any remaining expenses will be funded by new innovations for procuring additional funds for the continued support and maintenance of the ICT for education initiative. The costs for technological support were estimated to be $4.9 million US dollars during the planning stage. This was allocated into expenditures for meeting labour costs for research and development specialists, which were estimated at $1,000 US dollars daily per individual; international support specialist resources were estimated to accumulate $1,200 US dollars for daily specialists; and local specialist was estimated at $850 US dollars daily (Ministry of Education and Youth Jamaica, 2021d).

In 2005, the implementation of ICT infrastructure was commissioned for the Jamaican education system at a cost of $50 million US dollars, sponsored via the Universal Access Fund (UAF). Furthermore, between 2008 and 2009, the sum of $1.5 billion was made available to enhance the e-learning project (Jamaica Information Service, 2008a). This was followed up in 2015 by a further $700 million in Jamaican dollars invested in the Tablets in School program (Eason & Lamoni, 2015).

More funding is continuously being poured into online learning in an effort to achieve inclusive availability for all learners. This is exemplified in the contribution of $7 million Jamaican dollars to schools by the USF to help keep learners and teachers connected to online learning platforms (Ferguson, 2021b). Additionally, the United Nations Development Program (UNDP) and the United Nations Environment Program (UNEP) have made a further $11.6 million Jamaican investment to procure technology centres, along with the contribution of tablets to improve learners' access to online learning in the city of Kingston UNDP, 2017b; (UNDP, 2021b). However, despite these initiatives targeted at implementing and improving online education, there are factors that hinder its full value in the education sector.

2.7 Factors Impeding Inclusive Online Learning

Research predicted that the introduction and continued offering of online learning would be confronted with obstacles (Adnan & Anwar, 2020; Borup & Evmenova, 2019; O'Doherty et al., 2018) that should be managed towards the greatest utility of the online learning experience. Some major impediments reported to be representative of the online learning modality, regardless of the value it brings to education are: (1) unavailability of devices to parents and guardians to participate in their children's education effectively; (2)

a lack of prerequisite skills in teachers, parents and students which are necessary to understand the technologies in use by schools; (3) extra time demands placed on instructors in the design and execution of lessons, activities, reporting, continued professional development, and monitoring required for the synchronous and asynchronous classrooms; (4) fluctuating levels of support provided for the daily demands of online education; (5) keeping alignment between taught lessons and the prescribed curriculum; (6) the cultural barriers and language gaps which interferes with effective communication between teachers and parent or guardians (Shea, 2019; Willis & Exley, 2018).

Willis and Exley (2018) explain some of the impediments experienced during online education, based on a qualitative study conducted in an Australian school. The scope of the study examined online education for students ranging from 5 to 17 years-old using the Seesaw social media app. The sample population included two instructors and a total of thirty learners, along with their parents. The findings corroborate many of the impediments mentioned above as preventing online learning from achieving its greatest potential. The primary impediment cited was in the form of disapproval of the widespread use of smart technologies as a platform for presenting education to learners. A further discovery made during the study was the excessive demand on teachers' time in adapting their lesson plans for online learning, as there was no previous inclusion in the curriculum. In addition, there was inadequate support for the problems encountered during the use of the social media app for learning. Moreover, some features of the online learning platform (Seesaw App) were misused or ignored, resulting from instructors' lack of prerequisite skills, which culminated in inefficient use of the platform by students and parents. There was also a problem with parents' ability to use the platform to support their children.

Complimentary to this, a recent study by Baczek et al. (2021) which surveyed (*N* = 809) Polish students studying medicine online concluded, as did Willis and Exley (2018) that amidst the vast benefits afforded learners studying online, impediments were in the form of system failures with learning platforms and inadequate direct communications (54% and 70% respectively). However, the online learning experience was deemed a success, as reported by 73% of the sample population. In addition to the studies by Willis and Exley (2018) and Baczek et al. (2021), Karaoglan-Yilmaz et al.'s (2020) findings appear to be consistent in relation to the examples of factors mitigating against the success of online learning. The investigation identified a sample population of (*N* = 35) teachers in training, enrolled in the education department of a university in Turkey. The aim of the research was to ascertain the effectiveness of formative assessments administered online. The main disadvantages cited for the online learning experience included technical problems, time management issues, and dishonesty amongst students during the online sessions, especially in exams. Yet again, all participants in the study were in agreement that online formative assessments were progressively valued in assessing learners (p. 7).

Additionally, a series of recent studies in Australia, the USA, Canada, and the UK have indicated similar impediments experienced during online education. Raymond et al. (2016) carried out a study within an Australian university that applied a qualitative methodology for examining learning in peer groups in an online course. The sample size was (*N* = 61) learners. The results of the study reported impeding factors against online education such as technical issues resulting in distressed learners, a lack of technological skills, and a lack of adequate interactions among participants in the course. Likewise, Fredericksen (2017), conducted a country wide study in the USA using an online survey

method, among (*N* = 255) tertiary institutions engaged in online learning. Despite impediments, many benefits of online learning were revealed.

However, issues or problems associated with this type of learning included keeping instructors up to date with training, for the ever-changing technology in use, financing, establishing and enforcing ethical guidelines, providing support for online learning infrastructure, and staffing for online learning. While in the UK, Munro (2018) reported research outcomes highlighting various impediments to online learning. These were in the form of a lack of validation through accreditation when courses were offered across many country borders, the unavailability of devices, inadequate network infrastructure to provide connections to competing online courses globally, and increased competitiveness among schools around the world petitioning students globally. Though it was noted in the study that competition may improve the quality of the online education offered.

Whereas in Canada, Ives and Walsh (2021) conducted qualitative and exploratory research among several tertiary institutions, guided by a constructivist and interpretative ideology to examine distance and online learning. Several issues were discovered, the first being that adequate funding and the provision of access to online education have not yet realize their greatest potential, instructors have experienced challenges with the transition from teaching face-to-face to the online learning environment. Some of the institutions in the sample population had negative reports regarding support from the institution, but others flourished as a result of technical and administrative support. It was also noted that one university had strong resistance to the change to online learning, which was linked to concerns about technical support, changes in positions, and accountability. Other factors

uncovered that hindered the online process were a shortage in staffing and resources, and the need for clear goals and methodologies for guiding online education.

Similarly, a study conducted in the Philippines by Baticulon et al. (2021) among learners studying medicine, revealed almost identical barriers faced by online learners. The research reported obstacles to online education presented in the form of technological deficiencies, personal challenges (learning styles and responsibilities), inadequate support through schools (resources and staffing), and unequal distribution of ICT infrastructure in some areas, where students reside.

Likewise, Han et al. (2021) and Wang et al. (2018) undertook studies in China, a country with a considerable investment in online learning, and are reporting similar challenges that have been illustrated in the preceding paragraphs. Issues revealed in the studies about China's online education included increased hours of work for teachers, especially at the primary level, as the student to-teacher ratio is (100:1). Also, it was reported that the parents and guardians of elementary learners, have shown some resistance to online learning, as they question the validity of this type of learning experience. Further issues highlighted were a lack of technological skills and policies to safeguard users online, among various minority groupings within Chinese society. There was also inadequate financial investment in online learning, a lack of standardized e-resources and ways to share resources ethically within learning communities. The ICT infrastructure was not equitably distributed throughout the country, and there was a shortage of staff with expertise in using ICT in education. Despite these setbacks China has managed to attain computer usage country-wide.

In Pakistan, Adnan and Anwar (2020) reported that the emergence of the COVID-19 pandemic unveiled a serious disparity within the country in the distribution of ICT infrastructure. When schools were forced to hold classes online there were issues of inadequate or no LMS in place, and a lack of financing for current technologies and up-to-date ICT networks for education. Moreover, the disadvantaged groups in the country were unable to participate in online education because of poor or no Internet connectivity.

In contrast, other studies have cited negative impacts like learners' feeling exiled from other participants within a course online, which acts as a barrier for online education. Learners' feelings of isolation during online learning are displayed through apprehension about using technologies for online education, problems associated with learner communication within different modules, and instructors themselves lacking adequate techniques for teaching online classes (Gay & Betts, 2020b; Gillet-Swan, 2017; Reeves et al., 2017).

In comparison, an illustration of online education problems was reported in a study by Zhu et al. (2018) who examined 'MOOC design considerations and challenges from the instructors' perspective'. The researchers used a mixed methods approach with an online survey which gathered the views of (n = 145) lecturers. The results revealed that 49% found student engagement during MOOC courses difficult, 49% reported challenges in identifying techniques to improve interactions within the online courses, and 48% attribute challenges to increasing demands on lecturers' time in developing MOOC courses. Additionally, lecturers struggle with the assessment of learners in MOOCs with large participant enrollment. Correspondingly, Bonk et al.'s (2015) study conducted to examine the experiences of self-directed and informal learning of participants in the Massachusetts

Institute of Technology's (MIT) OpenCourseWare, reported challenges such as time management or inadequate time allotted for the course, insufficient interactions among participants within the course, technical issues, a deficiency in the quality of resources offered in some areas, and dissatisfaction with the subscription fees charged.

Juxtaposed to the MIT findings, Vivolo (2016) shared an article based on the New York State University identifying resistance to online learning, as fear from the institution and instructors of technology dominating education and replacing teachers. Further reasons for resistance against learning online were found in the findings of a survey within the university, which showed concern about the validity of the learning gained via online classrooms. Additionally, as other research has uncovered, more time was demanded from teachers to design online course; there were problems with technical and institution-wide support; and inadequate communication between participants engaged in online learning was reported.

Furthermore, in a study examining the development of an online course for engineering students, Bacon and MacKinnon (2016) highlighted challenges such as lecturers using the same strategies for their face-to-face classes in the online learning environment, which culminates in low performance. Additionally, learners' failure to manage their time during courses negatively impacted low achieversif they were not proactive in their organization skills.

2.7.1 Factors Impeding Inclusive Online Learning in Jamaica

Jamaica's education system has been plagued over the years with problems associated with the availability of school spaces, equal distribution of educational resources, quality of education offered, staffing needs, and safety (Ministry of Education

and Youth Jamaica, 2012a). Although online learning has brought innovation to education around the world including within the Jamaican education system this new approach to learning has brought with it many benefits, as well as some barriers and challenges that impede the online learning experience (Ali, 2020; Muthuprasad et al., 2021; Oberhelman & Dunn, 2016b).

The issues associated with online learning in Jamaica were like those affecting the process in other countries around the globe. Evidence of this has been reported by Onyefulu and Roofe (2019a) using a survey conducted with a sample population of 55 in-service teachers in training. Findings resulting from the study, showed that technical support was a grave obstacle to their online learning experience. Also, some teachers at the secondary level lacked the technology skills necessary to keep up with the demands of the online courses. There was confusion about navigating the LMS (Moodle), the ability of participants to manage their time effectively, and inadequate direct contact with instructors.

A persistent problem existed with power outages and unreliable Internet connectivity in some areas which was a major concern. In comparison with research findings in the USA and other countries, the main deficiency of the online learning environment was a lack of direct communication, technological skills, technical support, the ability to manage time effectively, inadequate infrastructure in some areas of the country, and schoolwide support for students engaged in online learning.

Central to online education in Jamaica Clarke (2015) conducted a study using the University of the West Indies Open Campus Learnings, participating in online learning. The findings revealed a 35% dropout rate in their first year and attributed this to some of

the factors uncovered by Onyefulu and Roofe (2019a), with 15% related to low quality learning experience, 71% related to time management, 12% related to a lack of support from the school, and inadequate communication among participants within the courses.

In exploring the possibilities of technology for education in Jamaica, Dunn (2016a) asks whether the various groupings in Jamaican society can have access to these resources. He cited that there was an unequal distribution of ICT network infrastructure. Hence, a digital divide exists between Jamaicans from low socio-economic status areas, where only 21% could access a reliable Internet connection within their homes. Evidence revealed that a further 80% of the population lacks without up-to-date digital connectivity. Conversely, though smartphone technology access is greater, boasting a 94% connectivity rate among minority groups, its physical size and storage capacity impede reliable usage for online education. Therefore, many students and teachers are not able to access online learning from their homes. Additionally, there are problems with a need for staffing with technical skills (p.7).

Complementary to this, Dunn (2016a) recounted the unequal distribution of ICT infrastructure across the island of Jamaica as a significant and compounding issue, in the hinderance of inclusive access to online learning in Jamaica. Recent reports about the ICT coverage in the country have shown that even though most Jamaicans have access to mobile technologies, only approximately 13% have broadband connectivity, fixed lines 14.3%, and amongst lower socio-economic groupings, Internet access is a pitiful 21%. Additionally, Jamaican households lack devices to connect to online learning, as there are only about 6.7 devices for every 100 residents. This is the reality, although there is an agency established, the USF, to provide free access to the public to increase the

availability of reliable Internet access points, for low-income earners and disadvantage schools and communities.

Equally important to the discussion of impeding factors to online education in Jamaica, Bourne and Owen-Wright (2018b) declared a primary impediment to be resistance to change from the traditional mode for teaching and learning, with the teacher at the center of the learning environment, instead of the students. Resulting in a reluctance to adapt new and contemporary teaching ideologies to help fix the high rates of failure amongst students about 75% at the secondary level institutions in national examinations.

Similar results were reported by Anderson (2018) who conducted a study within a Jamaican university where a program taught in the traditional mode was transformed into the online learning mode. Similar barriers to online course success surfaced, as uncovered by Onyefulu and Roofe (2019a) in their study. Issues identified included technical issues and, for all participants in the course, a lack of sufficient training in the use of the LMS. There were also inadequate interactions over the duration of the course between learners and instructors. Also, the learning design failed to meet the needs of all students. Moreover, teachers showed resistance to change in adapting the teaching practice methodology best suited for the online learning environment.

Yet again, Kelly-Williams' (2017) study conducted in Jamaica, which interviewed schoolteachers in early childhood education who were participating in the TIS, uncovered several issues for online learning at that level of education. Just as previous studies have shown, similar challenges were experienced in the form of insufficient training for teachers involved in the project, not enough tablets to meet the class sizes, a lack of technical and

administrative support, concerns about the safety of learners transporting tablets daily, and problems with connectivity to the Internet.

In contrast to Kelly-Williams (2017) and Onyefulu and Roofe (2019a) findings reported that technical support has been one of the major issues impeding online learning, Craig and Harindranath (2015) found different results in the case of technical support being a problem within one university in Jamaica. The research used a mixed-methods approach, among three of the university's sites, located in different parishes around the island, using LMS for online education. These researchers found that participants in the study were very satisfied with the technical support during courses. However, the study cited other similar problems such as decreased availability of resources, students lacking technology skills, technical issues, a lack of continued professional development for offsite campuses, and resistance to change.

In addition to the studies reviewed in the preceding paragraphs, Bleeker (2019a) conducted a study in the Caribbean to examine the implementation and use of USF. The agency was established to ensure access to ICT infrastructure for minority groups in disadvantaged areas of the islands. The evidence reported some challenges with the project in the form of a lack of laws and policies to guide its implementation, and the continuous provision of the service. There were political issues resulting from changes in government parties with different priorities than access to ICT, which delayed funding for the service. Other issues revealed were the use of outdated technology that is incompatible with current residents' needs and the underutilization of USF funds to attain national access to the Internet.

To conclude, a series of recent articles has indicated that Caribbean students are expected to struggle with online learning attributable to factors such as not owning a device, unreliable or unavailable Internet connectivity at home, and in some instances at school. Additionally, those who do have Internet connectivity will grapple with high costs and some instructors are still grappling with improving technology skills to deliver lessons effectively online (Caribbean National Weekly, 2021; Clarke D., 2021; Ferguson, 2020a; Mantock, 2020; Marius, 2020).

Amidst the vast amount of knowledge and skills that online learning via the ICT infrastructure in Jamaica has made available to learners who would otherwise not be able to access education, there are elements within the environment that retard its fullest potential. These include the problem of the digital divide between rural and urban Jamaica, inadequate ICT technical support, and the imbalance of employment by ICT networks for education between rural and urban schools. A significant problem that thwarts the online learning initiative is the inequality in allocation of ICT resources across the island of Jamaica, which poses a problem for access to certain groups in the country (Ingraham, 2015; Mayne & Dixon, 2020)

Additionally, some factors were identified as problematic for online learning in Jamaica, such as funding, as ICT networks will demand a large investment. Therefore, this could limit the expansion of online learning equitably around the country. Also, research shows that the information technology specialists who are graduating within the country are having difficulties securing jobs, hence a large number migrate with their expertise. Equally obstructive to the program was the ‘buy in’ by all stakeholders into the

new innovation in education, online learning (George, 2015). Nevertheless, online learning has played a part in assisting Jamaica in achieving its educational goals.

2.8 Online Learning Contribution in Achieving Jamaica's Education Goal

The chapter draws into focus the existence of a worldwide crisis where 264 million learners were estimated to not attend school in 2017 (UNESCO, 2021f). This number has risen considerably since the start of the COVID-19 pandemic to 291 million learners in 2020 (UNESCO, 2021f). The impact on children is immeasurable and places in jeopardy Goal 4 relating to the Sustainable Development Goals objectives, in recommending quality education for learners irrespective of status or station. Additionally, the World Declaration on Education for All (EFA) joins in the charge for every learner of school age to be afforded an education. Complementary to this, the United Nations Convention on Rights of Persons with Disabilities (CRPD) has advocated for students who are disabled, equal opportunity to participate in the same quality learning as their counterparts, Jamaica has used this guide to mandate inclusive education for all (Brissett, 2019; Samms, 2017; Searle, 2017).

Incidentally, many countries, including Jamaica, are finding 'Education for All' very difficult to achieve and maintain. Therefore, the open school mode of education has been put forward as a solution to complement the already extended physical school spaces, currently in operation (Commonwealth of Learning, 2017; Samms, 2017). Recent literature proposes a global recommendation for a compelling presence in the digital era, which requires foundational technological skills, key competency skills, and expertise in essential skill areas (Duhoe et al., 2020; Peters & Britez, 2019).

One of the criterion skill repertoires that is vital, points to the competencies of instructors in developing new methods of instruction using technologies for training

learners (Barrientos & Shahid, 2020). Therefore, online learning is recognized as a viable solution for increasing access to education and training at all levels of the educational system (Goodman et al., 2019). Yet, MOOCs are reporting a contradiction as they are plagued with high dropout rates (De Freitas et al., 2015). For example, the influence of online education has evolved and grown into more sophisticated modalities in comparison to its inception. Present offerings include open classroom, open schooling, open university, open courseware, and open education (see Figure 2.8). Currently, a wide variety of smart technologies have widened the options and quality of online education, which is creating an essential usage by the education system (Peters & Britez, 2019). Subsequently, there are diverse options available, such as MOOCs, LMSs, gamification software, and e-resources to name a few. Additionally, Sun and Chen (2016) support that to further promote inclusive education, online learning courses for-profit and not-for-profit have been on the rise over the last two decades (see Table 2.8).

Figure 2.8

Historical Moments in the Development and Increased Usage of Online Education.

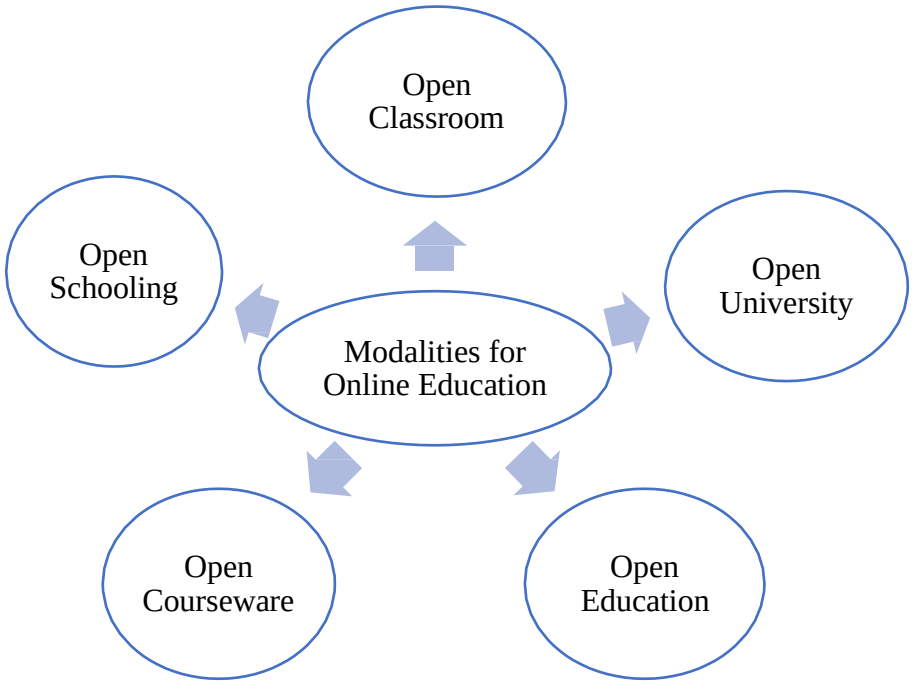


Table 2.8

Online Learning Programs Developed and Offered Over the Years (Schroeder, 2012; Sun & Chen, 2016).

Name	Sponsor	Year	Fees
Coursera	Princeton University, Stanford University, University of California Berkeley, University of Pennsylvania, and University of Michigan-Ann Arbor	2011	Private
eduMOOC	University of Illinois Springfield	2011	Free
edX	Harvard University and Massachusetts Institute of Technology	2012	Non-profit
iTunes U	Apple Corporation	2012	For-profit
Khan Academy	Salman Khan	2007	Non-profit
Minerva	Minerva project & Keck Graduate Institute United States Secretary of the Treasury	2012	Private
MITx	Harvard and edX	2001	Non-profit
Peer to Peer University	Hewlett Foundation and The Shuttle-Worth Foundation Initiative	2009	Non-profit
Saylor	Michael J. Saylor	2008	Non-profit
TED-Ed	Sapling Foundation	1984	Private & nonprofit
Udacity	Sebastian Thrun	2012	For-profit
Udemy	Eren Bali	2010	Free & for-profit
University of the People	Shai Reshef	2009	Non-profit

Furthermore, online learning is considered very useful to the education system in lieu of unforeseen interruptions to the learning process related to environmental issues like the COVID-19 pandemic (Duhoe et al., 2020). The online education modality can be useful as it promotes self-directed learning through interactions among peers, instructors, learning programs, and platforms. Giddings' (2015) study both confirms and reveals that self-directed learning is a major aspect of 21st century learning. Self-directed learning is described as a combination of behaviours and aptitudes directed towards the continuous enhancement of relevant skillsets over one's working age span. Giddings further posits, as supported by Meier (2015), that connectivism theory and ideology resonated with this type of learning. Additionally, it provides learners with multiple approaches within the online learning modality to access and use varying and competing information resources. Furthermore, it can facilitate the skills and knowledge necessary to stay current in the dynamic, fast-paced, digitally enabled working environment.

Although Giddings (2015) is of the opinion that the behaviourism philosophy hinders progress in self-directed learning Yarbrough (2018) believes that the behaviourism learning theory standpoint can guide the operation process expected of learners, instructors, and the institution. Referring to teachers' attitudes as crucial in the promotion and modeling of consistent and current teaching practices for online learning. While students are conditioned in the learning and study habits needed to achieve high performance through participation in online learning. Institutions and other stakeholders are also expected to present standards of operations and procedures within online education offerings. This should be geared towards producing prescribed institutional outcomes and goal achievement.

In response to the benefits of online learning for education, Jamaica has positioned itself to take full advantage of ICT for education and the value it can realize for its national education plan. The Ministry of Education in Jamaica has developed and enforced an ICT action plan and policies for gradual implementation at various levels within the education system, under the charter of 'The National Strategic Plan 2012-2020' and 'The Vision 2030' goals (Ministry of Education and Youth Jamaica, 2021d). Consequently, the main goals are to have 100% schools at the secondary level with reliable access to the Internet and continued professional development for instructors in the necessary technological skills for innovative delivery of the curriculum. However, despite these initiatives, George's (2015) study has revealed that Jamaica lacked a standardized approach to the offering of online education. Although Jamaica has started the process through the formation of the e-Learning Jamaica Company (e-LJam) along with participation in the CXC 'Notesmaster'. Complementary to this, at the tertiary level, Utech and UWI have been extending online learning through Moodle and Open Campus offerings, respectively (Commonwealth of Learning, 2017).

Controversially, across the Caribbean region, despite several initiatives to reform the education system; using innovative strategies like online education to increase access and participation inclusively, much more needs to be done to attain this goal. For example, in Trinidad and Tobago the eConnect and Learn (eCAL) program was launched where laptops were presented to all learners enrolled in high school (Maharaj-Sharma et al., 2017). In Barbados, educational reform was advocated through the program 'Education for All' (Pilgrim et al., 2018), while in Guyana the 'Education Strategic Plan' was implemented (Taysum & Abery, 2017). Similarly, across the globe reforms to education

have been challenging as a study by Samuels S. (2020) shares a convincing report published by the UNESCO (2021i)Institute for Statistics revealing a clear picture of this need, as (*N* = 258) million learners are not attending school globally, of which (*n* = 2.3) million and (*n* = 2.5) million and are elementary and secondary learners respectively. These numbers are inclusive of learners in the Caribbean and Latin America (UNESCO, 2019c). A comparison with the Commonwealth of Learning (2017) report showed a larger number number of (*N* = 263) million children; secondary school-aged learners account for (*n* = 200) million of the totals.

2.8.1 kills Training Island Wide

Education everywhere is changing both modes and practices leading to a myriad of different ways knowledge can be imparted to learners. Over the past two decades there has been a great demand for more robust channels for learning and instruction to meet the requirements of the current needs of students in the information and digital age (Colins & Halverson, 2018; Palvia et al., 2018; Williamson, 2021). Therefore, education leaders have embraced technologies in various formats for use in training and education (Duhoe et al., 2020). Central to the procurement of competent employees to fill the requirements of the current job market, online learning is one such avenue. A considerable amount of literature has been published citing various institutions and organizations utilizing online education, to assist in skills training in most societies around the world (Allen & Seaman, 2015; Palvia et al., 2018).

Correspondingly, a detailed examination of the use of online learning for specific skill training was carried out by the UNESCO (2020d) in Jamaica to plan the establishment of resilient modes of training for the Caribbean region under the education sector. To

facilitate the planning sessions, a joint meeting of the Ministry of Education and Youth, instructors, trainers, and leaders for training schools in Jamaica was held. This meeting was to enable discussions to develop a way forward for the Technical Vocational Education and Training (TVET) sector in Jamaica. Many feasible proposals were tendered that could be beneficial to the increase of access and continuation of skills training in response to crises like the COVID-19 pandemic. Some of the suggestions made were professional development in TVET, implementing ICT and innovative technologies in TVET courses, and ways to build strong support from all stakeholders. Distance education in the form of online learning, was advocated as the answer to the cessation of classes providing skills training courses (Duhoe et al., 2020; UNESCO, 2020e;). The use of ICT and other smart technologies was suggested, complimented by the creation of strong alliances amongst parents, industry, and other stakeholders. The participants further posited some other salient demands if the skills training is to successfully continue online. The demand put forward was for the provision of peripherals, software, funding, and a more reliable networked infrastructure, which is essential (Stone, 2017a).

However, despite the value these technologies bring in assisting the approaches for conducting continued skills training, there is a hinderance caused by insufficient access to the essential resources to soothe the transformation from the traditional training methods into new innovative learning digitally (Kebritchi et al., 2017; Palvia et al., 2018). Understandably, instructors requested the availability of current technologies and active participation in the decision-making process for the upgrading of the TVET training courses (UNESCO, 2020e).

Incidentally, previous research conducted by the Association of Caribbean States (ACS) and the French Development Agency (AFD) (2015) revealed that the TVET programs have undergone revision in 2012 to increase access to skills training for Jamaicans through the National Training System (NTS), the Career Advancement Program (CAP), the national Programs Division, the National Vocational Qualification of Jamaica (NVQ-J), and the Caribbean Vocational Qualification (CVQ). Subsequent reforms of the HEART/NSTA's training program were indicated through the formation of the HEART College of Innovation and Technology (HCIT) in 2010. Also, the most recent revisions of the programs in 2021 have continued towards the full implementation of GoJ's digital plan for Jamaica. The HCIT has been given the charge as a designated Academy Support Centre (ASC) and Instructor Training Centre (ITC) to position Jamaica for unforeseeable situations through education and training (HEART/NSTA, 2021).

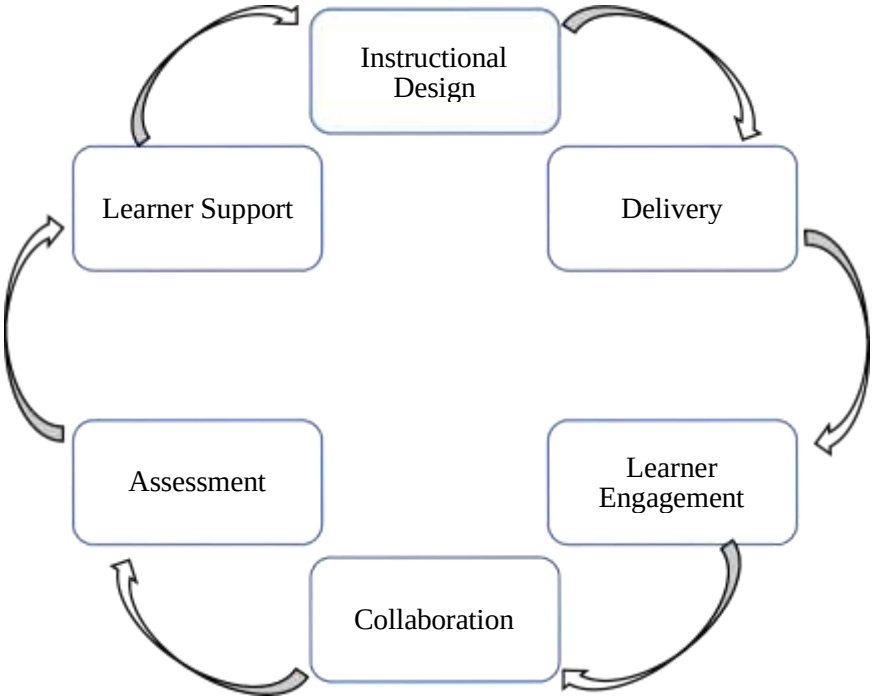
To add to the argument, numerous studies have debated whether the online mode of training can ensure the skills stipulated for an effective and productive workforce to efficiently compete within the now fiercely competitive global community, which is essential to economic growth and development (Marwecki, 2021; Shiohira, 2021). This is corroborated by Shiohira (2021) who emphasizes the importance of cost-effective connections for Internet use, which should be mandated by the state and schools, supported through public expenditure and the development of policies to guide their implementation. Therefore, ICT should be seen as an essential arm in improving skills training where the leaders of the various countries' goals should be to ensure equitable distribution of skills training and close the gap in the digital divide (p.43).

Furthermore, developments in TVET innovative practices have reorganized the ways in which learners are being prepared to respond to the demands of current society. A new venture has been introduced the ‘Innovation Hubs’ (iHubs) and has been conducted among several institutions across country borders, under the guidance of UNESCO-UNEVOC networks. The pilot project findings will be used to direct the TVET vision for best practices such as technological literacy for instructors and students that supersedes traditional teaching practices, via the employment of state-of-the-art ICT systems (Marwecki, 2021).

Correspondingly, Barrientos, and Shahid (2020) reiterated the value improvements that ICT-infused training environments could yield. Eligibility criteria reaped from the use of ICT for training include greater access to training for a wider cross section of learners within society, and the availability of training for lifelong learning (p. 12). For example, in Jamaica the HEART TRUST/NTA TVET programs have been organized to facilitate skills training for adults out of school. ICT can be utilized to facilitate upgrading the training approaches through technological networks or platforms for providing skills training by developing more innovative lesson designs (see Figure 2.9). Consequently, this learning design may promote improved support for learners, better engagement during lessons, networking among learners and resource persons, and standardized assessment practices (Barrientos & Shahid, 2020).

Figure 2.9

Benefits Derived From Technological Infusion in Skills Training (OECD, 2018a).



A study to understand more completely the key tenets of ICT in increasing access to and quality of TVET training for learners is reported by Bartley-Bryan (2017). The findings from the investigation reveal that approximately one hundred TVET courses have been offered over ICT-powered platforms by the University of Technology Jamaica (Utech). The move from a purely traditional teaching practice to a combination of 21st century instructional designs has provided greater access, student-centred learning, more engaged learners, and an avenue for self-directed learning. Furthermore, the use of ICT platforms for instruction and learning has enhanced collaborative interactions among various stakeholders locally and abroad, better utility of learning and staff resources, and timely professional development (p. 119).

Similarly, Utech, through its research department has collaborated with the Jamaica Development Bank to sponsor students involved in innovative training initiatives. They were able to develop state-of-the-art technology to aid deaf students. Complementarily, this resulted in the reorganization of the Lister Mair Gilby school for the deaf in Jamaica. Additionally, the creation of innovative networked technology platforms provided skills training for deaf learners, which was aided by a gift of tablets for every learner and instructor. This culminated in an opportunity for the very first deaf student to enroll in a business program at Utech (University of Technology, 2018). However, other studies have considered the relationship between skills training and learners' performance level via the online mode inadequate in preparing learners with the skill set necessary for the expertise needed in some job functions (Bettinger & Loeb, 2017; Kebritchi et al., 2017; Nash, 2015).

Yet, in Jamaica the HEART TRUST/NSTA an institution mandated for skills training, has envisioned the benefits of online learning in helping to fulfil its vision of bringing skills to Jamaicans by increasing access to meet the demands of the job market. The preparation of instructors to extend online education is ongoing where training is given in the form of developing online courses, the use of e-resources, and developing online ethical standards for practices for teaching asynchronously via a LMS (HEART/NSTA, 2021).

Downes' (2019) study was also conducted to examine ICT as a tool to increase access to skills employing a mixed-methods approach to training among 20 educational institutions across Latin America and 15 Commonwealth countries, including Jamaica. The study revealed that schools, TVET agencies within state ministries, and TVET institutions have developed ICT policies for Open Distance and Flexible Learning (ODFL).

This was made available to offer technical support and provide professional development for instructors in creating innovative course designs that are adaptable to personal and vocational responsibilities. In Jamaica this initiative is represented through the Human Employment and Resource Training (HEART) Trust, and the National Training Agency (NTA) which facilitates skills training over a network of several schools, ensuring adults have the necessary job-readiness skills to meet the demands of the workforce. To add to this, Isaacs (2015) reports that the Faculty of Education and Liberal Studies (FELS) at Utech is providing the training and professional development of technical and vocational education post-secondary instructors.

Similarly, UWI in Jamaica, Mona, has embraced the HEART TRUST/NTA initiative by offering online modules to learners to develop pertinent requisite skills, through an alliance between COL and HEART. This initiative has been helping to ensure participants in the programs have flexible instruction, promoting the highest quality workers, on par with worldwide standards. Many online courses have been created to support this mandate, as well as policies to guide its implementation and benchmark the standard of learning. The main aims of these programs are to empower students to become lifelong learners, promote more engaged learning environments, enhance instruction, utilize more innovative ways of enlisting learners in developing themselves personally and vocationally, and move towards inclusive access to schooling for all (Carr & Gruda, 2015; Hutton & Dixon, 2016; Mitchell, 2016).

Complementarily, at the elementary level of education, skills training is also deemed essential to the development of children. An example of this value placed on early skills training for learners can be seen in the TIS initiative. This was implemented in Jamaican

schools geared to teaching soft skills such as problem-solving and innovation (Kelly-Williams et al., 2017). Furthermore, the program also sought to resolve the issue of inequality in access to educational resources and sources (Coy et al., 2019). Juxtaposed to this is the example to the New Zealand education system which has made available inclusive education to various communities within the country that are in remote areas. Technological networks through shared learning platforms and resources via online learning have helped New Zealand achieve its educational objectives (OECD, 2018a).

2.8.2 essional Development Nationally

Bolderston et al. (2017) and Markham et al. (2017) in their studies revealed that in the field of medicine social media is fast becoming an essential platform for professional development on the job. Networking among people in the medical profession breaks down the barriers of restricted access to information from competing data sources. Platforms such as Twitter, blogs, and online case-based discussions are being used by doctors to collaborate with other colleagues globally, which makes possible real time solutions to common issues experienced on the job.

A similar study by Green and Huntington (2016) supports the value of providing tutorial groups, webinars, and video tutorials to assist medical practitioners in staying current with benchmarked practices within the fluid information age. In the field of education Misra's (2018) study revealed that MOOCs are very efficient in providing CPD for teachers. CPD is being offered through MOOCs such as Coursera, edX, Canvas Network, and Udacity, to name only a few. Many universities around the globe are participating in providing MOOC courses to learners. For example, the University of South Wales Australia, University of California USA, and the University College London.

Additionally, organizations like UNESCO and COL are providing funding and support for the promotion of CPD via MOOCs towards an investment in lifelong learning.

A Jamaican perspective reveals that ICT platforms are being used for professional development for teachers this is evidenced in Onyefulu and Roofe's (2019a) study to examine the use of online and blended learning for the professional development of in-service teachers. The findings revealed that teachers benefited from the online CPD course as they participated in self-directed learning opportunities to improve their practice, at a reduced cost. Furthermore, the literature review based on CPD through online learning in Jamaic, unveiled a study by Robinson M. (2019) who surveyed librarians about their CPD activities. The outcome of the investigation indicates that, due to the setbacks confronted by the traditional upgrading seminars, there is a need for online modality to reduce cost and increase access to professional development.

Similarly, the British Council (2021) has been offering CPD training in Jamaica for teachers available in online and face-to-face modes. Complimentary to this, UNESCO (2020e) in a joint venture with the MoEY, and the UWI Open Campus hosted online teacher professional development in Jamaica geared towards competencies in distance and online education, to become resilient during the COVID-19 pandemic and for future preparations. Further initiatives, such as 'No Child Left Behind' has been positively impacted by online learning.

2.8.3 Behind

There are several deficiencies that have plagued the Jamaican education system. The area of mathematics is one such problematic subject for learners. This is evidenced in a study undertaken by Bourne, (2019a) with a sample of Grade 6 students aged 10 to

12 within (*n* = 2) of the (*N* = 14) parishes in Jamaica, which amounted to 4,913 learners. The investigation used a quantitative research approach during the research process applied to the results from the 2017 Grade Six Achievement Test (GSAT) report on students who passed the examination, which was produced through the MoEY. Subsequently, the findings revealed a marked weakness among students in Mathematics where an approximately 50% pass rate was achieved annually over the past 10 years, which directly correlates to the low rate of passes at the secondary level in mathematics which is under 50% for the CXC. Clearly, there is a need to revise the learning design for teaching mathematics, which presents a shift from the traditional approach. Online professional development courses were provided for instructors in the schools, but most are impacted by failure. Additionally, game-based teaching was introduced with the integration of online platforms to provide equal access to resources for all learners Angheli-Zaicenco (2021) also supports this view.

Correspondingly, McLean's (2020) study cited other failings within the Jamaican educational system, which were identified among students who were at risk and some who dropped out of school. The Career Advancement Program (CAP) was created to assist these youths however, many failed to complete this course. Therefore, the introduction of a networked educational platform that promotes self-directed learning and innovative teaching strategies to engage learners could be made available. This could be coupled with flexible timetables for supporting the participants in CAP towards completing their skills training for job readiness. This is supported by Samuels S. (2020) who reported on Caribbean and Latin American educational problems and advocates for the use of open

educational resources to be implemented at the primary and secondary education levels to facilitate current benchmarked educational practices (p.232).

Additionally, a considerable amount of effort has been harnessed towards preparing educators to be resilient during the pandemic to ensure that learners are not left behind on their educational journey. An example of this was the online seminar provided by the Open University (OU) in the UK and COL for educational leaders and instructors from several countries, which includes Jamaica. The training includes deliberation for developing and designing action plans to achieve inclusive education for all. Additionally, to provide training for each delegate in creating innovative teaching resources and sources suited to their respective domains or countries in promoting education for all, despite environmental challenges. In short, the literature pertaining to inclusive education using online modality strongly suggests that irrespective of the efforts by many countries, in drafting policies geared towards a comprehensive offering of education and training, practitioners in the teaching profession lack adequate resources and continuous professional development. COL, with the help of the Open University's TESSA project, sought to fill this gap via a MOOC course for Commonwealth countries (Angheli-Zaicenco, 2021).

Notably, seminal contributions have been made by Iyare et al. (2018) to the discussion through a study conducted in Jamaica to determine the value of interactive technology in helping students to read with comprehension. The commissioned study focused on a sample population of 30 institutions at the primary level focused on learners in grade three. A mixed-methods approach was used during the research process. The findings revealed that the use of interactive technologies to complement traditional

teaching methods for reading comprehension can improve student's ability to improve their reading levels.

Coincidentally, the literature is revealing another aspect of inclusive education ensuring learners with disabilities are given the same opportunity for education. Evidence gathered in Samms' (2017) study examining the inclusion of children with disabilities within the educational system shows mixed responses from the various stakeholders. The parents seem ecstatic for their children to be in regular schools, yet some teachers feel that learners with severe disruptive disabilities may impede the learning environment to the detriment of all learners. Though they embrace those learners with mild to manageable disabilities, for whom they believe the regular education system can benefit.

Yet competing literature in Napier's (2016) study posits similar barriers that stereotype individuals with disabilities as unable to learn or function within society and prevent the progress of inclusion for this group. Further, technological enrichment activities have been discovered to have beneficial results in assisting the disabled in acquiring quality learning from the education system. Searle (2017) and Duhoe et al. (2020) contend that a lack of technological resources and staff trained in technology applications for education is an ongoing problem that is hampering inclusive education objectives across countries.

2.9 Summary

In summary, the intention of this chapter was to conduct a thorough review of the literature providing evidence of the value of 'online learning in increasing access to training and educational programs in Jamaica'. A multi-theoretical and conceptual framework that combines the connectivism and behaviourism theory ideologies towards a pragmatism

paradigm view was the foundation used to guide the mixed methods research process, a research strategy that is supported by (Grant & Osanloo, 2016).

The studies reviewed responded to six themes to validate whether: (1) online learning can be used to engage learners; (2) the ability of online learning to increase access to learning; (3) the attitudes of all stakeholders towards online learning; (4) online learning within Jamaica; (5) factors impeding inclusive online learning in Jamaica; and (6) ways in which online learning contributes to the achievement of Jamaica's education goals. The themes examined offer clarity based on the evidence found in past studies, reports from institutions in the USA, UK, New Zealand, China, Canada, and Jamaica, and using online learning reports and suggestions from educational organizations such as UNESCO, OECD, UNDP, and USF. A comparison of Theme 1 and 5 indicates that online learning is the new innovation for education and affords engaging classrooms that improve learners' performance (Stone, 2017a; Sun & Chen, 2016) which can be applied at all levels of the education system. However, Theme 5 presents some arguments that identify impediments (Kebritchi et al., 2017; Marius, 2020) which stifle the online education process (see Table 2.9).

Table 2.9

Studies Examining Learners' Engagement and Impediments Related to Online Education.

Studies Validating that Online Learning Can Engage Learners			**the Premises of Online**
Tang and Patrick (2018). Technology and interactive social media use among 8th and 10th graders in the US and associations with homework and school grades.	The study revealed a strong correlation between using computers for school results most often in positive pedagogical performance rates data derived from a sample population of youths 12 to 16 years of age.	**Shea (2019). Bridges and barriers to teaching online college courses: A study of experienced online faculty in thirty-six colleges.**	The study sample came from 36 colleges and 386 instructors to identify factors that support and those that impede its success. The number one factor found against online education among the lecturers was unattractive compensation followed closely by the lack of CPD for teaching in the online environment.
Tang B. et al. (2018). Online lectures in undergraduate medical education: Scoping review	The study reviewed 45 articles that discussed online instruction which revealed that this mode of educating learners in the medical field enhances their performance level.	**Palvia et al. (2018). Online education: Worldwide status, challenges, trends, and implications.**	This article presents some impediments across countries for online education. In the USA inadequate technological skills, more funding for CPD, refusal of instructors to engage in online learning, prejudice by employers against online credentials, high maintenance and implementation costs, student's perceived feeling of isolation. While challenges in the Middle East show lack of reliable Internet access, little acceptance for online learning by the general population, and little to no access to online education in Arabic jargon. Unequal distribution of ICT infrastructure was cited in Australia as an impediment to online education, while in Africa, cultural differences thwart the online learning programs, inadequate infrastructure, and a lack of ICT policy.
Sweany (2020). From theory to practice: Evidence-based strategies for designing and developing engaging online courses	The study emphasizes the value of online learning in engaging students when the design for courses allows learners to communicate with each other using multimedia tools.	**O'Doherty et al. (2018). Barriers and solutions to online learning in medical education – an integrative review.**	The study which scopes medical education revealed major factors that retards online learning such as time limitations, deficient technical skills, inadequate infrastructure, and lack of support from educational leaders.

Studies Validating that Online Learning Can Engage Learners			the Premises of Online
Susilawati and Supriyatno (2020). Online learning through whatsapp group in improving learning motivation in the era and post pandemic COVID-19.	The study employed a sample size of 30 university learners to determine the value of online learning through whatsapp group. The findings revealed that the use of the social media improve the motivation of learners.	**Kelly-Williams et al. (2017). Tablet but life still rough: Technology for early childhood sustainable development in Jamaica.**	The study revealed challenges were experienced in **nuff** the form of insufficient training for teachers involved in the project, not enough tablet to man classes, lack of technical and administrative support, and problems with connectivity to the Internet.
Sun and Chen (2016). Online education and its effective practice:	The study reviewed 47 research reports of the effectiveness of online learning to education. the findings show a correlation between well designed courses with direct relatedness to engaged and high performing learners.	**Clarke (2015). Virtual shock: Adult students' perceptions of their emotional experience on an online learning undergraduate degree at a regional Caribbean university (Doctoral Dissertation, University of Southampton).**	The findings from the study indicated that a 35% dropout rate in their first year and attributed this to 15% related to low quality learning experience, 71%-time management, 12% lack of support from the school, and inadequate communication among participants within the courses.
Roll and Wylie (2016). Evolution and revolution in artificial intelligence in education.	The study contends that maybe the human teacher or traditional teaching has become obsolete and new innovation for instruction should be promoted such as online learning which incorporates many resources directed towards learner engagement.	**Bacon and MacKinnon (2016). The challenges of creating successful collaborative working and learning activities in online engineering courses.**	The study highlighted challenges such as lecturers lack of technological pedagogical skills which culminates in low performance, time management impacting low achievers negatively.
Rienties and Toetenel (2016). The impact of learning design on student behaviour, satisfaction and performance.	This study verified through the analysis of 151 courses and 111,256 learners that the learning design of course can determine students' performance level.	**Willis and Exley (2018). Using online social media space to engage parents in student learning in the early years: Enablers and impediments.**	The scope of the study examined online education for students ranging from 5 to 17 years-old using the Seesaw social media App. The findings revealed a primary impediment as disapproval of smart technologies to present education and over-worked teachers in adapting their lesson plans for online learning.

Note: An analysis of the studies that examined learners' engagement in online learning and some impediments encountered during to Online education implementation and lesson/activities execution.

Consistently, throughout the literature review the findings have revealed that ICT can be an effective way, via online learning, of affording learners more opportunities to enroll in schooling (Jakobsdottir & Jakobsdottir, 2018; Kano, 2017). Complimentary to this, further discussions in regard to online learning were highlighted in Themes 2, 4, and 6. Theme 2 advocates the value of online learning in expanding participation in education and training at each level of the education system (Hutton, 2016; Joo et al., 2018; Kentnor, 2015; Samuels, S. 2020). Theme 4 defends the case that Jamaica has been positioned to implement inclusive online learning, based on the investment in ICT infrastructure and the development of ICT policy for education (Jamaica Information Service, 2021c; Mitchell, 2016; UNDP, 2021b).

Supplementary to this, Theme 6 validates that Jamaica and the rest of the world have already piloted online education successfully to meet educational goals such as ‘No child left behind’, CPD, and twenty-first century skills training (UNESCO, 2015a; University of the West Indies Open Campus, 2021; Wang et al., 2018). Therefore, the literature review has highlighted through evidence from archived data an examination of the extent of the use of online education within elementary, secondary, and tertiary institutions in several countries globally to provide context for its inclusive implementation in Jamaica (see Table 2.10).

Table 2.10

Analysis of Literature That was Reviewed

Theme 2 **The Role of Online Learning in Widening Access to Education.**	**Analysis of Theme 2 Studies, Articles, and Reports.**	**Theme 4** **Education's Engagement in Online Learning in Jamaica.**	**Analysis Of Theme 4 Studies, Articles, and Reports.**	**Theme 6** **Online Learning Contribution in Achieving Jamaica's Education Goals**	**Analysis of Theme 6 Studies, Articles, and Reports.**
Buchanan et al. (2019). Promoting environmental education for primary school-aged students using digital technologies **Forbes (2019). Digital technologies and online learning in primary education (New Zealand).**	Most children aged 5-12 own or have access to a smart phone, tablet, or laptop in most countries which evidence some technological skills which may provide ease of use for inclusion of online learning	Statistical Institute of Jamaica (2017). Information & Communication Technology. UNESCO (2021h). Sustainable development goals: Information and communication technologies (ICT). Jamaica Information Service (2021c). ICT policy for education sector.	GOJ has commissioned a detailed plan for the development the objective, to realize the 'Sustainable Development Goal (SDG4)' and 'quality and equal education for all' since the mid-2000s. The ICT team was formed to facilitate this goal attainment.	Ministry of Education and Youth (2021d). MOeY partnered with 1 On 1 and FLOW to expand online learning options.	MOeY in Jamaica has developed and enforced an ICT action plan and policies for gradual implementation at various levels within the education system, in response to the charter of 'The National Strategic Plan 2012-2020' and 'The Vision 2030' goals. The main goals are to have 100% schools at the secondary level with reliable access to the Internet and continued professional development for instructors in technological skills necessary, for innovative delivery of the curriculum.

Theme 2 **The Role of Online Learning in Widening Access to Education.**	**Analysis of Theme 2 Studies, Articles, and Reports.**	**Theme 4** **Education's Engagement in Online Learning in Jamaica.**	**Analysis Of Theme 4 Studies, Articles, and Reports.**	**Theme 6** **Online Learning Contribution in Achieving Jamaica's Education Goals**	**Analysis of Theme 6 Studies, Articles, and Reports.**
Gilbert (2015). Online learning revealingthe benefits and challenges. **Kizilcec et al. (2017). Towards equal opportunities in MOOCs: Affirmation reduces gender & Social-Class Achievement Gaps in China.** **Jakobsdottir and Jakobsdottir (2018). The development of online and blended learning in primary and secondary education in Iceland.** **Florian and Zimmerman (2015). Understanding by design, Moodle and blended learning: A**	Issues with lack of resources, gender stereotype, economic status of learners, and inadequate supply of teachers led to the adoption of online learning in many countries at the secondary level.	Information and Telecommunications Department Office of the Prime Minister (2011). Information and Communications Technology (ICT) policy. Government of Jamaica (GOJ) (2021b). E-Powering Jamaica: National Information and Communications Technology Strategy 2007-2012. Ministry of Education Jamaica (2012a). National education strategic plan: 2011-2020. Vision 2030 Jamaica (2009). Information and Communications Technology (ICT).	Jamaica has 100% access to the telephony service due to investments made in ICT reform of a yearly expenditure of approximately $80.9 million USD. Plans seeks to implement devices at the pre-primary school, primary and secondary institutions have been established. Jamaica is still seeking a more robust ICT infrastructure in line with the 'Vision 2030' goals to position the country for sustainable development through the support of ICT networked platforms.	HEART/NSTA (2021). Digital acceleration through education: A partnership between HEART/NSTA Trust & Cisco Networking Academy. Marwecki (2021). Innovating technical and vocational education and training: A framework for institutions	Reforms of the HEART/NSTA's training program have been well established through the development of the HEART College of Innovation and Technology (HCIT) in 2010. Further revisions of the programs progressed onto 2021 towards a digital plan proposed by GoJ. The HCIT has been given the charge as designated Academy Support Centre (ASC) and Instructor Training Centre (ITC) to position Jamaica for unfavourable education situations. The creation of new pathways for education introduced via

Theme 2 The Role of Online Learning in Widening Access to Education.	Analysis of Theme 2 Studies, Articles, and Reports.	Theme 4 Education's Engagement in Online Learning in Jamaica.	Analysis Of Theme 4 Studies, Articles, and Reports.	Theme 6 Online Learning Contribution in Achieving Jamaica's Education Goals	Analysis of Theme 6 Studies, Articles, and Reports.
secondary school case study.					(iHubs) among several institutions across country borders, under the guidance of UNESCO-UNEVOC networks.
Andrade (2015). Teaching online: A theory-based approach to student success. **Sun and Chen (2016). Online education and its effective practice: A research review.**	A major reason identified advocating for online learning by tertiary institutions reveal 68%, 67%, 46%, and 45% in response to issues in HE is citing timetable adaptability to time constraints, expand access to courses, increase modules offerings, and attract greater numbers of college and university learners.	Jamaica Information Service (2021c). Government to launch major ICT initiative in March. Ferguson (2021b). Access points must be shared with the community – USF boss. Eason and Lamoni (2015). Jamaica: Educating for the future.	In 2005, the implementation of ICT infrastructure was commissioned for the Jamaican education system costing $50 million USD, sponsored through the UAF. Additionally, between 2008 and 2009, $1.5 billion JMD was made available for improvement of the e-learning project. The USF made available $7 million JMD to schools to help keep learners and teachers connected to	Onyefuluand Roofe (2019a). Characteristics, technology capabilities, and experiences of in-service teachers on the use of online/blended learning at a tertiary institution in Jamaica. British Council (2021). Continuing professional development (CPD) training: Jamaica. UNESCO (2020e). Teacher development for online and blended learning	Online and blended learning has been used for the professional development of in-service teacher. CPD training in Jamaica for teachers is available online. Complimentary to this UNESCO (2020e) and MOEYI Jamaica, UWI Open Campus provides online teacher professional development in Jamaica geared towards competencies in distance and online education.

Theme 2 **The Role of Online Learning in Widening Access to Education.**	**Analysis of Theme 2 Studies, Articles, and Reports.**	**Theme 4** **Education's Engagement in Online Learning in Jamaica.**	**Analysis Of Theme 4 Studies, Articles, and Reports.**	**Theme 6** **Online Learning Contribution in Achieving Jamaica's Education Goals**	**Analysis of Theme 6 Studies, Articles, and Reports.**	
			online learning platforms	to ensure quality education during COVID-19 in Jamaica.		

Note: *Illustrating the analysis of literature related to Themes 2, 4, and 6.*

CHAPTER 3: RESEARCH METHODOLOGY

3.1 Introduction

The overarching aim of this study was to (1) investigate ICT's use for widening access to online learning; and (2) to gather valid and reliable data to reveal the connections between ICT tools and their impact on widening learners' access to training and educational programs in Jamaica (see Figure 1.1). Additionally, the secondary goal was to establish the value of ICT tools in affording learner quality training and education (see Figure 1.2). Furthermore, to identify some challenges faced with these systems in virtual classrooms across Jamaica. These aims were used to determine the significance of ICT tools in helping to close the achievement gap between different learners and offer equitable access to schooling opportunities. The goals of the study were underlain by the assumption that online learning can increase access to training and educational programs in Jamaica. Accordingly, the specific objectives of the research were:

1. To determine the extent to which online learning could be used to increase participation in education within public schools in Jamaica.
2. To determine whether there was any difference in the attitudes of learners and public education institution leaders in Jamaica toward online learning.
3. To deduce the effectiveness of online learning classrooms in providing quality training and education.
4. To determine any factors which impede the adoption of ICT mediated instructional approaches through online learning.

Central to the achievement of these objectives are the research methodology and research design. The following sections document in detail the mixed methods approach

adopted in this study which used a concurrent nested research design. This research design combines both the quantitative and qualitative approaches with the quantitative method as the focus for the research activities. Accordingly, the mixed methods approach combined two separate quantitative designs, (1) the descriptive and (2) the correlational designs, with a qualitative research design, grounded theory.

Further, a cluster sampling design was applied to determine the selection of the sample size. A three-stage cluster sampling approach was used to recruit participants for the primary data collection element for the quantitative data collection, with (1) simple random sampling selection used to form Cluster A, (2) Random cluster sampling for Cluster B, and (3) self-selection employed to develop Cluster C. Additionally, purposive sampling, self-selection and snowball sampling were used to recruit respondents for the interviews related to the qualitative primary research data collection, culminating in an overall sample size of 384.

Later, a deliberation followed to identify (N = 20) archived cases pertinent for use in the determination of the sample size related to the secondary research data. Arguments were presented that detail the specifics of the purposive (maximum variation) sampling method utilized to determine which of the archived reports should be included to respond to the research questions. Campbell et al. (2020) and Thomas (2022) assert that the use of the maximum variation sampling method permits the inclusion of a wider variety of information collected in response to the problem of interest. Therefore, the purposive sampling method was used to facilitate the evaluation of documents related to the issue from several perspectives in the search or any relevant patterns.

A detailed description of the data collection instruments used for the questionnaires was administered as part of surveys, interviews, opinion polls, and checklists utilized with archived reports. Similarly, a description of the operational variables slated for analysis was discussed, detailing the data analysis techniques applied to the collected quantitative data, which used descriptive and correlational analysis. The different types of descriptive analysis methods used were cross-tabulation, measures of central tendency and variability, and content analysis, which was applied to the secondary research data and analysed using the coding of related themes quantified. Additionally, Pearson's and Spearman's correlational analyses were applied to the data. On the other hand, constant comparative analysis using coding and memoing was administered to the qualitative datasets.

A narrative is presented to share the procedures observed in upholding ethical principles and to eliminate any biases. The discussion further elaborates on the four main ethical principles for research and the ethical approval process. The ethical principles related to participants' informed consent, its development, approval, and introduction to participants for the online surveys, opinion polls, and respondents for the interviews. Subsequently, a description follows detailing the procedures involved in developing the online survey, opinion poll and interviews and the software tools that were used to host these activities, such as SurveyMonkey, Zoom, and PDFiler.

The chapter progresses with a discussion about the triangulation techniques used during and after the data collection process and the strategies used when extracting data from the different groups within the sample. Correspondingly, details of the techniques used to analyse the data are highlighted at the respective stages of the study. Further

clarity is shown through the use of triangulation in effecting valid and reliable findings that can be applied to the population. This section concludes with a summary of the analysis procedures, emphasizing each method applied to evaluate and audit information, respond to the research questions, test each hypothesis, and develop theory relative to the phenomenon.

3.2 Research Paradigm

Ciocca and Delgado (2017), Schneider et al. (2019) and Zukauskas et al. (2018) admonished that research must identify a phenomenon residing in the real world and attempt to prove or disprove its presence. Similarly, to try to understand the reasons why and how it is impacting elements and people in society. Subsequently, discerning possible solutions to effect correction, management, or elimination. Hence, Ali and Pandya (2021d) and Nasution and Aulia (2019) deem the development of a problem statement, which in this study is whether *online learning can be a solution for public schooling in Jamaica,* necessary to assert the purpose of the study. It further permits the selection of clear guidelines about the paradigm or lens through which the researcher has examined the phenomenon.

Therefore, the current study is designed and set in the pragmatism ideology, which according to Kumatongo and Muzata (2021), incorporates positivism and interpretivism views, utilizing a mixed-methods research approach. It combines positivism objective statistical measurement of the problem and interpretivism providing the perspective of people who are impacted by the phenomenon. Kivunja and Kunyini (2017) and You et al. (2020) agree that paradigmatic direction for the study is an essential element necessary for the research process. Additionally, the presentation of the paradigm pathway for the

study drives the proper selection of the correct methodology, data collection methods, data analysis techniques, and the presentation of the findings.

Further to this, Kelly et al. (2018) and Mitchell A. (2018a) postulate that the pragmatic paradigm uses the abduction approach to guide the study, where the researcher combines the ideals of both the positivism and the interpretivism philosophies to overcome any shortcomings that may arise from abstraction. Kumatongo and Muzata (2021) both describe positivism as resonating with the quantitative approach, where the researcher, in this instance, has ascertained the realities of the issue through observation and logic to establish facts about the problem. For example, given the realities of the learning environment in public schools in Jamaica; can *online learning* increase entrance to schooling in the Jamaican public education system? Interpretivism, on the other hand, guides the qualitative approach which shares the participants' interpretation of the phenomenon. For example, whether teachers, students, administrators, Ministry of Education officers, and prospective learners believe that *online learning can* expand entry into learning.

Abduction reasoning is then, achieved through the examination of the problem of interest from both statistical evidence and from the participants' interpretations, then choosing the most favourable solutions for application to the problem based on careful comparisons. Therefore, decisions made relative to the phenomenon were value-based and determined by the activation of abductive reasoning through triangulation at selected stages of the research process. Accordingly, the researcher's intention in applying the mixed methods approach during the research process, to combine the quantitative

(positivism view) and qualitative (interpretivism view) methodologies to facilitate more accurate conclusions drawn through abductive reasoning (see Figure 3.1 and 3.2).

Figure 3.1

Abduction Paradigm Application in the Study

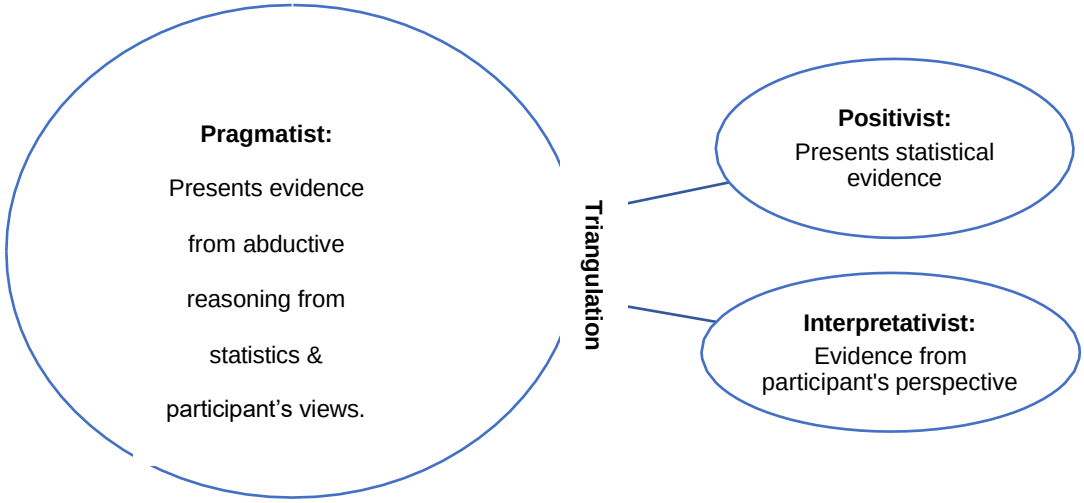
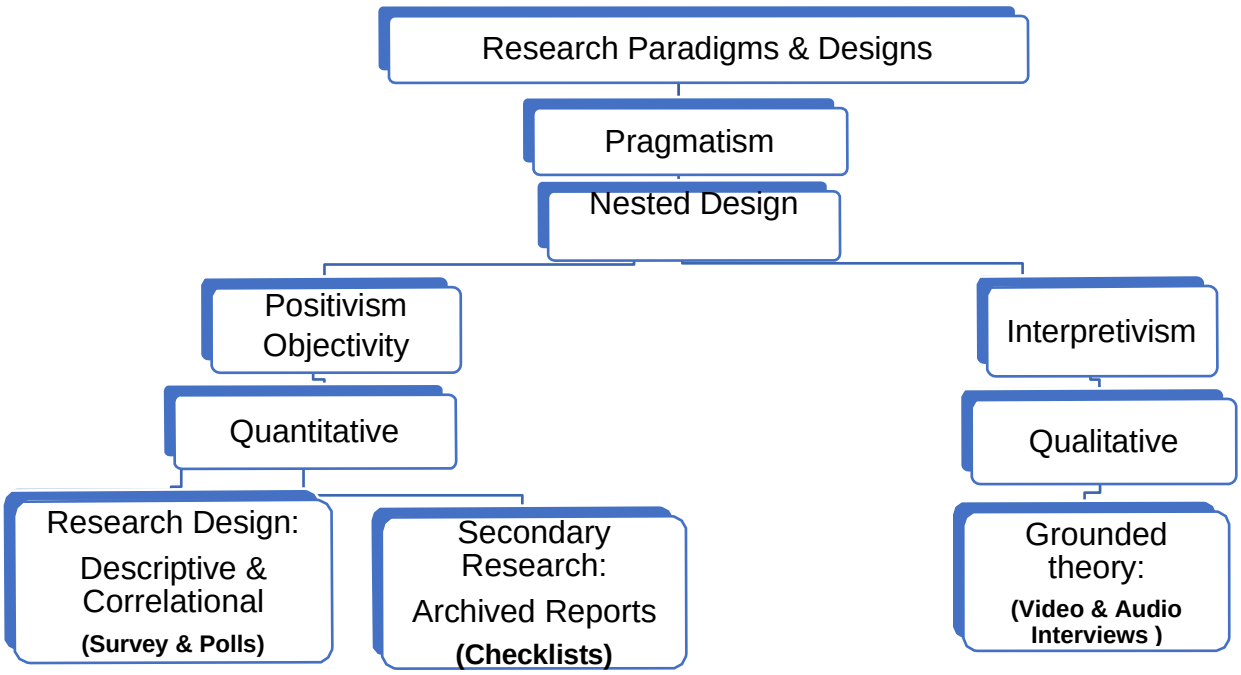


Figure 3.2

Links Between the Paradigms and the Research Designs (Kumatongo & Muzata, 2021)



The following sections document the study's research approach and design, the data collection and analysis techniques, and strategies to support the ethical gathering and analysis of data while minimizing the presence of biases.

3.3 Research Approach and Design

The legitimacy of research findings is substantiated by the appropriate research methodology applied during the study. Queiros A. et al. (2017) emphasized this when they asserted that scientific methodology is a vital instrument used in the selection of a valid research approach (quantitative, qualitative, or mixed methods), data collection, analysis, and reporting techniques to guide the research process. This study utilized the mixed-methods approach to guide the current investigation. The mixed-methods research approach of administering a concurrent nested design was selected to ensure a comprehensive examination of the problem.

Subsequently, two quantitative research designs were used, namely descriptive and correlational. The purpose of the descriptive design was to determine the characteristics and distribution qualities of the datasets. Hence, it was used to describe the population, classify patterns pertinent to answering the research questions and test the hypotheses. On the other hand, the correlational design facilitated the ability of the researcher to determine any notable relationships or lack thereof between the variables, relative to the research questions and hypotheses tested.

Additionally, the qualitative research applied the grounded theory (GT) design, which served to develop theories based on the qualitative data collected and analysed through induction and saturation techniques. This GT design was useful in addressing the limitations of the quantitative designs and legitimizing the study's findings for practical

implications. Therefore, the researcher was able to apply both quantitative and qualitative methods at the data collection and analysis stages of the study, which permitted triangulation of the results in drawing conclusions applicable to the problem.

Furthermore, evidence from recent studies such as Almeida (2018a) and Mangel et al. (2020) confirms that the triangulation of the data employing both methodologies will present a clearer picture of the benefits of online learning in increasing access to education and training in Jamaica. The quantitative methodology was used to develop inferences based on statistical evidence gathered from the quantitative primary and secondary research. Additionally, the desk research was utilized to examine archived data relating to online learning usage at the primary, secondary, and tertiary levels of education in Jamaica. The goal was to identify trends that may validate the primary research results and identify gaps that require attention.

In contrast, the qualitative approach allowed the respondents and the researcher to actively participate in the data collection process employing primary qualitative research. Specifically, it is used to add data representing the interpretation of the issue by the people who were impacted in some way. This was further adopted to substantiate the quantitative findings and provide a stronger basis for drawing reliable conclusions for generalization to the targeted population.

3.3.1 The Mixed Method Approach

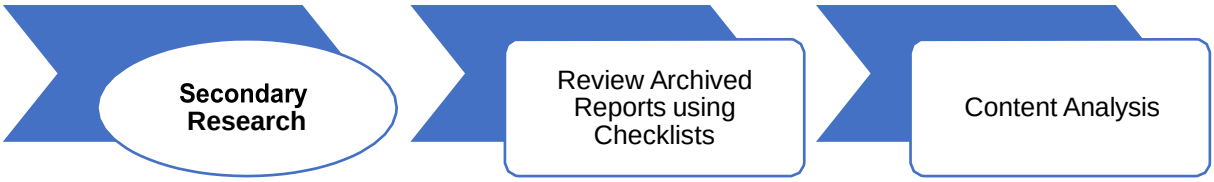
Berman (2017) and Schoonenboom and Johnson (2017) explain the mixed methods approach to research as a strategy that combines the application of both quantitative and qualitative research designs, to integrate data collected from both methodologies. Shorten and Smith's (2017) study also outlined that the mixed-methods

approach to research offers several research designs. This study employed the concurrent nested design, incorporating the use of two quantitative research designs (descriptive and correlational) to examine the connections between the variables under investigation. In addition, secondary research, reviewed archived reports to provide more context and quantify the results to uncover any patterns. Furthermore, Kumatongo and Muzata (2021) corroborated this analysis strategy where data collected from the archived cases can undergo quantitative analysis (see Figure 3.3).

Additionally, the qualitative research design Grounded theory was applied to gather data relating to the perceptions of persons within the sample population who are impacted by the issue. The concurrent nested design was used to position the quantitative technique as the main methodology, with the qualitative methods as a secondary aspect of the methodology. This was conducted with the participants through interviews.

Figure 3.3

The Secondary Research Transmission During the Study



Complementarily, recent studies like Schoonenboom and Johnson (2017) and Shorten and Smith (2017) revealed that the use of the mixed method approach affords the researcher the opportunity to conduct a thorough examination of the problem of interest, ensuring that all applicable areas are addressed. Therefore, the mixed-methods

approach determined the design, instrumentation, and analysis stages of the study. Creamer's (2016) study also confirmed the value of the mixed-methods approach, emphasizing that when researchers employ the mixed-methods approach in studies, the data collected could offer more robust and reliable insight into the issue.

Additionally, Kumatongo and Muzata (2021) and Mangel et al. (2020) support the use of mixed methods as being valuable in providing the researcher with latitude for in-depth exploration of the phenomenon. This was achieved through rigorous data collection and analysis represented by empirical statistical measurements (positivism view) and complemented with the human interpretation of how the issue impacted the people involved as producers and consumers (interpretivism view) of the online learning experiences. This has permitted the facilitation and compilation of accurate information through triangulation and expansion of the inquiry, to corroborate findings using the different methods to achieve a research report for effective application to the problem.

3.3.1.1 The Quantitative Approach. The study utilized the quantitative approach within the concurrent nested research design as the main methodology, employing statistical evaluation to examine the numerical data gathered through the survey, opinion poll, and qualitative data collected from the archived reports, which were later converted to statistical measurements (see Figure 3.6). Apuke (2017), Bryman (2016), and Marczyk et al. (2021) in their studies emphasized the significance of the quantitative approach as this methodology can be used to answer what, how much, and where through the application of mathematical measurements. The quantitative methodology is selected to serve the purpose of the study in confirming or disproving hypotheses 1 to 4 (see Table

2.2), put forward for an investigation using numerical objective measurements related to the phenomenon.

For instance, Basias and Pollalis' (2018) study which used a quantitative methodology, revealed that the collection of numerical data may result in the provision of a high degree of unbiased findings during the research process. While the qualitative methodology would attempt to determine the reason for the problem of interest using constant comparative analysis to develop a theory, the subsequent findings will be based on the perceptions of the people impacted within the research setting to draw a clear and insightful conclusion. However, this may produce opinionated results that are not necessarily generalizable to the problem of interest. Hence, the value of the quantitative methodology in the research; is to ensure neutrality in the data collection process thereby maintaining the validity and reliability of the study's outcome.

The strength of the quantitative approach is equally supported by Okagbue et al., (2021) and Queiros A. et al. (2017), who underscored in their study the many advantages that the quantitative methodology offers, which include reliability in applying precise processes, employing legitimate tools for gathering data, permitting large numbers of participants, and minimizing personal biases. In fact, the analysis procedures for the data were completed utilizing mathematical measurements made possible by the IBM Statistical Package for Social Sciences (SPSS) Modeler Subscription version. Equally important, the quantitative research approach applied (1) descriptive design to study the variables as they reside within the scope of the problem of interest and (2) correlational design to determine any relationship associated amongst the variables.

Notwithstanding, Jerrim and De Vries (2015) and Spicker (2018) asserted that there were some limitations to this research methodology, namely that it lacks flexibility in the techniques used to draw conclusions, and the aim was not to find a solution but to prove or disprove assumptions. Moreover, the positivism view prohibits interference from the affective views as it relates to people's experiences and cultural norms (interpretivism view) impacting the issue. Although the quantitative approach is combined with the qualitative approach, it provides the opportunity for the researcher to solicit the perceptions of people affected by the problem, unlocking more robust data to draw reliable conclusions relevant to responding to whether online learning can increase access to training and educational programs in Jamaica.

3.3.1.2 The Qualitative Approach. In contrast to the quantitative approach, which was guided by the positivism school of thought, the qualitative approach is focused on the interpretivism paradigm (McLeod, 2019; Rahman, 2017; Richardson A., 2018). In essence, it identifies qualitative data related to the phenomenon, which is residing in people's experiences and from which understanding can be gained through the examination of their perceptions. In this study, the interpretivist approach was achieved through the collection of data in non-numerical ordinal data using a 5-point Likert scale to measure attitudes and opinions, with choices ranging from strongly agree to strongly disagree. It is useful for this study as it is an inquisitive fact-finding methodology capable of providing answers to the why and how questions surrounding the phenomenon. Most significantly, when converted to and combined with the quantitative research approach, the primary data can become more reliable and trustworthy.

Similarly, Sutton and Austin (2015) also posit that the qualitative data collection and analysis methods are more probing, which can amplify the authenticity of the data. Furthermore, this approach can tap into the experiences of respondents to highlight many interpretations, therefore widening the scope for finding solutions to the issue. However, though useful in the research process, McLeod (2019) revealed that the qualitative methodology has limitations such as researcher biases, time issues, and the expense needed to carry out the study.

In this study grounded theory provided the opportunity to collect data indicative of the voice of the respondents relative *how* and *why* the phenomenon impacts society. Turhan (2019) corroborates that the grounded theory design is valuable for use during qualitative research to understand the causes of the problem. According to Markey et al. (2014), Singh and Estefan (2018) and Reiger (2018) grounded theory research design provides a standardized approach to conducting a study in which its application develops analytical patterns or trends in arriving at a theory applicable to the phenomenon. Hunter et al. (2011) and Singh and Estefan (2018) describe three separate approaches (see Table 3.1) that can be adopted in the use of Grounded theory:

(1) The classic Glaserian's technique, which is embedded in logical observation in the research process, allows the data collection and analysis to objectively uncover the ingrained theory. Therefore, it is similar to the positivism stance, where the researcher adapts a passive role in the collection and analysis of the data.

(2) The Straussian conditional matrix aims at achieving harmony by applying objectivity and inventiveness in a standardized way in the gathering and

analysis of the data. This method uses images as part of collecting and analyzing data.

(3) Charmaz's approach to grounded theory which uses a co-constructed method, that is situated in the belief that the gathering of the data, analysis of it, and arriving at a theory are influenced by the link between the researcher and the respondents. Additionally, emerging themes from initial analysis prompt the collection of new data and analysis, which is further compared with the initial categories until the data is saturated, and a theory is reached.

Table 3.1

Grounded theory Methods Used in Qualitative Research (Reiger, 2018).

Grounded theory Methods	**Classic Glaserian Technique**	**Straussian Technique**	**Charmaz's Technique**
Coding	Open coding by delving in data	Opening coding by systematic coding identifiers	Initial coding by examining strands of the data with code labeling
	Theoretical coding	Axial coding	Focused coding
	Selective coding	Selective coding	
Analysis	Theoretical coding themes	Coding paradigm/conditional matrix	Use of existing GT analysis tools

Charmaz's Grounded theory technique was employed for the study, as it is more focused on the interpretivism philosophy in investigating people's perceptions of the problem of interest and deriving salient theories residing in the data. This approach was

selected as it resonates with the pragmatism paradigm, which required analytical interrogation of qualitative data that asked pertinent questions for the duration of the study (Charmaz, 2016b; Miller P., 2015). The application of this method allowed the researcher to extract theory from competing data residing within the sample until a plausible theory was established following data saturation from delving directly into qualitative data related to the problem. Chong and Yeo (2015) and Reiger (2018) identified some benefits of using the grounded theory for this study, such as its coherence with factual data and the ability to produce practical outcomes. However, Markey et al. (2014) caution that an overwhelming number of codes could prove confusing to researchers.

3.3.2 search Design

The concurrent nested research design was used, with the quantitative approach as the key method, complimented with a qualitative method within the study, to respond to certain questions of an interpretative nature. The descriptive and correlational designs (quantitative approach) and the grounded theory design (qualitative approach) were adopted within the concurrent nested design to ascertain any relationship between the variables and hypotheses associated with the issue (see Table 2.2), through triangulation of the findings derived from both methods (see Figure 3.6).

Subsequently, data triangulation of the survey, opinionnaire, interviews, and the review of archived reports were used to ascertain if online learning could provide greater access to schooling within Jamaican public institutions through the examination of attitudes, the value of this delivery, and potential impeding factors. Bahramian et al. (2018) and Nie (2017) studies revealed that triangulation utilization will serve to examine responses from the different groupings, in the current study; Group 1 teachers, Group 2

students, Group 3 administrators, Group 4 MoEY officers, Group 5 prospective learners, and archived reports. Ideally, the data triangulation was used to establish patterns and trends disclosed at the analysis stage in the quantitative primary and secondary research and to make inferences using the results of the analysis from the qualitative primary research.

Jentoft and Olsen (2019) and Umanailo (2019) explained triangulation as a technique employed during research where several sources of datasets, methods, and assumptions guide the strength of the study. This set the scope for a better understanding of the problem of interest by permitting a view of the problem from various angles. Bartlett and Vavrus (2017) confirm that the review of archived reports can provide the opportunity during the research process to gather multiple viewpoints about the issue, as it occurs in a real-world setting. Consequently, where content analysis is applied for data analysis, the results were triangulated using statistical analysis to quantify themes recurring in each of the cases and to respond to hypotheses 1 to 4 (see Table 2.2). Therefore, the use of the primary research and archived report data portrayed a clearer picture of the problem, as the researcher triangulated the data from the reports with that of the quantitative and qualitative datasets. Though caution was exercised in limiting the timeline pursued along with the relevancy of discoveries to the current problem of interest.

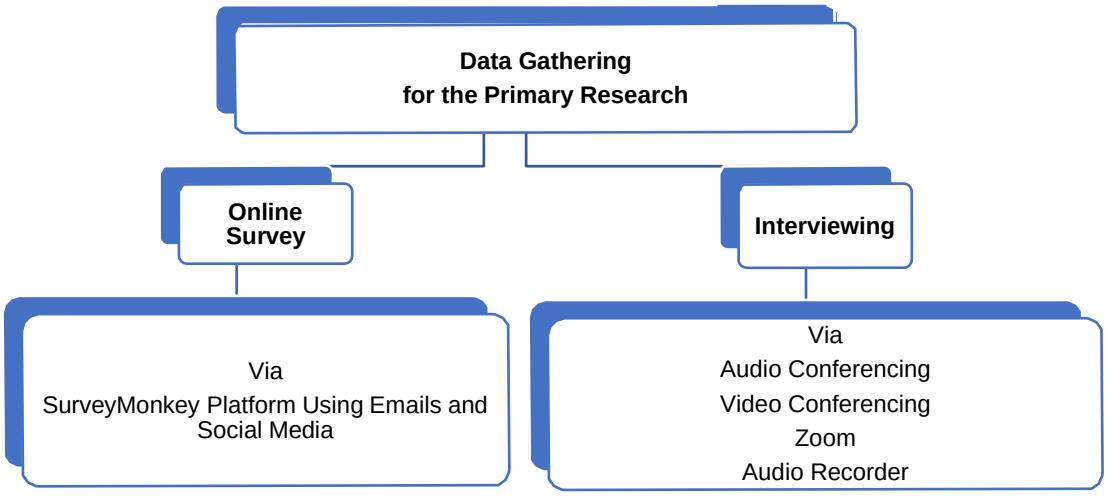
Checklists were used with the archived reports to identify relationships between the variables under study and to collect details directly related to the issue. The intended purpose was to contribute applicable information that was significant to the development and use of online learning, which is compelling enough to elicit greater access and high-performance competencies from both the producers and consumers of education. The

nested design was applied to examine whether the independent variable (1) *online learning* can increase access to the dependent variable (2), *training and educational programs.* Therefore, the triangulation and expansion of the studies' inquiry will increase the reliability and validity of the research findings.

3.3.2.1 Descriptive Research Design. Regarding the quantitative approach, the descriptive design was specifically employed in administering the primary research, where the data collection process was conducted via an online survey and opinion poll, using questionnaire instruments and the SurveyMonkey application as the data collection tool. Atmowardoyo (2018) posits that descriptive design for research is deemed the ideal technique to precisely illustrate a problem of interest under investigation. It is useful in manipulating variables influencing the phenomenon. Emails, text messages, and telephone conversations were utilized for recruiting participants within each cluster of the sample to facilitate this design (see Figure 3.4). This research design would present a convincing and decisive representation of the problem of interest.

Figure 3.4

Methods Used to Gather the Primary Data for the Investigation.



Moreover, the descriptive research design is useful in the research process when a large population (over 5,000) is being studied, as in the current study. Atmowardoyo (2018) advocates the value of the descriptive design in research, as does Akinlua (2019) who confirmed its versatility in that it does not require an independent variable or respond to any ‘cause and effect’ concerning the issue. Instead, during the research it serves to clearly outline and highlight new knowledge about the issue. Again, this type of research design is phenomenal in defining the problem of interest through comprehensive examination. Unreservedly, it permits the discovery of new information that may improve in the sample population.

Queiros A. et al. (2017) further convey in their study the justification of pairing the survey instrument for the data collection process with the descriptive design, as it is valuable in targeting a larger sample population. Correspondingly, Aggarwal and Ranganathan (2019) and Omair (2015) agree that the descriptive design can comprehensively use research questions to communicate the point-of-view, impressions, and practices that are indigenous to a community (public education institutions in Jamaica). This type of data collection tool also provides an ideal standard of representation for findings from the studied population. Additionally, Saleh’s (2017) study cited the survey technique as very cost-effective in comparison to observation and face-to-face interview methods. However, the value of the data collected is aligned with the capacity of the survey tool used De Leeuw and Hox (2018) recommend a mixed-mode design that sub-divides the questionnaire into different types of items. Additionally, the use of multiple distribution methods of the survey to participants is valuable in the current study, emails, text messages, and social media were employed, to name a few.

Equally important, Hawes and Dixon's (2021) study revealed that online polls are reliable in quantifying the opinions expressed by participants within the population where the issues are occurring. This was used to ensure enough time is given to participants to respond after carefully considering each item in the questionnaire. This method could be valuable during the research process as it can solicit opinions about phases of the phenomenon. For example, Bryman (2016) confirms that questionnaire instruments used along with the survey method are useful when the sample population has hundreds of participants. This was the case for the current study, where the questionnaire contained closed items deployed to effect distinct advantages in eliciting consistent and regulated responses. However, both Pozzo et al. (2019) and Wright (2017) cite various disadvantages associated with questionnaires which include slow recception of responses, biased outcomes, low response rates, and participants must be literate to take part in the research.

In response to the disadvantages cited by both Pozzo et al. (2019) and Wright (2017), the data collection process was accelerated through the use of the SurveyMonkey software to conduct the online surveys. It was chosen for its versatility in being compatible with all electronic systems and for its ability to provide confidential and reliable surveys. It also provides a timely and cost-effective way of acquiring reliable data (SurveyMonkey, 2021).

The secondary research was also carried out using the descriptive design, with the review of archived cases using checklists as the data collection tool. The checklists were organized and identified by series numbers, employed to examine each report (see Figure 3.6). The descriptive research design was used to validate whether there were any

relevant patterns occurring upon application of the content analysis method. It does not involve any testing of the variables but, seeks to determine established associations between similarities or differences. Additionally, it assesses the degree and quality to which these associations are developed (Queiros A. et al., 2017). Therefore, the archived reports reviewed provided deductive perspectives about online learning in public institutions in Jamaica that were triangulated with the results from the primary research for the current study.

3.3.2.2 Correlational Research Design. Asenahabi (2019) asserts that correlational design provides the opportunity in the study for the researcher to compare statistical data in the evaluation of the relationship or absence of a relatedness between the independent variable and the dependent variable. In the current study, the correlational design was used to contrast the relationship between the responses from the different groupings in the quantitative primary research datasets from the online surveys to: (1) determine the relationship between online learning and increased access to education in public schools in Jamaica; (2) identify the relatedness between students'.and education institution leaders' attitudes relative to online learning in Jamaica; (3) the relationship between online learning classrooms and quality training and education in Jamaican public schools; and (4) whether there is a relationship between impeding factors and online learning availability in public schools in Jamaica.

The Pearson's and Spearman's correlational coefficients were used as a standard of evaluation in determining the strength of the relationship residing in the quantitative primary research datasets. Pearson's correlational coefficient was used to ascertain the relationship between the variables in the datasets in order to make

inferences from the strength of the relationship (between 1 and -1) and the level of significance in the *p-value*, to test the hypotheses for the study (Bermudez-Edo et al., 2018). However, Bermudez-Edo et al. (2018) further emphasized that the Pearson correlation is not suited to evaluating non-monotonic dependencies. Therefore, Spearman's correlational coefficient was employed especially to identify the non-montonic relationships for the ordinal data collected. The Pearson correlational coefficient was then used along with the Spearman correlation to fill any gap, such as the assumption that the ranking may be flawed; a limitation of utilizing the Spearman correlational coefficient (Schober et al., 2018).

3.3.2.3 Grounded theory Research Design. Charmaz's (2006a) and Charmaz's (2017c) constructivist grounded theory (CGT) methods and designs were adopted for the current study; and used for the qualitative methodology, which aims to respond to the underlying reasons for the phenomenon. This was achieved by way of continuous abstraction of the data through coding and initially searching for the what and how inquiry leading up to answers as to the why for the phenomenon (see Table 3.1). Respondents were given a voice during the research process by partaking in a one-to-one interview to extract their interpretation about the independent variable (online learning) and its influence on the dependent elements impacting the phenomenon. For example, the lack of access to training and educational programs, student engagement, and students' and instructors' perceptions, amongst others.

Charmaz (2017c) explains that the CGT technique involves collecting data for initial coding and tagging or grouping them, based on similarity, into categories for theory development. Then further data is collected to identify patterns and trends in the initial

and subsequent data collection and coding. In the current study the initial coding was derived from the first set of interviews (see Appendix B) which were further categorized into themes and abstracted for theory development. The coding was also applied to a later set of interviews, which were also categorized for final theory development. CGT utilizes the constant comparative technique, specifically pairing initial data with new data, then emergent data with themes identified in the data. Additionally, Charmaz (2016b) postulates that the memoing of discoveries at each stage of coding takes place and is crucial in formulating theory in the data, until the data is saturated, and the definitive theory emerges from the CGT analysis (see Figure 3.5).

Moreover, Charmaz (2016b) and Lingard et al. (2015) assert that the grounded theory design can contribute data to fill the gaps in secondary research concerning a problem, employing the interview method to ensure that rich data is collected and that the limitations of the quantitative designs are addressed. Accordingly, in this study, interviews were conducted to uncover the perceptions of the individuals impacted by the phenomenon.

Figure 3.5

The Data and Analysis Stages During the Study for the Qualitative Approach.

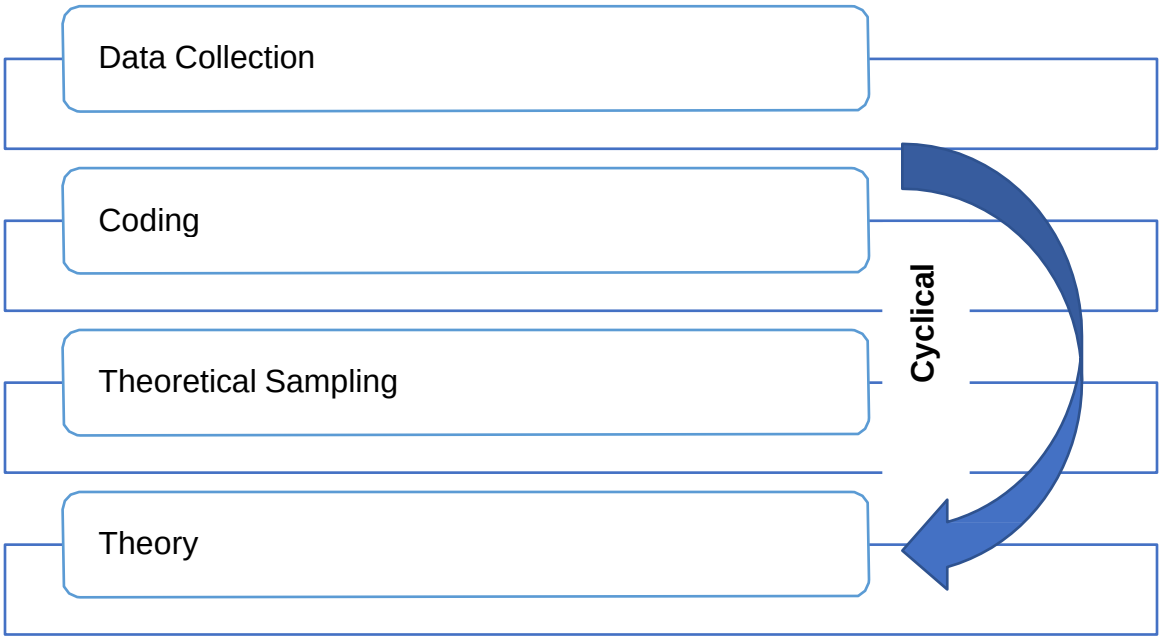
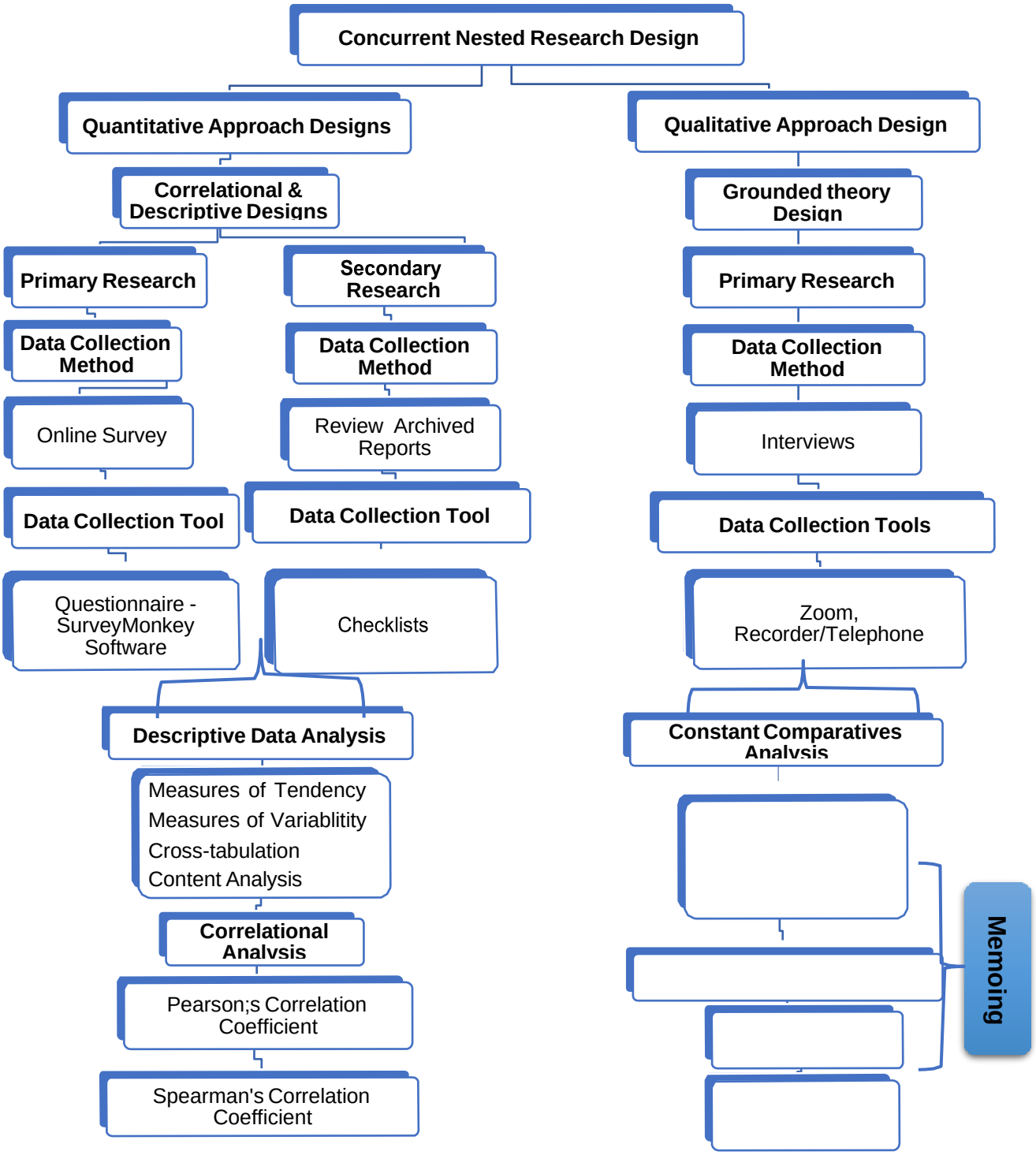


Figure 3.6

The Overall Research Design.



3.3.3 Description of Research Stages

The primary research commenced immediately following the determination of the sample, the selection of each participant, and the gathering of informed consent from the study participants (see Figure 3.3 and 3.6). Upon the acquisition of permission to conduct the study and the distribution of invitations to participants, the researcher conducted a pilot study using the survey, polls, and interview schedule, which provided an opportunity to test the SurveyMonkey software, telephone, and videoconferenceing facilitites. As a result of the feedback from the pilot study, some corrections were made regarding the presentation of a few items on the survey to facilitate easier completion by respondents. Additionally, to create pseudonymity for the participants in the interview, the video feature was disabled during the interview process. Further to this, to add more protection for the video content, the audio recording feature in Zoom was not used to record the interviews rather, a separate handheld recorder was used.

Gardiner et al. (2019) and Salimi and Safarzadeh (2019) posited that piloting a questionnaire is valuable in ascertaining its validity and identifying any potential problems during the research process. After the completion of the data collection pilot, the primary data collection phase commenced with the questionnaire for the survey. Concurrently, an interview approach and a schedule were used to survey interviewees' experiences. A timetable was created detailing the date and time for interviewing the selected participants based on their availability (see Appendix C). Van de Weil (2017) postulated that the interview schedule is a guide that organizes the questions to be asked in the interview to solicit valuable data.

The interviews were conducted using a mix of telephone and video conferencing calls, which commenced in October 2021 and were extended into the first three weeks of the fourth dissertation module 4. All respondents were interviewed using the Zoom meeting platform and recording was done separately, except for one participant who requested a telephone interview. The interviews were conducted while the respondents were at home or work. Interviews were between15 and 30 minutes in length.

Following this, the secondary research began following the selection of the twenty archived reports (see Figure 3.3). The twenty documents were reviewed using a checklist to record the data based on the stipulated criteria described by the checklist items (see Figure 3.3; Figure 3.6). The researcher began the data analysis after the 60-day period expired for the surveys, interviews, and checklists for the reviewed cases were completed (see Table 3.2; Figure 3.6). Further to this, a second phase of recruitment was undertaken, and respondents were sought for the online survey as the first data collection period yielded an insufficient number of responses. This second phase was conducted in August and October 2022 and the data analysis ensued thereafter.

Table 3. 2

Description of the Stages of the Research Process

Research Stages	Timeline
Research Approval	September 24, 2021
Research Request	September 27, 2021
Data collection Pilot	October 3, 2021
Data Collection	October 8, 2021
Data Analysis	December 1, 2021
Data Collection	August – October 2022
Data Analysis	Final -October 2022

3.4 Population and Sample of the Research Study

Mohsin (2016) and Taherdoost (2016a) asserted that sampling is essential in research as it is very difficult to gather data from every person or case in the population with respect to funding and time. Therefore, a decision regarding the sample size for the study is essential in (1) ensuring the legitimacy or efficacy of the research outcome, (2) establishing the forecasted expenses for the study, and (3) ascertaining the duration of time required to conduct the study (Majid, 2018). The total number of people or cases a sample is selected from is known as the population and the sample is the actual number of people or cases chosen to represent the targeted population. The selected sampling in research is used to draw conclusions indicative of the population for generalizations associated with current assumptions (Mohsin, 2016; Taherdoost, 2016a). Additionally, to reduce biases and errors the determination of the sample size for a study is essential.

This may be, to a large extent relative to the nature of the study and the goals of the researcher. The sample size can conclusively verify the reliability and authenticity of findings that can be effectively corroborated during the research process.

To illustrate this, McNeish and Stapleton (2016) cautioned that if the sample size, is not addressed to, several problems may arise which could culminate in invalid or inaccurate data and a flawed research process. Additionally, recent studies such as Malterud et al. (2016) and Sim et al. (2018) have revealed that the use of sampling for the study is usually more time-and cost-effective, as in many cases it is impossible to engage the whole population for the study. Therefore, in this study, at the first stage and quantitative research design element, cluster sampling was adopted utilizing simple random, random cluster, and self-selection sampling methods; this was followed by the second stage and qualitative research design, which involves purposive, snowball, and self-selection sampling.

Moreover, Sedgwick (2015) and Taherdoost, (2016a) revealed that the cluster sampling frame is considered suitable for studies that extend across a geographical region with several locations as it accommodates the organization of the population into groups or clusters. As a result, an allowance was made for participants to be chosen at random and to have an equal chance of being selected to participate in the study. Consequently, this sampling method permitted groups of public schools to be selected at different levels of the education system, participants from different MoEY offices, and prospective learners across Jamaica. Subsequently, four clusters were created; A, B, C, and D, and initial selections were used to formulate the primary sample clusters after the administration of probability proportional sampling, that is simple random selection.

As such, Alam et al. (2015) describe probability proportional to size sampling as a technique that chooses samples based on an unequal probability method related to the size of individual population clusters. Moreover, Rahli's (2017) study affirms that simple random sampling fits this stage as it designates a number for every unit in the population, allowing an equal chance for inclusion in the study. The second cluster was chosen using the random cluster sampling method applied to the primary sample groups within the cluster sampling design.

Etikan and Bala (2017a) and Rahli's (2017) studies described the random cluster sampling method as a reliable option for choosing participants who were sought from several geographical locations, to make possible selections from each area randomly. The third cluster was chosen using the self-selection sampling technique where participants from the second cluster were invited to participate in the study. Lehdonvirta et al. (2020) and Sharma (2017) postulate that the self-selection method is valuable for use in studies to give people within organizations a chance to participate in the research voluntarily.

The fourth, cluster was developed employing purposive (maximum variation), snowball, and self-selection sampling methods for the qualitative primary research section of the study. Etikan et al. (2016b) and Sharma (2017) posit that the purposive sampling method is not considered a probability sampling technique but is a judgement selection process that can be subjective in nature. While Palinkas et al.'s (2015) study revealed that the maximum variation sampling technique provides a wide range of participants within the sample size to be selected for the interviews. Undoubtedly, allowing the researcher to gain a deeper insight into the problem of interest.

Additionally, Etikan and Bala (2017a) and Parker et al. (2019) revealed that snowball sampling involves recruiting respondents, providing more respondents for participation in the study. The snowball technique was introduced to complement the selection process by inviting interviewees with experience and expertise about the problem to recommend other respondents for participation in the study. Finally, the secondary research sampling also employed the purposive sampling method to select the archived reports to be reviewed.

3.4.1 Cluster Sampling Design for the Primary Research

Alvi (2016), Kaushik S. (2016) and Martinez-Mesa et al. (2016) postulated that cluster sampling involves dividing the population into several sub-groups with similar qualities. In this instance, the population included Group 1 teachers, Group 2 students, Group 3 administrators in public educational institutions, Group 4 MoEY officers, and Group 5 prospective learners (higher education) within Jamaica.

The population has approximately 280,000 possible participants. After applying the sample size calculator to determine an appropriate sample size for the study and making allowances for a margin of error of 5% and a confidence level of 95%, the recommendation was to generate a sample size from the population of 384 participants for the study. The initial selection process was made from a list of the fourteen parishes and the corresponding counties, and then random selection of the parishes for use in the study was made to form Cluster A (see Figure 3.7; Table 3.3).

Figure 3.7

A Description of the Counties Related to the Island of Jamaica (Wikitravel, 2021)

Table 3.3

Cluster A Sampling Results Related to the Parishes as Per the Counties in Jamaica.

	Counties		
	Cornwall	**Middlesex**	**Surrey**
Parishes	St. Elizabeth	Clarendon	Kingston
	Trelawny	St. Ann	Portland
		St. Mary	

Secondly, a list was made grouping the selected parishes and related public education institutions; by education level, that is, primary, secondary, tertiary institutions, social media and MoEY offices within the three counties in Jamaica namely, (1) Cornwall, (2) Middlesex, and (3) Surrey. Following this, public schools within each selected parish at each educational level were chosen using the random cluster sampling technique to form Cluster B (see Figure 3.8). Accordingly, a systematic sampling approach was applied to the institutions in the selected parishes in Cluster B, where every 6th school was chosen to participate, and offices were selected randomly.

A total of 287 public primary schools, 118 public all-age and secondary schools, four public tertiary institutions, and four Ministry of Education offices were chosen (see Table 3.4). This was applied to address the varying size of each school and office which allows for an equal opportunity for selection during the sampling session. Equally important is the assurance that the sample chosen gives a true representation of the population being studied. Additionally, three social media platforms were chosen randomly from a list for the purposeful and snowball selection methods to recruit prospective learners. The self-selection sampling was then applied to Cluster B, inviting participants to volunteer for the study to create the third Cluster C (see Figure 3.8).

Table 3.4

The Number of Responses from the Online Survey

	Number of Schools Recruited Per Parish	Primary Schools	All-age & Secondary Schools	Tertiary Schools	MoEY Offices	Total Participants Responded	Total Participants Responded for the Pilot Study	Total Overall Number of Participants Responses
Cornwall	Trelawny	7	5	0	1	22	2	
	St. Elizabeth	7	6	1	1			
Middlesex	St. Mary	7	5	0	1	90	15	*205*
	St. Ann	7	5	1	1			
	Clarendon	7	7	1	1			
Surrey	Kingston	8	8	2	2	60	7	*53%*
	Portland	7	5	1	1			
	Missing Data Related to Parish					9		

3.4.1.1 Sampling for the Quantitative Survey. The students, teachers, administrators, Ministry of Education Officers, and prospective learners who responded to the invitation to participate were selected for Cluster Sample C and used for the data collection process to conduct the online survey. Five groups of participants were sought for the study:

(1) Group 1 Teachers

(2) Group 2 Students

(3) Group 3 Administrators

(4) Group 4 MoEY officers

(5) Group 5 Prospective learners

The study sought data relative to online learning from participants affiliated with primary, secondary, and tertiary public schools in Jamaica. Additionally, data was also collected from MoEY officers attached to primary and secondary schools as well as from prospective learners who were preparing to enter tertiary institutions. Groups 1, 3, and 4 participants who were attached to primary institutions provided the data linked to online learning at that level of education; Groups 1-4 participants who were affiliated with secondary schools produced the data relative to online learning at that level of education; and Groups 1, 2, and 5 participants connected to tertiary level institutions contributed data relevant to that level of education.

3.4.1.2 Sampling for Qualitative Interviews. Purposive sampling, specifically maximum variation or heterogeneous method was used to ensure the optimal selection of the 384 participants from the selected institutions; MoEY offices, and social media for prospective students who formed the Cluster C section and was used to form Cluster D

within the sampling design for the interviews to collect data for the study (see Figure 3.8). This was applied to the groups of individuals (1,3,4 & 5) selected from the primary, secondary, and tertiary institutions, MoEY officers, and prospective learners who had expertise and/or significant experience with the problem and could contribute data for achieving the study's purpose. One hundred participants were sought using initially purposive sampling, then self-selection, and the application of snowball techniques, and invited to participate in the interview process. A reasonable number of interviews conducted, which is deemed adequate for the qualitative aspect of the study as the emphasis was placed on data saturation which was achieved at the 44% point. These comprised participants who were teachers, administrators, MoEY officers, and prospective students impacted by the problem being investigated (see Appendix C; Table 3.5).

Table 3.5

Number of Participants Sought for Interviews and theTotal Responded Per Grouping

Groups	Amount Invited	Number Participated
Group 1: Teachers	45	23
Group 3: Administrators	20	10
Group 4: MoEY Officers	6	2
Group 5: Prospective Learners	14	9

3.4.2 ampling for the Secondary Research

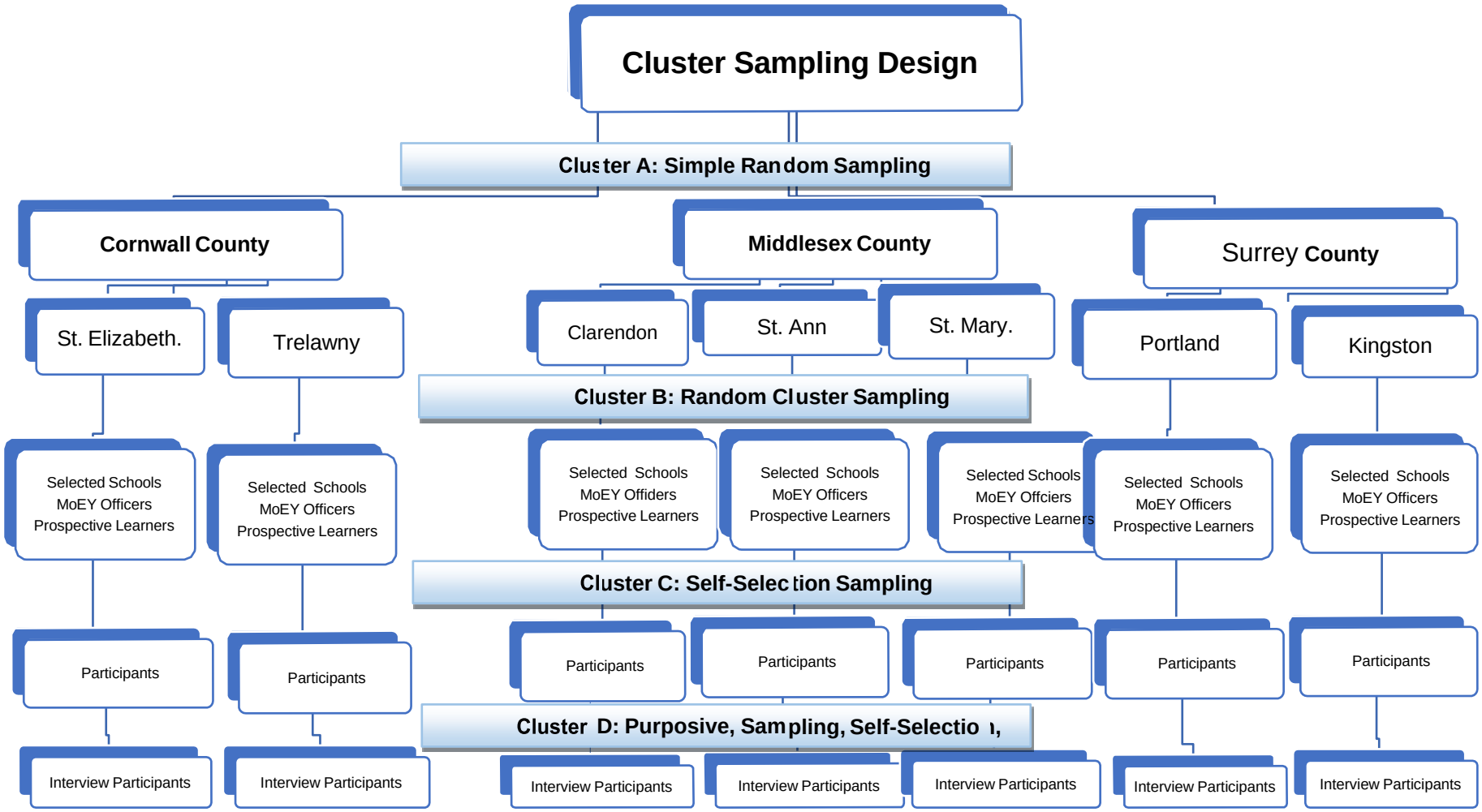
The purposive sampling technique was applied to select 20 archived reports relating to online learning in Jamaican public schools. Campbell et al. (2020) and Thomas (2022) describe purposive sampling as a method for evaluating and selecting either participants or, in this instance, documents that are applicable to the problem of interest. The number of archived reports that are included in the cases consisted of:

- Seven published between 2016 to 2021
- Six published between 2010 to 2015
- Two published between 2005 to 2009
- Five between 2000 to 2004

A range of archived documents were selected from the aforementioned year spans to check patterns that are relevant to the phenomenon. Desk research was undertaken using Google Scholar, Jamaican information archives, public institutions in Jamaica reports, and the Internet. The title of the reports was then purposefully chosen based on relevance to the issue.

Figure 3.8

Cluster Sampling Design Used With the Study.



3.5 Materials/Instrumentation of the Research Tools

The five instruments used for the collection of data were (1) 15-to-18-year-olds survey questionnaires, (2) 19-to-65-year-olds survey questionnaires, (3) an opinionnaire poll questionnaire, (4) an interview guide, and (5) a checklist (see Appendix D). The items and measures selected for the surveys and opinionnaires use a mix of nominal and ordinal scales. Brown (2011) explains that nominal scales are usually established from classes for example, gender and race, to name a few. On the other hand, ordinal scales arrange items according to ranked positions, for example, (1 *strongly disagree* to 5 *strongly agree*). Likert scales were used in the design of the surveys and the opinionnaire in this study, and responses to the items were measured using a 5-point scale.

The Likert scale items were utilized to develop Section B of the survey questionnaires and opinion poll for groups 1 to 5 following the Rensis Likert popular 5-point measuring scale (see Figure 3.9) (Likert, 2017). Chyung et al. (2017) and Kriksciuniene et al. (2019) also support the use of 5-point Likert items as it provides the researcher with enough latitude for applying several types of analysis techniques in manipulating the data for results. Hence, the Likert scale items were valuable for use within the surveys and opinionnaires to collect data for measurement. Perazzo (2021) and Simister (2017) characterize surveys and questionnaires as tools developed to gather data from many people in an organized way. Moreover, surveys containing questionnaires can display items in either print or electronic format.

3.5.1 vey Questionnaires

Each of the survey questionnaires used contained a preface section that outlined a clear invitation to participants, providing full disclosure of the topic for the study and the purpose that the study would serve the educational system in Jamaica and in general. Furthermore, the section identified the types of participants that were sought namely teachers, students, administrators, MoEY officers, and prospective learners. The significance of the study was explained briefly to give participants insight related to the proposed research activities. This was followed by an invitation statement to select yes or no as it relates to giving consent for participation in the study. Subsequently, the exact number of items contained in the questionnaire and the approximate time that would be required to complete it. The Group 2 survey questionnaire contained (*N* = 25) items; Groups 1, 3, 4, and 5 had (*N* = 35) items and 6 and 10 minutes, respectively, for completion (see Appendix D1; Appendix D2).

Also, the opinionnaire slated for Groups 1 to 5 was developed based on the modified version that was employed by Rose and Bugher (1983) and was used to solicit views from the population being studied relevant to the phenomenon. This opinionnaire contained (*N* = 30) items with an estimated completion time of 10 minutes (see Appendix D3). Most importantly, a statement was also included pledging the researcher's solemn promise to abide by the high ethical standards mandated by the UREC (see Appendix E); treating the data collected with the strictest of confidence ensured that the privacy of each participant and respondent was upheld during and after the research. Additionally, participants' responses were collected anonymously, that is, participants responded to each item privately using the questionnaire links hosted

through SurveyMonkey. Autonomy was offered to each participant, and they had the option to either withdraw from the study or refuse to answer any of the questions at any point during the research process.

Section A of the survey and opinionnaire questionnaire contained (*n* = 8) demographic questions using nominal scales that sought demographic information about the participants recruited for the study (see Appendix D1; Appendix D2; Appendix D3). These questions were multiple choice with a mix of single-select short-answer, and drop-down menus. The single-select multiple-choice questions had check boxes for the participants to choose the most appropriate choice from the list of options, lettered A to D. The survey questionnaire required online responses powered through the SurveyMonkey software, for ease of use and convenience for the participants. Moreover, the introduction to the study and a request to give consent were placed as the first questions. Each participant was required to indicate their consent before they were allowed to progress to the items in Sections A and B (see Appendix D1; Appendix D2; Appendix D3).

In Section B of the surveys and opinionnaire, the participants were required to use a 5-point Likert scale to rate each item employing ordinal scales; on a scale of (1 *strongly disagree* to 5 *strongly agree)* (see Table 3.6; Table 3.7). According to Chyung et al.'s (2017) and Joshi et al.'s (2015) studies relative to the 5-point scales, it has been corroborated that Likert scales are valuable in that they present the participants with equal options for selecting an answer on either side of the neutrality option. It allows each participant to express the degree of agreement or disagreement regarding the hypotheses being explored in the study. Central to the use of Likert-scaled items,

Mircioiu and Atkinson's (2017) study corroborates that both parametric and non-parametric analysis techniques can be applied to ordinal data. The data can be analysed and presented using charts and ranking respectively, for outlining clear meanings and varying interpretations of the collected data.

Table 3. 6

An Excerpt of a Questionnaire Using the 5-Point Likert Scale (Joshi et al., 2015).

	SD 1	D 2	N 3	A 4	SA 5
1. **Learners are not willing to learn using online classrooms.**					
2. Public schools in Jamaica adequately supply online learning.					
3. **Public schools in Jamaica can offer online learning to learners nationally.**					

Table 3.7

An Excerpt of an Item Contained in the Questionnaire Using a 5-Point Likert Scale.

1. Rate the factors listed below on a scale of 1 - 5; which would most impede the progress of online instruction in Jamaica?					
	SD 1	**D 2**	**N 3**	**A 4**	**SA 5**
A. **Lack of Internet Connectivity**					
B. **Lack of devices**					
C. **Teacher Resistance**					
D. **Lack of ICT Infrastructure**					
E. **Lack of Online Learning Resources**					
F. **Lack of Funding for Online Education**					

3.5.2 terview Guide

Unstructured interviews were used to collect the qualitative data from respondents during the study. Masrur and Shah's (2017) and Simister's (2017) studies concur about the value of instrumentation in educational research and describes interviews as a reliable way for generating people's perspectives related to any phenomenon. These interviews can contain structured, unstructured, or open-ended formats and should begin with facts about the interviewee's background, culminating in the acquisition of information associated with their interpretation and experiences with the issue being investigated. In the current study, the researcher utilized unstructured interviews to gain data relevant to the phenomenon.

Mann (2016) and Minhat (2015) emphasized that the use of interviews brings quality to the data gathered as it separates a group's views about the phenomenon from the individual personal opinions shared. The absence of scales gives the respondents the opportunity to voice their own perspective about the issue. Additionally, it is more flexible as the researcher can deviate from the interview guide to gain deeper insight related to the phenomenon by expanding the breadth of each item with individual respondents. Furthermore, interviews usually produce more details to drive abductive reasoning in comparing quantitative and qualitative data collected.

An interview guide was used to collect data from Groups 1, 3, 4, and 5 (see Appendix D4). It started with a detailed introduction to brief respondents about the topic, purpose, and significance of the study. Van de Weil's (2017) study exemplifies an interview guide as a document that outlines a systematic way for conducting interviews. Similar to the survey and opinion poll questionnaire, it begins with the establishment of assurances to the respondents about their right to autonomy, preserving anonymity, confidentiality, and privacy.

Additionally, the topic, purpose, and significance of the study were adopted from Table 3, the *general outline of the interview guide* (Van de Weil, 2017), (see Table 3.8); and like the survey and opinionnaire it began with (*n* = 8) demographic questions about the respondents, using multiple choice and short answer items in Section A. There were an additional (*n* = 21) items developed with a combination of probes and follow-up questions, requiring the respondents to elaborate in detail on the selections made from the three probe options (see Appendix D4). Responding to the instrument was

expected to take approximately 15 and 30 minutes using an audio interview with each respondent.

After the development of an interview guide and schedule, (see Appendix D4; Appendix C) the participants' consent for the interviews was sought through an electronic form and an interview guide which was sent either by email or shared initially before the interview began with a request for their signature as written proof of consent via PDFiler application software. Once the signed consents were sent the interview was added to the interview schedule, a meeting identification link was generated through the Zoom meeting platform, and the interview meeting details were shared by email or social media messaging.

Table 3.8

General Guidelines of the Interview Guide (Van de Weil, 2017)

Information Sheet • **Present the topic, purpose, and significance of the study** • **Invite the participants to take part in the study** • **Provide explanations about the expectations from participants** • **Assure participants of their rights related the ethical tenets of privacy, autonomy, etc.** • **Explain how the information will be used and contact information for the research**		
Body of the interview		
Introduction: Section A – Multiple Choice		
Question 1	Options	
Question 2	Options	
Question 3	Options	Fill in the Blank line
Section B		
Question 1	Probe	Follow up question
Question 2	Probe	Follow up question
Question 3	Probe	Follow up question

3.5.3 cklist Instrument

Oxman (1994) postulates that a review of archived articles requires the researcher to draw conclusions therefore, the purpose of the review should be clearly outlined and evaluated. Sherifff (2018) adds that the review of secondary data can be employed to triangulate the quality of the original data utilizing new assumptions and questions aimed at identifying and filling the gaps about the phenomenon identified from the previous studies. This process is assisted by the use of a checklist instrument (see Appendix D5); developed as an instrument for the review of documents to avoid biases and errors during the data collection process.

Krull and Duart's (2017) study shared that checklist procedures are valuable in gathering data during the review of archived cases, and should include reference lists, topic, purpose of the report, sample studied, level of education, and location. Hence, Section A of the checklist contained information about the person(s) conducting the review (researcher) and biographical information about each report reviewed. Section B presents items to identify areas of the reports related to the phenomenon being studied in the form of a yes or no response. The checklist was developed after a search for one was unsuccessful; however, after consulting the developmental guidelines used in the studies of Protogerou and Hagger (2019), Hofmann et al. (2017), and Tricco et al. (2018) the current checklist was created. It contained (N = 20) items in total (see Appendix D5).

3.6 Operational Definitions of Variables

Kaliyadan and Kulkarni's (2019) study describes a variable in research as an element that represents quantifiable data from a study and identifies various characteristics of a targeted population sample. Variables are further categorized into

nominal and ordinal, similarly dependent and independent. Apuke (2017) explains an independent variable as the element being influenced by other elements to measure any observable difference or change associated with a dependent variable. In contrast the dependent variable outcome relies on the employment of the independent variable. These variables are of a quantitative (rank variables) or qualitative (interpretative variables) nature. The quantitative variables can be discrete or continuous, if the variable is not assigned a value, it is discrete if a value is attached, it is continuous.

Shreffler and Huecker's (2021) study supports the collection of ordinal data in the study as it was able to provide different levels of representative measures to gain accurate measurement of the hypotheses used to uncover relevant data related to the phenomenon (see Table 3.12). In this study, data were collected for quantitative primary research through the use of an inventory and items utilizing a 5-point scale namely, strongly agree to strongly disagree. The 5-point Likert scale was employed to solicit data for the hypotheses and research questions (see Table 2.2).

Cross-tabulation analysis was used to conduct tests to establish the relationship between the responses from the dependent variables, which were the *attitudes* of Groups 1-5 relating to the independent variable of *online learning*. Additionally, it sought to determine the difference between the independent variable *online learning* and the dependent variable *student engagement* at each level of public education in Jamaica. Nayak et al. (2021) and McCulloch and Webb (2020) assert that the cross-tabulation analysis provided the researcher with the ability to examine the data in divisions of datasets. This permits the opportunity for comparisons among the various datasets in order to map relationships and determine the similarities and differences in responses.

Each group's responses within the data were tabulated with respect to the correlation across the relevant questions to identify similarities and differences.

Furthermore, Pearson's and Spearman's correlational coefficients, the measures of tendency and variability were applied to the ordinal data collected from Groups 1-5 to measure the relationship between the independent variable *online learning* and the dependent variable access to *training and educational programs*; and examine the impediments impacting online learning in Jamaican public schools. Ly et al. (2018) describe Pearson's correlational coefficient as a method used to determine the correlation between two elements within data that is paired indiscriminately. Correspondingly, Schober et al. (2018) and Sarikaya and Gleicher (2017) explained that Pearson's coefficient should be applied to a set of paired commonly dispersed evidence within the data, which is calculated employing a range of (-1 *diminishing association)* between the variables (see Figure 3.10); and (1 *strong association)* (see Figure 3.9*),* where (0 *no relationship)* among the variables paired (see Figure 3.11).

Figure 3.9

Pearson's Correlational Coefficient Showing Variables With Positive Relationship

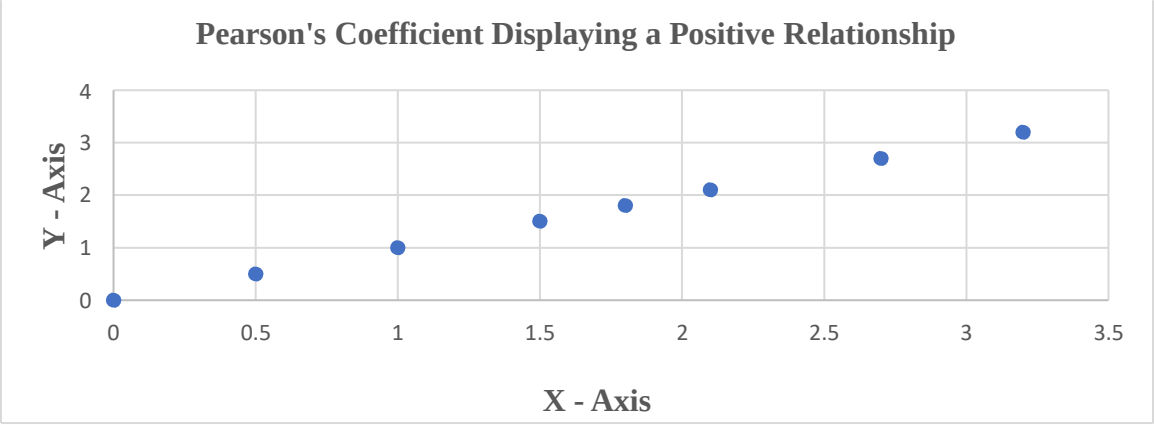


Figure 3.10

Pearson's Correlational Coefficient Depicting Variables With Negative Relationships

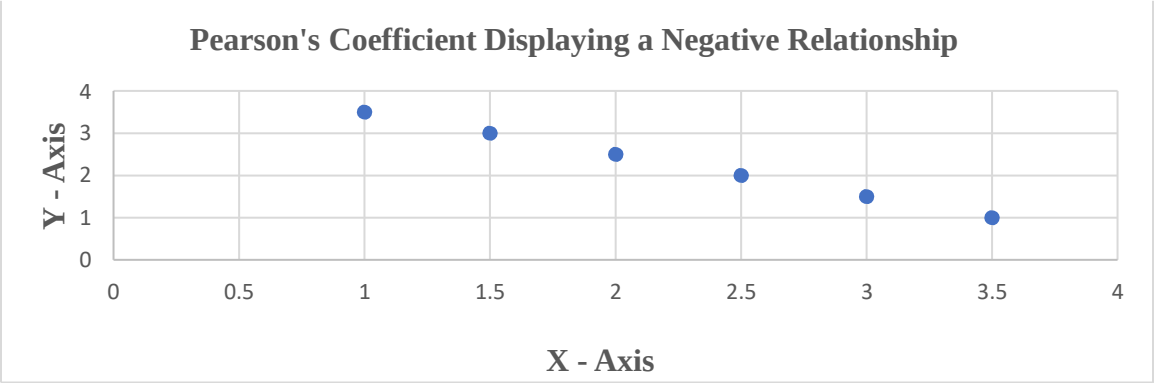
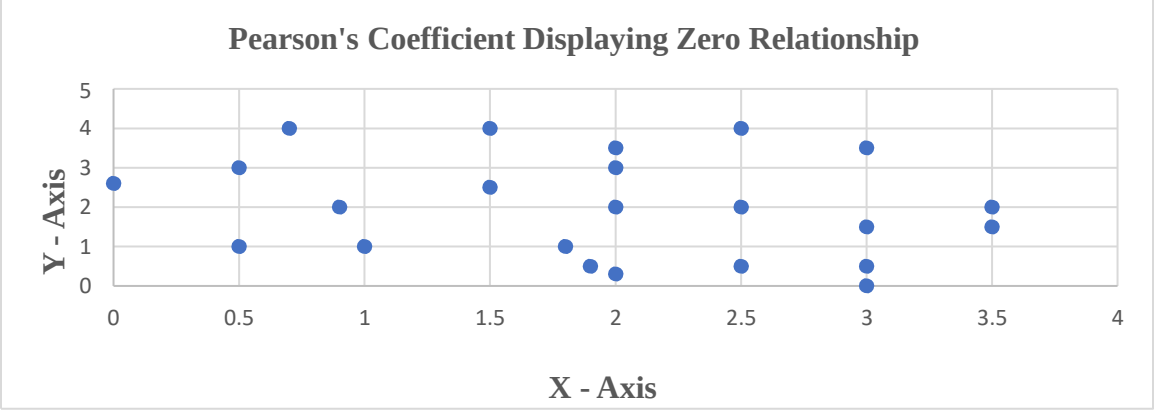


Figure 3.11

Pearson's Correlational Coefficient Showing Variables With Zero Relationship



On the other hand, according to Liu et al. (2018) and Schober et al. (2018) Spearman's rank correlational coefficient is usually used to measure variables for which no clear parallel interrelationship exists, indicating a scope of -1 to 1 or 0 relatedness. This can be employed through (1) *partial correlation*, eliminating the influence of each covariant and using one figure to sum up any correlation, and (2) *conditional correlation*, where several variables are compared based on one variable. For example, *student*

engagement in online learning is paired with *Internet access*, the *availability of online resources*, and *staff training* (see Table 3.9).

Table 3.9

Spearman's Rank Partial and Conditional Correlation Formulas (Liu et al., 2018).

Spearman's Rank Correlations	***Formula***
Partial Correlation	$YXY_{*}Z = corr\ \{X, F_{X/Z}), r(Y, G_{Y/Z})\}$
X and Y applied continuously ***$YXY_{*}Z$ represents a weighted average of YXY/Z where Z is expressed as a function of Z***	
Conditional Correlation	$YXY/Z = {}^{C}Z(P_{C}\backslash Z - P_{d}\backslash Z)$
X and Y occur continuously ***$^{c}Z = 3$***	

Beyer (2021) and Shetgovekar et al. (2020) describe the measures of central tendency as a method utilized in finding the total relative to a vast number of statistics with a singular record or tally. This measure is valuable in establishing one dispersion as well as being employed to explain numerous grouped records if the preferred dispersion for the measure of central tendency is known. Furthermore, the measure of central tendency determines the midpoint of distributions using the mean (average), median (the center of the dispersion), and mode (number of occurrences of each number in the set of statistics) (see Table 3.10).

Table 3.10

Different Measurements of Central Tendency (Beyer (2021).

Measures of Central Tendency	***Formulas***
Mean	*U =∑x/N* *∑ represents the total of all numbers* *N identifies total individual numbers*
Median	*2, 3, 4, 6, 16: 4 represents the median or middle value.*
Mode	*11, 12, 12, 13, 14: represents the number that occurs most frequent in the dataset.* *= 12*

Fadina et al. (2021) and Kulshreshta and Misra (2020) define variability as an operational number that totals the degree of distortion among indiscriminate variables. This practical measurement of the significance of the determination of the difference between number values in datasets is derived from the calculated averages and is applied to fulfil the *laws of invariance, standardization, and positive homogeneity (*see Table 3.11). Measures of variance identify groups of scores relatedness when paired with each other. A small variance indicates a good consistency of the numbers in the dispersion; however, a sizeable variance suggests that the mean produces uncertain results.

Table 3.11

Examples of the Measure of Variability (Fadina, 2021).

Measures of Variability	***Formulas***
Law invariance	*X, Y € X and $X \overset{d}{=} Y$, then v(X) = v(Y)*
Standardization	*V(m) = 0 include every m € ℝ*
Positive Homogeneity	*α ϵ [0.∞) where v(λX) = λ^{α}v(X)*

Nominal data were also collected, Potdar et al. (2017) associate these variables with categories such as gender, type of school, level of education, and occupation, to name a few which were collected in the current study. Descriptive statistics were used for analysis via cross-tabulation, distribution frequency tables, and measures of central tendency and variability. Kaliyadan and Kulkarni's (2019) revealed that the use of descriptive statistics to initially manipulate the variables to ascertain a summary of the relatedness of each variable residing in the data collected is valuable in validating research findings. The proceeding section will discuss the study procedures and ethical assurances.

Table 3.12

Operational Variables for the Quantitative Research Approach (Shreffler & Huecker, 2021).

Statistical Test/Analysis	Hypotheses	Research Question	Variables	Data Collection Instrument/Tool	Data Analysis Tool
• **Cross-tabulation** • **Measures of tendency and Variability** • **Pearson's Correlational Coefficient** • **Spearman's Correlational Coefficient**	• There are no differences in attitude among learners and public education institution towards online learning within Jamaica • There are differences in attitude among learners and public education institutions towards online learning within Jamaica.	What are the differences in attitude between learners and public education institutions towards online learning within Jamaica?	• Online learning • Students (Group 2) • Teachers (Group 1) • Administrators (Group 3) • Education officers (Group 4) • Prospective learners (Group 5)	• Survey • Questionnaire • Opinionnaire • SurveyMonkey	SPSS
• **Cross-tabulation** • **Measures of tendency and Variability**	• Online learning will not increase access to training and education in Jamaica	What is the relationship between online learning and increased access to training and	• Online learning • Increased access to training programs	• Survey • Questionnaire • Opinionnaire • SurveyMonkey	SPSS

Statistical Test/Analysis	Hypotheses	Research Question	Variables	Data Collection Instrument/Tool	Data Analysis Tool
• **Pearson's Correlational Coefficient** • **Spearman's Correlational Coefficient**	• Online learning can increase access to training and education in Jamaica.	education among learners?	• Increased access to education programs		
• **Cross-tabulation** • **Measures of tendency and Variability** • **Pearson's Correlational Coefficient** • **Spearman's Correlational Coefficient**	• Impeding factors are not responsible for the lack of comprehensive usage of online learning in Jamaica's public education. • Impeding factors are responsible for the lack of comprehensive usage of online learning in Jamaica's public education system.	What is the relationship between impeding factors and the comprehensive use of online learning for accessing education?	• Online learning • Impediments to online learning		

3.7 Study Procedures and Ethical Assurances

The study was conducted to collect data to determine whether hypotheses 1 to 4 (see Table 2.2) hold true in answering the research questions 1 to 4 (see Table 2.2); and discover its relationship to the phenomenon being investigated where the independent variable 1 is explored, *online learning,* and whether dependent variable 2 can *increase access to training and educational programs in Jamaica*. Loannidis (2018) and Pandey and Pandey (2021) support the research process and consider it an important element that underpins the ability of a society to harvest knowledge to effect growth economically, and otherwise.

Therefore, the current study used carefully designed procedures to prevent chaos, maltreatment, and the exploitation of participants and respondents sought for study. The researcher used due care, as evidenced from earlier research outlined in Bagatur's (2018) study about the Nazi's unethical experiment on humans; Spector-Bagdady and Lombardo's (2018) study also revealed atrocities inflicted on human participants in the Guatemala STD experiments; and the Tuskegee Syphilis study in America, where participants rights were violated, and grave harm was done.

This led to the development of very strict ethical procedures for use during the research process, rendering ethics in research paramount. Moreover, ethics in research governs the behaviours and code of conduct to be followed when conducting research activities; and should be employed in the determination of the direction and organization of each stage of the study. This section will discuss the ethical procedures and activities implemented for the current study.

3.7.1 hical Assurances

A key element of research is for researchers to ensure that the process is conducted ethically Harper et al. (2018) and Head (2020) studies postulates that in conducting a study ethically, investigators should seek (1) approval from the respective governing body for the research, (2) participants' informed consent, and (3) provide and safeguard participants through anonymity, confidentiality, beneficence, maleficence, privacy, and justice.

According to Head (2020) and Peled-Raz et al. (2020), the approval of the research ethics board is fundamental in ensuring an objective review of the proposed study procedures and their alignment with the acceptable rules that guide researchers in the field. The board consists of academicians with expertise in research; its functions are to guide the researcher in delving deeply into the realities of the research proposal's feasibility and carefully chart a course that will adhere to ethical principles. The research approval process has many pros and cons; Critics have observed that these boards can be indifferent and autocratic, which may result in unnecessary restrictions rather than assist the study process. On the other hand, the board helps novice researchers develop a workable study proposal.

Subsequently, the first ethical principle that researchers are mandated to comply with, is to gain participants' voluntary and informed consent to enter the study. Lentz et al. (2016) postulates that informed consent provides participants the opportunity to be briefed about the purpose and significance of the study, their expectations addressed, and given the option to opt in or out. Subsequently, autonomy would be assured through the informed consent process; Sil and Das (2017) emphasize in their study that when

participants voluntarily choose to participate, that is allowing them autonomy, as consent is freely given.

Additionally, Pieper and Thomson (2016) assert that when conducting a study with people, beneficence must be considered, the respondents should benefit, and no harm should befall them because of the research. Harper et al. (2018) and Head (2020) assert that of equal importance, researchers should try to gain the trust of participants regarding the preservation of their privacy through anonymous participation and assurance that their confidentiality will be maintained. These rules are established to maintain the integrity of the study and protect participants while operating in the research field.

3.7.2 udy Procedures

The key aspect of preparing to conduct primary research is to seek the approval of the research body that supervises research activities, which in this study is the UNICAF Research Ethics Committee (UREC). Specifically, the proposal for the research was initially presented to UREC in July of 2020 and approval gained in August of 2020; giving a brief overview of the phenomenon of interest, the purpose and significance; research approach and design; theoretical framework and paradigm setting; and methods. The approval process continued with the third dissertation chapter, where approval was sought in August of 2021 and given in September of 2021. There were requests for the formal research instruments to be developed or adopted from previous research, and the sample population and size determined.

Upon approval from UREC the research request was sent to the MoEY of Jamaica and then to the institutions in October 2021 that were selected for the sample size. The research request letters were emailed to the schools' gatekeepers briefing them about

the purpose and significance of the research, the participants' informed consent forms, survey instruments, and opinion poll instruments were shared. This was followed up with telephone calls in October 2021 to further address any questions raised by interested participants for the survey and opinionnaire. Additionally, prospective learners were invited via social media commencing in October 2021, and for ease of use, informed consent was also presented as the first question, mandating each participant to select *yes. I consented* before they were able to access the survey questions.

The surveys were online therefore, the SurveyMonkey application was employed to provide access to the participants via links sent to their emails, smartphones, and social media, beginning in October 2021 and with further recruitment in August 2022. Once completed, the responses were sent to SurveyMonkey's secured storage which is encrypted by my personal password-protected account, in December 2021 and November 2022. Additionally, the respondents sought for the interviews, were briefed by telephone and emails about the study's purpose and informed consent forms were emailed to them for signing electronically, starting in October 2021. The informed consent forms detailed the solemn promise of the researcher to uphold all ethical research tenets (see Table 3.13).

Table 3.13

Ethical Principles That Guide the Research Process.

Ethical Principles	Meaning
Informed Consent/Autonomy	Brief participants about the study and any risks and provide an atmosphere that encourages voluntary participation.
Beneficence/Maleficence	The research should benefit the participant and do no harm.
Confidentiality/Privacy	Participants have a right to privacy and confidentiality

The electronic participants' consent forms were sent to emails or social media platform for the participants to gain access; once these were returned, they were saved and stored electronically using a password secured software 'PDFiler', where the forms were signed electronically online. The responses from the survey were also stored using a password-protected account with SurveyMonkey, then the data was exported to and stored using secured encryption and the high-level security of Windows 10 S mode on a personal computer until they were loaded into the IBM SPSS Modeler and NVIVO 12 application versions for analysis. The secondary research was conducted using (N = 20) purposefully selected documents for review. The checklist was used to collect data from each selected case, and content analysis was applied. The data collected from the primary research was stored in a secured file offline until the research report was completed.

3.8 Data Collection and Analysis

The sample population sought for the primary research includes students, teachers, and administrators in public schools in Jamaica, ranging from the primary to tertiary level, MoEY officers, and prospective learners in Jamaica. The data was collected for the quantitative primary research from Group 1 teachers along with Group 2 students, Group 3 administrators, Group 4 MoEY Officers, and Group 5 prospective learners through invitations sent using emails, and social media platforms (Linkedin, WhatsApp, Facebook, and Twitter).

Once interest was expressed in participating in the research, the survey for participants aged 19-to-65 and 15- to 18-year-olds, and the opinionnaire were loaded into the SurveyMonkey software. These were then converted into electronic links geared towards easy access via email and social media and shared electronically with them. The first question in both the survey and opinionnaire, sought to obtain participants' informed consent and participants who selected (*Yes)* gave their consent and were able to proceed to the main body of the survey and opinionnaire. Once completed and the submission button was selected by the participants, the results from each participant were recorded and stored in a password-protected format.

On the other hand, the data that was collected for the qualitative primary research was gathered through a purposive sampling approach applied to Groups 1, 3, 4, and 5; invitations were sent using emails and social media to recruit those respondents with the experience and expertise to share about the phenomenon. Those respondents were then asked to suggest others who possessed the same expertise and experience. The respondents who were recruited for the interview were emailed, and an invitation was

sent for a telephone briefing by the researcher about the purpose, significance, and expectations of respondents and their rights as they relate to confidentiality, autonomy, beneficence, and privacy.

Subsequently, a copy of the interview guide was shared along with an electronic consent form, which was sent via email to potential participants to be signed electronically and returned to the researcher. The signing of the participants' consent forms was achieved using PDFiler which offered a paid encrypted account for sending and receiving electronic documents, as soon as each respondent clicked done after signing. The consent forms were stored in PDFiler using a password-protected account.

Furthermore, following receipt of the consent forms meeting identification (ID) links were created using the Zoom meeting platform. The links advising respondents of the date and time for the interview were dispatched via emails and text messages with the invitation to an audio interview which was conducted using Zoom. The interviews were recorded and stored using encryption on a personal computer and smartphone. Groups 1 3, 4, & 5 were used to collect data to respond to research questions and hypotheses for the interviews (see Table 3.14).

Table 3.14

Data Codes Used to Collect Data for the Research Questions and Hypotheses

Data Codes	Research Questions	Hypotheses
Group 1	1, 2, 3, & 4	1, 2, 3, & 4
Group 2	1, 2, 3 & 4	1, 2, 3, & 4
Group 3	1, 2, 3, & 4	1, 2, 3, & 4
Group 4	1, 2, 3, & 4	1, 2, 3, & 4
Group 5	1 & 4	1 & 4

The secondary research data was collected from 20 archived reports that are related to the phenomenon. Checklists were used to identify data useful in reference to research questions 1-4 and test hypotheses 1-4, (see Table 2.2).

3.8.1 titative Data Analysis

The web-based application SurveyMonkey was used to collect the primary data for the quantitative element of the study. Subsequently, the data that comprised participant responses to each of the online questionnaires was exported into Microsoft Excel, where numerical codes were used to identify each respondent and their responses were coded using numbers from one to five (see Appendix F). The data was also separated based on the sameness of the type of questionnaire items that is, the 15-to-18-year-olds and the opinionnaire were combined for analysis, while the 19-to-65-year-olds questionnaire responses (see Appendix F) were analysed separately as it included additional rating scale items. Data were then loaded per questionnaire type mentioned

above into the IBM SPSS Modeler Subscription version where initial descriptive statistical analysis was conducted using measures of central tendency, variability, and cross-tabulation.

Further statistical measures were undertaken following the descriptive analysis; correlational analysis was in the form of Pearson's correlation coefficient and Spearman's rank correlation coefficient. Central to this, the content analysis codes were quantified to determine any trends and patterns relative to the research questions and hypotheses 1-4 (see Table 2.2).

3.8.2 Descriptive Analysis

3.8.2.1 Measures of Central Tendency and Variability. The measure of central tendency calculates a number that characterizes the value of significant sections of the data, represented by the mean, median, mode, and standard deviation (Ali et al., 2019b). Measures were calculated from the data collected by way of the responses from the surveys in preparation for their manipulation through correlational analysis using Pearson's and Spearman's coefficients. Variability analysis was used to show the tabulated representations of the responses from different groupings in the data; to reveal significant patterns related to online learning and whether it can increase access to training and educational programs in Jamaica.

3.8.3 Correlational Analysis

3.8.3.1 Pearson's Correlation Coefficient. The Pearson's correlation coefficient was used to measure the depth of the relationship between the independent variable 1 (online learning) and the dependent variable 2, its ability to increase access to training and educational programs in Jamaica for each of the four groupings of participants. Pearson's correlation coefficient for the measurement of mathematical parameters is valuable in establishing the quality of the relationship between research variables in a regular classification, that is, whether a change in one variable can be correlated to a change in the other variable (Akoglu, 2018; Xu & Deng, 2017).

It will be used to determine the significance of the relationship between the variables represented by a value on a scale ranging from 1 to -1 (see Figure 3.12) for each group for the surveys. A value of 1 (*strong positive relationship*) between the variables; conversely, a value of -1 (*strong negative relationship*). The measure of a correlation between two variables spans 0 to positive 1 and 0 to negative 1 (Akoglu, 2018).

Figure 3.12

Pearson's Correlational Coefficient Value at Each Range (DATA VIZZES, 2018)

3.8.3.2 Spearman's Rank Correlational Coefficient. Spearman's rank correlation was used to measure the relationship between ranked set of data and the strength of the relationship between the variables (see Table 3.15), as ordinal values were used in the data, as information such as institution's size was not collected. Thirumalai et al.'s (2017) and Schober et al.'s (2018) studies characterize this statistical analysis method as non-parametric since it ranks the strength of the measurement presented among multiple variables, eliminating the need for inference about the frequency of distribution for each variable. Therefore, Spearman's rank correlational coefficient measured the ranking contingent on how convergent and divergent the variables reside in the datasets.

Table 3.15

Spearman's Rank Strength of the Relationship Among Variables (Schober et al., 2018).

Spearman's Rank Measuring Standard	Correlation
0	No relationship
0.19	Very weak
0.39	Very weak
0.59	Moderate
0.79	Strong
1	Very strong

Therefore, Spearman's coefficient rank was used to reveal general trends within the data that pointed to notable patterns of significance related to each hypothesis, by

ascertaining an increase or decrease in the ranked connections identified in the data and analysing them for generalization to the population studied. It is a measurement like Pearson's coefficient for demonstrating a relationship through a measurement scale of 0 to positive 1 and 0 to -1 correlation. However, Spearman's coefficient differs in that it highlights the relationship through rankings, by showing whether an increase in the rank of one variable shows the same increase in the rank of the other variable, vice versa, or none. Instead of indicating the quality of the measurement of the connections between each variable examined during the research.

3.8.3.3 Cross-Tabulation Analysis. Nayak et al. (2021) and McCulloch and Webb (2020) affirmed that cross-tabulation is commonly employed to examine categorical datasets. In this instance, it evaluated the relationship amongst and between different groupings within the datasets. Several groupings were used in the current study, and the cross-tabulation analysis method provided a reliable way to map their relationships in line with the study's variables. Furthermore, the cross-tabulation analysis illustrated the overall group responses for the various items to map any relatedness, differences, or no relationship occurring among the different groupings as it relates to online learning and access to training and educational programs in Jamaica. Therefore, cross-tabulation analysis presents results in a table format, compiling the number of times and percentages indicative of the sum of respondents in each unit. The information in each cross-tabulation table shows the elements for both rows and columns. This type of analysis is especially valuable in research when there are distinct dataset groupings to compare and contrast in order to quantify the relationship. As was the case in the current study, respondents were divided into five groups. Cross-tabulation was used to identify

patterns of relationships and trends to ascertain the significance of the results in relation to hypotheses 1-4 (see Table 2.2). Consequently, it was used to examine whether the hypotheses held true for all four groupings of participants (students, teachers, administrator, MoEY officers, and prospective learners) and determine the similarities and differences among each grouping of participants.

3.8.4 Qualitative Analysis

3.8.4.1 Grounded theory: Constant Comparative Analysis. The participants' narratives, which were emergent during the one-on-one interviews, were collected and recorded as audio files in MP3 format and exported and loaded into the NVIVO analysis software, where they were transcribed. The transcripts were transcribed verbatim from the audio recordings and were analysed using constant comparative analysis. This method of data analysis generates theories about the data collected at different intervals of the data gathering process (Tie et al., 2019). Additionally, the qualitative tools and procedures applied in the study ascribed to the tenets of the Lincoln and Guba (1985) model, which authenticate the reliability and trustworthiness of the qualitative methods and research procedures. These qualitative tools and procedures were further affirmed in the findings of the studies by Tobin and Begley (2004) and Loa and Chair (2022). Therefore, the qualitative analysis method was selected to address any shortcomings of the quantitative analysis yields and to use data saturation techniques to determine reliable findings. These results would then be triangulated with the results from the other analysis methods to draw valid conclusions.

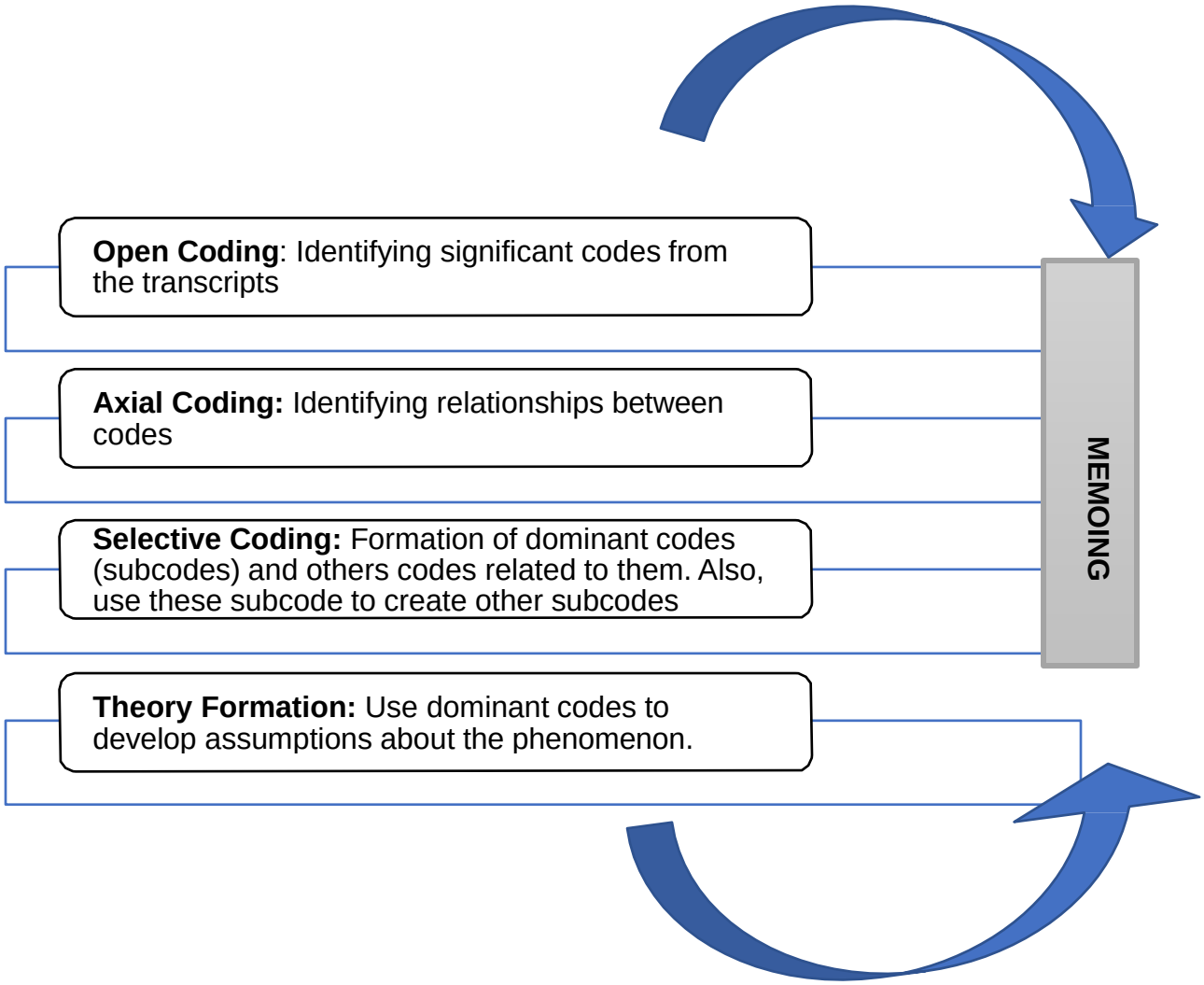
Hence, the analysis commenced by first identifying possible links in the data related to the phenomenon studied through organizing the utterances under several codes (see Appendix B). This is the first stage in the grounded theory analysis process and is considered essential to arriving at valid assumptions that reside in the data collected. The formation of codes refers to keywords that can be utilized by the researcher to pinpoint concepts in different areas of the data (Charmaz & Thornberg, 2021d; Erlingsson & Brysiewicz, 2017; Tie et al., 2019).

Initial coding was employed to classify emerging themes in the data. Axial coding followed to identify and group codes by how they were related to each other. Additionally, selective coding was then applied to compare different codes to identify the significant codes among the groups of codes. Those significant codes were further organized into other subcodes with related codes, thereby, developing various category levels in a tree-like structure and forming a coding system from the data. This was done by creating multiple subcodes and further refining them into subcodes of subcodes.

The researcher then creates memos of the discoveries at each coding stage of the data analysis, noting differences and similarities among codes and their categories (see Figure 3.13). Following the initial analysis of the set of interviews, another batch of interviews was then analysed that was collected after the first batch with each grouping of respondents. This was used to affect a second analysis process which was then compared to the findings from the initial cycle of analysed interviews; to draw clear and reliable conclusions for testing the theory developed from the data.

Figure 3.13

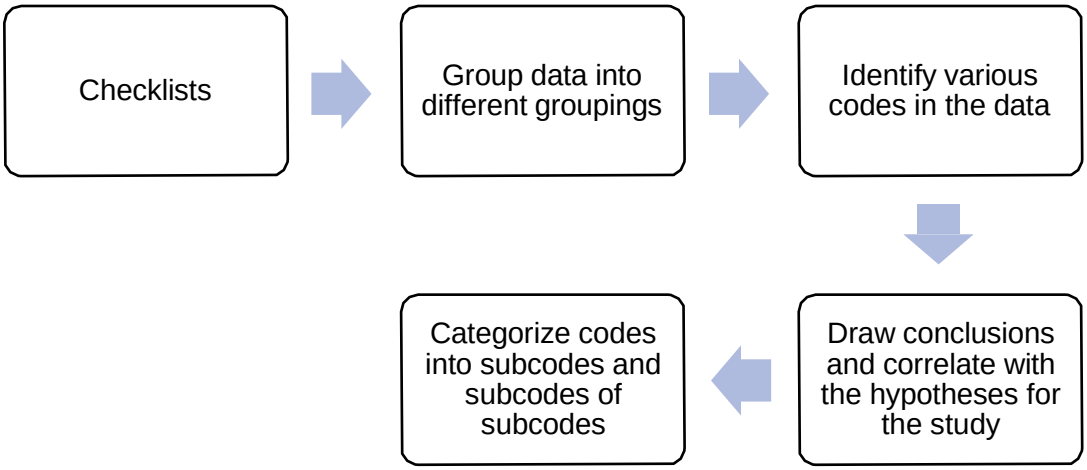
The Grounded Theory Analysis Steps for Formulating Theories From the Data.



3.8.4.2 Content Analysis. The data from the archived reports was loaded into NVIVO and abstracted to identify pertinent codes contained in the reports related to research questions 1-4. The goal here was to establish and quantify any similarities and differences in the trends these reports had previously uncovered. Further to determine relevant gaps in the researched area. Also, to audit the effect of sampling biases relative to low response rates on the current study's result. The content analysis was applied to develop the significant codes in the data and then quantify them relative to the number of occurrences in each archived report and represent them in a tabulated format (Kleinhekksel et al., 2020; Lock & Seele, 2015). Erlingsson and Brysiewicz's (2017) study describes content analysis as involving a process of converting a sizeable amount of data in text form towards the achievement of a succinct version that reveals only the fundamental information with clear meanings. Hence the value of the process of transforming the data into codes and sub-codes to show patterns. These codes were then grouped into various categories with associated codes. After the coding process, the data was tabulated to ascertain similarities, differences, and the number of occurrences necessary to arrive at valid conclusions related to the phenomenon (see Figure 3.14).

Figure 3.14

The Data Analysis of Archive Reports (Statswork, 2021).



3.9 Summary

Chapter 3 focused on the careful development of (1) the research method and design, (2) sampling design, (3) data collection instruments, (4) an application form for UREC's approval, (5) strategies to minimize or eliminate biases to uphold ethical principles, (6) defining variables, and (7) the collection and analysis of the primary and secondary data for the study. Subsequently, the research method design guiding the research process was the mixed methods approach, which used a combination of the quantitative and qualitative designs through a concurrent nested research design.

This design was chosen to guide the study as it resonated with the pragmatism paradigm which defines the way the researcher collected and analysed the data. Furthermore, it directed how conclusions were drawn in relation to the research questions and hypotheses for generalization of the phenomenon. In so doing the abduction method was employed to realistically examine the problem both objectively through statistical

measurements as well as via the voice of the respondents who have been impacted by the issue.

Subsequently, the study set out to use the quantitative approach as the dominant methodology. Thereby, within the concurrent nested research design, two quantitative designs were employed, which were: descriptive and correlational. Additionally, the Charmaz-Grounded Theory approach and design were applied to the qualitative methodology. Further, the sampling design was developed to facilitate the selection of participants for the quantitative and respondents for the qualitative primary research. After the selection of the sample size for the study, approval was sought to conduct the data collection from UREC. This was granted following a six-week deliberation.

Accordingly, the study collected nominal and ordinal data for identifying and categorizing the variables into those with and without statistical values. This was done to determine the relationship between and among the independent variables of *online learning* and the dependent variables. Additionally, the 5-point Likert scale was used because of its advantages in extracting responses in the study's natural discovery and progression, which lessens the presence of biases. Most importantly, descriptive statistics were used to give the researcher a summary of the significant patterns in the data. Then the variables were correlated using Pearson's and Spearman's coefficients to ascertain any relationship that was linked to the problem. While the measures of central tendency and variability pinpointed the degree of the relationship that existed between the variables, cross-tabulation analysis was used to identify relationships among the different datasets.

Equally important, to gather the data and test the hypotheses in responding to the research questions, the SurveyMonkey application was used to host and store the responses for the online surveys and opinionnaires. The PDFiler application was used to ensure that the ethical principles that guided the study were upheld in sending and receiving electronic participants' consent forms and accepting signed consent to participate in the study. Emails, text messages, and the Zoom meeting platform were also used to brief participants and respondents about the study.

Finally, the data was analysed using the IBM SPSS Modeler Subscription version for the quantitative data and the NVIVO 12 analysis application for the qualitative data. The descriptive analysis was employed to mine results using the measures of central tendency and variability to ascertain the mean, median, mode, and standard deviation for the interacting variables in the data. The cross-tabulation analysis, Pearson's and Spearman's correlation coefficients were used to analyse the relationships between and among the variables respectively. However, several limitations were acknowledged during the data collection process. Some of these were bureaucratic red tape in reaching pertinent respondents with expertise and experience in the phenomenon. Additionally, the schools selected in the sample population were in fully virtual teaching and learning for the initial recruitment, which posed some difficulties in recruiting participants in remote areas. Further to this, some respondents experienced a lack of access to a reliable internet connection and computer literacy.

CHAPTER 4. DISCUSSION OF RESEARCH FINDINGS

4.1 Introduction

This chapter demonstrates the authenticity of the findings through the validation of the study's procedures. The results provide confirmatory evidence of the findings and the trustworthiness with respect to the evidence gathered, the reliability regarding the instruments used in the study, the results, and the evaluation of the findings related to the phenomenon. The issue under examination is whether online learning can be used to provide greater access to training and educational programs within the Jamaican public education system. Central to this, the study simultaneously delved into the value of online classrooms in providing quality training and education. Arguments central to the study's goals identified impediments to online learning offerings in Jamaican public institutions and their impact on progress toward success.

Many controversies have arisen over the arguments for and against online learning as a viable complement to the traditional mode of learning. Almaiah et al. (2020) and Sadeghi (2019) identified some advantages associated with online learning, which include convenience, cost savings, flexibility, and more opportunity for part-time study. Schneider et al. and Sadeghi (2019) have also identified disadvantages relative to online classrooms in the form of increased interference of lessons from distractors, computer illiteracy, isolation, and accreditation issues. However, the feasibility of online learning at all levels of education within the Jamaican context has not been sufficiently explored. Therefore, the major goal of the chapter is to report the evidence pertaining to the data collected relative to the interpretation obtained through rigorous analysis.

Following the analysis section of this chapter, accurate evaluation and discussion are presented in concise and practical information sets, useful for application within the Jamaican context. Together, this provides evidence of actionable options to help alleviate the shortcomings in access to education for the underserved groups in Jamaica by providing more entry points and opportunities to enroll in skills training, and job readiness, especially for high school dropouts and those Jamaicans who may never enroll in a tertiary institution. Furthermore, a more informed position on the value of online learning within the Jamaican public school system from the primary to tertiary levels can be discerned. Subsequently, intentional decision-making may be facilitated by Jamaican education policymakers and leaders. Moreover, these leaders can use the results to formulate a more deliberate action plan through online learning, which may improve convenience through flexibility, time, and spaces for learning made possible through synchronous and asynchronous learning modes.

The presentation of the results and discussions are argued based on the four established research questions which have guided the research activities. These are:

1. What is the relationship between online learning and increased access to training and education among learners?
2. What are the differences in attitudes between learners and public education Institution leaders towards online learning within Jamaica?
3. Is there a relationship between online learning classrooms and quality training and education?
4. What is the relationship between impeding factors and the comprehensive use of online learning for accessing education?

The discussion indicates whether the null hypotheses for each research question have been accepted or rejected. The arguments presented are directly related to the findings in relation to the descriptive, correlational, constant comparative analysis, and content analysis. The judgements drawn were because of the triangulation of the evidence from the quantitative and qualitative datasets.

4.2 Trustworthiness of Data

Gunawan (2015) and Lincoln and Guba (1985) construed th**e** credibility of a study to be associated with the ability of the researcher to demonstrate to the readers and users of the research findings that they have “true value”, and are “relevant”, and “dependable”, and that “neutrality” was achieved in extracting findings and drawing conclusions. Shufutinsky (2020) adds that techniques that include code-verification, cloning, and tabular reflection and analysis of alternative meanings (TRAAM) can be vital tools to achieve more authenticity for the qualitative approach to the research process. Therefore, for the current study trustworthiness was confirmed and ensured by the guidance provided by Denzin (1978) and Lincoln and Guba (1985) in which trustworthiness models bring together several assumptions, datasets, and methods within the study.

Aguilar-Solano (2020) and Roulston’s (2018) studies support this strategy for qualitative studies and reveal that more than one method in studies reduces errors and biases. This was upheld in this study by using the mixed methodology applied within the concurrent nested research design by way of triangulation between time, space, person, and methods. Alexander (2019) corroborates that triangulation increases the effectiveness of the study’s method for accurate and practical generalization to the target

population, reduces the presence of bias, and creates neutrality during the research activities.

Therefore, current and past research indicates the use of a mixed-methods approach to produce more valuable outcomes and increase knowledge about an issue. Accordingly, this research was designed to apply both a quantitative and qualitative methodology to authenticate the “credibility”, “dependability”, “transferability”, and “confirmability” (Denzin, 1978; Gunawan, 2015; Lincoln & Guba, 1985) in validating the study’s findings. The grounded theory (GT) (Charmaz technique) design was employed for the qualitative primary research, the descriptive and correlational design (quantitative primary research), and a further content analysis for the secondary research was used to triangulate results; and identify revelations for the rejection or acceptance of the null hypotheses.

4.2.1 Trustworthiness of the Qualitative Methodology within the Mixed-Methods Approach

Gunawan (2015) and Kyngas et al. (2020) conclude that the trustworthiness of the qualitative method in research has several vital criteria. Lincoln and Guba, (1985) extended this discussion around this conclusion to argue that four criteria must be present to prove the accuracy of a study, which is further supported by Alexander (2019) and Hadi (2016). These elements include “credibility, dependability, confirmability, and transferability” (Lincoln & Guba, 1985, p. 300). Lincoln and Guba (1985) further assert *credibility* in a study to be achieved when the results from the conclusions drawn can be ascertained through the length of engagement, careful observation, and triangulation at various stages of the study’s process.

Accordingly, for the current research, this was achieved via triangulation at the analysis stages of the qualitative methodology side of the study to reduce the presence of biases. To illustrate, the Charmaz GT (constant comparative analysis) technique was used, where analysis was applied to initial interviews to aid theory formation. This was later compared to a later collection of interviews and theory development to determine confirmation or rejection of the null hypotheses. Alexander (2019) presents this as a time triangulation indicative of the Denzin (1978) triangulation model.

Equally important, was the content analysis which was used to produce the most frequent themes extracted from the archived documents and was quantified. These findings were then contrasted with the outcomes of the quantitative and qualitative primary research to establish whether to accept or reject the null hypotheses. Furthermore, triangulation was attained at the data collection stage from multiple participants at varying levels of education in the Jamaican public school system with experience of online learning selected for the interviews. Alexander (2019) relates this to space triangulation, that is, collecting data about online learning in Jamaica from several parishes and across various levels of the public education system.

Additionally, data triangulation ensued where the data for the study were collected from various groups including Group 2 (students), Group 1 (teachers), Group 3 (administrators), Group 4 (MOEY officers), and Group 5 (prospective learners). These participants were invited for interviews at each level of education. In addition, the selection of the archived documents (secondary research) spanned publication dates from 2000 to 2021 contributing rich data to test whether the null hypotheses held true. The use of multiple instruments (unstructured interviews and checklists) in the data

collection process was to confirm, as opined by Fusch et al. (2018), and eliminate or decrease the appearance of bias on the part of the researcher as well as from the participants. Furthermore, adding richness to the data, strengthens its ability to achieve data saturation, which validates trustworthiness.

Further to this, confirmability was achieved through triangulation using the research findings of various models (Alexander, 2019; Denzin, 1978; Lincoln & Guba, 1985). Moreover, in addition, the quantitative primary research, the qualitative primary research, and the secondary research outcomes were also used as the basis for passing judgement relative to the acceptance or rejection of the null hypotheses. Confirmability was also upheld through reflexivity by preserving the integrity of the data and findings by way of consistent memo writing of significant data points, which were used in drawing conclusions to refute or accept the null hypotheses. This was employed to reduce the incidence of biases and errors and authenticate the findings of the current study.

Fusch et al. (2018) and Tobin and Begley (2004) put forward the view that external validity is ensured by the transferability of the study's outcome. In the current study, transferability was attained by categorizing of the sample population into different groupings, which were further subdivided into sets corresponding to the education levels in the Jamaican public school system. Similarly, the classification of the data and findings related to the different groupings in the study gives a clear indication of whether the outcomes can be generalized to the population, which is indicative of the acceptance or rejection of the null hypotheses.

This study also draws on research conducted by Tobin and Begley (2004) and Loa and Chair (2022) which revealed that *dependability* is the systematic auditing of the

different stages of the research. It is concerned with the confirmation of how consistent the activities undertaken during the study were, if traceable, and whether the process was documented carefully. Consequently, this will be achieved through the audit of the study's relevant documentation by an internal and external auditor to verify the integrity and authenticity of the qualitative datasets utilized for analysis in making concluding judgements.

4.3 Reliability and Validity of the Quantitative Data within The Mixed Method Approach

Robinson et al. (2022) and Weakley et al. (2021) revealed that the reliability and validity of the data can be achieved through criterion validity. This was upheld by the triangulation of the measurement protocols in establishing reliability and validity (Kitchenham et al., 1995) for effective generalization to the targeted population. The measure of Cronbach's alpha was applied to ascertain how reliable the instruments were in achieving the study's objectives. The results returned (α = .831 and α = .845) (see Tables 4.2) and report high inter-item correlations (α = .776 and α = .950) (see Appendix G). Consequently, the Pearson and Spearman correlational coefficients were used to test the validity of the instruments. Mohamad et al. (2015) and Vaske et al. (2017) support a Cronbach's alpha falling between (α = .65 and α = .80) for the items on an instrument that is generally deemed reliable on the scale range of 0.00 to 1.00 (see Appendix L). The test of validity relative to the measuring instruments is acceptable at (α = .70) (Salem & Kiss, 2022). Additionally, the quantitative methodology in the study provides statistical measurement of the variables by way of triangulation in accepting or rejecting the null hypotheses to demonstrate the legitimacy of the outcome. Moreover, the instruments

that were used to collect the data via online questionnaires contained ordinal measurement items using a 5-point Likert scale. This afforded the opportunity for more detailed data collection to inform the quantitative judgement or conclusions.

To illustrate, Tutz (2021) and Willits (2016) confirmed that the 5-point Likert scale presents a much lower margin of error. Yet, the online survey can reveal biases. Therefore, 44 participants were interviewed with the goal of gaining insight into how the issue was viewed by them. This was done to reduce the margin of error from the surveys and to provide more reliable and valid findings fit for practical application to the population (see Table 4.1). This was reaffirmed by the audit of the quantitative instruments (questionnaires) which were evaluated by experts within the Unicaf Research Ethics Committee (UREC) who examined the instruments for reliability and validity. Additionally, validation of the instruments was benchmarked against the work of Likert (1974) as the 5-point Likert scales were applied for ordinal data collection procedures for unstructured interviews, the survey questionnaire, and the checklist for the archived documents.

Table 4. 1

Respondents per Grouping Interviewed

Numbers of Respondents	Type of Grouping in the Data
23	Group 1: Teachers
10	Group 3: Administrators
2	Group 4: MoEY Officers
9	Group 5: Prospective Learners
Corrupted digital data and withdrawal from the total: 3	

Note: This table illustrates the total number of respondents within each subdivision of the sample who were interviewed and the total amount that returned corrupted data from the overall number of respondents.

4.3.1 alidity Test of the Instruments

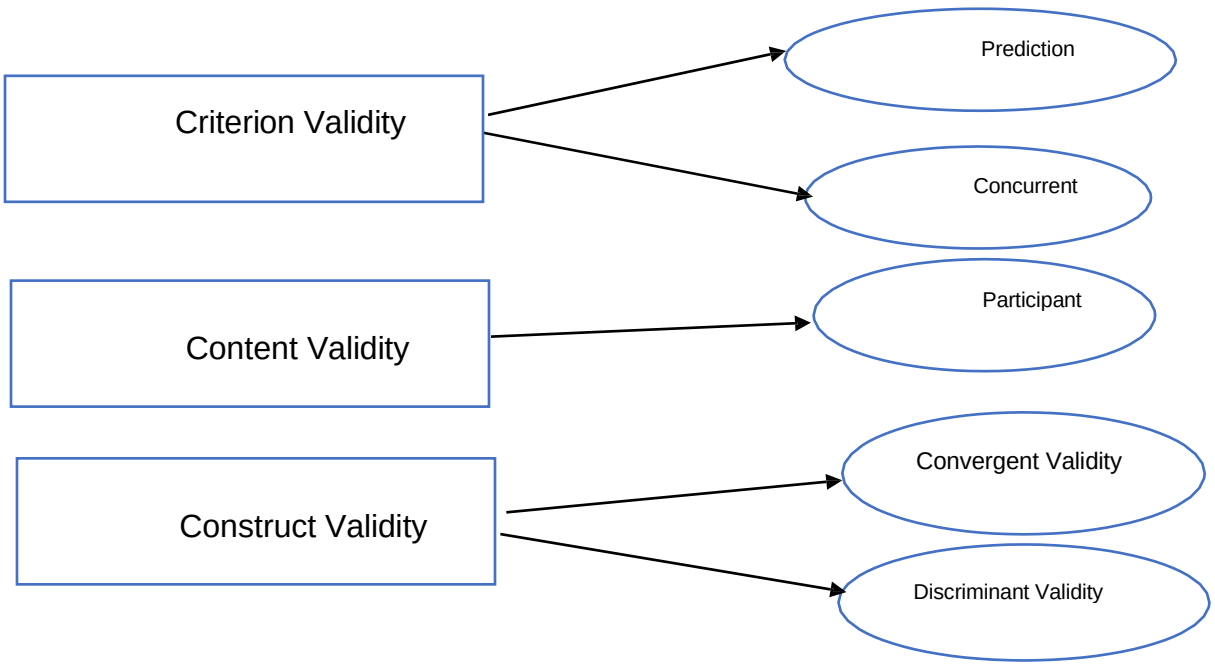
Studies by Chattopadhyay and Das (2022) and Frost et al.'s (2007) chronicled validity as the ability of the measurement instrument to measure the targeted assumptions that are not skewed towards something else. Therefore, validity measures in a study ascertain whether the instruments used for the data collection have measured the stated objectives. In contrast, reliability checks are utilized in the examination of the consistency of the measurement instrument over time. For example, if the same instruments were used in a similar study, could they produce similar results? Accordingly, the defense of the validity of the instruments may be sought from two perspectives: internal and external validity. Bo and Galiani (2021) contend that internal validity illustrates the strength of the

assumptions that guided the research, while external validity shows whether the outcomes from the study may be generalizable to the population.

This study used test validity for establishing the content, criterion, and construct validity, which was determined by the model developed by Cronbach and Meehl (1955) (see Figure 4.1) and used in Clark and Watson (2016) and Schimmack (2021) studies. Additionally, Bhattacharjee (2012) asserts that using both the theoretical and empirical methods for validity testing is crucial. Validity from a theoretical standpoint assesses the face and content validity and checks whether the measurement instrument measures the intended construct. On the other hand, the empirical evaluation of validity ascertains if the measurement instrument can measure the proposed construct in line with the assumptions of the construct. The criterion validity examples -convergent, discriminant, and predictive validity tests achieve this goal using factor and correlational analysis techniques.

Figure 4. 1

Cronbach and Meehl's Validity Test for Research (Cronbach & Meehl, 1955)



4.3.1.1 Face Validity. Yaddanapudi and Yaddanapudi (2019) and Taherdoost (2016b) cited face validity as abstract or intuitive assumptions that evaluate the usefulness of the research instrument utilized within the research process. Face validity is established when the instrument has the ability to show and audit its relativity in association with (1) its accuracy of the transcribed jargon; (2) the legibility of the text used; (3) the arrangement and choice of formatting features; and (4) the practicability of the completion process. Subsequently, in keeping with Taherdoost's (2016a) advice, for the instruments used in the current study in quantitative primary research, validity was legitimized first by way of face validity, that is, formatted using legible, clear, simple English jargon complemented by a consistent font type and sized in a logical arrangement.

Equally important, the feasibility of participants completing the questionnaires in a timely manner was provided using the SurveyMonkey software application and survey hosting platform. SurveyMonkey made the survey easily accessible and was able to record respondents' consent before questionnaires could be completed. Additionally, the presentation of the questionnaires was introduced and displayed in clear and distinct, simple language that could be decoded without confusion and made accessible using smart and dumb devices.

Furthermore, the use of 5-point Likert scales and drop-down menus was employed to promote quick responses from each respondent. The reliability and validity of the study's outcomes was also verified utilizing the measure of Cronbach's alpha to evaluate the reliability of the 5-point Likert scale used within the instruments. The Pearson and Spearman correlational coefficients tested the strength of the relationship between each

item, highlighting the discriminant and convergent significance of each (see Appendix H). The confidence interval satisfied the level of confidence about how adequately the results from the study are significant for generalization to the population for practical application.

4.3.1.2 Content Validity. Rubio et al. (2003) and Schimmack (2021) contend that content validity tests whether the instrument items evaluate similar subject matter and speak to the internal validity of the instruments for data collection. The 5-point Likert scale questionnaire items for the three surveys: (1) the 15-to-18-year-old survey, (2) the opinionnaire survey, and (3) the 19-to-65-year-old survey were measured for content validity using Cronbach's alpha and factor analysis (see Appendix G; Appendix I). The alpha results showed good ratings of (α = .831) on the other hand, the two rating scale items, which consisted of 11 items to be rated using the 5-point Likert scale, returned (α = .845) (see Tables 4.2). The Cronbach alpha rating shows high inter-item correlations between (α = .776 and α = .950) relative to the items' usefulness in measuring whether online learning (see Appendix G) can increase access to training and education programs in Jamaican public schools. Besides, the literature review was exhausted to identify and use benchmarks for making the final choices of items and instruments employed and directed towards the study's objectives and assumptions.

Table 4. 2

Reliability Test of Inter-items of the Survey Questionnaires

Questionnaires	Cronbach's Alpha	Item Types	Number of Items
15 to 18, Opinionnaire & 19- to 65-year-old questionnaire 5-point Likert scale questions	.831	Ordinal	17
19- to 65-year-old questionnaire rating scale questions	.845	Ordinal	11

Note: Reliability of the inter-item correlation using Cronbach's alpha rating. It is indicating a high inter-item correlation using 1 to -1, where (1 *represents the highest rate* and -1 *the lowest*).

4.3.1.3 Discriminant Validity and Convergent Validity. Bhattacharjee (2012) opined that convergent validity ascertains the proximity of items on a measurement instrument in measuring the proposed construct, while discriminant validity determines the extent to which the measurement instrument does not measure the other unintended constructs. Baek et al. (2010) and Farrell and Rudd (2009) further postulate that the discriminant validity ascertains the degree to which dormant or hidden variables are different in comparison to other latent variables within the dataset. The current research used correlational and exploratory factor analysis to evaluate the convergent and discriminant validity (see Appendix I). Therefore, the total item bank was correlated with the 5-point Likert scale items using Pearson's and Spearman's correlational coefficients. The test for discriminant and convergent validity returned a significant relationship between the items that are related in their purpose (convergent validity) and an

insignificant correlation residing among items that were dissimilar (discriminant validity). This has clearly indicated the usefulness of either accepting or rejecting the null hypotheses (see Appendix I).

The questionnaire instruments for the online survey (adult and students 'questionnaire, opinionnaire) were designed to measure relationships among competing participants' groups and to determine whether a relationship or no relationship existed based upon analysis of the data collected in relation to the null and alternate hypotheses. Subsequently, the exploratory factor analysis (EFA) was administered to the measurement instrument and evaluated to determine whether each factor is showing an *eigenvalue* that is greater than (1.000), that factors with a common construct are displaying (r = .60) or higher (convergent validity), and that factors with different constructs are loading factors below (r = .30) (discriminant validity).

Most of the factors returned a factor loading .60 to 1.000 while a few fell below (r = .30) (see Appendix I). The *Kaiser-Meyer-Olkin* measure of sampling adequacy returned (.830) which is good (see Appendix I), indicating enough sampling and a good verification of the measurement instrument's validity. The communalities table results show all except two of the factors above the (.50) acceptance threshold (see Appendix I): the two exceptions were (.475) and *(*.492) respectively. Furthermore, the rotated component matrix table (see Appendix I) shows factor loadings of high absolute value and variability of (.40) which is acceptable for a sample size of over 200 respondents (see Appendix I), no cross-loadings were identified.

4.3.1.4 Criterion Validity. Mohajan (2017) and Shou et al. (2021) cited criterion validity as the ability of the instruments (students and adult questionnaires and opinionnaire) used during the research to forecast or demonstrate noticeable rejection or acceptance of the null hypotheses for concurrent and predictive deployment of the instruments. In addition, the criterion of validity examines whether responses from the opinionnaire, student, and adult questionnaires produce similar results in line with the intended purpose of the items. Therefore, it is a measure of how well the instruments in the quantitative design were able to show significant behaviours or qualities related to the phenomenon.

Criterion validity was ensured in the current study through the concurrent validity measure as the opinionnaire, student, and adult questionnaires were deployed at the same time within the sample and produced similar responses to the variables. Similarly, the findings from the questionnaire items were able to predict the same outcomes from the checklist instrument. These were applied for the selection of the archived documents and represent the predictive validity that was used in arriving at conclusions. The predictive validity of the measurement instrument was also established through the epistemological process and correlational analysis.

Predictive validity was employed to show the fit of the instrument's performance (see Appendix J) based on the current study's proposed construct (Han C., 2023; Hoffman et al., 2020). Good predictive validity is shown among the items in the measurement instrument using the *2-tailed* significance levels of (p = .01**) and (p = .05*) and the Pearson's correlational coefficient. There is support for the evidence and

theoretical framework based on the interpretations made from the responses of the respondents.

4.3.2 iability

Singh A. S. (2017) and Zohrabi's (2013) studies describe reliability as the underlying strength of the instruments in the measurement of the problem of interest in realizing substantial outcomes based on the assumptions that guided the research process. Additionally, measures of reliability are undertaken to determine whether the results are consistent with the use of the instrument when reused under the same conditions. The pilot survey and the initial and later application of the instrument to the sample were employed to ensure the reliability of the instruments administered for theory measurement. Reliability was ascertained within the instruments through the consistency of the use of the 5-point Likert scale, which was utilized throughout each questionnaire for the quantitative methodology. Furthermore, the same demographic items were used across each instrument for both quantitative and qualitative measurement. The checklist was also used as a measuring standard, and the 5-point Likert scales were also applied to satisfy the hypothesis testing.

Additionally, Oktavaia et al. (2018) and Taherdoost (2016b) revealed in their study that a test of the reliability of the instrumentation process examines the internal consistency of each measurement administered for the study. The internal consistency of the study instruments is essential as it computes the correlation between different items within the instruments or sets of responses. The questionnaire instruments returned (α = .831) and (α = .845) for the 5-point Likert scale items and the rating items on the adult questionnaire (see Tables 4.3 and 4.4).

The Cronbach's alpha reliability testing shows the item statistic for the questionnaires ranging from (α = .813) to (α = .837) for the 17 items using the 5-point Likert scale and for the 11-rating scale items on the 19-to-65-year-old questionnaire ranging from (α = .776 to α = .950) (see Appendix G). This has confirmed the reliability of the instrument for gathering data relative to the proposed theoretical construct for the study. It is indicating a high inter-item correlation using 1 to -1, where (*1 represents the highest rate* and -1 *the lowest*).

Table 4. 3

Reliability Items within the 19-to-65-Years-Old Survey Questionnaire Instrument

Cronbach's Alpha	N of Items
.831	17

Note: Reliability testing of the internal consistency average for the 5-point Likert scale items within the questionnaire instrument using Pearson correlations significance

Table 4. 4

Reliability of Items within the Questionnaire Instrument

Cronbach's Alpha	N of Items
.845	12

Note: Reliability testing of the internal consistency average for the 5-point Likert scale items within the questionnaire instrument using Spearman correlations significance

Leppink and Perez-Fuster (2019) asserted that a further test for reliability that may be used is the test retest an example is the Charmaz GT technique applied in the qualitative design. Additionally, the test retest was used in the current study to show the degree of correlation between responses from participants at the primary, secondary, and tertiary levels within the public education system in Jamaica. This was demonstrated with the administration of the initial and later interviews utilizing the same interview schedule. Yet again, the pilot of the survey instrument and the later responses from the surveys. The test re-test also looks closely at the degree of the relationship between the responses from the different groupings, Groups 1- 5. Accordingly, the difference in means, be it high or low, is a test of the instrument's reliability. If there is a difference reliability is low, and if there is no difference, reliability is high.

Another reliability test is the inter-rater test which examines the extent to which the instrument items used can obtain the same results among different respondents in the datasets, for example, by comparing the results from the content analysis (secondary research) with those of the surveys (primary research) to identify any difference or similarity in the outcomes. Finally, the parallel forms of reliability testing of pairing, for example, the online opinionnaire with the adult survey questionnaire responses to determine the relationship between the pair of similar tests.

4.4 Results

Three hundred and eighty-four respondents were sought for the study however, 53% (*n* = 205) responded for the quantitative primary research and 11% (*n* = 41) for the qualitative primary research. Therefore, the overall total of participants responding to the study amounted to 64% (*n* = 246) of the (*N* =384) sought.

4.4.1 titative Primary Research Data analysis: Demography

The demography of the survey (questionnaire) sample presents the data from (*n* = 205) respondents who responded to the (*N* = 384) sought. The respondents ages ranged from 15-65 years old (see Table 4.5). This represents 53% (*n* = 205) of the 384 respondents that were sought for the study. The surveys (questionnaires) were conducted jointly online using the SurveyMonkey software application, emails, and social media platforms. However, it was a challenge reaching the gatekeepers and participants associated with the study. This was caused by the challenges imposed by the COVID-19 pandemic and poor or no Internet connection in some areas. Subsequently, this hindered the process as participants and respondents from the different groupings within the sample were engaged fully in online learning and were not within the physical school space which would have provided an easier way for contacting them. Therefore, locating contact information for the participants for the different groupings was difficult, a predicament associated with surveys in general. Studies by Dalati and Gomez (2018) and Lavidas et al.'s 2022) corroborate that the number of respondents to self-administered surveys is usually low, largely due to the ubiquity of the items and missing data.

Table 4. 5

Total Respondents in the Quantitative Study

Surveys	Total Respondents	Response Rates for Individual Questionnaires	Overall Response Rates from the 384 Sought
Pilot & 15-to-18 Survey	27	13%	7%
19-to-65 Survey	37	18%	26%
Opinionnaire Survey	141	69%	37%
Total Respondents	205	100%	53%

Overall, amongst the three surveys, (*n* = 23) participants were from the county of Cornwall, (*n* = 106) from Middlesex, and (*n* = 67) from Surrey; five elected not to answer, and there were four occurrences of missing data. The data for the pilot, 15-to-18 survey questionnaire, and the opinionnaire survey were combined for analysis while the analysis of the data gathered in the 19- to 65-year-old survey questionnaire was done separately. The later survey contains several different items than the former two surveys. The application of the descriptive statistics analysis revealed that overall, for the three surveys, 11% (*n* = 23), 52% (*n* = 106), 33% (*n* = 67) dispersion of the respondents across the three counties respectively; and 4% (*n* = 5) did not respond. Additionally, 38% (*n* = 78) of the respondents have reported that their schools use virtual learning, 31% (*n* = 63) use hybrid learning, 30% (*n* = 62) traditional mode, and 1% (*n* = 1) asynchronous mode. In addition, the qualification level of the participants revealed 1% (*n* = 1) with some high

school, 24% (*n* = 49) at the high school level, 2% (*n* = 5) primary school, and the remaining 73% (*n* = 149) had completed a tertiary level degree (see Table 4.6; Figure 4.2).

Further extraction of the quantitative data disclosed that of the 205 respondents 30% (*n* = 141) were male and 69% (*n* = 63) were females, with 1 missing data point. In addition, the data revealed that of the five groupings identified for participation in the study, Group 1 accounted for 56% (*n* = 115) of the responses, Group 2 and 5 combined, 3, 4, and 5: 30% (*n* = 62), 8% (*n* =17), 3% (*n* = 7) respectively. Groups 2 and 5 were combined for purposes of data analysis as both fell under the category of students and the number of responses was very low. The different school levels to which the respondents are attached showed primary 28% (*n* = 56), secondary 42% (*n* = 85), tertiary 26% (*n* = 54), MoEY offices 2% (*n* = 5), missing data 2% (*n* = 5). In contrast, the number of years in training or working in education ranges from under ten years (46%: *n* = 95), 11 to 24 years (44%: *n* = 91), 25 to 34 years (6%: *n* = 12), and (4%: *n* = 7) missing data (see Table 4.7; Figure 4.2). The missing data were the result of some respondents' failure to respond to some items on the questionnaires.

Table 4. 6

Demography: Descriptive Statistics of the Counties, Learning Mode, Qualifications, and Age

Learning Mode				Qualifications				County				Age					
Virtuallearning	Hybrid Learning	Face -to-Face	Asynchronous Learning	Some School	High School	Primary School	Tertiary School	Cornwall	Middlesex	Surrey	Prefer Not to Answer	0-15	16-20	21-35	36-45	46-55	56-65
78	63	62	1	1	49	5	149	23	106	67	5	25	47	62	46	16	9

Table 4. 7

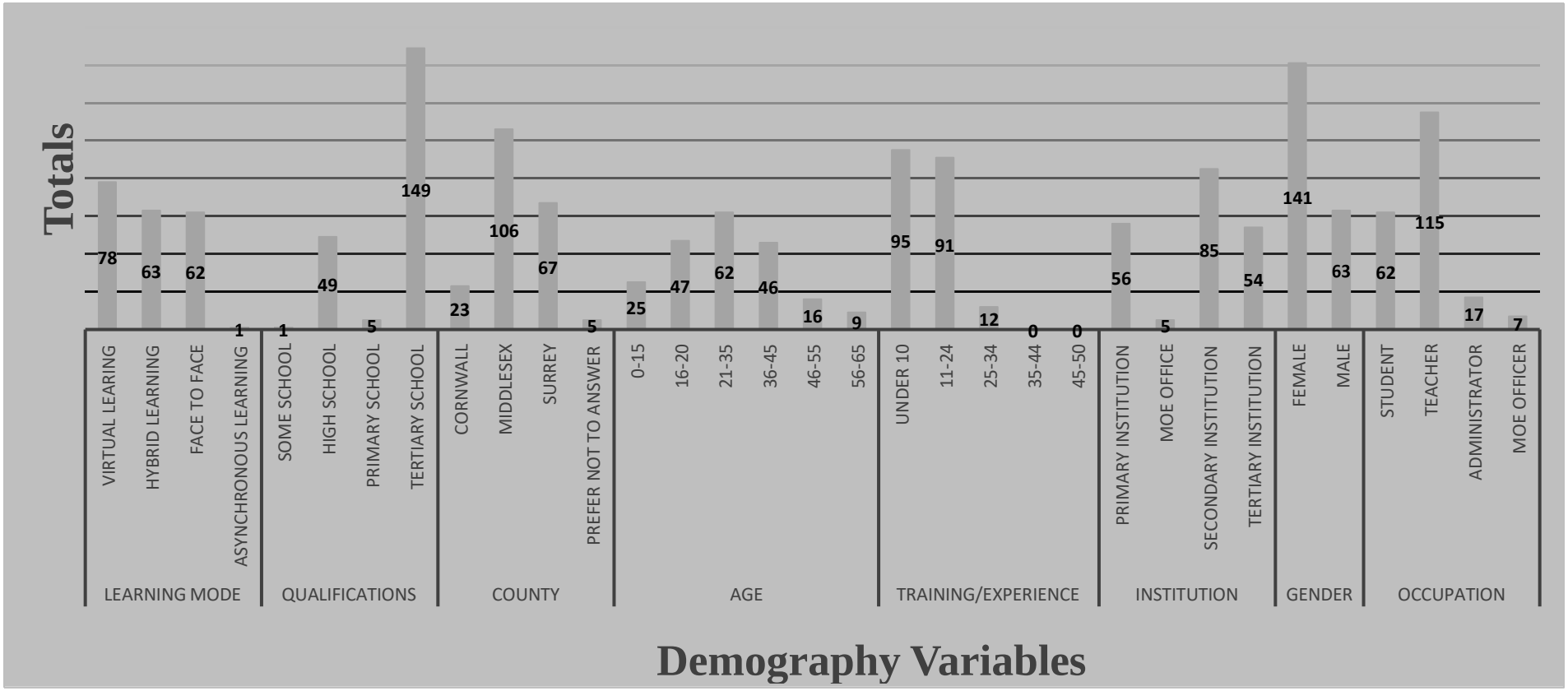
Demographic and Descriptive Statistics of the Training/Experience, Institution, Gender, and Occupation

Training/Experience					Institution				Gender		Occupation			
Under 10	11-24	25-34	35-44	45-50	Primary Institution	MOE Office	Secondary Institution	Tertiary Institution	FEMALE	MALE	Student	Teacher	Administrator	MOE Officer
95	91	12	0	0	56	5	85	54	141	63	62	115	17	7

Note: The table shows the demographic descriptive statistics of the counties, learning mode, qualifications, and age contained within the datasets for the primary quantitative research.

Figure 4.2

Demographic Variables for the Quantitative Primary Research



Note: The demography relates the to participant's group, gender, institutions, age, experience, counties, and mode of learning.

4.4.2 alitative Primary Research Data Analysis: Demography

One hundred interviewees were sought for the qualitative primary research from which 44% responded. However, of the (*N* = 44) interviews, (*n* = 41) recordings were transcribed and used for the qualitative analysis. The participants included (*n* = 12) males and (*n* = 33) females; (*n* = 1) of the participants withdrew (No. 43), and (*n* = 2) recordings could not be transcribed (No. 1 & 44). Additionally, (*n* = 23) teachers, (*n* = 10) administrators, (*n* = 2) MoEY officers, and (*n* = 9) prospective students were interviewed. One participant withdrew from the study and two recordings were compromised and could not be transcribed. The initial data collection and analysis consisted of (*n* = 21) interviewees (No. 2-22) which were analysed first using the constant comparative analysis technique. A further second batch of interviews was collected amounting to (*n* = 20) (No. 23-42) in total; these were analysed and compared to the findings from the initial interviews.

Several challenges were encountered while conducting the interviews. These include connectivity issues, lengthy transcription, some respondents withdrawing (busy schedules), and poor transcript quality due to the form of automatic transcription processing. Further, a majority of the responses were from the primary institutions, most responses from Middlesex County, and only two responses for interview from Group 4. The gatekeepers within the tertiary and MoEY offices were very difficult to reach and were made to commit to being interviewed. This was further compounded by the COVID-19 pandemic, which hindered the data gathering process as all schools were fully virtual, which made it difficult to reach participants at home.

The secondary research used (*N* = 20) archived documents ranging from the years 2000 to 2021 for the content analysis. The archived document pool was related to online learning in Jamaica, which was very limited and presented some difficulty in finding documents evenly spread over the prescribed period. The documents used consisted of seven issued between 2016 and 2021, six issued between 2010 and 2015, two issued between 2005 and 2009, and five issued between 2000 and 2004. The documents included articles, journals, and reports.

4.4.3 search Question 1/Hypothesis 1

4.4.3.1 Descriptive Statistic Analysis of the Quantitative Datasets. The descriptive statistics and cross-tabulation test were applied to the data which produced responses to research question 1 “What is the relationship between online learning and increased access to training and education among learners?” The variables used to solicit responses were attendance at online classes, increased access to learning for persons with disabilities, access to tertiary education, and continuing education, equal access to online learning in rural and urban areas (see Tables 4.8; Table 4.9).

Results from the Measures of Central Tendency and Variability for the 19-to 65-Year-Old Survey 19-to-65-Year-Old Survey. The results revealed that (*n* = 37), the mean range for the variables was between (*M* = 1.92 to *M* = 4.11) and the standard deviation ranged from (*SD* = 0.567 to *SD* = 1.145) with *a* variance between (S^2 = 0 .321 and S^2 = 1.188) (see Table 4.8).

Results from the Measures of Central Tendency and Variability for the 15-to-18-Year-Old and Opinionnaire Surveys. The results show the mean range for the variables was between (*M* = 2.07 to *M* = 3.98) and the standard deviation ranged from (*S*

= 0.746 to *S* = 1.195) with a variance of between (S^2 = 0.557 and S^2 = 1.429) (see Table 4.9).

The Cross-Tabulation Analysis. For the 15-to-18-year-old and opinionnaire surveys combined with (*n* = 168) overall, the responses show 44% (*n* = 74) *strongly agree (SA)* and *agree (A).* The percentage range for *strongly disagree (SD)* and *disagree (D)* was 35% (*n* = 59) and neither *agree* nor *disagree (N)* 21% (*n* = 35) (see Figure 4.4). In addition, in the 19-to-65-year-old survey (*n* = 37), 45% (*n* = 17) *strongly agreed* and *agreed*, 38% (*n* = 14) *strongly disagreed* and *disagreed*, and 17% (*n* = 6) neutral (see Figure 4.3).

Table 4.8

19-to-65-Year-Old Questionnaire Survey Responses Related to Increased Access for Schooling

	n	*Min.*	*Max.*	*M*	*SD*	S^2
Online learning provides opportunity for learners to access tertiary education.	37	2	5	4.11	0.567	0.321
Online learning provides access to learning for persons wishing to enroll in continuing education.	37	1	5	3.78	0.947	0.896
Your performance has improved in online classrooms.	37	1	6	3.46	1.145	1.311
Online learning can increase the availability of skills training across Jamaica.	37	1	5	3.14	0.976	0.953
Online learning provides access to learning for persons with disability.	37	1	5	2.92	1.010	1.021
Learner's attendance to online classes is greater than that for face to face.	37	1	4	1.92	1.010	1.021
Online learning is available equally in rural and urban public schools.	37	1	5	1.92	1.090	1.188
Valid N (listwise)	37					

Note: The descriptive analysis of the 19 to 65 survey datasets based on the variables related to research question 1 and hypothesis 1, shows that the standard deviation illustrates a moderately close dispersion associated with the mean values, representing a small variability or distribution spread of the values in the dataset. Therefore, the data can be used to make good predictions regarding the null hypothesis.

Figure 4.3

19-to-65-Year-Old Questionnaire Survey Responses to Increased Access for Education

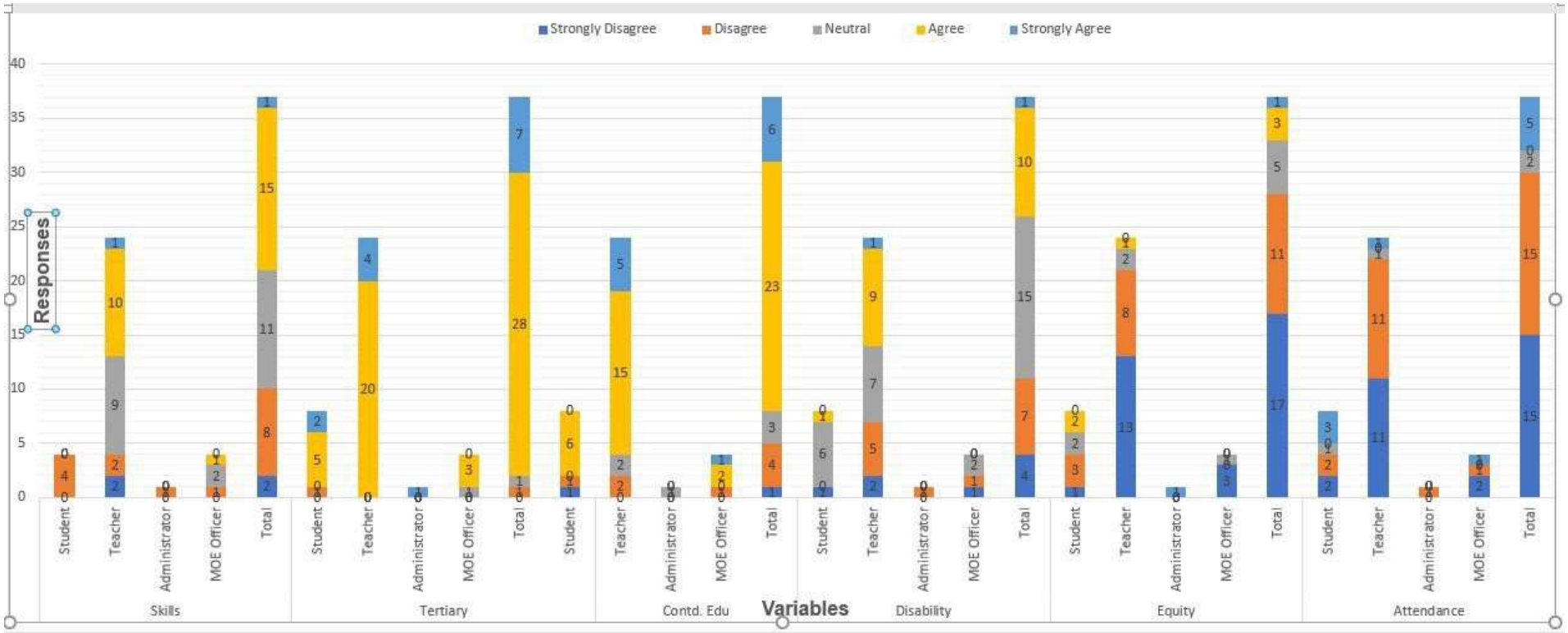
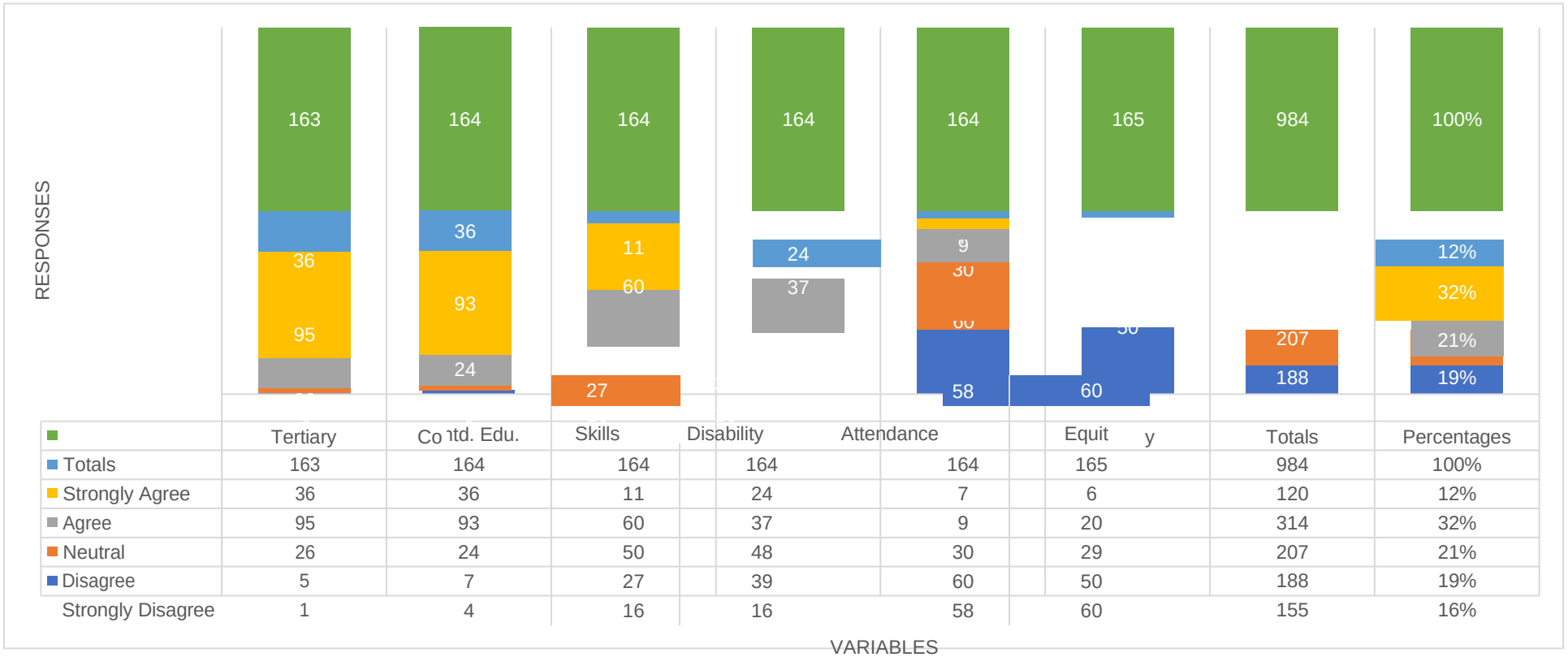


Figure 4. 4

Opinionnaire and 15 to 18 Questionnaire Survey Responses to Increased Access for Education



	Tertiary	Co ntd. Edu.	Skills	Disability	Attendance	Equit y	Totals	Percentages
Totals	163	164	164	164	164	165	984	100%
Strongly Agree	36	36	11	24	7	6	120	12%
Agree	95	93	60	37	9	20	314	32%
Neutral	26	24	50	48	30	29	207	21%
Disagree	5	7	27	39	60	50	188	19%
Strongly Disagree	1	4	16	16	58	60	155	16%

Note: Responses from Groups 1-5 based on the relevant variables to establish whether to reject or accept the null hypotheses in determining if schooling options can be attained through the provision of virtual classrooms in Jamaica.

Table 4. 9

Descriptive Statistics for the Opinionnaire and 15-to-18-Year-Old Questionnaire Survey Responses

Descriptive Statistics						
	n	***Min.***	***Max.***	***M***	***SD***	S^2
Online learning provides opportunity for learners to access tertiary education.	166	1	5	3.98	0.746	0.557
Online learning provides access to learning for persons wishing to enroll in continuing education.	167	1	5	3.90	0.873	0.762
Online learning can increase the availability of skills training across Jamaica.	167	1	5	3.13	1.088	1.183
Online learning provides access to learning for persons with disability.	167	1	5	3.07	1.195	1.429
Learner's attendance to online classes is greater than that for face to face.	167	1	5	2.07	1.065	1.134
Online learning is available equally in rural and urban public schools.	168	1	5	2.15	1.148	1.317
Valid N (listwise)	166					

Note: The descriptive analysis of the responses from the 15-to-18 survey questionnaire based on the variables related to research question 1 and hypothesis 1, shows that the standard deviation has demonstrated a significantly close relationship to the mean values representing a small variability in the distribution spread the values of in the dataset. Therefore, the data can be used to make good predictions to either accept or reject the null hypotheses.

4.4.3.2 Pearson's and Spearman's Correlational Analysis for the Combined 15-to-18-Year-Old and Opinionnaire Surveys. This was applied to the variables related to whether increased access is possible through online learning within the Jamaican public school system. Pearson's correlation showed that most of the variables were at the significance level ($p < .05$). This was shown by way of a p-value range between ($p < .01$ and $p = .011$) except for the skills and disability variable at ($p = .202$), the continuing education and tertiary education variables which indicate a significance level of ($p < .05$). There was also a moderate Pearson's correlation relationship between the continuing education and tertiary variables of ($r = .469$) and a weak Pearson's correlation for the others ($r = .100$) to ($r = .195$) respectively. In comparison to the Spearman's ranking correlation which used a *2-tailed* significance of ($p = .05$) also revealed p-values to be ($p < .05$) at ($p = .000$ and $p = .002$) for all variables except for the skills and disability variables which show ($p > .05$) at ($p = .246$). Furthermore, the Spearman's ranking returns a moderate (*rho* = .534) for the continuing education and tertiary education variables and a weak ranking between (*rho* =.091 to *rho* = .242) (See Table 4.10).

Table 4. 10

Combined 15-to-18-Year-Old and Opinionnaire Surveys Comparing Pearson's and Spearman's Correlational Coefficients

Online learning provides opportunity for learners to access tertiary education.	Pearson Correlation	.469**	Spearman's *rho*	Online learning provides opportunity for learners to access tertiary education.	Correlation Coefficient	.534**
	Sig. (2-tailed)	0.000			Sig. (2-tailed)	0.000
Online learning provides access to learning for persons wishing to enroll in continuing education.	Pearson Correlation	.469**		Online learning provides access to learning for persons wishing to enroll in continuing education.	Correlation Coefficient	.534**
	Sig. (2-tailed)	0.000			Sig. (2-tailed)	0.000
Online learning can increase the availability of skills training across Jamaica.	Pearson Correlation	0.100	Spearman's *rho*	Online learning provides access to learning for persons with disability.	Correlation Coefficient	0.091
	Sig. (2-tailed)	0.202			Sig. (2-tailed)	0.246
Online learning provides access to learning for persons with disability.	Pearson Correlation	0.100		Online learning can increase the availability of skills training across Jamaica.	Correlation Coefficient	0.091
	Sig. (2-tailed)	0.202			Sig. (2-tailed)	0.246
Learner's attendance to online classes is greater than that for face to face.	Pearson Correlation	.195*	Spearman's *rho*	Learner's attendance to online classes is greater than that for face to face.	Correlation Coefficient	.242**
	Sig. (2-tailed)	0.011			Sig. (2-tailed)	0.002
Online learning is available equally in rural and urban public schools.	Pearson Correlation	.195*		Online learning is available equally in rural and urban public schools.	Correlation Coefficient	.242**
	Sig. (2-tailed)	0.011			Sig. (2-tailed)	0.002

Note: The total number of respondents is (*n* = 168), however, one incomplete was omitted, hence (*n* = 167) was correlated at the

significance level (*p* = .05*)* (*2-tailed*) Pearson's (*r)* and correlated at significance level (*p* = .05*)* Spearman's (*rho).* Pearson's and Spearman's correlational coefficient comparisons from the responses of the opinionnaire and 15-to-18-year-old survey questionnaires related to whether online learning can increase access to training and educational programs within the Jamaican public school system.

4.4.3.3 Correlational Analysis for 19-to-65 Survey Questionnaires. Pearson's correlation showed the *p-value* for most of the variables to ($p > .05$), and the results show a range of ($p = .158$ to $p = .967$). However, the correlation between the equity and attendance variables indicates ($p < .05$), showing ($p = .002$). There was also a weak Pearson's correlation relationship between ($r = -.007$ to $r = .237$), except for the equity and attendance variables, which returned a moderate correlation of ($r = .498$). In comparison, the Spearman's ranking correlation which used a *2-tailed* significance of ($p = .05$) also revealed ($p > .05$), results illustrating values between ($p = .214$ to $p = .889$), except again for the equity and attendance variables with ($p = .004 < .05$). The Spearman's ranked correlation returned a weak ranking between (*rho* = -.024 and *rho* = .209), and for the equity and attendance variables, a moderate ranking of (*rho* = .498) (see Table 4.11). Consequently, the null hypothesis is accepted for all variables except the equity and attendance variables, for which the null hypothesis was rejected.

Table 4. 11

Pearson's and Spearman's Correlational Coefficients 19- to 65-year-olds Survey

Variables						
Online learning is available equally in rural and urban public schools.	Pearson Correlation	.498**	Spearman's *rho*	Online learning is available equally in rural and urban public schools.	Correlation Coefficient	.463**
	Sig. (2-tailed)	0.002			Sig. (2-tailed)	0.004
Learner's attendance to online classes is greater than that for face to face.	Pearson Correlation	.498**		Learner's attendance to online classes is greater than that for face to face.	Correlation Coefficient	.463**
	Sig. (2-tailed)	0.002			Sig. (2-tailed)	0.004
Online learning provides access to learning for persons wishing to enroll in continuing education.	Pearson Correlation	-0.007	Spearman's *rho*	Online learning provides access to learning for persons wishing to enroll in continuing education.	Correlation Coefficient	-0.024
	Sig. (2-tailed)	0.967			Sig. (2-tailed)	0.889
Online learning provides opportunity for learners to access tertiary education.	Pearson Correlation	-0.007		Online learning provides opportunity for learners to access tertiary education.	Correlation Coefficient	-0.024
	Sig. (2-tailed)	0.967			Sig. (2-tailed)	0.889
Online learning provides access to learning for persons with disability.	Pearson Correlation	0.237	Spearman's *rho*	Online learning provides access to learning for persons with disability.	Correlation Coefficient	0.209
	Sig. (2-tailed)	0.158			Sig. (2-tailed)	0.214
Online learning can increase the availability of skills training across Jamaica.	Pearson Correlation	0.237		Online learning can increase the availability of skills training across Jamaica.	Correlation Coefficient	0.209
	Sig. (2-tailed)	0.158			Sig. (2-tailed)	0.214

Note: The total number of respondents (n = 37) correlated at the significance level (*p = .05)* Pearson's (*r)* and Spearman's (*rho)*. Pearson's and Spearman's correlational coefficient comparisons from the responses from the 19-to-65-year-old survey questionnaire related to increasing access for learners in the public school system in Jamaica.

4.4.3.4 Qualitative Analysis using Constant Comparative Analysis. Pertinent codes were uncovered after analysis relative to research question 1 regarding the use of online learning for increased access to schooling. Some salient codes arising were “access, online, rural, urban, training, attitudes, internet, convenience, affordability, learning, and classroom.” These codes were analysed to establish some notable themes related to research question 1 such as “learners’ and school attitudes is based on Internet access” and “computer literacy and online learning offered in rural versus urban areas.” After additional analysis the themes established the theory that “access to online learning is dependent on Internet connectivity, location, attitudes, and the competence of learners and teachers” (see Table 4.12).

Table 4. 12

Constant Comparative Analysis Results

Codes	Sub-themes	Themes	Theory	Groups	Initial Analysis First Set Interviewees Evidence in Datasets	Final Analysis Second Set Interviewees	Groups
What is the relationship between online learning and increased access to training and education among learners?							
access	Learner/instructor	learners' and	Access to online learning is dependent on		**Secondary Level**		
online learning	connectivity	school attitudes	Internet connectivity, location, attitudes	1	Interviewee 20...increasing access to skills training at the university level	Interviewee 27…the urban areas the internet is more accessible…	1
rural	learner resources	based on access to Internet and	and competence of learners and teachers				
urban		computer literacy		1	Interviewee 13... enrollment since the start of online classes has decreased…		
training	availability of devices						
attitudes							
internet	rural /urban equity			1	Interviewee 3... has increased access to education in the urban areas		
learner							
attendance	CPD for instructors.	online learning		1	Interviewee 14...access has not really increased at the secondary level...		
convenience		offered in rural					
classrooms		versus urban areas		1	Interviewee 15...online classrooms...help students who maybe ill...financially challenged		
affordability	Learners/institutions' attitude			1	Interviewee 9...all schools are now offering online learning	.	
	online classroom access					**Primary Level**	
				1	Interviewee 4…online learning is dependent on location...	Interviewee 32: We don't have a reliable internet …the urban area... they have the internet	1
				3	Interviewee 18...enrollment to online classes is the same as...face to face		
				1	Interviewee 11...not provided greater access to primary school children...		

Codes	Sub-themes	Themes	Theory	Groups	Initial Analysis First Set Interviewees	Final Analysis Second Set Interviewees	Groups
What is the relationship between online learning and increased access to training and education among learners?					**Evidence in Datasets**		
				1	Interviewee 7…online learning is for the academically inclined learners, the highflyers, smart students.		
						Tertiary Level	
				2	Interviewee 17...online learning has increased the class sizes	Interviewee 40: the internet access in the rural areas... It's related to data. Because of poor signal, in some parts in islands in some... certain parishes.	1
						Interviewee 29: School of education...enrollment...in that modality…currently have the largest number of students...	1

Note: Comparative analysis of the datasets highlights theory development from the first and second sets of interviews, displaying initial codes, themes and theories uncovered in the datasets. The themes illustrate that increased access to online classrooms is dependent on internet connectivity, location, attitudes, and the competence of learners and instructors within the Jamaican public school system. It also reveals direct evidence from interviewees from the different groupings in the sample.

4.4.3.5 Content Analysis Results *Applied to the Secondary Research*. The findings from the content analysis present several codes linked to greater access to education through online learning that appear repeatedly in the datasets. These codes were "access, resources, education, learning, student, institutions, online, support, quality, training," and "development" to name a few. Likewise, using a tree map analysis has also produced similar codes indicating the strength of their implications to online learning and access to education (see Figure 4.5; Figures 4.6). Equally important is the results illustrated in Table 4.13 which also underscores the relevance of these codes in the data. The weighed percentages show "resources, access, student, learning, support," and "online" with the highest weighed percentages and number of counts ranging from a maximum of 122 to 46 times.

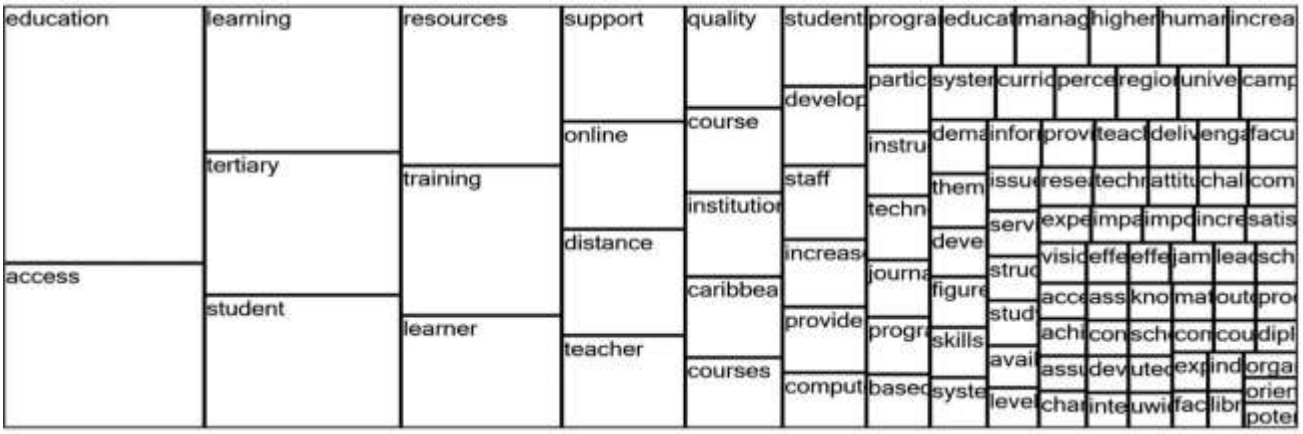
Figure 4. 5

Word Cloud Results From the Content Analysis

Note: Word cloud results from the content analysis identifying word frequency in the archive documents data related to the ability of online learning to increase access to schooling.

Figure 4. 6

Tree Map Findings From the Content Analysis



Note: Tree map results from the content analysis identify a word frequency in the archived documents datasets relative to online learning and increased access to education

Table 4.13

Word Averages From the Results of the Content Analysis

Word	Length	Count	Weighted Percentage (%)
Resources	9	122	3.97
Access	6	118	3.84
Student	7	108	3.52
Learning	8	48	1.56
Support	7	46	1.50
Online	6	37	1.20
Education	9	29	0.94
Participation	13	20	0.65
Perceived	9	17	0.55
Availability	12	16	0.52

Note: Most frequent Word averages relative to the content analysis in the data related to the ability of online learning to increase access in Jamaican public schools

4.4.4 Research Question 2/Hypothesis 2

4.4.4.1 Descriptive Statistical Analysis of the Quantitative Datasets. The responses to research question 2 “What are the differences in attitudes between learners’ and public education institution leaders’ toward online learning within Jamaica?” revealed by responses to items which ask about” willingness to learn online”, “Jamaican public-school’s ability to offer online learning adequately”, “recommending online learning”, and “improved performance in online learning” (see Figure 4.7; Figure 4.9) (Tables 4.14; Table 4.15).

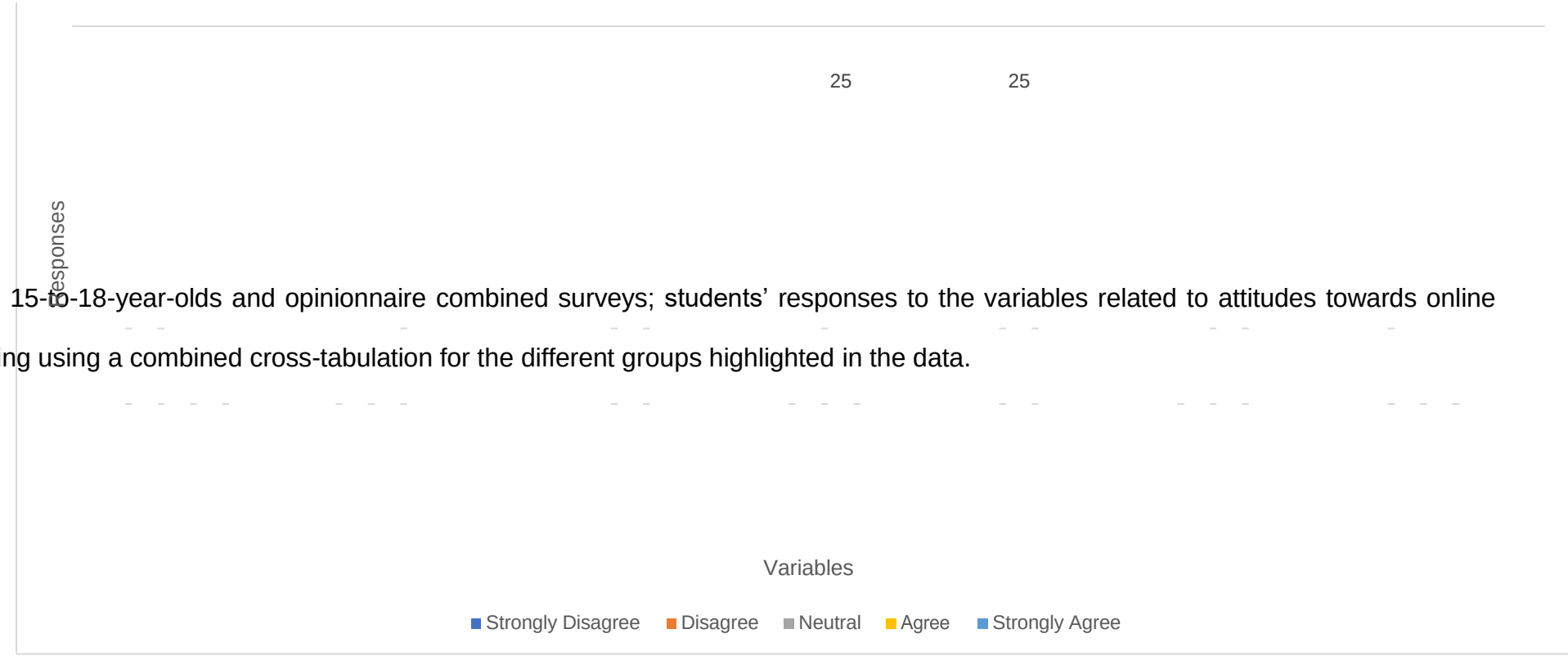
Results from the Measures of Central Tendency and Variability for the 19- to 65-Year-Old Survey. The datasets revealed (n = 37), with the mean range for the variables at (M = 1.92 to M = 4.19) and standard deviation ranging from (SD = 0.967 to SD = 1.222) with variance between (S^2 = 0.935 and S^2 = 1.311) (see Table 4.15).

***Results from the Measures of Central Tendency and Variability for the Combined 15- to 18-Year-Old and Opinionnaire Surveys*.** The results show that with (n = 168), the mean range for the variables were at (M = 2.15 to M = 3.97) and the standard deviation ranged from (SD = 1.000 to SD = 1.236) with a variance between (S^2 = 0.054 and S^2 = 1.528) (see Table 4.14).

The Cross-tabulation Results. The responses from Groups 1 to 5 contrasted students' attitudes with that of the education institution leaders' attitudes towards online learning within the datasets of the 19- to 65-year-old survey and the combined 15-to-18-year-old and opinionnaire surveys. The results for the combined 15-to-18-year-old and opinionnaire surveys (see Figures 4.7; Figures 4.8) and the 19-to-65-year-old survey (see Figure 4.9: Figure 4.10) showed that as it related to items indicative of preference, performance, adequacy, and equity for online learning, the overall totals based on students' and education institution leaders' attitudes responded in like manner to (1 *strongly disagree* to 5 *strongly agree)* about the same items relative to attitudes in the datasets.

Figure 4. 7

Students' Responses Related to Attitudes Toward Online Learning



Note: 15-to-18-year-olds and opinionnaire combined surveys; students' responses to the variables related to attitudes towards online learning using a combined cross-tabulation for the different groups highlighted in the data.

Table 4. 14

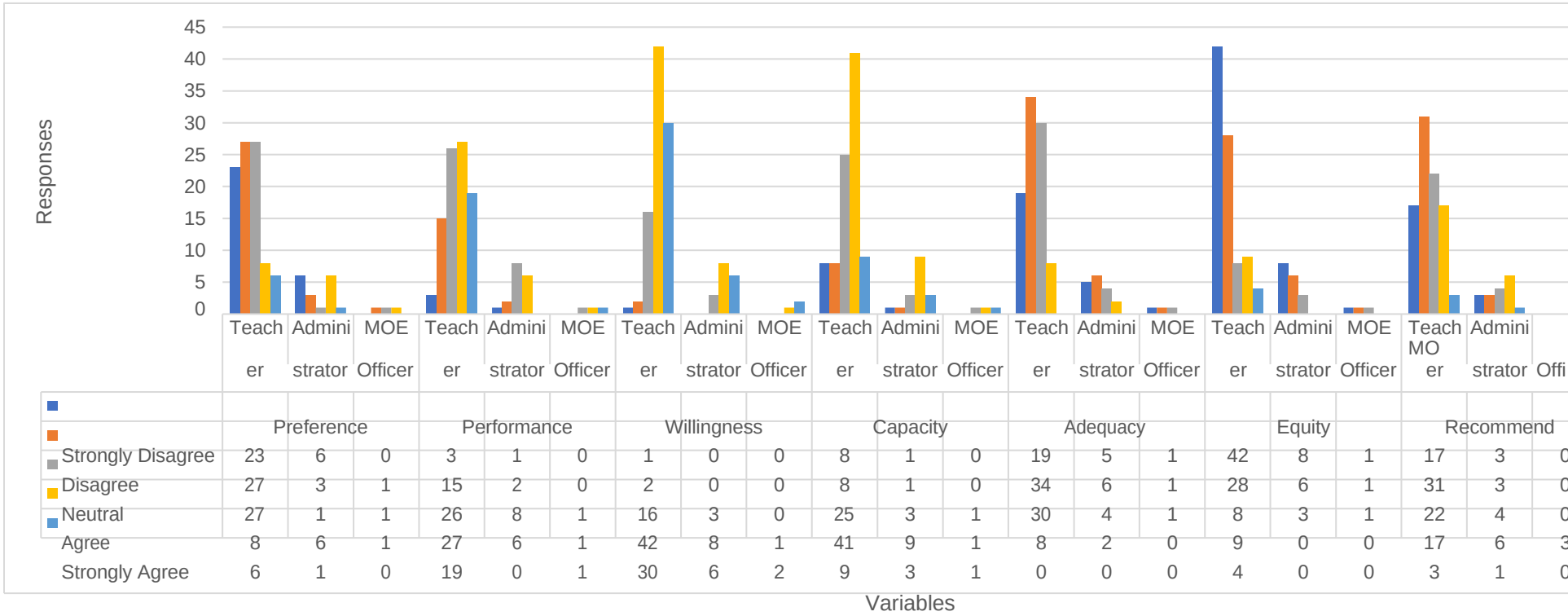
Students' and Education Institution Leaders' Attitudes Toward Online Learning

	n	***Min.***	***Max.***	***M***	**SD**	**S2**
You are willing to learn using online classrooms.	168	1	5	3.97	1.000	0.999
Public schools in Jamaica can offer online learning to learners.	168	1	5	3.49	1.027	1.054
Your performance has improved in online classrooms.	167	1	5	3.28	1.086	1.179
You prefer online learning over face-to-face learning.	167	1	5	2.52	1.236	1.528
Public schools in Jamaica adequately supply online learning.	168	1	5	2.49	0.979	0.958
Online learning is available equally in rural and urban public schools.	168	1	5	2.15	1.148	1.317
I recommend online learning for public schools in Jamaica	167	1	5	2.63	1.164	1.355
Valid N (listwise)	165					

Note: A comparison of the means, standard deviation, and variance illustrate a large variability between the students (Group 2 and 5) and the education institution leaders' (Group 1, 3, and 4) responses. The mean value ranges between (M = 3.97 to M = 2.15) and shows the spread through the standard deviation and variance using total cases of (n = 168), listwise (n = 165), (n = 167), (n = 168). The equity variable, however, is reporting a smaller spread than the other attitude variables used in the analysis.

Figure 4. 8

Eduction Institution Leaders' Responses Related to Attitudes Toward Online Learning

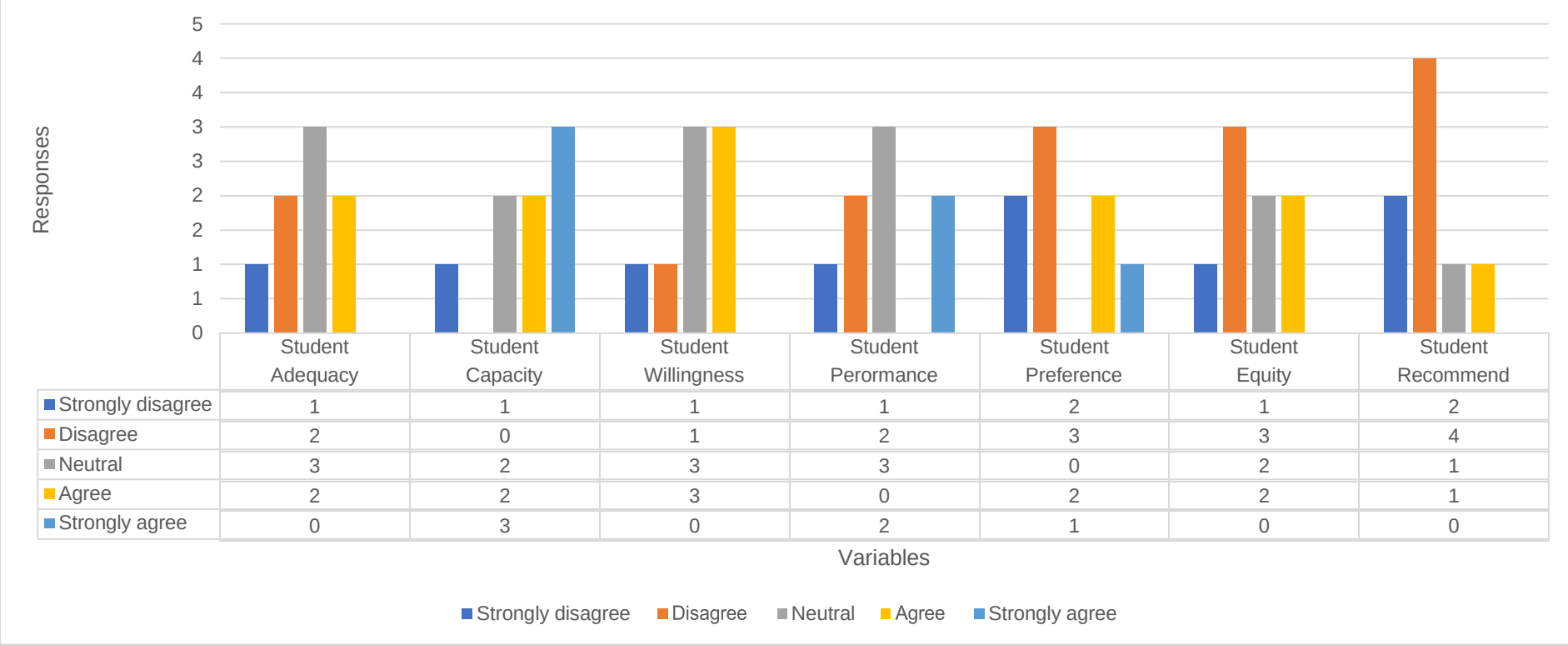


	Preference			Performance			Willingness			Capacity			Adequacy			Equity			Recommend		
	Teacher	Administrator	MOE Officer	Teacher	Administrator	MOE Officer	Teacher	Administrator	MOE Officer	Teacher	Administrator	MOE Officer	Teacher	Administrator	MOE Officer	Teacher	Administrator	MOE Officer	Teacher	Administrator	MOE Officer
Strongly Disagree	23	6	0	3	1	0	1	0	0	8	1	0	19	5	1	42	8	1	17	3	0
Disagree	27	3	1	15	2	0	2	0	0	8	1	0	34	6	1	28	6	1	31	3	0
Neutral	27	1	1	26	8	1	16	3	0	25	3	1	30	4	1	8	3	1	22	4	0
Agree	8	6	1	27	6	1	42	8	1	41	9	1	8	2	0	9	0	0	17	6	3
Strongly Agree	6	1	0	19	0	1	30	6	2	9	3	1	0	0	0	4	0	0	3	1	0

Note: 15-to-18-year-olds and opinionnaire combined surveys; education institution leaders' responses to the variables related to attitudes towards online learning using a combined cross-tabulation for the different groups highlighted in the data.

Figure 4. 9

Students' Attitudes Toward Online Learning in the 19-to-65-Year-Olds Survey

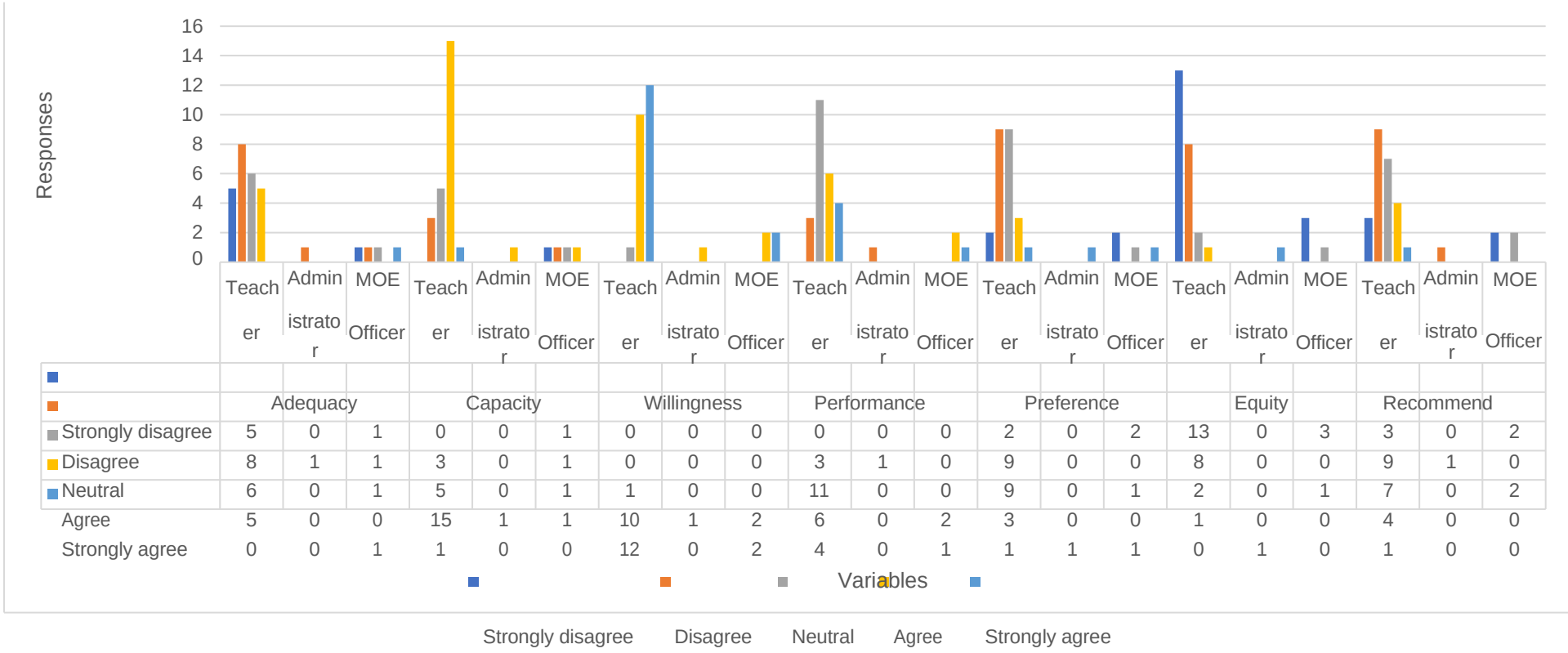


	Student Adequacy	Student Capacity	Student Willingness	Student Perormance	Student Preference	Student Equity	Student Recommend
Strongly disagree	1	1	1	1	2	1	2
Disagree	2	0	1	2	3	3	4
Neutral	3	2	3	3	0	2	1
Agree	2	2	3	0	2	2	1
Strongly agree	0	3	0	2	1	0	0

Note: 19-to-65-year-olds survey; students' responses to the variables related to attitudes toward online learning using a combined cross-tabulation for the different groups highlighted in the data.

Figure 4. 10

Education Institution Leaders' Attitudes Toward Online Learning in the 19-to-65-Year-Olds Survey



Note: 19-to-65-year-olds survey; education institution leaders' responses to the variables related to attitudes toward online learning using a combined cross-tabulation for the different groups highlighted in the data.

Table 4. 15

Descriptive Results: 19-to-65-Year-Olds Survey Responses Related to Attitudes

Variables	N	Min	Max	M	SD	S^2
You are willing to learn using online classrooms.	37	1	6	4.19	0.967	0.935
Public schools in Jamaica can offer online learning to learners	37	1	5	3.51	1.017	1.035
Your performance has improved in online classrooms.	37	1	6	3.46	1.145	1.311
You prefer online learning over face-to-face learning.	37	1	5	2.70	1.222	1.492
Public schools in Jamaica adequately supply online learning.	37	1	5	2.54	1.095	1.200
I recommend online learning for public schools in Jamaica.	37	1	5	2.43	1.042	1.086
Online learning is available equally in rural and urban public schools.	37	1	5	1.92	1.090	1.188
Valid N (listwise)	37					

Note: The descriptive analysis from the 19-to-65-year-old survey datasets shows that the standard deviation has a fairly large dispersion of the values from the means, representing a large variability or distribution spread of the values in the dataset. Therefore, the data can be used to make good predictions to either accept or reject the null hypothesis.

4.4.4.2 Correlational Analysis for the Combined 15-to-18-Year-Olds and Opinionnaire Surveys. Pearson's and Spearman's correlational analysis of the variables related to students' and education institution leaders' attitudes toward online learning in the Jamaican public school system returned results for Pearson's correlation with the *p-values* for two of the variables showing *(p* < .05); and falling between (*p* = .000 to *p* = .027) and two (*p* > .05), falling between (*p* = .062 and *p* = .429). There was also a weak Pearson's correlation relationship between (*r* = .302 and *r* = .061). In comparison to Spearman's ranking correlation, which used a *2-tailed* significance of (*p* = .05) and revealed (p < .05) results indicating (*p* = .000 to *p* = .048) and one (*p* > .05) at (*p* = .411). A weak Spearman's ranking was shown in the result between (*rho* = -.276 and *rho* = .064) (see Table 4.16). Consequently, indicating evidence to either accept or reject the null.

Table 4. 16

The Combined 15-to-8-Year-Olds and Opinionnaire Survey Illustrating Pearson's and Spearman's Correlational Coefficients

You are willing to learn using online classrooms.	Pearson Correlation	0.061	Spearman's *rho*	You are willing to learn using online classrooms.	Correlation Coefficient	0.064
	Sig. (2-tailed)	0.429			Sig. (2-tailed)	0.411
Online learning is available equally in rural and urban public schools.	Pearson Correlation	0.061		Online learning is available equally in rural and urban public schools.	Correlation Coefficient	0.064
	Sig. (2-tailed)	0.429			Sig. (2-tailed)	0.411
Your performance has improved in online classrooms.	Pearson Correlation	.302**	Spearman's *rho*	Your performance has improved in online classrooms.	Correlation Coefficient	.276**
	Sig. (2-tailed)	0.000			Sig. (2-tailed)	0.000
Public schools in Jamaica can offer online learning to learners.	Pearson Correlation	.302**		Public schools in Jamaica can offer online learning to learners.	Correlation Coefficient	.276**
	Sig. (2-tailed)	0.000			Sig. (2-tailed)	0.000
You prefer online learning over face-to-face learning.	Pearson Correlation	.171*	Spearman's *rho*	You prefer online learning over face-to-face learning.	Correlation Coefficient	.188*
	Sig. (2-tailed)	0.027			Sig. (2-tailed)	0.015
Online learning is available equally in rural and urban public schools.	Pearson Correlation	.171*		Online learning is available equally in rural and urban public schools.	Correlation Coefficient	.188*
	Sig. (2-tailed)	0.027			Sig. (2-tailed)	0.015
Public schools in Jamaica adequately supply online learning.	Pearson Correlation	0.145	Spearman's *rho*	Public schools in Jamaica adequately supply online learning.	Correlation Coefficient	.153*
	Sig. (2-tailed)	0.062			Sig. (2-tailed)	0.048
I recommend online learning for public schools in Jamaica	Pearson Correlation	0.145		I recommend online learning for public schools in Jamaica	Correlation Coefficient	.153*
	Sig. (2-tailed)	0.062			Sig. (2-tailed)	0.048

Note: The total number of respondents (*n* = 168) correlated at the significance level (*p = .05)* Pearson's (*r)* and correlated at significance level (*p = .05)* Spearman's (*rho)*. Pearson's and Spearman's correlational coefficient comparisons from the responses related to the attitudes of learners and education institution leaders toward online learning in the Jamaican public school system.

4.4.4.3 Correlational Analysis for the 19-to-65-Year-Olds Survey Questionnaire. Pearson's and Spearman's correlational analysis of the variables related to attitudes of learners and education institution leaders toward online learning in the Jamaican public school system illustrates results for Pearson's correlation of most variables with ($p > .05$) and has indicated by the results a range between ($p = .020$ to $p = .814$), except for the equity and preference variables with ($p = .006$). There was also a weak Pearson's correlational relationship between three pairs of the items with a range of ($r = -.113$ to $r = -.040$), and two sets of paired items returning moderate, where ($r = .380$ and $r = .440$) respectively (see Table 4.14; Appendix K). Comparably, Spearman's ranking correlation, which used a significance level of ($p = .05$) also revealed *p-values* to be 50% ($p > .05$) and 50% ($p < .05$) and a weak ranking between the items of (*rho* = -.116 to *rho* = .382) (see Table 4.14; Appendix K).

Table 4. 17

*Pearson's and Spearman's Correlational Coefficients 19-to-65-Year-Olds Survey V*ariables

You are willing to learn using online classrooms.	Pearson Correlation	-.380*	Spearman's *rho*	You are willing to learn using online classrooms.	Correlation Coefficient	-.346*
	Sig. (2-tailed)	0.020			Sig. (2-tailed)	0.036
Online learning is available equally in rural and urban public schools.	Pearson Correlation	-.380*		Online learning is available equally in rural and urban public schools.	Correlation Coefficient	-.346*
	Sig. (2-tailed)	0.020			Sig. (2-tailed)	0.036
Your performance has improved in online classrooms.	Pearson Correlation	-0.113	Spearman's *rho*	Your performance has improved in online classrooms.	Correlation Coefficient	-0.116
	Sig. (2-tailed)	0.506			Sig. (2-tailed)	0.494
Public schools in Jamaica can offer online learning to learners	Pearson Correlation	-0.113		Public schools in Jamaica can offer online learning to learners	Correlation Coefficient	-0.116
	Sig. (2-tailed)	0.506			Sig. (2-tailed)	0.494
You prefer online learning over face-to-face learning.	Pearson Correlation	.440**	Spearman's *rho*	You prefer online learning over face-to-face learning.	Correlation Coefficient	.382*
	Sig. (2-tailed)	0.006			Sig. (2-tailed)	0.020
Online learning is available equally in rural and urban public schools.	Pearson Correlation	.440**		Online learning is available equally in rural and urban public schools.	Correlation Coefficient	.382*
	Sig. (2-tailed)	0.006			Sig. (2-tailed)	0.020
Public schools in Jamaica adequately supply online learning.	Pearson Correlation	-0.040	Spearman's *rho*	Public schools in Jamaica adequately supply online learning.	Correlation Coefficient	-0.046
	Sig. (2-tailed)	0.814			Sig. (2-tailed)	0.785
I recommend online learning for public schools in Jamaica.	Pearson Correlation	-0.040		I recommend online learning for public schools in Jamaica.	Correlation Coefficient	-0.046
	Sig. (2-tailed)	0.814			Sig. (2-tailed)	0.785

Note: The total number of respondents (*n* = 65) correlated at the significance level (*p* = .01) Pearson's (*r)* and correlated at significance level (*p* = .05) Spearman's (*rho).* Pearson's and Spearman's correlational coefficient comparisons from the responses of the 19-to-65-year-olds survey questionnaire related to attitudes of learners and education institution leaders toward online learning in the Jamaican public school system.

4.4.4.4 Qualitative Analysis using the Constant Comparative Analysis. The extraction of codes related to learners' and education institution leaders' attitudes toward online learning within the dataset of the initial and second administration of the unstructured interviews identified codes such as "electricity, access, attendance, availability, beliefs, willingness, weather, face-to-face, online, learning, affordability, primary, secondary, tertiary", and "Internet" were significant in the responses (see Table 4.18). Careful evaluation of the codes produced themes such as "attendance and affordability reflect preference for either face-to-face versus online learning", "class attendance is related to attitudes", and "culture within schools' impact attitudes" (see Table 4.18). Further examination of the resulting themes formulated the assumption that "attitudes toward online learning are influenced by cultural norms, affordability, and attendance to online learning for the public education system in Jamaica" (see Table 4.18).

Table 4. 18

Constant Comparative Analysis Results

Codes	**Sub-themes**	**Themes**	**Theory**	**Groups**	**Initial Analysis** **First Set Interviewees**	**Final Analysis** **Second Set Interviewees**	**Groups**
What is the difference in attitudes between learners and public education institution leaders towards online learning within Jamaican public schools?					**Evidence in Datasets**		
Electricity Weather Internet Affordability Face-To-Face Online Learning Access Willingness Attendance Primary Secondary Tertiary Beliefs Availability	preference for face-to-face versus online class attendance is related to attitudes culture within schools' impact attitudes	Attendance and affordability reflect preference for either face-to-face versus online learning cultural norms in schools affect online class attendance	attitudes towards online learning are influenced by cultural norms, affordability, and attendance to online learning.		**Secondary Level**		
				1	Interviewee 13...both online and face to face learning can be engaging...	Interviewee 38...less than 50%...student...consistently attend online classes...they are not responsive in the online classes.	3
				1	Interviewee 10…I'd say yes, you have a number of our kids who are very much willing to learn via this. Modality… It already is the future…	Interviewee 38… Yes, they are willing to learn … I don't think that they are comfortable with online learning … I would prefer a mixed modality.	3
						Interviewee 41…I can say yes, I can't say no…you have some more willing to learn but not all…	1
					Primary Level		
				1	Interviewee 19…Well, based on my school, I would think so…I see we really want to use this medium to learn.	Interviewee 33… Based on the data we've collected on the number of students…shows that most of our students are online and are connecting.	1

				3	Interviewee 1… some of the students are willing, … they love learning those students will work online with you.	Interviewee 34…I think most are willing. But sometimes those who are not able to join…	1
					Tertiary Level		
				5	Interviewer Are learners willing to learn using the online classroom? . Interviewee 16…No, we are not. Interviewee 39…Not so much…for the time being I work with it.		2
				2	Interviewee 12…Well, I wouldn't to say yes, and I wouldn't say no…so it has its advantages and disadvantages.	Interviewee 40…in terms of attitude… small percentage…more mature audience…those who are not technologically savvy.	1

Note: Constant comparative analysis and theory development from the first and second set of interviews displaying initial codes, themes, and theories uncovered in the datasets. The themes illustrate a difference in attitudes towards online learning among learners and education institution leaders. It also reveals direct evidence from interviewees from the different groupings in the sample.

4.4.4.5 Content Analysis Results Applied to the Secondary Research. The results from the review of archived documents highlighted some of the most frequently occurring codes. This included attitudes such as “feelings, perceived, learning, education, online, towards, attention, students, change, technology, positive, negative”, and “usefulness” (see Figures 4.11; Figure 4.12). Additionally, word averages from the content analysis also gave prominence to codes such as “positive, attitude, negative, feelings, education”, and “perceived”, showing the highest weighted percentage rates (see Table 4.17).

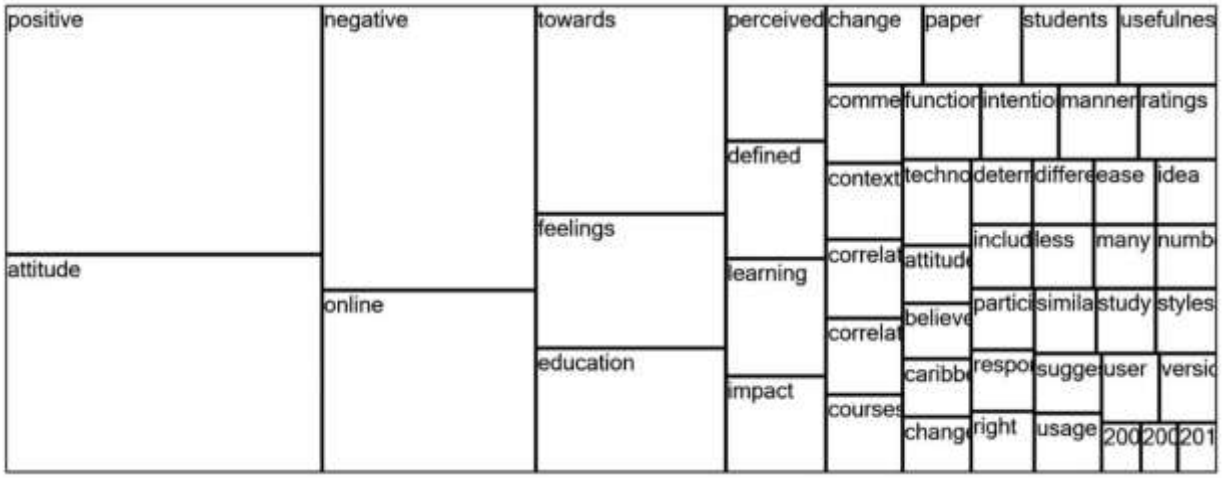
Figure 4. 11

Word Cloud Results From the Content Analysis

Note: Recurring themes identifying word frequency in the data relate to the attitudes of education institution leaders and learners towards online learning in Jamaican public schools.

Figure 4. 12

Tree Map Results From the Content Analysis



Note: The word frequency in the data is related to the attitudes of education institution leaders and learners toward online learning in Jamaican public schools.

Table 4. 19

Word Averages From the Results of the Content Analysis

Word	Length	Count	Weighted Percentage (%)
Positive	8	40	7.84
Attitude	8	35	6.86
Negative	8	31	6.08
Online	6	20	3.92
Feelings	7	20	3.92
Education	8	13	2.55
Perceived	9	12	2.35
Learning	7	6	1.18
Impact	8	6	1.18
Change	6	5	0.98
Students	5	4	0.78
Usefulness	8	4	0.78

Note: The word frequency in the datasets from the archived documents identifies the percentage of recurring themes related to the attitudes of education institution leaders and learners towards online learning in Jamaican public schools.

4.4.5 search Question 3/Hypothesis 3

4.4.5.1 Descriptive Statistics Analysis of the Quantitative Datasets. The responses to the research question “Is there a relationship between online learning classrooms and quality training and education?” unveiled responses to variables associated with “improve performance relative to learning online”, “more engaged lessons than face-to-face”, “availability of devices, resources, and the Internet for online learning” (see Table 4.20; Table 4.21).

Results from the Measures of Central Tendency and Variability for the 19-to-65-Year-Olds Survey. This has revealed that for (*n*= 37), the mean range for the variables was (*M* = 1.95 to *M* = 3.46) and the standard deviation ranged from (*SD* = 0.848 to *SD* = 1.289) with variance between (S^2= .719 and S^2= 1.536) (see Table 4.18).

Results from the Measures of Central Tendency and Variability for the Combined 15-to-18-Year-Olds and Opinionnaire Surveys. The results show that with (*n* = 168), the mean range for the variables was (*M* = 2.17 to *M* =3.28) and the standard deviation ranged from (*SD* = 1.001 to *SD* = 1.250) with variance between (S^2= 1.002 and S^2 =1.562) (see Table 4.17).

The Cross-Tabulation Analysis. This was applied to the responses from Groups 1 to 5 to determine whether there is any relationship between online learning providing quality training and education for learners within the datasets of the 19-to-65-year-olds survey, and the combined 15-to-18-year-olds and opinionnaire surveys respectively (see Figure 4.13; Figure 4.14). The 15-to-18-year-olds and opinionnaire survey results show 53% (*n* = 89) *strongly disagreed* and *disagreed*, compared to 24% (*n* = 40) of the responses *strongly agreed* and *agreed* (see Figure 4.13). Twenty-three percent (*n* = 89)

remained neutral. The 19-to-65-year-olds survey also had similar results (see Figure 4.14). All analysis exercises show clear and significant relationships on which a decision can be made to accept or reject the null hypothesis.

Table 4. 20

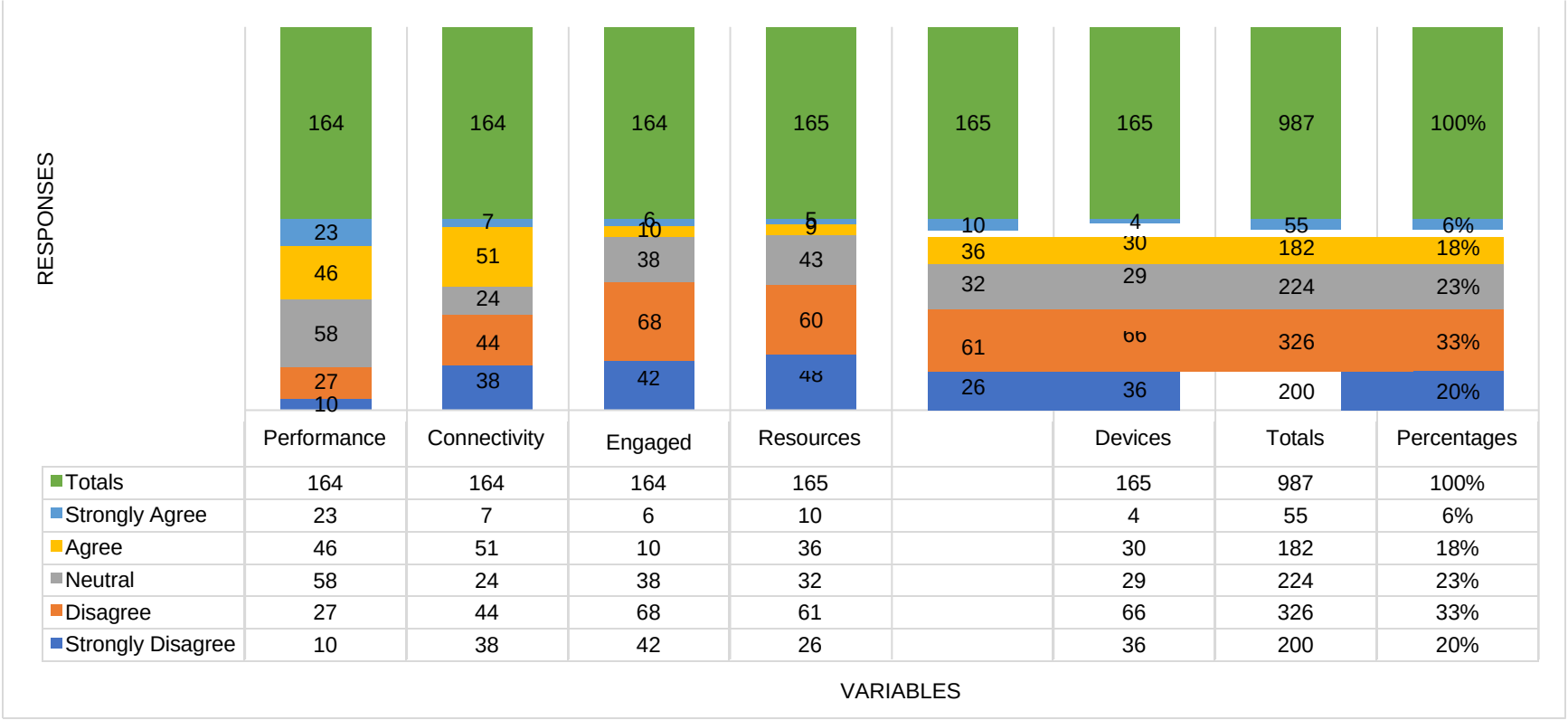
The Combined 15-to-18-Year-Olds and Opinionnaire Surveys Descriptive Results Related to Research Question 3

	n	***Min.***	***Max.***	***M***	***SD***	S^2
Your performance has improved in online classrooms.	167	1	5	3.28	1.086	1.179
Internet connectivity is readily available to schools in your area.	167	1	5	2.66	1.250	1.562
Learners are more engaged in online lessons than in face to face.	167	1	5	2.21	1.017	1.034
Learners have access to a reliable Internet connection.	168	1	5	2.17	1.001	1.002
Online resources are readily available to learners.	168	1	5	2.65	1.158	1.341
Devices to access online learning are readily available.	168	1	5	2.40	1.090	1.188
Valid N (listwise)	165					

Note: The descriptive analysis of the 15-to-18-year-olds and opinionnaire survey datasets are shows that the standard deviation has a moderately small dispersion of the values from the means, representing a moderately small variability or distribution spread of the values in the dataset. Therefore, the data can be used to make good predictions to either accept or reject the null hypotheses.

Figure 4.13

Cross-Tabulation Analysis Results of the Combined 15-to-18-Year-Olds and Opinionnaire Questionnaire Surveys



	Performance	Connectivity	Engaged	Resources		Devices	Totals	Percentages
Totals	164	164	164	165		165	987	100%
Strongly Agree	23	7	6	10		4	55	6%
Agree	46	51	10	36		30	182	18%
Neutral	58	24	38	32		29	224	23%
Disagree	27	44	68	61		66	326	33%
Strongly Disagree	10	38	42	26		36	200	20%

Note: The combined 15-to-18-year-olds and opinionnaire questionnaire surveys measure Groups 1 to 5 responses to the variables related to the relationship between online learning and quality training and education for learners.

Table 4. 21

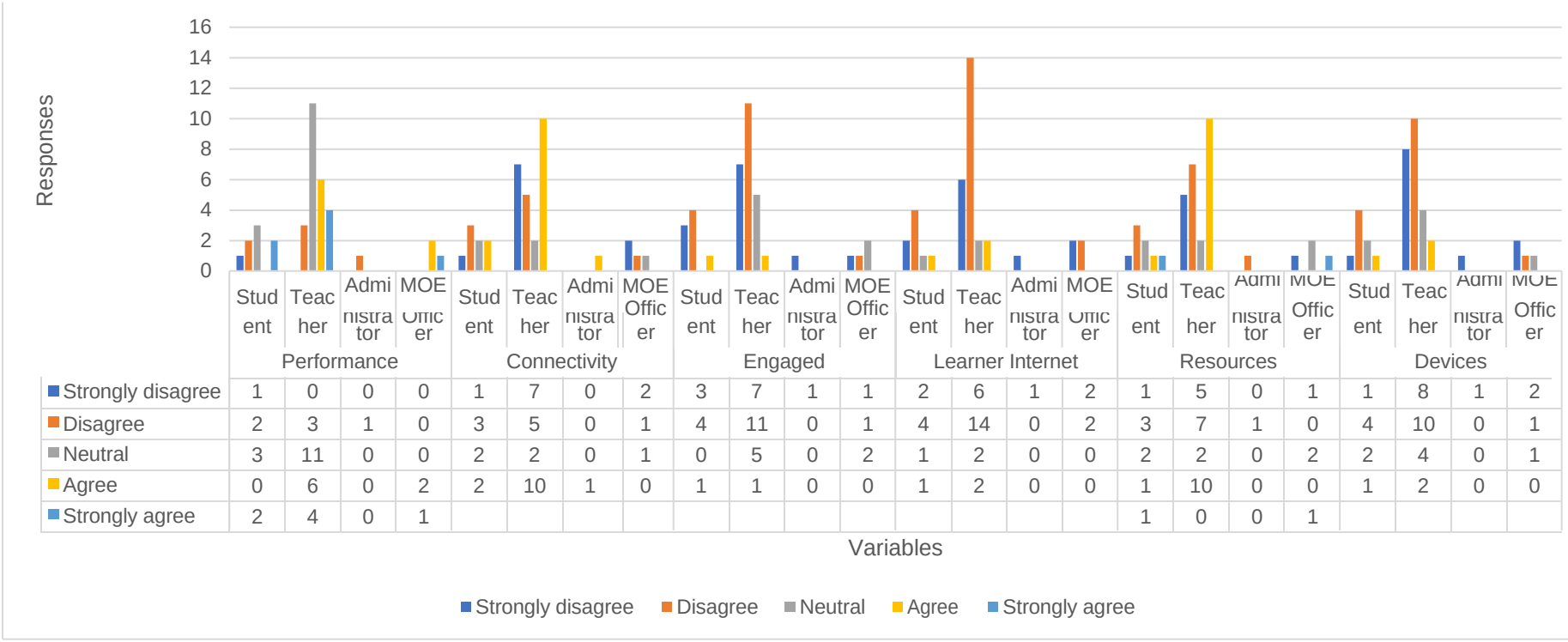
The 19- to 65-Years-Old Survey Descriptive Results Related to Researcgh Question 3

Variables	*n*	*Min.*	*Max.*	*M*	SD	S^2
Your performance has improved in online classrooms.	37	1	6	*3.46*	1.145	1.311
Online resources are readily available to learners.	37	1	5	*2.73*	1.239	1.536
Internet connectivity is readily available to schools in your area.	37	1	4	*2.57*	1.237	1.530
Devices to access online learning are readily available.	37	1	4	*2.03*	0.928	0.860
Learners are more engaged in online lessons than in face to face.	37	1	4	*1.97*	0.866	0.749
Learners have access to a reliable Internet connection.	37	1	4	*1.95*	0.848	0.719
Valid N (listwise)	37					

Note: The descriptive analysis results from 19-to 65-year-olds survey datasets show that the standard deviation has a moderately small dispersion of the values from the means, representing a moderately small variability or distribution spread of the values in the dataset. Therefore, the data can be used to make good predictions to either accept or reject the null hypotheses

Figure 4. 14

19-to-65-Year-Olds Survey Results Relative to Responses for Research Question 3



	Performance				Connectivity				Engaged				Learner Internet				Resources				Devices			
	Student	Teacher	Administrator	MOE Officer	Student	Teacher	Administrator	MOE Officer	Student	Teacher	Administrator	MOE Officer	Student	Teacher	Administrator	MOE Officer	Student	Teacher	Administrator	MOE Officer	Student	Teacher	Administrator	MOE Officer
Strongly disagree	1	0	0	0	1	7	0	2	3	7	1	1	2	6	1	2	1	5	0	1	1	8	1	2
Disagree	2	3	1	0	3	5	0	1	4	11	0	1	4	14	0	2	3	7	1	0	4	10	0	1
Neutral	3	11	0	0	2	2	0	1	0	5	0	2	1	2	0	0	2	2	0	2	2	4	0	1
Agree	0	6	0	2	2	10	1	0	1	1	0	0	1	2	0	0	1	10	0	0	1	2	0	0
Strongly agree	2	4	0	1													1	0	0	1				

Note: The 19- to-65-year-olds survey measured Groups 1 to 5 responses relative to the variables related to online learning and quality training and education for learners.

4.4.5.2 Correlational Analysis of the Combined 15-to-18-Year-Old and Opinionnaire Survey Questionnaires. Pearson's and Spearman's correlational analyses were applied to the variables related to whether online learning could provide quality training and education for learners. For Pearson's correlation relationship, it showed the *p*-values for all the variables were ($p < .05$). There was also a moderate Pearson's correlation of ($r = .503$ to $r = .369$) and a weak yet significant relationship between performance and connectivity variables at ($r = .210$) (see Table 4.22; Appendix K). On the other hand, Spearman's ranking correlation also revealed ($p < .05$), and a moderate correlation between the between (*rho* = .519 and *rho* = .363) and a weak but significant correlation ranking between the performance and connectivity variables (see Table 4.22; Appendix K).

Table 4. 22

Pearson's and Spearman's Correlational Coefficients Comparing Responses

Your performance has improved in online classrooms.	Pearson Correlation	.210**	Spearman's *rho*	Your performance has improved in online classrooms.	Correlation Coefficient	.202**
	Sig. (2-tailed)	0.007			Sig. (2-tailed)	0.009
Internet connectivity is readily available to schools in your area.	Pearson Correlation	.210**		Internet connectivity is readily available to schools in your area.	Correlation Coefficient	.202**
	Sig. (2-tailed)	0.007			Sig. (2-tailed)	0.009
Learners are more engaged in online lessons than in face to face.	Pearson Correlation	.369**	Spearman's *rho*	Learners are more engaged in online lessons than in face to face.	Correlation Coefficient	.363**
	Sig. (2-tailed)	0.000			Sig. (2-tailed)	0.000
Learners have access to a reliable Internet connection.	Pearson Correlation	.369**		Learners have access to a reliable Internet connection.	Correlation Coefficient	.363**
	Sig. (2-tailed)	0.000			Sig. (2-tailed)	0.000
Online resources are readily available to learners.	Pearson Correlation	.505**	Spearman's *rho*	Online resources are readily available to learners.	Correlation Coefficient	.519**
	Sig. (2-tailed)	0.000			Sig. (2-tailed)	0.000
Devices to access online learning are readily available.	Pearson Correlation	.505**		Devices to access online learning are readily available.	Correlation Coefficient	.519**
	Sig. (2-tailed)	0.000			Sig. (2-tailed)	0.000

Note: The total number of respondents (n = 168) correlated at the significance level (p = .05) Pearson's r and Spearman's *rho*. Pearson's and Spearman's correlational coefficient comparisons for the responses from the combined 15-to-18-year-olds and opinionnaire survey questionnaires related to whether online learning classrooms can provide quality training and education for learners within the Jamaican public school system.

4.4.5.3 Correlational Analysis of the 19-to-65-Years-Old Survey Questionnaire.

Pearson's and Spearman's correlational analyses of the questionnaires related to whether online learning classrooms can provide quality training and education for learners within the Jamaican public school system. For Pearson's correlation it showed for all the variables ($p \geq .05$) (see Table 4.23). There was also a weak Pearson's correlation relationship of between ($r = .007$ and $r = .149$) except for the devices and resources variables indicated a moderate relationship ($r = .417$). The Spearman's ranking correlation also revealed ($p > .05$) and a weak correlation ranking between (*rho* = -.025 to *rho* = .161), except for the devices and resources variables with ($p = .008$) less than the significance level and a moderately high (*rho* = .431) (see Table 4.23).

Table 4. 23

Pearson's and Spearman's Correlational Coefficients for the 19-to-65-Year-Olds Survey

Variables						
Internet connectivity is readily available to schools in your area.	Pearson Correlation	0.007	Spearman's *rho*	Internet connectivity is readily available to schools in your area.	Correlation Coefficient	-0.025
	Sig. (2-tailed)	0.968			Sig. (2-tailed)	0.883
Your performance has improved in online classrooms.	Pearson Correlation	0.007		Your performance has improved in online classrooms.	Correlation Coefficient	-0.025
	Sig. (2-tailed)	0.968			Sig. (2-tailed)	0.883
Learners have Internet connection.	Pearson	0.149	Spearman's	Learners have reliable Internet connection.	Correlation Coefficient	0.235
	Sig. (2-tailed)	0.378			Sig. (2-tailed)	0.161
Learners are more engaged in online lessons than in face to face.	Pearson Correlation	0.149		Learners are more engaged in online lessons than in face to face.	Correlation Coefficient	0.235
	Sig. (2-tailed)	0.378			Sig. (2-tailed)	0.161
Devices to access online learning are readily available.	Pearson Correlation	.417*	Spearman's *rho*	Devices to access online learning are readily available.	Correlation Coefficient	.431**
	Sig. (2-tailed)	0.010			Sig. (2-tailed)	0.008
Online resources are readily available to learners.	Pearson Correlation	.417*		Online resources are readily available to learners.	Correlation Coefficient	.431**
	Sig. (2-tailed)	0.010			Sig. (2-tailed)	0.008

Note: The total number of respondents (*n = 37)* correlated at the significance level (*p* = .05*)* Pearson's (*r)* and the Spearman's (*rho)*. Pearson and Spearman's correlational coefficient comparisons from the responses of the 19-to-65-year-olds survey

questionnaire related to whether online learning classrooms can provide quality training and education for learners within the the Jamaican public school system.

4.4.5.4 Qualitative Analysis Applying Constant Comparative Analysis. This analysis uses the qualitative datasets to identify codes associated with online classrooms and the provision of quality training and education. Relevant codes such as “preference, willingness, performance, Internet, resources, devices, competence”, and “training” were compelling from the responses (see Table 4.24). These were then further analysed, and several notable themes were developed like “well adapted or frustrated teachers/students depend on support” and “level of school, improved or poor performance”, and “available or unavailable resources” (see Table 4.24). Upon data saturation, relevant theories were drawn and indicate that “engaged learners in online classrooms depend on available support systems at different school levels, and availability of online learning resources, infrastructure, and computer literacy impacts student engagement” in public schools in Jamaica (see Table 4.24).

Table 4. 24

Constant Comparative Analysis Results

Codes	Sub-themes	Themes	Theory	Group	Initial Analysis First Set Interviewees	Final Analysis Second Set Interviewees	Group
Research question 3: What is the relationship between online learning delivery and engaged learners?					**Evidence in the Datasets**		
Preference willingness performance Internet Resources Devices Competence training	Improved/poor performance Adapted/absent in online classrooms Available/unavailable resources based on rural or urban Affordability/availability internet service Teacher/student competence	well adapted or frustrated teachers/student depend on support systems and school level	Engaged learners in online classrooms depend on available support systems at different school level. Availability of online learning resources, infrastructure, computer literacy impacts student engagement.	1	**Primary schools:**		1
					Interviewee 19...Google Meet feature...draw students' attention in the online lesson…engage learners... smartboard, games...interference from…	Interviewee 35...some of them…other factors… Device…Wi Fi, … '50% in my class…so that was a problem'.	
				1	Interviewee 7: online learning improves students' engagement during lessons especially for the low achievers	'Interviewee 24: …more engaged in the face to face than online…you have 10 children in your class and five will be there'… internet problem.	5
				Secondary Level			
				5	Interviewee15...videos... culturally produced ...enhanced lesson…very engaging in the online classrooms	Interviewee 28: …feedbacks…from teachers…speaking to speak into themselves... is the child really behind that camera?	3
				1	Interviewee 9...the use of videos, games, and PowerPoint presentations...holding student's attention in the online classes ...homes with...distractions.	Interviewee 38...less than 50%...student...consistently attend online classes...they are not responsive in the online classes.	3
				Tertiary Level			

Codes	Sub-themes	Themes	Theory	Group	Initial Analysis First Set Interviewees	Final Analysis Second Set Interviewees	Group
Research question 3: What is the relationship between online learning delivery and engaged learners?					**Evidence in the Datasets**		
Preference willingness performance	Improved/poor performance	well adapted or		1			
					Primary schools:		1
performance Internet Resources Devices Competence training	Adapted/absent in online classrooms Available/unavailable resources based on rural or urban Affordability/availability internet service Teacher/student competence	frustrated teachers/student depend on support systems and school level	Engaged learners in online classrooms depend on available support systems at different school level. Availability of online learning resources, infrastructure, computer literacy impacts student engagement.		Interviewee 19...Google Meet feature...draw students' attention in the online lesson…engage learners... smartboard, games...interference from…	Interviewee 35...some of them…other factors… Device…Wi Fi, … '50% in my class…so that was a problem'.	
				1	Interviewee 7: online learning improves students' engagement during lessons especially for the low achievers	'Interviewee 24: …more engaged in the face to face than online…you have 10 children in your class and five will be there'… internet problem.	5
				Secondary Level			
				1	Interviewee 17...online learning platforms...made research resources for assignments easier...videos during lectures makes the content more …	Interviewee 29: Well, I wouldn't say that they're more engaged...the level of engagement is good. Not excellent...	1
				2	Interviewee 8...some students are willing...easier to watch recordings of lesson…	Interviewee 30…only if you turn on the camera...option to answer a question or not	2

Note: Constant comparative analysis and theory development from the first and second sets of interviews displaying initial codes, themes, and theories uncovered in the datasets. The themes illustrate that the online classrooms can provide quality training and education, but is dependent on several factors, namely computer literacy, infrastructure, resources, and the level of education at which online learning is applied in the Jamaican public school system.

4.4.5.5 Content Analysis Results *Applied to the Secondary Research*. The results from the review of archived documents highlighted some of the most frequently occurring codes. This included “online, access, education, student support, funding, Jamaica, tertiary, teacher, learning, Internet, quality, resources, training”, and “participation” (see Figures 4.15; Figure 4.16). Additionally, word averages from the content analysis also highlighted significant codes such as “Internet, learning, online, access, positive, education”, and “quality” showing the highest weighted percentage rates and word count of 101 to 18 times occurring in the datasets (see Table 4.25).

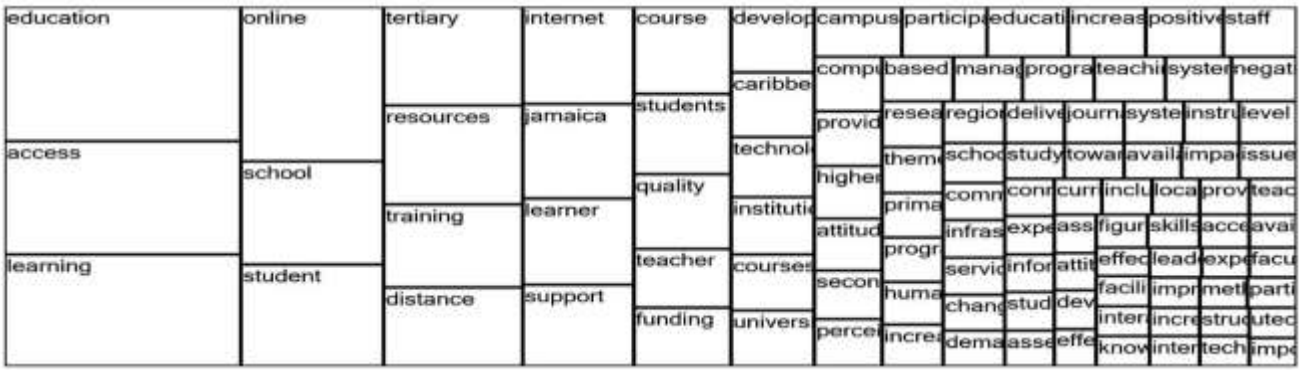
Figure 4. 15

Word Cloud Results From the Content Analysis

Note: Recurring themes in the datasets are related to the ability of online learning classrooms to provide quality training and education for learners.

Figure 4. 16

Tree Map Results From the Content Analysis



Note: The tree map displaying word frequency from the document dataset analysis is related to the ability of online learning classrooms to provide quality training and education for learners.

Table 4. 25

Word Averages From the Results of the Content Analysis

Word	Length	Count	Weighted Percentage (%)
Internet	8	101	5.64
Learning	8	88	4.91
Online	6	35	1.95
Positive	8	28	1.56
Access	6	22	1.23
Education	9	22	1.23
Course	6	18	1.01
Quality	7	18	1.01
Connectivity	12	17	0.95
Students	8	14	0.78
Availability	12	13	0.73
Engage	6	12	0.67

Note: Percentages of the word frequency in the archived document datasets relate to the ability of online learning classrooms to provide quality training and education.

4.4.6 search Question 4/Hypothesis 4

4.4.6.1 Descriptive Statistics Analysis of the Quantitative Datasets. The responses to research question 4 “What are the relationships between impeding factors and the comprehensive use of online learning for accessing education?” produced responses to variables such as “online learning resources availability”, “equitable availability of online learning in rural and urban Jamaica”, “device availability”, “access reliable Internet service to learners”, “willingness to learn online”, and “availability of Internet connectivity” (see Table 4.26; Table 4.27; Figure 4.17; Figure 4.18)

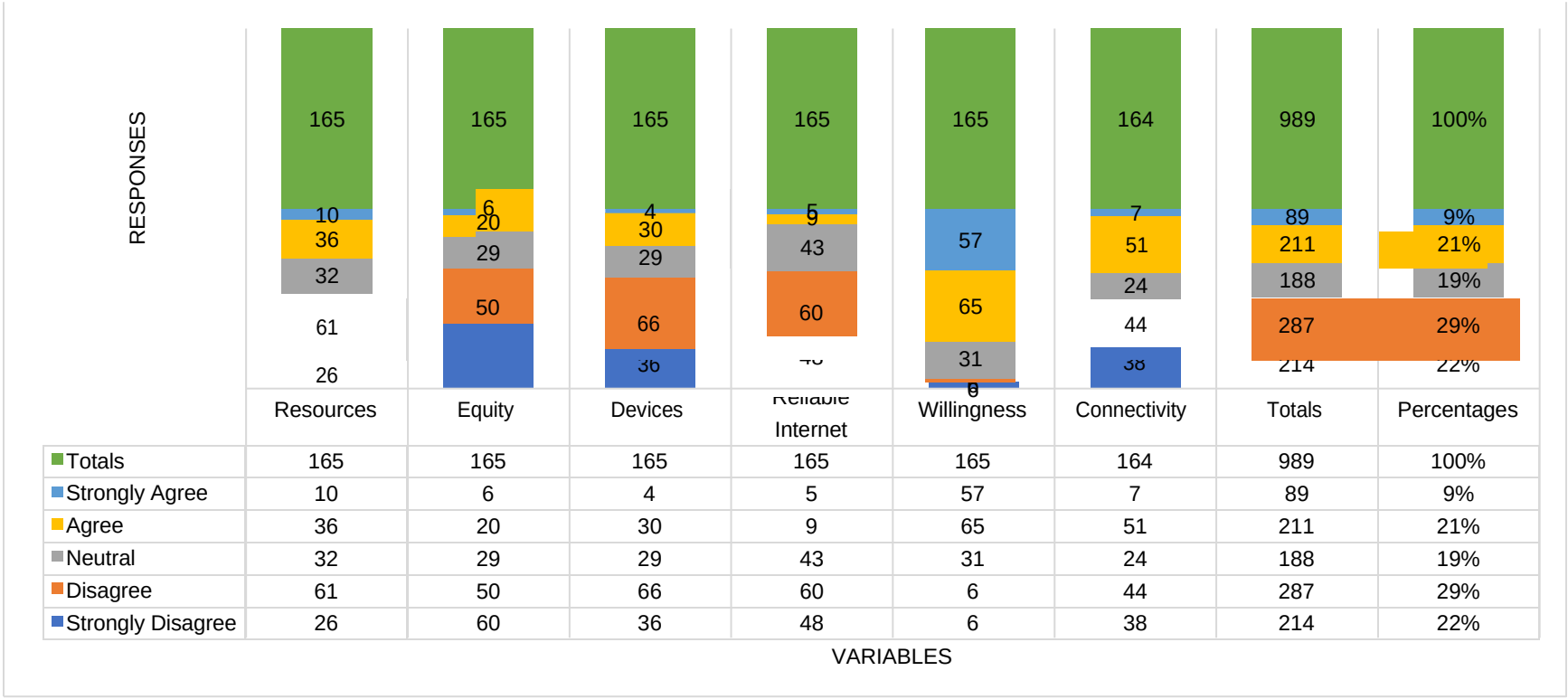
Results from the Measures of Central Tendency and Variability for the Combined 15-to-18-Year-Olds and Opinionnaire Surveys. In the results returned for (n = 168), the mean range for the variables was (M = 2.65 to M = 3.97) and the standard deviation ranged from (SD =1 .090 to SD = 1.250) with variance between (S^2 =1 .002 and S^2 = 1.562) (see Table 4.26).

Results from the Measures of Central Tendency and Variability for the 19-to-65-Year-Olds Survey. The results revealed (n= 37), the mean range for the variables was (M = 1.92 to M = 4.19) and the standard deviation ranged from (SD = 0.848 to SD = 1.239) with variance between (S^2 = 0.197 and S^2 = 1.536) (see Table 4.27).

The Cross-Tabulation Analysis. The results from the responses relative to Groups 1 to 5 in determining the impact of some impeding factors on the inclusive use of online learning within the datasets of the 19-to-65-year-olds survey and combined 15-to-18-year-olds and opinionnaire surveys respectively (see Figure 4.18; Figure 4.17), clearly show significant relationships that have provided a basis on which to accept or reject the null hypothesis.

Figure 4. 17

Cross-Tabulation of the 15-to-18-Year-Olds and Opinionnaire Survey Questionnaire Responses of Groups 1 to 5



Note: The combined 15-to-18-year-olds and opinionnaire survey questionnaires for Groups 1 to 5 computed responses related to some impeding factors that contributed to the use of online learning within the Jamaican public education system.

Table 4. 26

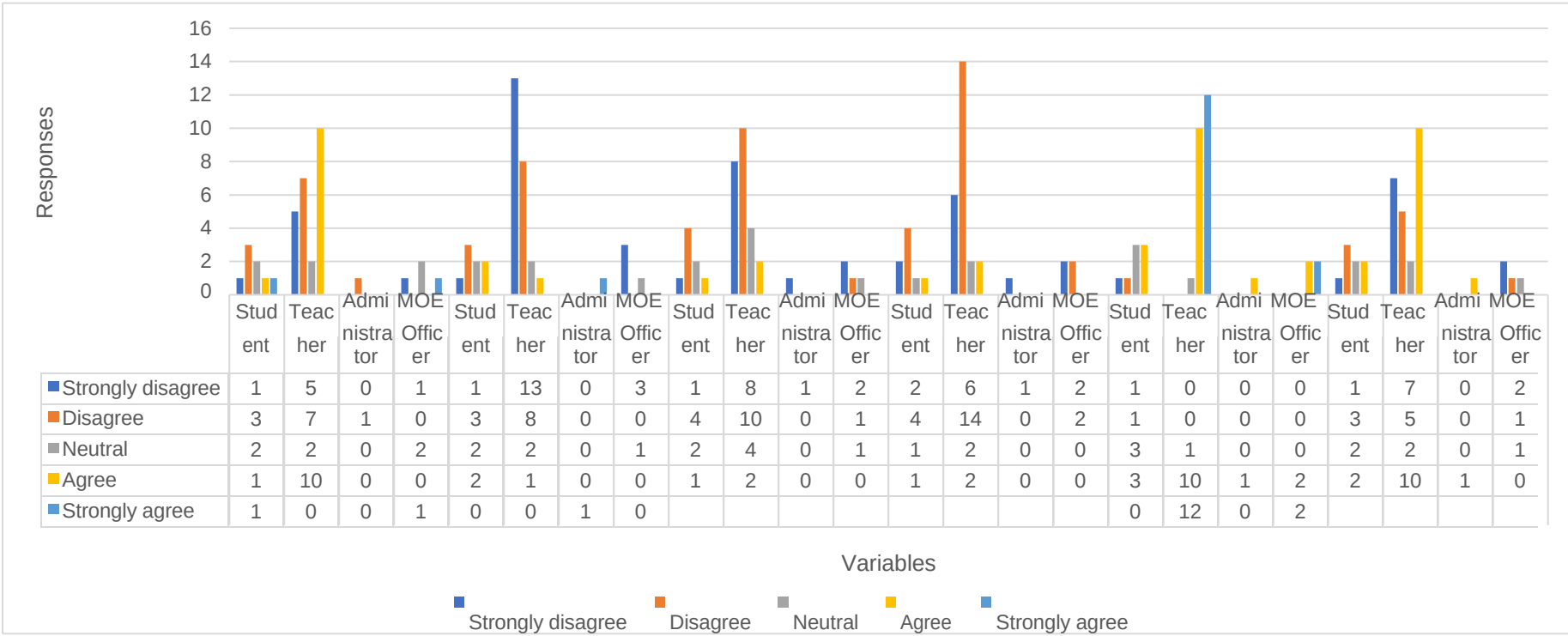
Descriptive Results for the Combined 15-to-18-Year-Olds and Opinionnaire Survey Questionnaire

	n	***Min.***	***Max.***	***M***	***SD***	***S2***
Online resources are readily available to learners.	168	1	5	2.65	1.158	1.341
Online learning is available equally in rural and urban public schools.	168	1	5	2.15	1.148	1.317
Devices to access online learning are readily available.	168	1	5	2.40	1.090	1.188
Learners have access to a reliable Internet connection.	168	1	5	2.17	1.001	1.002
You are willing to learn using online classrooms.	168	1	5	3.97	1.000	0.999
Internet connectivity is readily available to schools in your area.	167	1	5	2.66	1.250	1.562
Valid N (listwise)	167					

Note: in the descriptive analysis of the 15-to-18-year-olds and opinionnaire survey questionnaire datasets, the result in the table shows that the standard deviation has a moderately small dispersion of the values from the means, representing a moderately small variability or distribution spread of the values in the dataset. Therefore, the data can be used to make good predictions to either accept or reject the null hypotheses

Figure 4. 18

Cross-Tabulation of *19-to-65-Year-Olds Survey Questionnaire for Groups 1 to 5 Responses*



	Student	Teacher	Administrator	MOE Officer	Student	Teacher	Administrator	MOE Officer	Student	Teacher	Administrator	MOE Officer	Student	Teacher	Administrator	MOE Officer	Student	Teacher	Administrator	MOE Officer	Student	Teacher	Administrator	MOE Officer
Strongly disagree	1	5	0	1	1	13	0	3	1	8	1	2	2	6	1	2	1	0	0	0	1	7	0	2
Disagree	3	7	1	0	3	8	0	0	4	10	0	1	4	14	0	2	1	0	0	0	3	5	0	1
Neutral	2	2	0	2	2	2	0	1	2	4	0	1	1	2	0	0	3	1	0	0	2	2	0	1
Agree	1	10	0	0	2	1	0	0	1	2	0	0	1	2	0	0	3	10	1	2	2	10	1	0
Strongly agree	1	0	0	1	0	0	1	0									0	12	0	2				

Note: The 19-to-65-year-olds survey questionnaire for Groups 1 to 5 responds to the variables related to some impeding factors that contributed to the use of online learning within the Jamaican public education system.

Table 4. 27

Descriptive Result for the 19-to-65-Year-Olds Survey Responses

Variables	***n***	***Min.***	***Max.***	***M***	***SD***	***S²***
You are willing to learn using online classrooms.	37	1	6	4.19	0.967	0.935
Online resources are readily available to learners.	37	1	5	2.73	1.239	1.536
Internet connectivity is readily available to schools in your area.	37	1	4	2.57	1.237	1.530
Devices to access online learning are readily available.	37	1	4	2.03	0.928	0.860
Learners have access to a reliable Internet connection.	37	1	4	1.95	0.848	0.719
Online learning is available equally in rural and urban public schools.	37	1	5	1.92	1.090	1.188
Valid N (listwise)	37					

Note: In the descriptive analysis of the 19-to-65-year-olds survey datasets, the result for impeding factors in the table shows that the standard deviation has a moderately small dispersion of the values from the means representing a moderately small variability or distribution spread of the values in the dataset. Therefore, the data can be used to make good predictions to either accept or reject the null hypotheses

4.4.6.2 Correlational Analysis Related to the 15-to-18-Year-Olds and Opinionnaire Survey Questionnaires. Pearson's and Spearman's correlational analyses of the variables related to impeding factors and their contribution to the use of online learning within the Jamaican public school system indicates a result for the Pearson's correlation showing a ($p < .05$) significance level. There was also a weak Pearson's correlation relationship between (r =.279 and r =.296) except for the devices and reliable Internet variables, which indicate a moderate (r = .585) (see Table 4.28). In comparison to, Spearman's ranking correlation also revealed all variables ($p < .05$) significance levels. There were also weak rankings (*rho* = .288 to *rho* = .336), except again for the devices and reliable Internet variables which had a moderate ranking (*rho* = .583) (see Table 4.28).

Table 4. 28

Pearson's and Spearman's Correlational Coefficients Comparing Responses

Internet connectivity is readily available to schools in your area.	Pearson Correlation	.279**	Spearman's *rho*	Online learning is available equally in rural and urban public schools.	Correlation Coefficient	.336**
	Sig. (2-tailed)	0.000			Sig. (2-tailed)	0.000
Online learning is available equally in rural and urban public schools.	Pearson Correlation	.279**		Internet connectivity is readily available to schools in your area.	Correlation Coefficient	.336**
	Sig. (2-tailed)	0.000			Sig. (2-tailed)	0.000
You are willing to learn using online classrooms.	Pearson Correlation	.296**	Spearman's *rho*	You are willing to learn using online classrooms.	Correlation Coefficient	.286**
	Sig. (2-tailed)	0.000			Sig. (2-tailed)	0.000
Online resources are readily available to learners.	Pearson Correlation	.296**		Online resources are readily available to learners.	Correlation Coefficient	.286**
	Sig. (2-tailed)	0.000			Sig. (2-tailed)	0.000
Devices to access online learning are readily available.	Pearson Correlation	.585**	Spearman's *rho*	Devices to access online learning are readily available.	Correlation Coefficient	.583**
	Sig. (2-tailed)	0.000			Sig. (2-tailed)	0.000
Learners have access to a reliable Internet connection.	Pearson Correlation	.585**		Learners have access to a reliable Internet connection.	Correlation Coefficient	.583**
	Sig. (2-tailed)	0.000			Sig. (2-tailed)	0.000

Note: The total number of respondents (*n* = 168) correlated at the significance level (*p = .05)* Pearson's (*r)* and Spearman's (*rho)*. Pearson's and Spearman's correlational coefficient comparisons for the responses of the combined 15-to-18-year-olds and opinionnaire survey questionnaires related to impeding factors contribution to the use of online learning within the Jamaican public school system.

4.4.6.3 Correlational Analysis of the 19-to-65-Year-Old Survey Questionnaire.

The Pearson's and Spearman's correlational analyses of the items associated with the impact of some impeding factors on the inclusive use of online learning within the Jamaican public school system show the Pearson's correlation with *p-values* for most of the variables ($p < .05$). There was also a weak Pearson's correlation relationship between ($r = .113$ to $r = .344$), except for the willingness and resources variables, which indicate a moderately high correlation of ($r = .743$) (see Table 4.29; Appendix K). Additionally, the results illustrated the Spearman's ranking correlation, which used a significance level that also revealed most at ($p < .01$) and a weak ranking between (*rho* = .086 to *rho* = .387), except again for the willingness and resources variables with a moderate high (*rho* = .741) (see Table 4.29; Appendix K). Consequently, the null hypothesis was rejected for all variables except the willingness and resources variable for which the null hypothesis was accepted.

Table 4. 29

The 19-to-65-Year-Olds Survey Results for the Pearson's and Spearman's Correlational Coefficients

Internet connectivity is readily available to schools in your area.	Pearson Correlation	.344*	Spearman's *rho*	Internet connectivity is readily available to schools in your area.	Correlation Coefficient	.387*
	Sig. (2-tailed)	0.037			Sig. (2-tailed)	0.018
Online learning is available equally in rural and urban public schools.	Pearson Correlation	.344*		Online learning is available equally in rural and urban public schools.	Correlation Coefficient	.387*
	Sig. (2-tailed)	0.037			Sig. (2-tailed)	0.018
You are willing to learn using online classrooms.	Pearson Correlation	0.113	Spearman's *rho*	You are willing to learn using online classrooms.	Correlation Coefficient	0.036
	Sig. (2-tailed)	0.504			Sig. (2-tailed)	0.833
Online resources are readily available to learners.	Pearson Correlation	0.113		Online resources are readily available to learners.	Correlation Coefficient	0.036
	Sig. (2-tailed)	0.504			Sig. (2-tailed)	0.833
Devices to access online learning are readily available.	Pearson Correlation	.743**	Spearman's *rho*	Devices to access online learning are readily available.	Correlation Coefficient	.741**
	Sig. (2-tailed)	0.000			Sig. (2-tailed)	0.000
Learners have access to a reliable Internet connection.	Pearson Correlation	.743**		Learners have access to a reliable Internet connection.	Correlation Coefficient	.741**
	Sig. (2-tailed)	0.000			Sig. (2-tailed)	0.000

Note: The total number of respondents (*n* = 37) correlated at the significance level (*p* = .05*)* Pearson's (*r)* and Spearman's (*rho)*. Pearson's and Spearman's correlational coefficient comparisons from the responses of the 19-to-65-year-olds survey questionnaire related to the impact of some impeding factor on the use of online learning within the Jamaican public school system.

4.4.6.4 Qualitative Analysis Applying the Constant Comparative Analysis. This analysis uses the qualitative datasets to identify codes linked to impeding factors interfering with the inclusive implementation of online learning. Undoubtedly, codes discovered include “difficult, support, distractions, cameras, participation, parents, resistance, unreliable, data, rural areas, resources”, and “affordability” which were significant in the datasets. These were then further analysed to form themes such as “weather and power outages impact Internet access” and “support systems influence learner access and participation” (see Table 4.30). Upon data saturation, final theory development asserts that “impeding factors hinder increased access to learning via online classrooms” especially in rural areas, as it relates to public schools in Jamaica (see Table 4.30).

Table 4. 30

Constant Comparative Analysis Results

Codes	Sub-themes	Themes	Theory	Groups	Initial Analysis First Set Interviewees	Final Analysis Second Set Interviewees	Groups
What is the relationship between impeding factors and the comprehensive use of online learning for accessing education?					**Evidence in Datasets**		
					Secondary Level		
Difficult Support Distractions Cameras Participation Parents Resistance Unreliable Data Rural Areas Data Affordable Devices Support	weather conditions affect power outages adequacy of support systems internet reliability depends on location and cost home environment and learner compliance	The weather and power outages impact internet access support systems influence learner access and participation	impeding factors hinder increase access to learning via online classrooms especially in rural Jamaica	1	Interviewee 20...only about 10% of the students…. are having challenges.	Interviewee 27…socio-economic background of the parents...	1
				1	Interviewee 9...some are frustrated... internet connectivity issues...	Interviewee 22…They will get...frustrated...nobody would participate...It would take a long while for the Wi Fi or internet service, to reach...persons in the rural areas.	5
					Primary Level		
				3	Interviewee 1...devices were ...distributed to some grade levels…. teachers were not given a device	Interviewee 23…90% ...trained with JCC ...online strategies...challenges with students owning their won device...internet connectivity...poor.	1
				3	Interviewee 18...learners at the primary level are not competent enough to handle that independent learning	Interviewee 24… unable to go online...some of are afraid of technology…not willing to learn...the internet connection...the major thing...	1
				1	Interviewee 10...students are...having challenges with lack of devices and internet connectivity...		1
				1	Interviewee 12...students...have challenges with background noises at home…connection problems.		

Codes	Sub-themes	Themes	Theory	Groups	Initial Analysis First Set Interviewees	Final Analysis Second Set Interviewees	Groups
What is the relationship between impeding factors and the comprehensive use of online learning for accessing education?					**Evidence in Datasets**		
				1	Interviewee 7...lack of parental supervision for primary learners... need for all stakeholders... work together to fix the challenges with online learning.		
					Tertiary Level		
				1	Interviewee 4...do not have the resources to participate in the online learning environment.	Interviewee 39...they were having...challenges to teach online... Did you have access to a reliable internet service? your home at home at home? Yes	1
					Interviewee 17... lecturers …not technology wise... they're used to teaching at school…some students cannot afford Wi-Fi…most impeding factor…the internet	Interviewee 40...the primary issue is accessibility to devices...in the urban area...especially in the inner city... more predominant in the rural areas.	1
				2		Interviewee 28... competence...I know that a different people in a general sense...have different levels of comfort...	1

Note: Constant comparative analysis and theory development from the first and second sets of interviews displaying initial codes, themes, and theories uncovered in the datasets. The themes illustrate some impeding elements that restrict and limit the expansion of online learning in Jamaica's public school system. It also reveals direct evidence from interviewees from the different groupings in the sample.

4.4.6.5 Content Analysis Results *Applied to the Secondary Research*. The results from the review of archived documents highlighted some of the most frequently occurring codes. These consisted of “online, access”, “education”, “student”, “funding”, “tertiary”, “teacher”, “learning”, “Internet”, “quality”, “resources”, “training”, and “support” (see Figures 4.19; Table 4.31). Additionally, word averages from the content analysis also underscore codes such as “Jamaica”, “negative”, “online”, “education”, and “Internet” displaying the highest weighted percentage rates and word count of 89 to 12 times repetition in the datasets (see Table 4.31).

Figure 4. 19

Word Cloud Results From the Content Analysis

Note: A word cloud highlights the most frequently recurring themes related to impeding factors to online learning in the Jamaican public education system.

Table 4. 31

Tree Map Results From the Content Analysis

Word	Length	Count	Weighted Percentage (%)
Jamaica	7	89	6.44
Negative	8	24	1.74
Online	6	17	1.23
Education	9	12	0.87
Communication	13	11	0.80
Campus	6	10	0.72
Technology	10	10	0.72
Students	8	8	0.58
Feelings	8	7	0.51
Learning	8	7	0.51
Struggle	8	6	0.43
Support	7	6	0.43

Note: Most recurring word averages in the datasets related to factors that impede the online learning modality

4.5 Evaluation of Findings

The overarching aim of the study was to gain a better understanding as to whether or to what extent online learning can be used to increase access to training and educational programs within the public education system in Jamaica. Further to this, a secondary aim was to identify whether impeding factors impact the comprehensive employment of online learning across public schools in Jamaica. Therefore, to achieve the study's objectives a multiple theoretical and conceptual framework was used combining positivism and connectivism ideologies. Accordingly, to increase the reliability and validity of the measures, the study used a mixed-methods approach at the data collection and analysis stages.

Subsequently, the pragmatism philosophy guided the research process which preceded the extraction of the results. Brandl et al. (2019), Cornish (2009), and Wikandaru et al. (2021) describe the pragmatism paradigm ideology as establishing a research space in which a more balanced discussion is supportive of a more strategic and critical analysis of the phenomenon. This is achieved through competing views being evaluated to provide the opportunity for triangulation across different analysis methods and tools. In so doing, an opportunity is provided to make judgements that may be generalizable to the population under study. Most importantly, the pragmatist researcher seeks to answer from the results of the analysis whether the results mirror the real-life phenomenon being studied (online learning) and whether the results can be usefully applied to the problem (increasing access) by directing actions or responses for practical application in the scope of the targeted population (Jamaican public schools).

The analysis of the datasets from both the quantitative (descriptive, correlational, cross tabulation, content analysis) and the qualitative GT analysis (constant comparative analysis) was used in the triangulation of the results to develop theories. These theories were then employed to draw conclusions about different datasets that were analysed across the concurrent nested research design. Further, the analysis involved the juxtaposition of the behaviorism and connectivism theories during the analysis process. Al-Shammari et al. (2019) and Malik (2021) postulated that the behavorism theories of Skinner, Thorndike, Watson, and Mager support the premise that modality and the setting in which learning occurs affect prescribing educational goals. Hence, the behavorism theory was used to direct the descriptive statistics, correlations, and cross-tabulation analysis of the variables examined, which underpinned the decision whether to accept or reject null hypotheses 1 to 4.

On the other hand, Cabrero and Roman (2018) revealed that the connectivism theory acknowledges and examines the overall viewpoint of real-life phenomena using various knowledge networks in a pragmatic way. Thereby, provides the opportunity to examine social norms and external influences. Additionally, Cleary (2021) cited that, according to Siemens (2017) the employment of the connectivism theory permits competing options to abduct more details for complete learning about the phenomenon. Further, the connectivism theory guided the GT approach using constant comparative analysis for the interview datasets and content analysis for the archived document datasets. Moreover, connectivism theory provided a pivot through the utilization of coding and the organization of significant themes to develop useful assumptions residing in the datasets for drawing conclusions.

Again, both the results of the statistical measurement regarding the responses relative to each research question and hypothesis via deductive, inductive, and abductive reasoning influenced how the results and findings were extracted. The descriptive, correlational, constant comparative, and content analyses represent a pluralistic examination of the datasets. This may aid in how the findings can reliably serve actions for practical application to online offerings within the Jamaican public school system.

4.5.1 search Question 1/Hypothesis 1.

4.5.1.1 Results From the Descriptive Statistics Related to the Surveys Responding to Items Connected to the Null Hypotheses Claiming Online Learning Will Not Increase Access to Training and Education in Public Schools Within Jamaica. From the cross-tabulation responses, the results from the different groupings within the sample *agreed* and *strongly agreed* that online learning can increase access to skills, continuing education, tertiary, and disability variables. The evidence is seen in the response rates for *strongly agree* and agree in which of the (*N* = 491) responses related to these variables, 80% (*n* = 395) *strongly agreed* that online learning is valuable for increased access for learners. Conversely, (*N* = 329) responses were tendered for the attendance and equity variables. The results show that 69% (*n* = 228) *disagreed* and *strongly disagreed* with the attendance and equity variables and suggest some hindrance to the success of online learning as it relates to increased access for learners. A closer look at the overall cross-tabulation results revealed that 44% (*n* = 361) *strongly agree* and *agree*, 35% (*n* = 287) *strongly disagree* and disagree, and 21% (*n* = 172) remained neutral.

Further to this, the results from the measures of central tendency and variability indicate that there is a moderately close dispersion of the standard deviation from the mean, representing a small variability or distribution spread of the values in the combined 15-to-18-year-olds and opinionnaire survey, and 19-to-65-year-olds responses. The results from the survey responses across each grouping related to research question 1 and hypothesis 1 also established a close dispersion of the standard deviation from the mean responses coming from the groupings. Therefore, the same conclusion can be drawn as with the cross-tabulation analysis results online learning could be used to increase access to schooling for continuing education and at the tertiary level, but not currently at the primary and secondary levels (see Table 4.8; Table 4.9: Figure 4.3; Figure 4.4). Additionally, Pearson (*r)* and the Spearman (*rho)* for the groupings based on ($p \leq .05$) and a critical value of ($r = .152$) and ($rho = .159$) indicate that there is sufficient evidence to reject the null hypothesis given a margin of error of 5% (see Table 4.32).

Table 4. 32

Correlational Analyses Results

15-to-18-Year-Olds and the Opinionnaire											
Pearson's Correlational Analysis Results						**Spearman's Correlational Analysis Results**					
Significance Level (*p* = .05)		Null Hypothesis	Critical Value (*r* = .152)		Null Hypothesis	Significance Level (*p* = .05)		Null Hypothesis	Critical Value (*rho* = .152)		Null Hypothesis
Above	Below		Above	Below		Above	Below		Above	Below	
2	4	Rejected	6	-	Rejected	2	4	Rejected	4	2	Rejected
19-to-65-Year-Olds Survey Questionnaire											
Pearson's Correlational Analysis Results						**Spearman's Correlational Analysis Results**					
Significance Level (*p* = .05)		Null Hypothesis	Critical Value (*r* = .32)		Null Hypothesis	Significance Level (*p* = .05)		Null Hypothesis	Critical Value (*rho* = .335		Null Hypothesis
Above	Below		Above	Below		Above	Below		Above	Below	
4	2	Accepted	2	4	Accepted	4	2	Accepted	2	4	Accepted

Note: The significance level of (*p* = .05) for Pearson's and Spearman's *2-tailed* significance levels was used respectively. Critical values for (*n* = 37*, df* = 35, at *p* = .32) Pearson's *(r)* and (*p* = .335) Spearman's (*rho)* for the items of the 19-to- 65-year-olds survey: Critical values for the combined 15-to-18-year-olds and the opinionnaire surveys (*n* = 168, *df* = 166), the critical value was at (*p* = .152) Pearson's *(r)* and (*p* = .152) Spearman's (*rho)*. The accepted rule of thumb for hypotheses testing using the critical value permits the rejection of the null hypothesis if the test statistics are larger than the critical value. On the other hand, if the test statistic is less than the critical value accepts the null hypothesis. Furthermore, for the significance level, if the *p-value* is smaller than the significance level, reject the null hypothesis and accept the null hypothesis when the *p-value* is larger.

Additionally, the constant comparative and content analyses have corroborated the possibility of online learning increasing access at the tertiary and continuing education levels, but the findings indicate that this may be dependent on the connectivity, location, attitudes, and competence of teachers and learners. Since the evidence points to widespread connectivity issues across Jamaica, Groups 1, 2, 3, and 4 highlighted the lack of competency of some teachers and learners as a major problem. This was also evidenced in the findings of Barrot et al.'s (2021) and Talimbekas and Arifani's (2022) studies where the findings reported the same challenges with connectivity and costs that hindered accessibility. Some barriers highlighted that mitigated the progress of online learning include access to; online classes, pertinent resources, and devices, especially for poor families. Sahu et al. (2022) asserted that the behaviorist theory of learning emphasized the need for accessibility and relevance of content in order for learners to benefit from the online learning modality. This was essential for stimulating learners' interest and at the same time, providing feedback through assessments that is suited for measuring learning targets. Further, corroboration was noted in doubts expressed and reported for online learning successes currently at the primary and secondary levels.

Consequently, the expectations relative to the theoretical framework for the study assumed that online learning would provide additional options for schooling. Yet, though accessibility problems were encountered by some participants, as reported by the results of research question 1, indications to a large extent from the findings are to reject the null hypothesis. The results further illustrate this through the small dispersion of the mean relative to the standard deviation, and the weak and moderate correlation for Pearson's *r*

and Spearman's *rho* correlations, indicating a minimal relationship between the variables used for research question 1.

Therefore, the null hypothesis is rejected, as not enough evidence was shown between the variables to imply that online learning would not increase entry into training and education programs. Most importantly, the evidence based on the triangulated results and combined evaluation of the quantitative and qualitative analyses has provided the basis for concluding that the improvement and implementation of reliable ICT infrastructure and CPD are vital if online learning is to increase access to training and education across Jamaican public schools. Maheshwari's et al.'s (2021) study findings revealed a similar position where ICT infrastructure availability to improve Internet reliability was significant in its effect on the learner's motivation to learn online. However, online learning was still shown through the evidence in the findings to provide more options for enrolling in school.

4.5.2 search Question 2/Hypothesis 2

4.5.2.1 There are no Differences in the Attitudes Among Learners and Public Education Institution Leaders Toward Online Learning within Public Education in Jamaica

Jamaica. The results from the descriptive analysis which responded to the variables connected to learners and the public education institution leaders in Jamaica have shown similarities and differences in attitudes towards online learning. It is interesting that the responses from the different groupings within the sample *disagreed* and *strongly disagreed* about the online learning sub-variables "preference, equity, adequacy, and recommending", while they *agreed* and *strongly agreed* about the "capacity, willingness,

and performance" variables connected to attitudes toward online learning in Jamaica (see Figure 4.7 to 10).

The overall results from the cross-tabulation analyses have shown that there are not many differences in the attitudes of students and education institution leaders toward online learning. This was established by the responses where for education institution leaders, 40% *strongly disagreed* and *disagreed* and for students it was 33%. Additionally, 36% institutions *strongly agreed,* and students returned 37%. Furthermore, both students and institutions have supported online learning through the "performance, willingness, and capacity" sub-variables. The results also showed that both students and education institution leaders did not have a preference, were not willing to recommend, or believed that online learning was equitably distributed in Jamaican public schools (see Appendix M). Nazari et al., (2021) associates this with a lack of the use of the connectivism learning theory premises for online learning success. In this study the author has highlighted the value of flexibility through e-resources, the use of communities of learning, linking multiple communication channels to develop new knowledge, and investment in infrastructure that connects learning.

Similarly, the measures of central tendency and variability results indicate that there was a moderately large dispersion between the mean, standard deviation, and variance for the "willingness, capacity, and performance" sub-variable, as a group in comparison to the "preference, equity, and recommend" sub-variables. This indicates the similarity of the attitudes of students and education institution leaders relative to each sub-variable regarding online learning. Moreover, the evidence is shows that both students and education institution leaders agreed that they are willing, that capacity

exists, and that performance has improved with online education. In addition, both students and education institution leaders uphold that there is a lack of adequacy and equity in the distribution of online learning and would not recommend it (see Table 4.14; Table 4.15).

Additionally, in the current study the results show a marked preference for face-to-face learning over online learning. This notion was also reported in, Rai and Basnet's (2021) study, where there was a 56% report from some respondents relative to their preference for face-to-face over online learning. Although the findings revealed that 68% of instructors believe in the value of online education. Gherhes et al.'s (2021) study also reported similar results relative to the preference sub-variable, as a majority of the respondents in that study expressed a preference for face-to-face learning over the online learning mode. This was largely due to factors such as technical problems, a lack of interaction, and an Internet connection.

Yusra et al. (2022) confirm the findings in Gherhes et al.'s (2021) study in respect of the behaviorism learning theory ideology, which believes that learning is possible depending on the stimulus injected in the learning environment and the quality of the response exhibited by the learners and is measurable. The behaviorism learning theory further proports that students may show high performance rates with the right stimulus and vice versa. Online learning environments can use the behaviorism learning theory to design the optimum learning goals and instructional materials that will produce the most favorable responses from learners. The current study findings showed that there was a generally negative view among the participants as it relates to online learning in Jamaica. However, the results also highlighted that this was largely due to the connectivity and lack

of resources issues faced by both instructors and learners alike. The bahavorism learning theory views are in line with these findings where negative stimulus (lack of connectivity and resources) resulted in poor performance and negative attitudes toward online learning.

Notably, the results from the survey responses as they relate to all groupings within the sample (Groups 1-5) report no significant difference between students' and education institution leaders' attitudes toward online learning within public schools across Jamaica. This was also evidenced by the outcomes relative to Pearson's and Spearman's correlations, where both results indicated a weak and moderate correlation among the measurement sub-variables. These results were further examined and produced significant grounds for accepting the null hypothesis (see Table 4.33).

Table 4. 33

Correlational Analysis Results

15-to-18-Year-Olds and the Opinionnaire Surveys											
Pearson's Correlational Analysis Results						**Spearman's Correlational Analysis Results**					
Significance Level (p = .05)		Null Hypothesis	Critical Value (r = .152		Null Hypothesis	Significance Level (p = .05)		Null Hypothesis	Critical Value (rho = .152)		Null Hypothesis
Above	Below		Above	Below		Above	Below		Above	Below	
4	4	Accepted	6	2	Accepted	2	6	Rejected	4	4	Accepted
19-to-65-Year-Olds Survey Questionnaire											
Pearson's Correlational Analysis Results						**Spearman's Correlational Analysis Results**					
Significance Level (p = .05)		Null Hypothesis	Critical Value (r = .32)		Null Hypothesis	Significance Level (p = .05)		Null Hypothesis	Critical Value (rho = .335)		Null Hypothesis
Above	Below		Above	Below		Above	Below		Above	Below	
4	4	Accepted	4	4	Accepted	4	4	Accepted	4	4	Accepted

Note: The significance level of (p = .05) for Pearson's and Spearman's *2-tailed* significance levels was used respectively. Critical values for (n = 37, df = 35, at p = .32) Pearson's *(r)* and (p = .335) Spearman's (*rho)* for the items of the 19-to- 65-year-olds survey: Critical values for the combined 15-to-18-year-olds and the opinionnaire surveys (n = 168, df = 166), the critical value was at (p = .152) Pearson's *(r)* and (p = .152) Spearman's (*rho)*. The accepted rule of thumb for hypotheses testing using the critical value permits the rejection of the null hypothesis if the test statistics are larger than the critical value. On the other hand, if the test statistic is less than the critical value accepts the null hypothesis. Furthermore, for the significance level, if the *p-value* is smaller than the significance level, reject the null hypothesis and accept the null hypothesis when the *p-value* is larger.

In addition, most of the students and education institution leaders report improved performance in online learning in comparison to performance during the face-to-face modality for the descriptive analysis. In contrast, the responses from the interviewees at all levels of education revealed that the reliability of the assessment methods and results is questionable. The findings in the qualitative datasets relate this to the uncertainty associated with whether these assignments were completed by the students, which questions the validity of online test scores.

Equally important was the available evidence from the constant comparative analysis which also suggests that all groupings within the sample were willing to learn using online modes and had a preference for face-to-face learning. This again underlines the similarity in the attitudes of students and education institution leaders. Likewise, the emergent theory arising from the constant comparative analysis is that “students’ and education institution leaders’ attitudes toward online learning is influenced by factors such as cultural norms, affordability, and access to online learning” (see Table 4.18). Chen et al.’s (2020) study corroborated this as the findings revealed that learners’ willingness to continue learning online is dependent on the platform design, the level of feedback provided over the platform, and the teacher-parents alliance. The constant comparative analysis themes and theory suggest the same. On the other hand, the content analysis shows more positive attitudes than negative ones (indicating willingness) while variables such as “feelings” and “perceptions” impacted students’ and education institution leaders’ attitudes toward online learning, which are directly linked to cultural norms (see Table 4.18).

Equally important was the triangulation of all findings from the quantitative and qualitative analyses which were thoroughly evaluated for similarities and differences. The subsequent conclusion indicated based on the evidence, that there is a similarity in the responses for the quantitative and qualitative analyses results relative to the learners' and institutions' attitudes. However, slight differences were reported in the correlational, constant comparative, and content analysis results. Therefore, the null hypothesis is accepted with a margin of error of 5%.

4.5.3 search Question 3/Hypothesis 3

4.5.3.1 The results from the Descriptive Statistics Related to the Surveys, Responding to the Sub-variables Connected to Whether Online Learning Classrooms Can Provide Quality Training and Education for Learners Within Jamaican Public Schools. The cross-tabulation analysis of the responses from all groupings within the sample reports inadequacies of sub-variables such as "lack of devices, Internet access, resources, level of engagement, and reliable Internet service" to ensure learning in online classes. The evidence shows that 56% of the responses *strongly disagreed* or *disagreed* that these sub-variables were not adequately supplied to support learning in online instruction. While there was a 24% *strongly agreed* and *agreed* to the sufficiency of these sub-variables 18% elected to remain neutral. The performance sub-variable was the lone outlier within the results showing improvement in learners' performance in online classrooms. Gherhes et al.'s (2021) study findings affirmed the value of online classes as they revealed that learners were more engaged during online classes than face-to-face classes. Additionally, students' responses recorded 31.1% higher performance in online classes, while 37.4% reported the same performance in

face-to-face modes of learning. Yusra et al. (2022) also corroborated that this was possible with the right stimulus in the online learning environment to achieve the desired responses.

The performance sub-variable concurred with one of the connectivism learning theory premises, which asserted that online learning provided the option of combining many learning networks and information sources for improving knowledge (Husin et al., 2021; Dennis, 2020). Similarly, the measures of central tendency and variability analysis results indicated that there was a moderately small dispersion between the mean, standard deviation, and variance for all sub-variables except again for the performance variable, an outlier. The small dispersion in the responses is related to inadequacies in all sub-variables except for the one outlier “improved performance in online classes”.

Furthermore, Pearson’s and Spearman’s correlational analyses were applied to the items, and the results illustrated a range between a weak to moderate relationship for Pearson (*r*) and a weak to moderate correlation range of the items linked to learners’ engagement in online classrooms in public schools in Jamaica. An evaluation of the significance levels of the items compared to the critical values indicated inconclusive results and failed to provide a substantial basis for accepting or rejecting the null hypothesis (see Table 4.34).

Table 4. 34

Correlational Analysis Results

15-to-18-Year-Olds and the Opinionnaire											
Pearson's Correlational Analysis Results						**Spearman's Correlational Analysis Results**					
Significance Level (p = .05)		Null Hypothesis	Critical Value (*r* = .152		Null Hypothesis	Significance Level (*p* = .05)		Null Hypothesis	Critical Value (*rho* = .152)		Null Hypothesis
Above	Below		Above	Below		Above	Below		Above	Below	
-	6	Rejected	6	-	Rejected	-	6	Rejected	6	-	Rejected
19-to-65-Year-Olds Survey Questionnaire											
Pearson's Correlational Analysis Results						**Spearman's Correlational Analysis Results**					
Significance Level (*p* = .05)		Null Hypothesis	Critical Value (r = .32)		Null Hypothesis	Significance Level (*p* = .05)		Null Hypothesis	Critical Value (*rho* = .335		Null Hypothesis
Above	Below		Above	Below		Above	Below		Above	Below	
4	2	Accepted	2	4	Accepted	4	2	Accepted	2	4	Accepted

Note: The significance level of (*p* = .05) for Pearson's and Spearman's *2-tailed* significance levels was used respectively. Critical values for (*n* = 37*, df* = 35, at *p* = .32) Pearson's *(r)* and (*p* = .335) Spearman's (*rho)* for the items of the 19-to- 65-year-olds survey: Critical values for the combined 15-to-18-year-olds and the opinionnaire surveys (*n* = 168, *df* = 166), the critical value was at (*p* = .152) Pearson's *(r)* and (*p* = .152) Spearman's (*rho)*. The accepted rule of thumb for hypotheses testing using the critical value permits the rejection of the null hypothesis if the test statistics are larger than the critical value. On the other hand, if the test statistic is less than the critical value accepts the null hypothesis. Furthermore, for the significance level, if the *p-value* is smaller than the significance level, reject the null hypothesis and accept the null hypothesis when the *p-value* is larger.

Based on these results, many of the responses related to the sub-variables relative to learning during online classes demonstrated sufficient evidence to reject the null hypothesis that online learning may not engage learners in the public school system in Jamaica with a margin of error of 5%. The constant comparative analysis also corroborated the results of the descriptive and correlational analyses, as the interviewees in both the initial and final datasets identified inadequacies in the “resources, devices, engaging students, access to Internet, reliable Internet service, and computer literacy” sub-variables related to student learning in online classrooms in Jamaica.

Furthermore, the assertion was that engaged learners in online classrooms depend on available support systems at the different school levels inclusive of resources, infrastructure, and computer literacy. This notion is supported by the connectivism learning theory within the conceptual framework, which confirms that learning can be enhanced and opportunities for learning provided through multiple learning networks, as is provided through online education. However, if accessibility is a problem, then the engagement of learners is an issue for learning (Boyraz & Ocak, 2021). Further, Chen et al. (2020) asserted that student learning in online classes is reliant on the level of maturity of the students in independent learning, coupled with the support of teachers, parents, and the platform used.

Moreover, the content analysis of the archived documents further revealed that “access, training, resources, support, Internet, and funding” as the most frequent words appearing in the dataset, indicating that these elements are essential for learning during online instruction. These elements were deemed inadequate as per responses from the surveys, interviews, and review of archived documents. Therefore, triangulation of the

quantitative analysis results with those of the qualitative analysis outcomes was employed to draw conclusions and has indicated similar assumptions relative to sub-variables such as “location, affordability, and connectivity” which impact learning during online classes.

On the other hand, where the resources and support systems were adequate students were engaged in quality online learning. This was the initial assumption for the current study, as supported by Don et al.’s (2022) study findings which support the claim that online learning offers opportunities that can enhance learning for both the instructor and the learners. Although Egielewa et al.’s (2022) study reported challenges relative to negative stimulus in the online learning environment, which return negative reactions from students of about 42%. The overall results from the study report show that students enrolled in tertiary education in Nigeria are resisting the adaptation to the online learning modality, mostly due to a lack of positive reinforcements (equitable access to online classes). However, participants who had a positive viewpoint about online learning were exposed to favorable stimuli (available connectivity and resources) resulting in better performance rates from students.

Therefore, learners can be engaged in online classes as they present many learning tools and resources. Hence, an explanation for, the outlier performance sub-variable, which is present in each result across the different datasets analysed. Consequently, the evidence has clearly shown enough evidence to reject the null hypothesis 3 online learning classrooms may not engage learners in the public school system in Jamaica. This conclusion is drawn from the evidence illustrated by the ($p < .05$) for most of the sub-variables analysed and most indicating ($r > .152$, $rho > .152$) for the critical values indicating a rejection of the null hypothesis for the correlational analyses,

though the cross-tabulation analysis showed most of the responses refuting the adequacy of these sub-variables.

4.5.4 search Question 4/Hypothesis 4

4.5.4.1 The Results From the Quantitative and Qualitative Analysis Related to Whether Impeding Factors are Responsible for the Lack of Comprehensive Usage of Online Learning. The results indicated that some impeding factors to online learning include “availability of devices”, “learner access to Internet”, “online learning in rural and urban areas, connectivity, resources, and willingness to engage in online learning”. The evidence has been established by way of 30% *strongly agreed* and *agreed* that those variables were supplied in sufficiency, while 51% *strongly disagreed* and *disagreed* that they were inadequately distributed for the success of a national offering of online classes in public schools in Jamaica. Hence, these sub-variables were seen as impediments to online learning. This has been reported in the majority of the participants’ and respondents’ responses from Groups 1 to 5. The exception is the willingness sub-variable, which is the outlier indicating that all groupings in the sample are willing to learn online. Rai and Basnet’s (2021) study further corroborated some of the problems associated with online learning, as the findings revealed 76% of instructors reported unreliable Internet, 40% lacked devices, and 56% had power outage issues.

Additionally, the measures of central tendency and variability results reported that there was a moderately small dispersion between the mean, standard deviation, and variance for all of the sub-variables except again for the willingness sub-variable, an outlier. The small dispersion in the responses shows agreement that these sub-variables are impediments based on the inadequacies in all except for the one outlier, in propelling

online learning exclusively within Jamaican public schools. The willingness sub-variable has highlighted in the results another premise of the connectivism learning theory: that the development and implementation of a variety of learning communities promote continuous addition to knowledge and offer current information to activate applicable solutions in real life (Rai & Basnet, 2021; Siemens, 2017).

This is further supported by the findings from Pearson's and Spearman's correlational analyses. The results have established for the combined 15-to-18-year-olds and opinionnaire and the 19-to-65-year-olds surveys significant relationships between the sub-variables, where most were at ($p < .05$) margin of error. This is indicating a rejection of the null hypothesis: impeding factors are not responsible for the lack of comprehensive usage of online learning within the public education system in Jamaica (see Table 4.35).

Table 4. 35

Correlational Analysis Results

15-to-18-Year-Olds and the Opinionnaire											
Pearson's Correlational Analysis Results						**Spearman's Correlational Analysis Results**					
Significance Level (p = .05)		Null Hypothesis	Critical Value (r = .152)		Null Hypothesis	Significance Level (p = .05)		Null Hypothesis	Critical Value (rho = .152)		Null Hypothesis
Above	Below		Above	Below		Above	Below		Above	Below	
-	6	Rejected	6	-	Rejected	-	6	Rejected	6	-	Rejected
19-to-65-Year-Olds Survey Questionnaire											
Pearson's Correlational Analysis Results						**Spearman's Correlational Analysis Results**					
Significance Level (p = .05)		Null Hypothesis	Critical Value (r = .32)		Null Hypothesis	Significance Level (p = .05)		Null Hypothesis	Critical Value (rho = .335)		Null Hypothesis
Above	Below		Above	Below		Above	Below		Above	Below	
2	4	Rejected	4	2	Rejected	2	4	Rejected	4	2	Rejected

Note: The significance level of (p = .05) for Pearson's and Spearman's *2-tailed* significance levels was used respectively. Critical values for (n = 37*, df* = 35, at p = .32) Pearson's *(r)* and (p = .335) Spearman's (*rho)* for the items of the 19-to- 65-year-olds survey: Critical values for the combined 15-to-18-year-olds and the opinionnaire surveys (n = 168, *df* = 166), the critical value was at (p = .152) Pearson's *(r)* and (p = .152) Spearman's (*rho)*. The accepted rule of thumb for hypotheses testing using the critical value permits the rejection of the null hypothesis if the test statistics are larger than the critical value. On the other hand, if the test statistic is less than the critical value accepts the null hypothesis. Furthermore, for the significance level, if the *p-value* is smaller than the significance level, reject the null hypothesis and accept the null hypothesis when the *p-value* is larger.

The pattern of the results is consistent with the constant comparative analysis related to the sub-variables such as “connectivity”, “resources”, “devices”, “reliable Internet”, “support system at home”, “location”, and “cost” as elements that impede the online learning process within public schools in Jamaica. Further to this, the theory arising from the datasets revealed that “impeding factors hinder increased access to learning via online classrooms especially in rural Jamaica”. Ouma’s (2021) study findings confirmed the same problems in several countries where unfavorable attitudes toward online learning were predominantly related to the impediment elements encountered during remote teaching during the COVID-19 pandemic. Some problems identified were distractions at home, poor Internet service, technological issues, a lack of computer literacy, and costs. The results further revealed that 66% in Indonesia responded negatively to online learning, 75.93% complained of issues with learning online, 71.6% believe online learning is more difficult than the traditional learning mode, 66% of students in Ghana have rated online learning negatively, and 77% of Pakistani learners express a dislike of online learning.

Additionally, the results from the content analysis provided confirmatory proof through highlighted elements such as “funding”, “training”, “Internet quality”, “resources”, “support”, “access” are some of the top themes identified within the dataset of the archived documents that could hinder online learning within the Jamaican public school system. Based on the evidence in the themes recurring frequently within the datasets of the archived reports, this has established that there are great deficiencies as it relates to availability and access, which underpin the foundation of the success of inclusive or

comprehensive online learning across the Jamaican public school system. In India, Kamble et al.'s (2021) study further identified similar elements restricting the online learning process, Internet connectivity was emphasized as negatively influencing learners' interest in excelling in online classes.

In the final analysis for research question 4 and hypothesis 4 employing a triangulation of the results from all analysis sources used in the study, the findings regarding the null hypothesis are rejected as the results indicated that there is enough compelling proof that "impeding factors are to a great extent responsible for a lack of comprehensive usage of online learning in Jamaican public education". Furthermore, there is overwhelming evidence in the descriptive analysis that shows most of the participants from Groups 1 to 5 *disagree*d and *strongly disagreed* with the availability of all the sub-variables linked to impediments to online learning.

The results also emphasized through those responses that there is insufficient provision for the achievement of inclusive offerings of online learning within Jamaican public schools, except for the willingness sub-variable which is the outlier within the sub-variable group. Similarly, the descriptive analysis has demonstrated a small dispersion of the standard deviations from the mean value relative to impediment items, which shows significant evidence of their impact on online learning. Finally, the constant comparative and content analyses both underscored several impeding factors resulting in challenges in the comprehensive offering of online learning.

4.6 Summary

This chapter has decisively questioned and clarified through the guidance of the research questions and hypotheses, the practicability of an online learning arrangement in the expansion of greater entry levels into training and educational courses, within the public education sector in Jamaica. Firstly, the discussion established the trustworthiness of the data collection process for the qualitative research approach within the concurrent nested research design, adopted for the study. Convincingly, the qualitative methodology employed upheld Lincoln and Guba's (1985) model in proving the trustworthiness of the study.

This was achieved through the establishment of credibility using data from different types of datasets (primary and secondary). Dependability was ascertained via the application of the Charmaz GT technique, which compared the results of the initial and later data collection and then analysed the results to test the consistency of the findings. Similarly, confirmability was sought through the examination of archived documents relative to the phenomenon against the results of the primary research findings. Moreover, transferability is illustrated as directions are presented to readers for the practicability of the findings from the research for application in practice at the primary, secondary, tertiary, and policymaking levels in the education sector of Jamaica. This is especially relevant to public institutions.

Secondly, the reliability and validity of the data gathered for the study were verified by means of criterion validity, confirmed through the mixed methods methodology utilized with the concurrent nested research design. This was established with the application of

two quantitative designs, descriptive and correlational, to provide opportunities for triangulation of the findings from the study. Furthermore, the validity of the research instruments (questionnaires) was validated using internal and external validity. This was achieved via a validity test of the instruments using Cronbach's alpha to test the standardization of the items contained in the questionnaires. The results show a (α = .831) and (α = .845) inter-item correlation respectively, for the questionnaires, showing the internal consistency among the items at a high to moderately high correlation.

Thirdly, the result of the study as it relates to each research question and hypotheses was obtained from the (n = 205) participants for the surveys, (n = 41) interviews, and (n = 20) archived documents reviewed. Participants were sought from all three counties in Jamaica and from seven (n = 7) of the (N = 14) parishes. Despite several challenges the sample contains five groups: Group 1 (Teachers). Group 2 (students), Group 3 (administrators), Group 4 (MoEY officers), and Group 5 (prospective students).

The participants in the different groupings were selected from the primary, secondary, tertiary, and MoEY offices. The descriptive statistics findings produced for research question 1 and hypothesis 1 a standard deviation with a moderately small dispersion from the mean in the datasets for the surveys. The correlation analysis indicated a weak relationship relative to the Pearson's *(r)* and Spearman's (*rho*) correlational coefficients. Additionally, the GT applying constant comparative analysis after data saturation produced an overall theory to associate "access to online learning as dependent on Internet connectivity, location, attitudes and competence of learners and teachers". On the other hand, the content analysis applied to the datasets of the archived

documents word frequency and weighted percentages demonstrated that recurring codes such as “resources”, “training”, “support” were some of the top concerns residing in the data.

The findings for research question 2 and hypothesis 2 revealed a relatedness between the attitudes of institutions and learners in the data. While Pearson’s and Spearman’s correlational analyses showed a weak relationship among the items analysed. Similarly, the qualitative findings using constant comparative analysis concluded that “attitudes towards online learning are influenced by cultural norms, affordability, and attendance to online learning*”.* Further to this, themes that were persistently occurring from the abduction of the archived datasets emphasized “attitude”, “feelings”, “negative”, “positive”, “impact”, “learning”, “online” in the top percentiles for the content analysis.

Research question 3 and hypothesis 3 produced outcomes for the descriptive statistics analyses of a moderately small dispersion of the standard deviation from the mean spread of the values situated in the data. Convincingly, the Pearson’s (*r*) and Spearman’s (*rho*) correlational coefficients demonstrated a moderate relationship between the variables paired for abduction. Comparably, the constant comparative analysis following saturation presents a final assumption resting in the datasets that “engaged learners in online classrooms depend on available support systems, resources, computer literacy, and infrastructure at the various levels of education”. The content analysis identified several recurring codes highlight the significance of the engagement

of learners in online classes. These were “access”, “learning”, “support”, “Internet”, “resources”, “training”, “online” which fell within the upper percentiles in the results.

Likewise for research question 4 and hypothesis 4, the findings uncovered after analysis indicate, for the descriptive statistical analyses a moderate dispersion of the standard deviation from the mean values representing items within the datasets. The correlational analyses, however, showed a significant relationship for Pearson’s *(r*) and Spearman’s (*rho*) coefficients respectively, between the variables relative to impeding factors against the success of online learning. Prominent in the results from the qualitative analysis for research question 4 is the concluding assumption that “impeding factors hinder increase access to learning via online classrooms, especially in rural Jamaica”. Correspondingly, the content analysis results indicated that the most common themes point to the final theory that “negative attitudes, Internet connectivity issues, lack of support culminates into many struggles in the offerings of online education”.

In summary, the salient aims of the present study were to establish a measure of the usefulness of online learning within the public education system in Jamaica by supplying a greater number of options to learners for accessing training and educational courses. Further, to ascertain whether online learning classrooms provide quality lessons and uncover any factors impacting their success. Several important findings have surfaced that can have significant implications for the implementation and continued offering of online learning in Jamaica.

Regarding providing increased access to schooling, the conclusion drawn after triangulation of the results from the quantitative and qualitative data analysis is that online

learning can provide increased access though currently it might not be feasible. Significant findings in the study related to access have illustrated that there is a lack of equity in the distribution of ICT infrastructure, predominantly in the rural areas of Jamaica. This problem further impacts reliable Internet connections and the ability for students to attend online classes. Although, evidence is presented in the results that suggests that online learning could be feasibly used at the continuing, skills, and tertiary education levels. Nevertheless, a hybrid model may be more practical at the primary and secondary levels.

The research did not find any notable difference between schools and learners' attitudes in connection to online learning. There were several plausible explanations highlighted in the study's outcome; there was agreement about the willingness to learn online, that it improves performance, and the capacity for offerings. Additionally, the groupings in the datasets disagreed with the ability to distribute equitable online learning opportunities and noted a preference for traditional learning over online learning. Adequate evidence was produced to agree or disagree with this assumption. Consequently, the null hypothesis for research question 3 was rejected.

The findings for research question 4, "Are impediments hindering the progress of online learning within Jamaican public schools? Indicate that the null hypothesis is rejected as the results show that impeding factors such as "power outages", "lack of funding", "poor Internet service", "inadequate resources" restrict the development and advancement of online learning for inclusive delivery for public institutions across Jamaica. Unreservedly, the results have demonstrated that online learning can be used

to extend access to learning and can engage learners. However, the impeding factors associated with online courses, have suggested that an inclusive offering is not feasible nationally currently. Though, at the continuing and tertiary levels of education much growth in enrollment in training and educational programs could be achieved. In contrast, at the primary and secondary levels, a hybrid model may be adopted until the impediments can be eliminated or reduced.

CHAPTER 5: IMPLICATIONS, RECOMMENDATIONS, AND CONCLUSIONS

5.1 Introduction

The education system within Jamaica has been hampered significantly by literacy issues in primary education (Bourne & Owen-Wright, 2018b), high dropout rates at the secondary school level (McLean, 2020; Myrie, 2017) and a low percentage of high school graduates enrolling in higher education or post-secondary education (Barrett-Adams & Hayle, 2021). Further, there is a need to provide opportunities for continuing education for the individuals who fall into the dropout group. An extension to this problem is the provision of convenience to continuing education and tertiary education in terms of location, cost, and access. More evidence of the issue related to the equitable distribution of educational opportunities in Jamaica was shared by Blackman **(**2021) and Gordon et al. (2021) in recent studies which reported that the COVID-19 pandemic has brought to the fore the need to use other learning modalities to supplement the traditional face-to-face mode of learning. Consequently, there is a need to close the gap in learning delivery that has been revealed by the digital divide within the country.

Arghode et al. (2017) and Mayer (2019) deemed online learning a viable method that can be used to provide the necessary compliment to face-to-face delivery and the physical classroom. Their findings suggest that there is a need to determine the feasibility of this approach within the Jamaican public school system. Hence, the underlying assumption upon which the positioning of the study rests is the assertion that online learning can increase access to training and educational programs within public schools in Jamaica. The main intention of the study was to ascertain to what extent online learning

can be used to broaden the opportunities for entry into schooling and to determine whether learners can be engaged in learning through online classrooms. Additionally, the purpose was to establish whether there were any elements that would interfere with the comprehensive implementation of online learning within the public education system in Jamaica.

Accordingly, this study was designed to combine quantitative and qualitative methods to permit triangulation of the results and present rich data from which reliable and valid judgements could be developed and presented. Dawadi et al. (2021) and McKim (2017) support the value of the mixed-methods approach in providing more scholarly rigor and meaningful insight into the problem of interest. Most importantly, it offers redress or countermeasures to the limitations of the quantitative and qualitative methods during the research process. Moreover, the use of a mixed-methods approach allowed the activities of the study to be guided by the pragmatism ideology and the employment of abduction in extracting results from the data collected.

The current study sought to address a phenomenon present within the education sector that suggests a pragmatic approach in the search for solutions. Mitchell A. (2018) and Pham (2021) asserted that the fundamental objective of education viewed through the lens of the pragmatism ideology, emphasized scholarly procedures based on informed practice that can be applicable in the real world. Therefore, data uncovered during the research process was collected and analysed using statistical measurements as well as qualitative measures. This offered a voice for the participants to share their experience and understanding of the phenomenon and provided the opportunity for

objective measurement of the problem. Most importantly, empirical, and rich data were gathered and analysed to afford the extraction of reliable findings through triangulation across the different data collection methods used during the research process. As prominent in the literature, recent research such as Kamau's (2022) study revealed that some difficulties associated with ICT programs may be related to inadequacies indicative of implementation, maintenance, and control issues. The study further suggests that the pragmatism approach is best for uncovering solutions for practical application to the problem.

In view of the research methodology three designs were employed within a concurrent nested research design. These were the descriptive, correlational, and grounded theory (GT) designs. Though it should be noted that the research intention was to examine public education within Jamaica, at the primary, secondary, and tertiary levels. Furthermore, based on this design, the study utilized both quantitative and qualitative methods at the data collection and analysis stages. Equally important, were the ethical obligations that underpinned the procedures for the selection and recruitment of the research sample. First approval was sought and received from the research governing body, which is the Unicaf Research Ethics Committee (UREC). Next, informed consent was sought from the participants and respondents. The gatekeepers were informed of the research, and no objections were raised before the study convened. The sample population consisted of Group 1 teachers, Group 2 and 5 students, Group 3 school administrators, and Group 4 Ministry of Education and Youth (MoEY) officers. The participants and respondents served were either enrolled students, prospective students

or education leaders who worked at the primary, secondary, or tertiary levels of education and worked in MoEY offices.

This chapter, discusses the implications of the study, first detailing the theoretical implications. This outlines whether the findings from the study accept or reject the null hypothesis that online learning can be used to increase access to training and educational programs within the public education system of Jamaica. In juxtaposition, if the null hypothesis is accepted, then it cannot be employed in providing a greater number of learners to partake in schooling. Secondly, the practical implications have highlighted the actual outcomes resulting from the study as it relates to online learning and the larger enrollment numbers of learners within public schools in Jamaica. The discourse describes the feasibility of online learning offerings at the primary, secondary, and tertiary levels of education in Jamaica. Thirdly, future research recommendations are put forward for responding to gaps identified within the current research.

5.2 Implications

The implications of this study have provided the necessary information to guide the expansion and further implementation of online learning offerings in the public education system of Jamaica. Furthermore, it has offered research-informed strategies to identify elements of constraint impacting accessibility and the provision of these virtual classes. Consequently, the study has identified ways to measure online learning by affording learners more options for gaining access to learning. Other countries have also used research to determine online education prospects and their convenience for the enhancement of and increased opportunities for learning. Adnan and Anwar (2020) have

used their study to determine the value of online learning in Pakistan. The findings revealed that it is very difficult to use online learning as an alternative way for schooling in Pakistan which is a developing country. There were major issues with accessibility and affordability, with 78.6% believing face-to-face classes were more suitable for learning than the online mode. Beer (2019) also conducted a study to measure the effectiveness of online learning in the United Kingdom (UK). The findings reported significant patterns of behavior in online learning for practical application through relevant success rates at the various stages set for competency attainment.

Similarly, the findings from this study have identified some important implications that are significant to the Jamaican context of online education, for which several key patterns were confirmed. Firstly, implications for the theories in the conceptual framework: (1) the behaviorism learning theory resonates with the belief in operant conditioning for improving learning during online classes. This is activated using the gamification strategy for drill and practice during online learning to engage learners and support self-paced learning, thereby responding to the varying learning needs of the student. Additionally, the provision of enrichment lessons through virtual learning can support the conditioning of learners (Darwish et al., 2021; Malik, 2021). Therefore, the findings have suggested that the adoption of the behaviourism principles by ensuring that the right stimuli are inputted into the learning environment at all levels of the public education system in Jamaica. Additionally, there is a need to set learning standards to be obtained during online learning, specifying the resulting rewards or punishments for all stakeholders. By

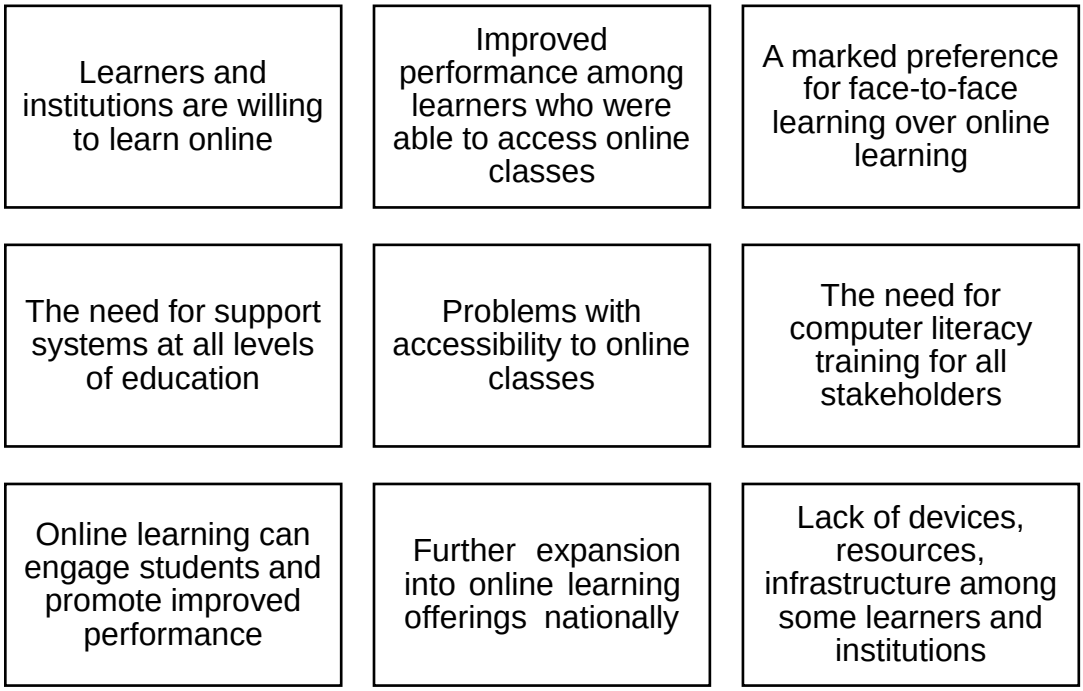
way of examples, the use of a national LMS, qualified instructors, adequate resources, and regular maintenance and upgrading are mandated.

Comparably, (2) the connectivism learning theory emphasizes the importance of machine learning in improving performance and learners' engagement which is offered through virtual classes. Further to this, online learning affords an education system by way of equitably distributing educational resources and the provision of networked learning communities. Another implication related to the connectivism theory is that the maintenance and upgrading of learning connections are paramount to preventing challenges with accessibility to online learning (Boyraz & Ocak, 2021; Downes, 2019). The connectivism theory may be used to direct how information resources are acquired and shared among all public schools in an effort to solve the inequality problems relative to the distribution of resources for online education. Furthermore, it could provide the basis for identifying intentional benchmarked digital resources pertinent to the success of online learning across public primary to tertiary schools in Jamaica. For example, content curation software, education enhancement software, and networked information sources.

Secondly, there are implications for practice for policymakers and other stakeholders (see Figure 5.1). Most importantly, the findings from the study may be used by policymakers, educational leaders within schools, students, and parents. This may be employed to activate interest in using, expanding, and appreciating the value of online learning as an alternative to face-to-face schooling.

Figure 5. 1

Implications for Practice



5.2.1 ications for Theory

The findings of this study support the assertion that online learning can be used to increase access to schooling and that learners and institutions are willing to engage in online learning. Bettinger and Loeb (2017) support this assertion using evidence from the USA where universities, colleges, and K-12 schools have seen increases in enrollment resulting from online learning. Zylfiu and Rasimi's (2020) study which was conducted in Kosovo reported that 95% of teachers agree that online learning provides access to schooling. Farrand and Wells (2019) further corroborate that online learning is seen as a useful method for bringing an alternative classroom to more learners. Additional evidence was further illustrated in the results of the current study that those students who were able

to access online learning also reported improved performance. This was further corroborated by the theory developed from the constant comparative analyses relative to each research question, which has indicated that the success of online learning is dependent on the provision of ICT infrastructure, resources, trained staff, computer-literate learners, and support systems.

O'Doherty et al. (2018) and Queiros and de Villers (2016) findings confirm that online learning success is hinged on support systems, learners with connectivity issues being given assistance, learners and instructors requiring training in computer literacy, and the availability of learning resources. In this study the evidence derived from both the quantitative and qualitative data suggests that all groups within the sample agreed that schools within the public education system: primary to tertiary levels can provide online learning. However, currently, because of connectivity issues, location, unreliable Internet service, affordability, inadequate resources, and location, it is not comprehensively feasible. O'Doherty et al. (2018) and Queiros and de Villers (2016) further cited these same issues in South Africa and many other countries where connectivity issues and other barriers prevented and limited some learners' access to online learning.

There was also significant proof manifesting from the results that primary school teachers and administrators agreed that online learning at the primary school level is not effective unless there is a conducive learning environment and parental support for these learners. This is supported by Corbett and Spinello's (2020) study which postulated that one of the premises of the connectivism theory asserts that for online learning to be successful, sustenance and support for the different learning networks are imperative. To

add to this, at the primary school level, findings are supported by the behaviorism theory. Pange and Pange's (2011) study revealed that learning can be observed through learner attitudes that are influenced by external factors, or, in this case, the online learning environment. For example, how stimuli such as connectivity, parental support, and learning communities impacted various responses from students in the virtual classroom.

Mahmud et al.'s (2018) work affirmed that the main premise of the behaviorism learning theory emphasizes the way learning is attained, that is, the use of a constant modification of the learning environment that can be controlled by the teacher as well as the learner. The behaviorism learning theory also promotes individualized demonstrations of learning and responses through educational software applications. These are used to enhance learning by meeting prescribed objectives through the employment of the online learning modality. In contrast, limitations reported by teachers and administrators at the secondary level retard, this process as in some homes, learning through online classrooms was hindered by connectivity issues.

Further, the outcomes of the current study have established online learning as a valuable way of providing learners with greater access to training and educational programs at the continuing and tertiary levels of education. Therefore, online learning can be used at this level of education as it offers self-directed and machine learning associated with drill and practice to assist mature learners. Stewart (2021) postulates that the ability of online learning to engage learners is demonstrated through the behaviorism ideology, which employs lesson activities that provide the learner with self-paced learning towards the attainment of learning goals. Additionally, there is supplemental learning

available via platforms in the online classroom that can be used to provide immediate feedback (chatrooms, live lessons) central to achieving specific lesson targets. Similarly, the utilization of drills and practice offered through videos and smartboards aid retention activities as part of online learning.

Further, Corbett and Spinello (2020) assert that the connectivism learning theory developed by Siemens (2017), has corroborated the need for learning offered through training and educational programs, to be liberated and enhanced by online learning. Justification rests in its ability to allow the formation of alliances between key learning stakeholders and the leveraging of a networked classroom setting, which uses technological platforms and applications. These networked classrooms form valuable educational linkages among (1) the learners, (2) education sources, and (3) educational practitioners in responding to varying learning styles and the needs of students. Moreover, some proportion of the current study's results highlighted the connectivism learning theory premises, which upheld that online learning provided Group 1 teachers with easy access to learning resources such as videos and learning games, convenience for exposure to resource persons, and access to real-life examples of learning content within the virtual classroom.

Similarly, Groups 2 and 5 students alluded to the value of using chatrooms, videos, eBooks, and online libraries for lesson reflections and review in enriching their learning experiences. This was found by the participants and respondents to be essentially related to the improved performances of those learners who were able to access the online learning classrooms. Williams et al. (2016) support the idea that machine learning such

as instructional videos and other online learning resources, may improve students' performance. Equally important, the outcome from the study also alluded to online learning capacity in increasing access to tertiary and continuing education by all groupings within the sample in both the quantitative and qualitative results. Again, Reese's (2015) study evidenced the relevance of the connectivism learning theory within the theoretical framework for the study. This is revealed in the findings that the connectivism learning theory emphasized (1) self-paced learning, (2) diversification of learning resources and sources, and (3) the use of networked learning communities which promote new and current knowledge acquisition, conveniently made possible via online learning opportunities.

Therefore, the theoretical implications regarding online learning and increased access to training and educational programs provide evidence to support the notion that online learning is viable. Downes' (2019) study supports this notion that the connectivism theory of learning has the ability to inform learning individually, as well as, within networked communities using online learning. This can be achieved by creating smarter public schools in Jamaica that harness new methodologies and modes of learning, and provide more convenience and space for learners to tap into knowledge.

MacLellan's (2022) study also corroborates the value of the connectivism learning theory for intentional interventions in education towards benchmarking learning expectations to suit the digital era. The connectivism learning theory was found to be essential in connecting students to learning communities through many information resources that would be successfully accessible in normal and crisis learning situations.

The importance of the inclusion of the premise of the connectivism learning theory is to help minimize or eliminate learning losses for students in the event of an unforeseeable event disrupting regular classes.

Dziubaniuk et al.'s (2023) study further supports the relevance of the connectivism learning theory for the use of digitization tools for educating students and assisting teaching practitioners in designing learning environments geared towards achieving an improved performance rate among students. This was identified as attainable through the connectivism learning premise, whereby learning takes place through many and diverse information sources that can be continuous and adaptable in nature to fit the fast-changing pace of information validity currently.

Kilag et al.'s (2023) study probed blended learning classes and whether the connectivism learning theory principles are applicable and useful. They have discovered that at the secondary level of education in the Philippines learners who were engaged in learning that was organized utilizing the connectivism learning theory guideline exhibited more favorable performance rates. This was a marked difference compared to those students who were engaged in the experiment employing traditional learning strategies. The conclusion drawn from the study was that the administration of connectivism learning theory principles as a guide in designing learning situations has great value for education.

Coupled with this, the behaviorism theory of learning compliments the online learning environment as purported by Masethe et al.'s (2017) study, through the provision of avenues for immediate feedback and reflection related to lesson content. Mahmud et al. (2018) further claimed that learning can be attained through the use of different

learning experiences, such as virtual learning. This is emphasized by the behaviorism ideology, which ultimately can provide learning attainment predictions.

5.2.2 ractical Implications

5.2.2.1 Research Question 1. What is the Relationship Between Online Learning and Increased Access to Training and Education Among Learners? Hypothesis 1: Online Learning Will Not Increase Access to Training and Education Within the Public Education System in Jamaica. The triangulation of the findings from both the quantitative and qualitative analyses related to the five groupings within the sample studied has highlighted the following barriers to accessing online learning:

- connectivity issues
- affordability
- unreliable Internet service providers
- deficiencies in computer literacy
- inadequate support systems
- theft of ICT materials
- lack of ICT infrastructure
- inequality in the provision of government aid for online learning

These were especially evident in the rural areas of Jamaica as major barriers to the inclusive provision of online learning. These barriers are examples of external stimuli that can negatively impact the learning process. The behaviorism learning theory contends that negative stimulus may produce learning losses while the provision of positive stimulus through the necessary support systems can achieve lesson targets

using virtual learning (Malik, 2021; Stewart, 2021). In addition, Boyraz and Ocak (2021) assert that the connectivism learning theory cautions that multiple network connections are necessary to provide knowledge to learners, and success is reliant on the implementation and maintenance of these learning connections.

Consequently, these findings show that corrective measures must be applied to any further support for online learning by increasing access to training and educational programs within the public education system at the primary, secondary, and tertiary levels. Undoubtedly, if online learning is to achieve its full potential in delivering greater numbers of entrants to schooling, these issues need to be addressed at the community and national levels. Furthermore, the findings suggested that the public education system can currently use online learning to create greater access to schools. Although specifically, improvements to accessibility can be used to provide further opportunities for primary, secondary, continuing, and tertiary education for those learners who are predominantly not residing within the cities and parish capitals.

Additionally, the current study has highlighted new outcomes from the analyses relative to online learning at the primary level, which reported an overwhelmingly negative attitude towards online learning at this level. The concerns shared allude to a learning gap with specific issues related to the need for parental support during online lessons for primary school children. Cui et al.’s (2021) study asserted that about 36% of caregivers struggled with assisting their children in online classes and most learners received low assessment grades in some parts of China. The implication is that most learners at the

primary level are not mature enough to practice independent learning and require assistance with learning online.

Danchikov et al.'s (2021) study further confirmed this as the findings report several issues affecting online learning success. Seventy-two percent of participants report problems with distraction at hom; 60% feel isolated; and 62% fail to balance lesson demands during virtual classes. Hence, the findings in this study have proposed a hybrid modality, a unanimous response presented for a successful implementation of online learning at this level. Gilbert (2015) and Powell et al. (2015b) validated this notion that there is value in using a hybrid modality. Their study reports that approximately 75% of school districts in the USA use this approach for credit recovery, enrichment education, and self-paced learning. This was nonexistent during the face-to-face learning mode.

Correspondingly, at the secondary level, though some students were mature enough to engage in online learning, they did not have a conducive learning environment that was free of distractions from family members, noisy background, and additional responsibilities during online learning hours, which is vital for learning online (Danchikov et al., 2021). The results from most of the groupings within the current study's sample report many distractors which prevent secondary school level learners' engagement during online learning classes and result in learning losses. The hybrid modality is also suggested for this level of education.

5.2.2.2 Research Question 2. What are the Differences in Attitudes Between Learners and Public Education Institution Leaders Toward Online Learning Within Jamaica? Hypothesis 2. There are No Differences in the Attitudes Among Learners and Public Education Institution Leaders Toward Online Learning within Public Schools in Jamaica. The results from a comparison of the quantitative and qualitative analyses revealed no notable differences in attitudes of learners and public education institution leaders regarding online learning within public schools in Jamaica. Most of the responses after analysis point to a preference for traditional face-to-face learning, largely indicative of the challenges encountered with poor Internet service, connectivity issues, and a lack of devices and resources. Cui et al.'s (2021) study also revealed that 94.9% of caregivers and 93.5% of learners want to revert to traditional learning modalities. However, it should be noted that the majority of the groupings in the current study believed that the public institutions in Jamaica have the capacity and willingness to offer online learning.

This was corroborated in Cui et al.'s (2021) study which reported that 77.9% of parents and 73.9% of learners in China expressed satisfaction with their experience with virtual learning. Subsequently, the performance of learners and access to learning can be improved using online learning. Yet, a significantly large percentage of the participants and respondents in this study do not recommend inclusive online learning for Jamaican public schools presently, unless connectivity and other issues are addressed. Especially at the primary and secondary levels. Though a small percentage of the participants in Groups 1, 2, and 5 prefer the online learning modality, in contrast,

Group 4 disagrees with this modality for primary, skills training, and some secondary learners. Again, a hybrid modality is suggested as being a more realistic approach.

5.2.2.3 Research Question 3. Is There a Relationship Between Online Learning Classrooms and Quality Training and Education? Hypothesis 3. Online Learning Classrooms May Not Engage Learners. The findings report that students who were able to connect to the online classrooms were engaged in diverse learning sources, which include applications of educational software, video conferencing with resource persons, and virtual field trips, to name a few. Meylani et al.'s (2015) study supports the findings from this study that online learning can be utilized to enhance the teaching practitioners' ability to effect improvements in the level of learning gains during lessons. Similarly, Goldie's (2016) study concurs with the current study that the connectivism learning theory is supported, specifically the premises that suggest learning resides in technological gadgets and software applications. Additionally, the connectivism learning theory also promotes the use of multiple sources of learning to enrich and increase new knowledge for learners when exposed to several networked learning communities.

Meylani et al. (2015) also cited drill and practice learning via educational software applications and gamification as positive reinforcement for the brain to retain information and improve critical thinking skills. Although, in the current study issues with a lack of devices, connectivity issues, unfavorable learning conditions at home, and computer literacy were noted among a percentage of instructors and learners to have presented challenges with engaging some learners. Therefore, corrective measures must be

implemented, including proper funding, monitored support systems, and updates regularly, in order to unlock the full potential of the online learning modality for engaging learners in the public schools within the Jamaican educational system.

5.2.2.4 Research Question 4. What is the Relationship Between Impeding Factors and the Comprehensive Use of Online Learning for Access to Education? Hypothesis 4. Impeding Factors are Not Responsible for the Lack of Comprehensive Usage of Online Learning Within Public Schools in Jamaica. Impeding factors such as power outages, lack of infrastructure, unreliable Internet service providers, theft of ICT materials, inadequacies in computer literacy, location, funding, socio-economic status, cultural norms in schools, and a lack of support systems were among the challenges encountered in the implementation and continued offerings of online learning at all levels of the education system. Yet, Roddy et al.'s (2017) study findings revealed that one benchmarked practice for successful online learning is developing the school's ability to competently offer online lessons. Their study further suggests that training instructors through continued professional development (CPD) is another key factor. Gilbert (2015) also suggests that closing the digital divide between lower- and upper-class status can result in greater access to online education.

Therefore, the deterrents and hindrances to the comprehensive offering of online learning must be fixed and programs introduced to train both instructors and students inclusively (rural and urban areas). In Jamaica, some programs have been implemented to address some of the challenges. However, a more comprehensive approach is needed

that takes into consideration the specific needs of schools and their unique learning environment, location, and level of education. One solution will not suit all situations.

5.2.3 Implications for Practice of the Addition of New Knowledge

This study's findings have presented new data that can be used to design bespoke programs and assist educational policymakers and executives in partnering with pertinent information and communications technology (ICT) companies. These relationships and decisions are ongoing, but new discussions should convene with a more concentrated approach to devise action plans that remedy the inequities in implementation, distribution, and maintenance of the ICT infrastructure; a move necessary to bring equitable opportunities for accessing online classrooms irrespective of location within Jamaica. Plummer et al.'s (2021) study findings affirmed the importance of these community partnerships used in Canada for higher education institutions and the need to evaluate their effectiveness. These partnerships are seen as essential to the successful provision of resources and responding deliberately to local needs. Zollinger and DiCindio (2021) revealed that in some parts of the USA networked community partnerships such as museums played a vital role in assisting underserved communities in accessing online learning.

In Jamaica funding for ICT was provided through the Universal Service Fund (USF) where free Wi-Fi was made available at key points around the island to facilitate the availability of the Internet. However, the study's results highlighted the inadequacy of these access points and that there was insufficient power in most of the areas with affordability issues. Palau et al. (2021) found similar findings where the digital divide was

more pronounced in rural Spain and in the public education sector. Additionally, the results from this study identified issues with the capacity of users that these networks can facilitate that need addressing. Furthermore, while some schools have access, the Internet service is unreliable due to the compatibility issues of the infrastructure used relative to the differences in the physical terrain islandwide. The study's findings suggest that there has been no differentiation among ICT needs in the cities or among schools in the rural areas. Therefore, the individual needs of the different schools based on location and school-level needs should be revisited to ensure equity between rural and urban institutions.

Valuable information was also discovered related to the offering of online learning to primary school learners as it relates to the existence of social problems that could impede the process. Social problems such as lack of proper parental support, affordability, lack of computer literacy, and other social problems that learning at home may attract and increase. At the high school level, cultural norms connected to learning such as seeing schools only as a physical place outside of the home, have contributed to secondary students' casual attitude toward online learning. This is seen in their attitudes toward online learning as they are working or performing chores during the virtual lesson-timed hours. Findings from a study by Barrot et al. (2021) corroborate that several factors limit the progress of online education. These were unmasked during the COVID-19 pandemic and include few resources, inadequate ICT infrastructure, and distractions in homes relative to virtual learning.

Consequently, there is a need to design programs to sensitize parents and guardians as to the correct procedures and expectations for successful learning for their children during online sessions. Furthermore, there is currently provision for online learning at the secondary level for preparation for external examinations. However, there is a need to revise the program to include credit recovery for failing learners as well as opportunities for learners who have previously dropped out of formal education, giving them an opportunity to continue their education and achieve their high school diploma Powell et al. (2015a) support this notion. In addition, to correct the connectivity issue, immediate attention is needed to provide a more comprehensive distribution of free Internet access points. This may facilitate a more successful inclusion of learners from lower socio-economic backgrounds with affordability issues in online learning.

A surprising discovery unearthed by the study was that online learning at the tertiary level was in its developmental stages for the majority of tertiary institutions, based on the limited number of responses from that group in the sample. There may be a problem of a lack of competency among teachers at the secondary and tertiary levels in the practice of online instruction as these were reported to be barely adequate. Danchikov et al.'s (2021) study also discovered the same issues associated with online learning. Similarly, Garzon-Artacho et al. (2021) report very low teaching competencies in instructional technologies and difficulties training technology savvy instructors. Further studies using a purposive sample could reveal more concise results. Hence, a concentrated effort must be made by educational managers and policymakers to train teachers in the dual modality of executing their practice. Their competencies should be in

the traditional and virtual teaching and learning environments. Most importantly, enforce mandatory inclusion within teacher training programs, and continuous professional development for teachers nationally.

Finally, the emergence of the COVID-19 pandemic has shown clearly that education managers and policymakers in Jamaica should implement a national platform custom-made to suit the learning needs of Jamaican learners with differentiation strategies to fit each level of education, as well as the cultural and social norms practiced. The learning communities such as e-Learning Jamaica (e-ljam), Primary Exit Profile (PEP) Book, Book Fusion, Educate Jamaica 2.0, and MoEY eResources App should be powered collectively as standardized learning benchmarks for learners within the public school system within Jamaica. This can be achieved via the national platform for easy and increased access to training and educational programs irrespective of location and economic status.

5.3 Recommendations for Application

The Jamaican public school system has been plagued with a percentage of illiteracy at the primary level, dropouts at the secondary level, and a large percentage of graduates who simply disappear after completing high school without enrolling in a tertiary institution or continuing education (Barrett-Adams & Hayle, 2021; Bourne & Owen-Wright, 2018b). Further, a problem exists with high dropout rates in the CAP program, which was created to assist dropouts and at-risks youths (McLean, 2020). Consequently, the study hypothesized the use of online learning within the public education system as a way of eliminating or reducing the problems outlined above.

In this study, the results suggest that online learning can be used to increase access to training and educational programs within the public education system in Jamaica. However, there is a major problem with connecting learners to these online classes. Furthermore, learners are experiencing difficulties in accessing the education resources that have been made available through the educational software applications and the learning management systems. This problem was also revealed in the studies by Mohan et al. (2020) and Crawford et al. (2020) where several institutions lack the proper infrastructure to host online learning in Jamaica. Correspondingly, Hibbert (2020) and Crawley et al. (2020) also associate inefficiencies in Internet connection and the absence of resources with access issues, impacting many students in Jamaica, who are experiencing a learning gap.

5.3.1 mendations for Application

5.3.1.1 Research Question 1. The findings from the study have uncovered the existence of a major problem with connectivity issues, especially in rural areas. This would be counterproductive to the success of the offering of online learning in response to increasing access to training and educational programs. Additionally, the results have demonstrated several setbacks in the implementation of inclusive online learning in Jamaican public schools. In some instances, there is no provision of ICT infrastructure to connect learners to online learning. This problem is not restricted to Jamaica. In the United States of America, about 50% of learners of low economic status were unable to access an Internet connection for online classes (Trust-West, 2020). It should also be noted that, though the connectivity problem persists, in some areas of Jamaica, the

infrastructure is present (Dunn et al., 2016c). However, it is inadequate and in need of upgrading and proper support systems for efficient deployment, which is central to providing greater access to schooling. George's (2015) and Morris and Henderson's (2017) studies also corroborated this as a dilemma in need of attention.

Additionally, the results highlighted problems with the theft of ICT infrastructural equipment in some areas of Jamaica. Even though there are currently partnerships with several service providers in respect of implementing Internet connections within the public schools, the theft issue is hindering the process. Furthermore, the partnership arrangements lack an agreement related to regular maintenance of the ICT investment in education. The results also indicated that widespread power outages across Jamaica have been impacting the reliability of the Internet service. Another finding has also revealed that, in respect of the national provision of free Wi-Fi via an arrangement with the USF(USF, 2021a), the distribution of this service is not inclusive enough to allow comprehensive access nationally. Bleeker (2019a) further corroborates this problem and associates it with the lack of intentional policies established to ensure strategic demands for national distribution and maintenance of the USF's access points, which have not been a priority.

5.3.1.2 Research Question 2. Triangulation of the results from each type of analysis culminates in a conclusion that attitudes regarding online learning are influenced by external and internal elements directly impacting both the learners and the schools. One of the major elements impacting online learning was accessibility, which is a vital component of the connectivism learning theory for learning success. Wordu and Azery (2021) postulate that learning which is guided by the connectivism learning premise necessitates networking through multiple linkages in virtual classes. The results from the qualitative analysis demonstrate through the overall theory related to Research Question 2 that online learning successes are dependent on culture, cost, and learners' and institutions' preferences. Bleeker's (2019a) study concurs, reporting that although the Internet service is available, the opportunity to access it, is restricted based on cost, computer literacy, and available resources. Therefore, a convincing conclusion can be drawn that there were no significant differences in attitudes among institutions and learners towards online learning.

Yet, there is a need to improve the adequacy of the supply of online learning to curb negative attitudes regarding recommending online learning across Jamaica. This may be achieved through the equitable implementation of ICT infrastructure and the unified efforts of the partnerships among the MoEY, the Internet service providers, and the power company in Jamaica. On the other hand, programs should be developed to promote the best practices for online learning for learners, parents, and institutions. This recommendation is highlighted by the connectivism learning theory as an essential factor in the progress of virtual learning. These programs should be used to eliminate biases

toward online learning efficacy versus the traditional method, in an effort to sensitize the Jamaican public. In India a study conducted by Malhotra L. and Bhatia (2021) revealed similar programs that were promoted by the government in conjunction with the national association for instructors and other stakeholders to provide user-friendly support systems for online learning. Considering the problems associated with online learning, a hybrid model should be equitably rolled out, at all levels of education until an inclusive virtual education offering is reached.

5.3.1.3 Research Question 3. The data analysis found evidence that there are inadequacies in the distribution and availability of resources and the quality of instructional techniques used to engage learners during online lessons. The findings in this study related to Research Question 3 have emphasized the point that online learning can engage learners in Jamaican public schools; therefore, engagement can be further enhanced if the deficiencies are amended. Furthermore, Lancaster (2019) also verified that there is a significant problem with the supply of resources for online learning in Jamaica.

Based on the evidence presented, the existing programs in place to support online learning and resources require more funding and an intention to ensure a national distribution to learners and educators. Undoubtedly, this move should be made to support online learning at each level of education by employing deliberate design development for online classes. These should be commissioned specifically for the fundamental needs and categorically acknowledge the different exigencies relative to each level. Given the centrality of the issue of engagement to the success of online learning, programs for

computer literacy must be made mandatory for each learner at all levels of education. In the Pacific Islands, this point is corroborated in a study carried out by Reddy et al. (2021) where the findings report the need for computer literacy interventions, which were remedied through the application of the digital literacy programs such as digilitFj and the Digital Literacy Intervention Program (DLIP) for all stakeholders in education. In Jamaica, this should be matched with that of numeracy and literacy, as there is overwhelming evidence of a lack of computer literacy among all stakeholders within teaching and learning. Most importantly, there must be a more intentional application of training for instructors and educational managers in the practice of both online and traditional instruction and administration. At the primary education level, where the results highlighted a major problem in engaging learners as a result of a lack of supervision, the recommendation is the provision of public learning centres, manned by MoEY teacher's aides, to support the young learner in the absence of their parents. Finally, the development and implementation of a learning management system using educational resources tailored to a Jamaican context for education is recommended.

5.3.1.4 Research Question 4: What is the Relationship Between Impeding Factors and the Comprehensive Use of Online Learning for Accessing Education?

The findings identified several impeding factors. A description of the problems encountered was in relation to the inadequacies in: (1) electricity service, (2) resource availability, (3) reliable Internet service, and (4) ICT infrastructure across Jamaica, which were notable. Similarly, Watson (2013), Miller P. (2015), and Kelly-Williams et al.'s (2017) studies confirmed that impeding factors impact the widespread use of online learning in Jamaica. Moreover, the findings from the analysis emphasized inadequacies in the supply of resources, reliable Internet service, and the equitable implementation and maintenance of ICT infrastructure to support online learning. The constant comparative analysis findings verified this evidence as the concluding theory developed directed attention to elements which limit the offering and expansion of virtual learning. It is also prominent in the literature review that the online learning initiatives in Jamaica are limited and lack comprehensive coverage of all areas (e-ljam, 2020; Hamilton, 2010).

Unreservedly, the results provided confirmatory evidence to justify the urgency of government intervention programs. Similarly, it is vital that more support be solicited, with recognition of the accountability of the power company, Internet service providers, and further community partnerships, to ensure quality service. As was mentioned above, the current programs in operation to assist with the distribution and procurement of resources should be improved. Hence, these projects must be more purpose-driven regarding

equity, maintenance, and adequacy of the resources, as currently there is a lack of efficiency associated with the agencies tasked with managing these schemes.

5.3.2 Application for Education Leaders

Together, the results of the quantitative and qualitative research findings have confirmed that the connectivity problem must be addressed. The quantitative analysis results report inefficiencies in connectivity, unreliable Internet service, and support systems, to name a few. On the other hand, the qualitative analysis produced a concluding theory and asserts that access to online learning is dependent on Internet connectivity, location, attitudes and competence of learners and teachers. Therefore, the Jamaican government, education managers, and policymakers must first procure enough funding to implement and provide: (1) ICT infrastructure in all institutions, (2) proper support systems, (3) maintenance, and (4) security of the ICT infrastructure, if online learning is to be used to increase access to schooling. Price's (2016) study has also established the emergence of these interventions from education leaders. Further to this, there is a need to sensitize the Jamaican public through programs in respect of the value of preserving and protecting national infrastructure, especially those geared towards education.

Another recommendation is the necessity of injecting more funding into the USF initiative to provide a more comprehensive distribution of these access points and to categorically assist those learners with affordability issues in maintaining access to an Internet service. The partnerships with Internet service providers need to be strengthened for more efficient service. Also, an additional partnership is necessary with the power

company to alleviate the frequency of power outages that are impeding the process. In addition, the allocation of ICT infrastructure should be equitably distributed across the different parishes in Jamaica if increased access to training and educational programs within the public school system in Jamaica is to be attained nationally. Hernandez's (2017) and Sulaiman and Halamy's (2021) studies have endorsed that national implementation is imperative for unlocking the full potential of online learning and increasing access to education.

5.3.3 Recommendations for the Primary Level of Education

At present, based on the results of the study as it relates to primary education, the suggestion is a hybrid model with the inclusion of asynchronous learning, for primary school-aged learners. Further to this, in response to the difficulties encountered in engaging this level of support, special learning centers supervised by teacher's aides can be established to assist parents and guardians in supporting their children's online learning. Additionally, continuing education programs should be made available through community centres for parents and guardians, to improve their computer literacy status. This could take the form of a government intervention hosted through the Ministry of Education, commissioning teacher's aides for mandatory prescribed sessions weekly. Correspondingly, educational software should be developed in the Jamaican context, to reinforce students' engagement with online learning.

5.3.4 Recommendations for the Secondary Level

There are compelling reasons to ensure that not just some but all secondary-level learners can access online learning nationally from public institutions. There are current

offerings that have proven valuable to learning at this level. Yet, because of connectivity issues, affordability issues, and other impediments, many high school students fail to benefit from these schemes. These projects are still in the infant stages and need to be expanded for more deliberate, comprehensive usage, irrespective of location and socio-economic status. Sulaiman and Halamy (2021) reported that in Malaysia, intentional action plans are underway consisting of government interventions to include a Universal Service Provision (USP) to offer equity in the distribution of Internet access, free connectivity to poor families, and a 5-year plan for eliminating the digital divide.

Therefore, it is vital that Jamaica align its national educational planning to include schemes that target the improvement of online learning. Based on the current accessibility problem, a hybrid model is also recommended complimented by the synchronous and asynchronous modes. This could be used as a learning intervention for high school dropouts and learners in continuing education, especially to be made mandatory for credit recovery in secondary schools.

5.3.5 Recommendations for Tertiary Levels

The available evidence has suggested that online learning at the tertiary level is in its infant stage, in Jamaica. Therefore, there should be a concentrated effort to train and retrain teachers in the instructional skills necessary to competently engage learners in the online modality. Government intervention is needed through grants and subsidies for tertiary institutions in mandating teacher education programs and establishing these courses for new instructors and practitioners. Furthermore, if the corrective measures identified in this study are addressed, online learning can be employed to increase access

to tertiary-level education irrespective of location and facilitate greater numbers of entrants than traditionally experienced in the face-to-face learning modality. Online learning can then be used to improve the mere 27% of Jamaicans who have been enrolling in tertiary education (United Nations, 2020b).

5.4 Recommendations for Future Research

Several limitations have been identified within the findings of the current study and in this section recommendations for future research are presented that, in part, address these limitations. First, the sample resided in public institutions in Jamaica within the time frame of the pre-and post-COVID-19 pandemic. This is of relevance as the participants and respondents sought both the surveys and interviews, which were initially taught in the virtual space and later in the physical school location. Therefore, the data collection process was challenging to reach all individuals comprising the sample (384), in the end, 64% responded to the study. Evidence in the literature as far back as Brown C. et al.'s (1976) study has noted significant difficulties in accessing social research fields which ultimately may impact the quality of the knowledge reported from a study's findings. Story (2019) asserted that most surveys encounter high rates of nonresponse and increase the incidence of bias.

However, the use of mixed-methods research can help reduce the limitations of a low response survey. Richard and Belanger's (2018) study findings also revealed a problem with recruiting participants in social research. Ali et al.'s (2021d) study findings further associate a prevalent occurrence of low response rates to online surveys ranging

from 26.07% to 52.46% in comparison to paper-based response rates from a low of 42.88% to 71.76%.

Bakkalbasioglu (2020), Deane et al. (2019) and Miller et al. (2022) highlighted this as a common occurrence when trying to sample elites or conducting research within a developing country, which was the case with this study. The researchers further contend that although studies may use purposive sampling to identify the contact information for these types of participants, getting them to commit to participating in a study can be futile. This was a notable obstacle during the data collection stage of this study. Consequently, future research into the phenomenon of the study should recruit a larger number of participants and respondents, to gather a more representative sample of the target population to be able to generalize the results. The recommendation is to use Bakkalbasioglu's (2020) approach which was used to examine the value of employing *interviewee-as-fixers* in attaining a full sample size. This strategy was reported in the study to be valuable to researchers, who conduct studies in problematic settings, those without university or foundation backing, and novice researchers.

Additionally, a sample of seven of the 14 parishes in Jamaica was randomly selected for the study; however, out of the seven, one parish, Clarendon, provided the majority of the sample and may have given a biased view of the problems encountered in the other parishes. Subsequently, snowballing and self-selection sampling were then applied to recruit participants for the study. A limitation of these methods can manifest in the form of biases. McGarry et al. (2018) and Parker et al.'s (2019) studies confirmed this possibility in the form of *gatekeeper bias* compared to random sampling, which gives

each person within the population an equal chance of being selected. Therefore, it is recommended that more comprehensive coverage be provided for the sampling of the 14 parishes using a random sampling strategy, which could provide more comprehensive coverage and further add to the knowledge uncovered in the current study. Most importantly, it could provide a more accurate understanding of the most effective ways of using online learning to increase access to training and educational programs in the Jamaican public education system.

A further limitation exists in respect of the proportionality of sampled groups; in Group 1 teachers were the largest within the sample, followed by students and then administrators. The least number of responses to the study came from Group 4, education officers, but represented the number sought for that group. Another shortcoming was that many of the responses came from primary and secondary teachers, leaving a significant gap in the responses from tertiary-level instructors, as it was very difficult to gain commitment from these individuals to participate in the study. Relative to tertiary-level education, the results obtained from the limited data collected and analysed indicate a lack of competence in online instruction methodology among several instructors at the tertiary level of education in Jamaica.

This issue is prominent in the literature. Graham (2019) and Martin et al. (2019b) report that in the USA, there is an assumption that the prior practice of instructors is adequate for transferability to the online modality. However, in much research, this is erroneous, as online instruction requires more teaching contact time, competency in manipulating online learning resources, and employing digital communication techniques

adeptly. Undoubtedly, future researchers should examine tertiary-level online learning progress to identify deliberate action plans for the exploration of this type of offering relative to a Jamaican context. Mixed-methods research is suggested with a focus on the type of offerings, numbers, quality, and feasibility of expansion.

In contrast, a limitation was revealed concerning the inadequacies relative to the matter of community partners and government intervention initiatives by both participants and respondents in the study. These community partners include Digicel, LIME, and Flow telecommunication companies, which have partnered with the MoEY in the expansion of more accessible Internet service within schools and communities in Jamaica. O'maley and Kak's (2018) study also reported an agreement to offer free Internet access to GoJ's projects and schemes. The arrangement was to ensure the public was able to view government content based on a contract with Digicel and Flow in 2016. The Jamaican Information Service (JIS) programs and other government websites were among the free viewing options available via free access to the Internet, which includes educational programs.

A further novel introduction to these schemes is the promotion of mobile learning for the underserved communities in Jamaica (Amad, 2018). Robinson et al. (2020) corroborate this and report that even though the funds slated for the project are considerable, proper action plans are not in place for purposeful implementation to create enough access points. The study further confirmed that many individuals in Jamaica who could benefit still do not have Internet connections. Correspondingly, in another study, Hylton and Hylton-Fraser (2022) revealed that the GoJ through MoEY, has implemented

programs, such as the USF, Tablets in Schools (TIS), and e-Learning Jamaica Company Limited. However, the study further confirms that if increases in access to training and educational programs are to be achieved, then this cannot be focused only on the face-to-face modality.

Subsequently, for the attainment of inclusive and equitable distribution of these initiatives, online learning modalities would be valuable, which could be strengthened with the assistance of further research. Although these projects were found to be ongoing, there is still urgency for the procurement of quality, accessible Internet service, electricity, and the provision of free Wi-Fi. Consequently, there is a need for a separate study to investigate the value of these projects such as the USF, and a future partnership with the power company to support underserved communities in Jamaica. Additionally, an evaluation is required involving a national community needs assessment study using both quantitative and qualitative methods. From the results of this study, best practices necessary for the continued contribution of these initiatives could then be identified and enhanced with further implementation injected: for the provision of the ICT infrastructure, Internet connectivity, maintenance, and the security of these investments.

Most importantly, anchoring the connection of learners to online learning through the distribution and maintenance of these Internet access points was markedly inadequate in Jamaica. Abante et al. (2021) study also portrayed this as a problem globally for groups in the lower socio-economic strata, who have affordability issues that separate them from taking advantage of contemporary education modalities. Furthermore, Ali et al. (2018e) explored impediments working against the success of

online learning and discovered many of the same barriers, as highlighted in the current study. Some of the major difficulties were connectivity issues, pedagogical issues, and individual issues directly related to the learners. Subsequently, research is vital to direct future improvements for these schemes and to determine how best to distribute them across the 14 parishes intentionally to ensure those learners with the greatest need as it relates to affordability issues may benefit. The deficiencies highlighted propound the view that future qualitative research to determine action plans is needed. This research should strive to identify best practices in the implementation and identification of support systems necessary to keep these Internet access points efficient, especially as it is related to powering online education nationally.

Concurrently, a rigorous study should be carried out to evaluate a surprising discovery that arose from the current study, where an extensive problem with theft of ICT infrastructural parts in Jamaican communities was identified. This study did not address the cause and solution for this problem, but it goes to the essence of the success of online learning across Jamaica. However, Clark R. and Hakim (2017) and White S. J. (2017) shed light on the issue, revealing the theft of ICT infrastructure as a growing global problem obstructing many key areas, online learning being one of them. Further research in this area may include an examination of the nature and cause of this practice in Jamaican communities. The recommendation is that the Jamaican government and international education partners such as UNESCO and the OECD should collectively fund this study to ensure its feasibility. Equally important, is developing a workable action plan to inform and provide a solution.

A relevant implication for online education in Jamaica is that the current study's findings did not provide sufficient data to draw clear conclusions regarding how impediments associated with online learning can be managed or eliminated. Moreover, one such impediment was a notable negative view of online learning versus the traditional learning modality. Therefore, qualitative research is necessary to rebut and verify online learning's efficacy in supporting education, and the public's perception that online learning is inferior to the traditional face-to-face modality. The results of such an investigation could be used to promote the essence of online learning in education, a move that is paramount if success is to be reached for inclusive access. Additionally, recent research, such as Quesada-Pallares et al.'s (2019) study has confirmed that online learning is invaluable in providing several options for engaging in schooling via interaction with and application of learning modules. McLean G.'s (2017) study, on the other hand, lauded online learning as affording adult learners the space to be a part of learning communities, which can be essential to learning.

Strong evidence is presented by Conrod and Openo's (2018) study, which discussed the significant contribution that online learning brings to education via the Internet and other technologies. Convincingly, they emphasize how learners can use technology versus a focus on what it may do for learners, which is seen as the real value of online learning. The findings revealed that online learning guided by this focus could unlock superior teaching and learning successes. This could lead to the transformation of a resolve to use technology to enrich and provide more access to education. Therefore, the usage of online learning across Jamaican public schools must increase

simultaneously with the roll-out of deliberate programs geared towards reforming and redirecting the teacher education training modules, curriculum, parental associations, and national media education coverage to assist in sensitizing education practitioners and the Jamaican public.

Another area of research that could strengthen the findings from the current study, as it relates to online learning, is a study of private schools in Jamaica and their online offerings. The investigation may be focused on making a comparison with the findings reported in this current research. In addition, ascertaining whether online learning has been used to affect and reach greater numbers of learners in those institutions. Subsequently, this suggested research could be used to garner an understanding of the attitudes of private education institutions and learners regarding online learning. Additionally, a determination of whether these institutions were successful in offering engaging virtual classrooms, and if so, what benchmarks were applied in practice to achieve online learning goals. Further there are approximately 1,109 private schools nationally in Jamaica (Statistical Institute of Jamaica, 2017). A comparison should be made of the impediments experienced in online learning offerings in private schools compared to those found in the impediments revealed through the current study's results.

Finally, based on the data collection, for the current study, the participants and respondents originated from individuals working in education, students, and prospective learners. Many of these participants and respondents were also parents and guardians. It is prudent to suggest that future research may focus some attention on the examination of the parents' and guardians' voices concerning the value of online learning in increasing

access to schooling. Incidentally, Dong et al. (2020) reported that in China, parents' views provided valuable data for the successful implementation, application of corrective measures, and maintenance of online learning. Abuhammad's (2020) study verifies this and reports four main restraints mitigating against Jordanian's online education. These were individual, funding, technological, and operational limitations. Jordan's educational leaders also evaluated the parents' views about online learning and then used them to inform their online education practices. In like manner, a probe of theories is associated with the challenges and successes linked to the experience of the online learning modality.

Similarly, Garbe et al.'s (2020) study which was based in the USA, solicited parents' perceptions towards online learning and discovered many struggles that indicate important significance to future education reforms of online learning. Norway was another country where parents' views relative to online education and the direction of their future educational needs were examined. The findings from the study report an increase in caregivers' participation in their children's education and improved relationships with instructors. This promoted a renewed understanding of the individual student's online educational needs (Bubb & Jones, 2020). Accordingly, Jamaica could find that a study delving into the parents' and guardians' vision and attitudes relevant to online learning may be beneficial in directing further implementation and solutions to current problems. Therefore, the data could be used to direct a better solution for addressing parental deficiencies that had a significant impact on the success of online education.

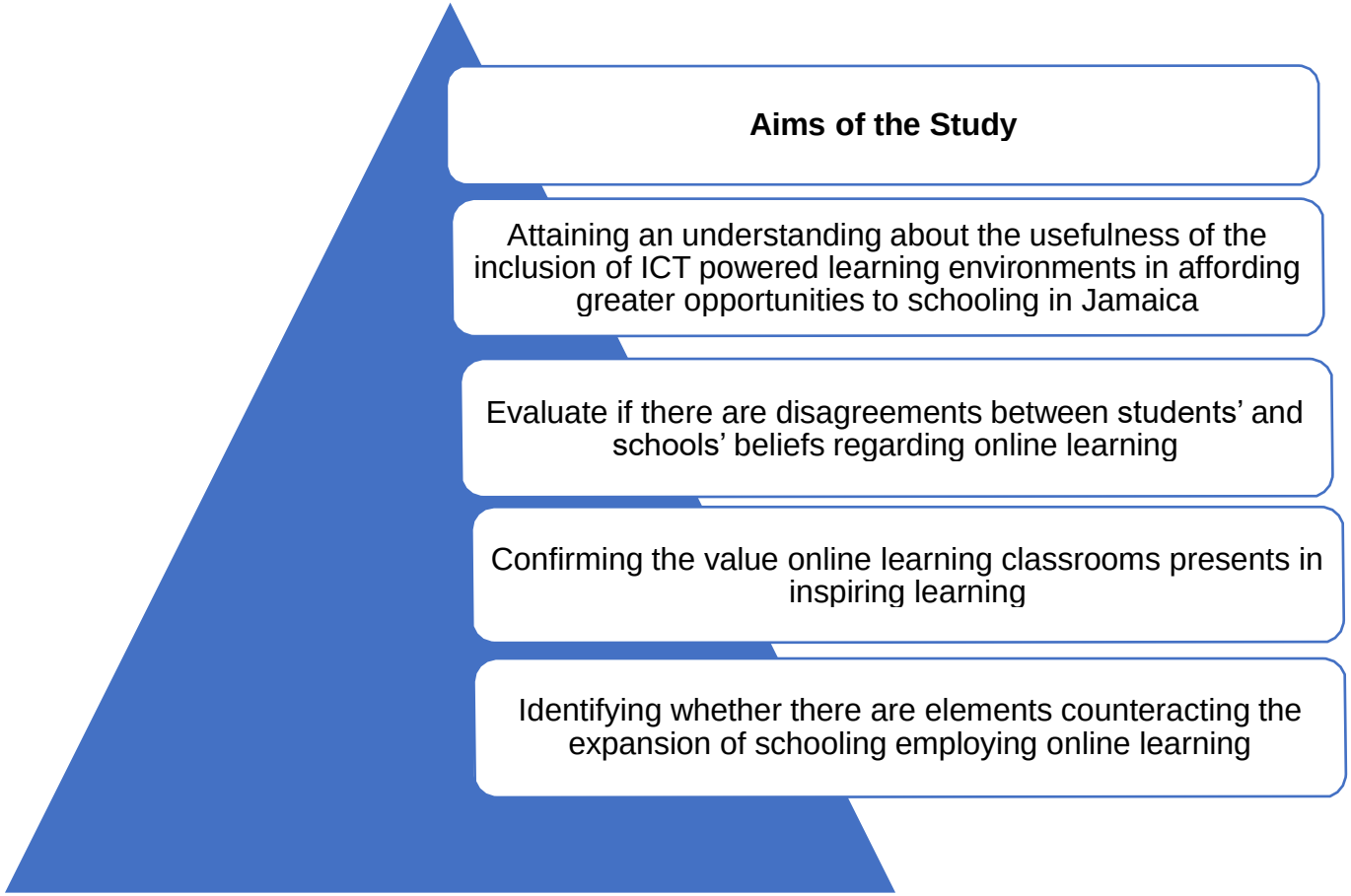
5.5 Conclusions

The study addressed a problem at all levels of the public education sector relative to attendance, dropout rates, and enrollment in education in Jamaica. Arguments are presented in the study to establish the value of online learning for affording learners more choices in educating themselves. Consequently, to achieve this goal, the study undertook the task of ascertaining whether the use of the online classroom may provide a viable solution to the phenomenon under four broad goals (see Figure 5.2). A mixed-methods approach was adopted utilizing a concurrent nested research design. The design combined research activities at all stages of the study, employing both quantitative and qualitative methodological approaches. The quantitative methods within the design, incorporate, for the primary research, the descriptive and correlational constructs. Additionally, for the qualitative methodology, the grounded theory was used, applying the Charmaz GT technique. To further strengthen the findings from the study, secondary research was conducted with archived documents.

Therefore, the epistemological setting for the study charted a pragmatism ideology where both interpretivism and positivism views were used to present both sides of the issue. The result of the pragmatism philosophical usage during the study activated abduction reasoning and effective triangulation of all research methods in use within the investigation, directing clear judgements for generalization to the population. This concurrent nested research design was used to allow the researcher the ability to verify the study's results by way of statistical measurements and knowledge from practitioners and persons affected by the issue.

Figure 5. 2

Main Aims of the Study



5.5.1 Results and Findings

Seminal to the fundamental goals of the study are the specific objectives and hypotheses to steer the research activities. These were also used to gauge the conclusions that were drawn relative to the results and the findings from the study (see Table 5.1).

Table 5. 1

Results Relating to Each Research Question and Hypotheses

Research Questions and Hypothesis	Results and Findings
RQ 1. What is the relationship between online learning and increased access to training and education among learners?	The null hypothesis is rejected as the evidence indicate that online learning can provide more options to schooling irrespective of the availability and connectivity issues.
H10. Online learning will not increase access to training and education in Jamaica. **H1a.** Online learning will increase access to training and education in Jamaica	
RQ 2. What are the differences in attitudes between learners and public education institution leaders toward online learning within Jamaica?	The null hypothesis is accepted as there were no notable differences identified between learners' and public education institution leaders' attitudes.
H20. There are no differences in the attitudes among learners and public education institution leaders toward online learning within Jamaica. **H2a.** There are differences in attitudes among learners and public education institution leaders within Jamaica.	
RQ 3. Is there a relationship between online learning classrooms and quality training and education?	The null hypothesis is rejected with a 5% chance of error.
H30. Online classrooms may not engage learners. **H3a.** Online classrooms can engage learners.	
RQ 4. What is the relationship between impeding factors and the comprehensive use of online learning for accessing education?	The triangulation of the findings indicated that the null hypothesis is rejected.
H40. Impeding factors are not responsible for the lack of comprehensive usage of online learning in Jamaica's public education. **H4a.** Impeding factors are responsible for the lack of comprehensive usage of online learning in Jamaica's public education.	

5.5.2 Significance of the Study

The significance of finding reliable and valid answers to the research questions and hypotheses was to present a report that may provide relevant and accurate information to educational leaders, policymakers, administrators, teachers, students, and other stakeholders. This information is essential in assisting with the development of action plans to improve the current offerings of online learning. Further to this, the findings could be used to assist in the effective expansion and implementation of the online learning modality nationally, especially for the underserved groups such as those learners in remote areas, school dropouts, and more convenient access to tertiary education, credit recovery initiatives, and enrichment programs. Another important use of the information is the clarity it brings to the abetment and support of the problem of the COVID-19 pandemic, which greatly impacted the education system.

5.5.3 Research Question 1 and Hypotheses 1

The findings demonstrate that online learning can be used to extend schooling especially at the continuing, skills, and tertiary levels. However, at present within the public education system in Jamaica online learning is hampered by factors that impede the process. The triangulation of the results also illustrates that though access can be greatly increased in urban areas due to more ICT infrastructure and support systems: in rural areas, despite efforts to use free Wi-Fi access points, many schools and learners are still having problems connecting to online classrooms.

5.5.3.1 Implications for Practice. This study has established some practical implications that hinge on the need to apply corrective measures to the elements that limit

access to the use of online classrooms. Deliberate steps should also be taken to develop online learning programs that engage learners, especially the primary and secondary levels, through enrichment and credit recovery initiatives. These results have provided relevant and important information that has highlighted that a hybrid model may be the best course of action for the implementation of online learning for these students.

5.5.4 Research Question 2 and Hypothesis 2

The results have demonstrated that there are no significant differences associated with the attitudes of the students and various institutions within the sample. The quantitative analyses showed a similarity in the groupings within the sample as it relates to preferences for online learning and face-to-face learning. Specifically, the measures of central tendency and variability also report similarities between the learners and schools, which are indicative of the groups both agreeing and disagreeing with variables in the same direction. Comparably, the same trend was noted for the relationship between the significance levels and critical values, related to both the Pearson's and Spearman's correlational analyses. The pattern of responses from the participant groupings within the datasets was reported for the constant comparative analysis in both the initial and second sets of data. All the groupings within the datasets agreed that the public education system has the capacity to offer online learning and is willing to learn online, and that the performance of learners can be improved using the online learning modality. Yet, to a large extent, the challenges encountered during remote learning due to the COVID-19 pandemic may have resulted in the negative attitudes expressed by some of the

participants and respondents. Undoubtedly, the results have shown convincing evidence that the null hypothesis should be accepted.

5.5.4.1 Implications for Practice. The results have indicated that there are no compelling differences in the attitudes of students and schools in connection to online learning as an alternative mode of learning. There was a noteworthy preference for the traditional schooling mode across all levels of education in the public sector. Again, residing in the experiences of the emergency remote learning as a consequence of the COVID-19 pandemic. The findings revealed that a notable number of the participants claim they would not recommend online learning currently for Jamaican schools until the connectivity issue and other impeding factors are dealt with sufficiently.

5.5.5 Research Question 3 and Hypothesis 3

The findings regarding whether students can be effectively inspired to learn in classrooms organized and streamed online have established that some participants and respondents who were able to connect to online classes, were engaged. Juxtaposed were cases in which attempts to engage students were futile due to the interference of an unreliable Internet connection, and a lack of resources. The proof of these judgements drawn was indicative of the small spread of variance between the standard deviation and the mean, showing unanimity among the responses connected to the level of engagement of students in virtual classes, with the performance variable being an exception. Equally important, is that the correlated items illustrate clear results relating to the significance level, critical value, and accepting or rejecting the null hypothesis. Therefore, compelling

proof has been presented that the results for Research Question 3 Hypothesis 3 reject the null hypothesis on account of a margin of error of 5% for engaging learners.

5.5.5.1 Implications for Practice. The results have emphasized that virtual classes can engage learners provided that connectivity, affordability, and support system problems are non-existent. Goldie (2016) and Meylani et al. (2015) also support the findings afore mentioned as they endorse the value to education of the use of machines and communities of learning. Most importantly, the problems associated with attendance in online classrooms by both instructors and students need national attention from the designated government and community partnerships.

5.5.6 Research Question 4 and Hypothesis 4

The results have definitely underscored impeding factors as being critical to many of the challenges impacting the online learning approach fin Jamaican public schools. Evidence has been reported in the findings that though the different groupings in the datasets are willing to utilize online classes, there are several deterrents. The descriptive analysis evidenced this in the small dispersion of the standard deviation from the mean. The constant comparative and content analyses have identified many challenges with the offering of online learning. The correlational analysis, on the other hand, presents weak correlations regarding the non-existence of these impediments to online learning in Jamaica. Consequently, there is sufficient proof in the results to support the rejection of the null hypothesis.

5.5.6.1 Implications for Practice. It was revealed through the results of the current study that impeding elements mostly external to the learning environment, limit

online learning. Many constraints have been identified during the remote teaching thrust upon the education system. The digital divide must be addressed on a country-wide level. Projects and other schemes should be developed for management or elimination.

5.5.7 Implications for Theory

One of the foundations of the behaviorism theory for learning, according to Pange and Pange (2011) is that the learners' attitudes may be impacted by influences outside of the immediate learning environment. This has been proven in the evidence associated with the difference in attitudes of learners and institutions as it relates to learning in online classes. Some of the external elements identified in the evidence are the availability of connectivity, electricity, parental support, and funding. Mahmud et al. (2018) also emphasized another important premise of behaviorism as indicative of how learning may be achieved or improve with the adjustment of the type of classroom employed. The findings corroborate this as the results report that online learning can engage students provided that resources and other support systems are readily available.

Another conclusion that may be drawn from the results of the study relates to the connectivism learning theory where Corbett and Spinello (2020) postulated that for online learning to unlock its full potential in the offerings to public schools in Jamaica, support systems are a necessity. Additionally, online learning implementation at all levels of education allows access to learning communities and better use of all types of learning resources. Reese (2015) further contends that the connectivism learning theory promotes current knowledge discoveries that are easily accessible, irrespective of time and distance. These values associated with online learning are representative of the findings

from the study. Comparably, Stewart (2021) asserts that the behaviorism learning philosophy emphasizes the value of self-directed learning in the achievement of learning goals. Again, the evidence in the results confirms this, as online learning can be used in the provision of self-paced lessons asynchronously, allowing students to learn at their own pace.

5.5.8 Recommendations for Application

In general, the study's results have presented new information for practical application within the public education system of Jamaica. Some of the negative attitudes identified by the findings can be used by educational policymakers and leaders as a point of reference when implementing improvements and expansion of the online learning modality. Further to this, these negatives can be employed as a platform for developing virtual lessons and educational learning resources relative to the individual needs of the different levels of schooling. The study has also uncovered a significant problem for online school at the primary level in the form of social problems such as inadequate parental support and distractions at home during learning time. This has also drawn attention to the need to re-train and train instructors for practice in online instruction.

The recommendations are evident in the results as it relates to the urgency for enhancements applied to the necessary support systems, additional ICT infrastructure, and CPD. Furthermore, the findings suggest that for further employment of this type of learning modality to become more actionable, these corrective measures must be deliberate and intentional at all levels of education. Moreover, the results proposed a hybrid model incorporating face-to-face and asynchronous learning particularly for those

learners at the primary and secondary levels of education. Equally important, the results emphasize a need for deliberate commitment to expand online learning for continuing and tertiary education to facilitate access for prospective learners towards more convenient and cost-effective access.

To sum up, recommendations for application of the findings in activating improvements and further expansion of the offering of online learning must consist of interventions at all levels of education. The community partnerships should be expanded to offer more inclusive support in getting schools and learners connected to the Internet. Additional community partners are recommended, especially with the power company operating in Jamaica. Action plans are necessary to manage the USF funds for a more intentional drive towards national coverage of the underserved communities. Accordingly, the prevalent problem with the theft of the ICT infrastructural parts should be made a priority, as this is a serious impediment.

Finally, schools at all levels of the public education system should implement and promote a national initiative to mandate computer literacy for all learners by procuring the necessary resources to make it a reality. CPD is essential for teachers to remain current and relevant in the information age and changing educational environment. Education leaders should lobby for grants to assist staff in timely upgrading professional skills through a recertification at least every 10 years. Also, there is promotion through the parent and teachers' association, regarding parenting programs that supplement school goals. Further to this, provide community projects for enrichment programs using online learning assisted by teacher's aides provided by the schools in collaboration with MoEY.

The study did not show conclusively that the expansion and adoption of online learning within the public school system in Jamaica will increase access to institutions at this time, except at the continuing and tertiary level of education. However, it has clearly shown the usefulness of online learning if the recommended corrective measures are intentional and deliberately directed with respect to improvements and expansion of these classes. Most importantly, the results from the current study can be used as a guide in the development of educational programs, the addition of other pertinent community partners, the upgrading of individual schools, and the further implementation of ICT infrastructure relevant to eliminating the impeding elements. Another point of note is the value that future research will add to the current information uncovered by the study. A sampling of all 14 parishes in Jamaica, inclusive of the private educational institutions is a suggestion for the optimal introduction and enhancement of online learning classrooms.

REFERENCES

Abante, A. S., Cruz, R. P., Guevarra, D. F., Lanada, M. I. B., Mascale, M. J. S., Roque, W. B., Salonga, F. R., Santos, L. C. & Cabrera, W. C. (2021). A comparative analysis on the challenges of online learning modality and modular learning modality: A basis for training program. *International Journal of Multidisciplinary research and analysis*, 4(4), 463-476. https://www.doi.org/10.47191/ijmra/v4-i4-17.

Abascal, J., Barbosa, S. D. J., Nicolle, C., &Zaphiris, P. (2016). Rethinking universal accessibility: A broader approach considering the digital gap. *Universal Access In The Information Society, 15,* 179-182.https://doi.org/10.1007/s10209-015-0416-1.

Abdullah, M. B., Harun, M., &Jali, M. R. M. (2017). Government funding in education industry. *International Journal of Academic Research in Business and Social Sciences*, 7(6), 1-4. https://doi.org/10.6007/IJARBSS/v7-i6/3036.

Abend, G. (2008). The meaning of theory. *Sociological Theory*, *26*, 176-199. https://doi.org/10.1111/j.1467-9558.2008.00324.x.

Abuhammad, S. (2020). Barriers to distance learning during the COVID-19 outbreak: A qualitative review from parents' perspective. *Heliyon,* 6(11), 2-5. https://www.doi.org.10.1016/j.heliyon.2020.e05482.

Adam, T., & Tatnall, A. (2017). The value of using ICT in the education of school students with learning difficulties. *Education and Information Technologies*, *22(6)*, 2711-2726. https://vuir.vu.edu.au/35161/1/

Adnan, M., & Anwar, K. (2020). Online learning amid the COVID-19 pandemic: Students' perspectives. *Journal of Pedagogical Sociology and Psychology*, 2(1), 45-51. https://doi.org/10.33902/JPSP.2020261309.

Aggarwal, R., & Ranganathan, P. (2019). Study designs: Part 2 – Descriptive studies. *Perspective Clinical research*, 10(1), 34-36. https://www.doi.org/10.4103/picr.PICR_154_18.

Aguilar-Solano, M. (2020). Triangulation and trustworthiness -Advancing research on public service interpreting through qualitative case study methodologies. *FITISPOS International Journal*, 7(1), 31-52. https://www.doi.org/10.37536/fitispos.ij.

Ahmady, S., Shahbazi, S., & Heidari, M. (2020). Transition to virtual learning during the coronavirus disease-2019 crisis in Iran: Opportunity or challenge? *Disaster Medicine and Public Health Preparedness,* 14(3), 11-12. https://doi.org/10.1017/dmp.2020.142.

Akinde, T. A., & Adetimirin, A. A. (2017). Perceived usefulness as a correlate of extent of information and communications technologies (ICTs) use for teaching by library educators in universities in Nigeria. *International Journal of Library and Information Science,9(3)*, 14-24. https://DOI.ORG/10.5897/ijlis2016.0739.

Akinlua, S. (2019). Comparing and contrasting descriptive designs: Observational studies, correlational research, developmental design and survey research. *ResearchGate*, 1-12. https://www.scholar.google.com.

Akoglu, H. (2018). User's guide to correlation coefficients. *Turkish Journal of Emergency Medicine*, 18, 91-93. https://www.doi.org/10.1016/j.tjem.2018.08.001.

Al-Ababneh, M. (2020). Linking ontology, epistemology and research methodology, *Science and Philosophy*, 8(1), 75-91. https://doi.org/10.23756/sp.v8i1.500

Alam, M., Sumy, S., A., & Parh, Y. A. (2015). Selection of the samples with probability proportional to size. *Science Journal of Applied Mathematics and Statistics*, 3(5), 230-233. https://www.doi.org/10.1164/j.sjams.20150305.13.

Al-Azawei, A., & Al-Masoudy, M. (2020a). Predicting learners' performance in virtual learning environment (VLE) based on Demographic, Behavioural and engagement antecedents. *International Journal of Emerging Technologies in Learning (iJET),* 15(9), 60-75. https://doi.org/10.3991/ijet.v15i09.12691.

Al-Azawei, A., & Lundqvist, K. (2015b). Learner differences in perceived satisfaction of an online learning: An extension to the technology acceptance model in an Arabic sample. *The Electronic Journal of e-Learning,* 13(5), 408-426. : https://www.ejel.org.

Alaziz, M. A. A. (2017). A survey on virtual classroom system for online training. *International Journal, 4(1),* 1-3. https://doi.org/10.22362/ijcert/2016/v4/i1/xxxx.

Alcacer, J., Cantwell, J., &Piscitello, L. (2016). Internationalization in the information age: A new era for places, firms, and international business networks? *Journal of International Business Studies,* 47, 449-512. https://doi,org/10.1057/jibs.2016.22.

Aldahdouh, A., Osorio, A., &Caires, S. (2015). Understanding knowledge network, learning and connectivism. *International Journal of Instructional Technology and Distance Learning,* 12(10), 1-19. https://files.eric.ed.gov/fulltext/ED572896.pdf.

Alenezi, A. (2019). Effectiveness of educational technology applications in Saudi Arabian secondary schools. *Journal of Informatics and Mathematical Sciences*, *11(2),* 221-233. https://doi.org/10.26713/jims.v11i2.845.

Alexander, A. P. (2019). Lincoln and Guba's quality criteria for trustworthiness. *IDC International Journal*, 6(4), 1-6. https://www.idcinternationaljournal.com/oct-2019/article_6_manuscript_IDC_august_October_2019_DR_Annie_full.pdf.

Ali, W. (2020a). Online and remote learning in higher education institutes: A necessity in light of COVID-19 pandemic. *Canadian Center of Science and Education*, 10(3), 16-25. https://www.doi.org/10.105539/hes.v10n3p16.

Ali, Z., & Bhaskar, S. B., & Sudheesh, K. (2019b). Descriptive statistics: Measures of central tendency, dispersion, correlation, and regression. *Airway*, 2(3), 120-125. https://www.doi.org/10.4103/ARWY.ARWY_37_19.

Ali, F., Ciftci, O., Nanu, L., Cobanoglu, C., & Ryu, K. (2021c). Response rates in hospitality research: An overview of current practice and suggestions for future research. *Cornell Hospitality Quarterly*, 62(1), 105-120. https://www.doi.org/10.1177/1938965520943094.

Ali, A., & Pandya, S. (2021d). A four-stage framework for the development of a research problem statement in doctoral dissertations. *International Journal of Doctoral Studies*, 16, 470-485. https://www.doi.org/10.28945/4839.

Ali, S., Uppal, M. A., & Gulliver, S. (2018e). A framework highlighting e-learning implementation barriers. *Information Technology & People*, 31(1), 156-180. https://www.doi.org/10.1108/1TP-10-2016-0246.

Aliyyah, R. R., Rachmadtullah, R., Samsudin, A., Syaodih, E., Nurtanto, M., & Tambunan, A. R. S. (2020). The perceptions of primary school teachers of online learning during the COVID-19 pandemic period: A case study in Indonesia. *Journal of Ethnic and Cultural Studies, 7*(2), 90-109. https://doi.org/10.2933/ejecs/388.

Alizadeh, M. (2019). Virtual reality in the language classroom: Theory and Practice. *CALL Education Journal,* 20(3), 21-30. https://www.researchgate.net.

Allen, I. E., & Seaman, (2015). *Grade level tracking online education in the United States*. Babson Survey research Group, Babson College, Forest Street, Babson Park, MA 024557. https://eric.ed.gov/?id=ED572778.

Ally, M. (2008). Foundations of educational theory for online learning. *Theory and Practice of Online Learning*, 15-44. https://scholar.google.com.

Almaiah, M. A., Al-Khasawneh, A., & Althunibat, A. (2020). Exploring the critical challenges and factors influencing the E-learning system usage during COVID-19 pandemic. *Education and Information Technologies,* 1.https://doi.org/10.1007/s10639-020-10219-y.

Almeida, F. (2018a). Strategies to perform a mixed methods study. *European Journal of Education Studies,* 5(1), 137-151. https://www.doi.org/10.5281/zenodo.1406214.

Almeida, F., & Simoes, J. (2019b). The role of serious games, gamification and industry 4.0 paradigm. *Contemporary Educational Technology*, 10(2), 120-136.

https://doi.org/10.30935/cet.554469

Al-Shammari, M., Rasheed, A., & Al-Shammari, H. A. (2019). CEO narcissism and corporate social responsibility: Does CEO narcissism affect CSR focus? *Journal of Business Research*, 104, 106-117. https://doi.org/10.1016/j.jbusres.2019.07.005

Alves, P., Miranda, L., & Morais, C. (2017). The influence of virtual learning environments in students' performance. *Universal Journal of Educational Research,* 5(3), 517-527. https://doi.org/10.13189/ujer.2017.050325.

Alvi, M. (2016). *A manual for selecting sampling techniques in research*. University Library Munich, Germany. https://www.mpra.ub.uni=muenchen.de/id/eprint/70218.

Amad, T. (2018). Mobile phones as a learning tool: A lecturer's viewpoint. *Society and Business Review*, 1-10. https://www.doi.org/10.1108/SBR-03-2018-0021.

Anderson, K. S. (2018). Chartering new territories: Wading in the e-learning waters at a prominent university in Jamaica-case study exploring the first fully online program over the period 2013-2017. *International Conference e-Learning*, 193-196. https://files.eric.ed,gov/fulltext/ED590269.pdf.

Anderson, T. (2016). Theories for learning with emerging technologies. *Emergence and innovation in digital learning, 1*, 35-50. https://doi.org/10.15215/aupress/9781771991490.01. .

Andrade, M. S. (2015). Teaching online: A theory-based approach to student success. *Journal of Education and Training Studies, 3*(5), 1-9. https://doi.org/10.11114/jets.v3i5.904.

Angheli-Zaicenco, N. (2021). Connections: Learning for sustainable development. *Commonwealth of Learning*, 26(1), 1-16. https://oasis.org.

Anikina, O. V., & Yakimenko, E. V. (2015). Edutainment as a modern technology of education. *Procedia-Social and Behavioural Sciences* 166, 475-479. https://doi.org/10.1016/j.sbspro.2014.12.558.

Apuke, O. D. (2017). Quantitative research methods a synopsis approach. *Arabian Journal of Business and Management Review*, 6(10), 40-47. https://www.doi.org/10.12816/004336.

Arghode, V., Brieger, E. W., & McLean, G. N. (2017). Adult learning theories: Implications for online instruction. *European Journal of Training and Development*, 41(7), 593-609. https://doi.org/10.1108/EJTD-02-2017-0014.

Asenahabi, (2019). Basics of research design: a guide to selecting appropriate research design. *International Journal of Contemporary Applied Researches*, 6(5), 1-14. https://www.ijcar.net

Association of Caribbean States (2015). Jamaica case study: Technical and vocational education and training. *Association of Caribbean States*. https://www.academia.edu/25354197/JAMAICA_CASE_STUDY_TECHNICAL_AND_VOCATIONAL_EDUCATION_AND_TRAINING_TVET?auto=download.

Atmowardoyo, H. (2018). Research methods in TEFL studies: Descriptive research, case study, error analysis, and R & D. *Journal of Language Teaching and Research*, 9(1), 197-204. https://www.doi.org/1017507/jltr.0901.25.

Awgichew, S., & Ademe, E. (2022). History education for nation-building in Ethiopia, Germany, Rwanda, South Africa, Switzerland, and USA: A comparative analysis. *Cogent Education*, 9, 1-18. https://doi.org/10.1080/2331186X.2022.2113210.

Bacon, L., & MacKinnon, L. (2016). The challenges of creating successful collaborative working and learning activities in online engineering courses. *LACCEI (Latin American and Caribbean Consortium of Engineering Institutions)*, 1-9.: https://doi.org/10.18687/LACCEI2016.11.151.

Baczek, M., Zaganczyk-Baczek, M., Szpringer, M., Jaroszynski, A., & Wozakowska-Kaplon, B. (2021). Students' perception of online learning during the COVID-19 pandemic: A survey of Polish medical students. *Medicine*, 100(7), 1-6. https://doi.org/10.1097/MD.0000000000024821.

Baek, H. S., Lee, K. U., Joo, M. J., & Choi, K. S. (2010). Reliability and validity of the Korean Version of the Connor-Davidson resilience scale. *Psychiatry Investigation,* 7(2), 109-115. https://www.doi.org.10.4306/pi.2010.7.2.109.

Bagatur, E. (2018). Nazi medicine- Part 1: Musculoskoskeletal experimentation on concentration camp prisoners during World War II. *Clinical Orthopaedics and related research*, 476(10), 1899-1905. https://www.doi.org/10.1097/CORR.0000000000000431.

Bagozzi, R., & Phillips, L. W. (1982). Representing and testing organizational theories: A holistic construal. *Administrative Science Quarterly, 27(3)*, 459-489. https://doi.org/10.2307/2392322 .

Bahramian, H., Mohebbi, S. Z., Khami, M. R., Quinonez, R. B. (2018). Qualitative exploration of barriers and facilitators of dental service utilization of pregnant women: A triangulation approach. *BMC Pregnancy Childbirth*, 18, 153. https://www.doi.org/10.1186/s12884-018-1773-6.

Bakkalbasioglu, E. (2020). How to access elites when textbook methods fail: Challenges of purposive sampling and advantages of using interviewees as "Fixers*". Qualitative Report,* 25(3), 688-699. https://www.nsuworks.nova.edu/tqr/vol25/iss3/9

Balliu, V., & Belshi, M. (2017). Modern teaching versus traditional teaching- Albanian teachers between challenges and choices. *European Journal of Multidisciplinary Studies,* 2(4), 2-26. https://dx.doi.org/10.26417/ejms.v4i4.p20-26.

Barrett-Adams, D., & Hayle, C. (2021). Integrated higher education in support of flexible learning pathways in Jamaica. *IIEP-UNESCO*, 1-158. https://www.scholar.google.com

Barrientos, K., & Shahid, Z. (2020). *Promoting quality in TVET using technology: A practical guide*. United Nations Educational, Scientific and Cultural Organization and UNESCO-UNEVOC International Centre for TVET, France and Germany. https://unesdoc.unesco.org/ark:/48223/pf0000374602/PDF/374602eng.pdf.multi.

Barrot, J. S., Llenares, I. I., & Rosario, L. S. (2021). Students' online learning challenges during the pandemic and how they cope with them: The case of the Philippines. *Education and Information Technologies,* 26, 7321-7338. https://www.doi.org/10.1007/s10639-021-10589-x.

Bartlett, L., &Vavrus, F. (2017). *Rethinking case study research*. Taylor & Francis, New York and London. https://www.academia.edu/34539663/rethinking_case_study_research?auto=citations&from=cover_page.

Bartley-Bryan, J. M. (2017). *Jamaica: Utech. Using ICTs and blended learning in transforming TVET*. United Nations Educational, Scientific and Cultural Organization (UNESCO) and Commonwealth of Learning, Paris, France and BC, Canada. https://che.ac.ls/wp-content/uploads/2019/01-Using-ICTs-and-Blended-Learning-in-Transforming-TVET.pdf#page=132.

Basias, N., & Pollalis, Y. (2018). Quantitative and qualitative research in business & technology: Justifying a suitable research methodology. *Review of Integrative Business and Economics Research,* 7(1), 91-105. https://www.sibresearch.org/uploads/3/4/0/9/34097180/riber_7-s1_sp_h17-083_91-105.pdf.

Basilaia, G., & Kvavadze, D. (2020). Transition to online education in schools during a SARS_CoV-2 Coronavirus (COVID-19) pandemic in Georgia. *Pedagogical Research*, *5(4),* 1-9. https://doi.org/10.29333/pr/7937.

Baticulon, R. E., Sy, J. J., Alberto, N. R. I., Baron, M. B. C., Mabulay, R. E. C., Rizada, L. G. T., Tiu, C. J. S., Clarion, C. A., & Reyes, J. C. B. (2021). Barriers to online learning in the time of COVID-19: A national survey of medical students in the Philippines. *Medical Science Educator*, 1-12. https://doi.org/10.1007/s40670-021-01231-z.

Beer, N. (2019). Designing a rubric to measure elements of transformative learning in online learning: A case study of a FutureLearn MOOC. *Journal of Transformative Learning Media in Education*, 7(1), 1-11. https://doi.org/10.5334/jime.506.

Belcastro, A. T. (2015). Rebalancing quality education in a democratic society. *Creative Education,* 6, 428-439. https://doi.org/10.4238/ce.2015.64043.

Bell, F. (2011). Connectivism: Its place in theory-informed research and innovation in technology-enabled learning. *International review of Research in Open and Distributed Learning, 12(3)*, 98-118. https://doi.org.10.19173/irrodl.v1283.902.

Bent-Cunningham, C., & Allida, D. (2017). Lived experience of literacy coaches in the technology-based classrooms to improve students' literacy among non-traditional high schools in Jamaica. *East African Journal of Education and Social Sciences*, 2(2), 1-16. https://doi.org/10.46606/eajess2021v02102.0071.

Berman, E. A. (2017). An exploratory sequential mixed methods approach to understanding researcher's data management practices at UVM: Integrated findings to develop research data services. *Journal of eSciene Librarianship*, 6(1), 1-25. https://www.doi.org/10.7191/jeslib.2017.1104.

Bermudez-Edo, M., Barnaghi, P., & Moessner, K. (2018). Analysing real world data streams with spatio-temporal correlations: entropy vs. Pearson correlation. *Automotion in Construction*, 88, 87-100. https://doi.org/10.1016/j.autcon.2017.12.036

Berry, S. (2018). Professional development for online faculty: Instructors' perspectives on cultivating technical, pedagogical and content knowledge in a distance program. *Journal of Computing in Higher Education*, 31(1), 121-136. https://doi.org/10.1007/s12528-018-9194-0.

Bettinger, E., & Loeb, S. (2017). Promises and pitfalls of online education. *Evidence Speaks Reports*, 2(15), 1-4. https://www.k12accountability.org/resources/Online-Education/Promises_and_Pitfalls_of_Online_Ed.pdf.

Bexheti, A., & Mustafi, B. (2015). Impact of public funding of education on economic growth in Macedonia. *BERG Working Paper Series*, 98, 1-20. https://hdi.handle.net/10419/107594.

Beyer. A. (2021). *Introduction to Statistics for Psychology. Chapter 4: Measures of central tendency.* Pressbooks, Montreal, Canada. https://www.scholar.google.com.

Bhagat, K. K., Wu, L. Y., & Chang, C. Y. (2016). Development and validation of the perception of students towards online learning (POSTOL). *Educational Technology & Society*, 19(1), 350-359. https://www.jstor.org/stable/jeductechsoci.19.1.350.

Bhattacharjee, B., & Deb, K. (2016). Role of ICT in 21st century's teacher education. *International Journal of Education and Information Studies, 6*(1), 1-6. https://www.ripublication.com.

Blackman, S. N. J. (2021). The impact of COVID-19 on education equity: A view from Barbados and Jamaica. *Prospects*, 1-15. https://www.doi.org/10.1007/s11125-021-09568-4.

Bleeker, A. (2019a). Using universal service funds to increase access to technology for persons with disabilities in the Caribbean. *ECLAC – Studies and Perspectives Series – The Caribbean*, 79, 1-85. https://www.hdl.handle.net/11362/44913.

Bleeker, A., & Crowder, R. (2020b). Studies and perspectives: Selected online learning experiences in the Caribbean during COVID-19. *Santiago, Economic Commission for Latin America and the Caribbean (ECLAC)*, 105, 32-38. https://repositorio.cepal.org/handle/11362/47742.

Blundell, G. E., Castaneda, D. A., & Lee, J. (2020). A multi-institutional study of factors influencing faculty satisfaction with online teaching and learning. *Online Learning, 24*(4), 229-253. https://doi.org/10.24059/olj.v24i4.2175.

Bo, H., & Galiani, S. (2021). Assessing external validity. *Research in Economic*, 75(3), 274-285. https://www.doi.org/10.1016/j.rie.2021.06.005.

Boisselle, L. N. (2014). Online-learning and its utility to higher education in the anglophone Caribbean. *SAGE,* 1-14. https://doi.org/10.1177/2158244014555118.

Bolderston, A., Watson, J., Woznitza, N., Westerink, A., Di Prospero, L., Currie, G., Beardmore, C., & Hewis, J. (2017). Twitter journal clubs and continuing

professional development: An analysis of a #MedRadJClub tweet chat. *Radiography*, 24(1), 3-8. https://www.doi.org/10.1016/j.radi.2017.09.005.

Bolliger, D. U., & Martin, F. (2018). Instructor and student perceptions of online student engagement strategies. *Distance Education*, 39(4), 568-583. https://www.doi.org/10.1080/01587919.2018.1520041.

Bond, M. (2020). Facilitating student engagement through the flipped learning approach in k-12: A systematic review. *Computers & Education*, 151, 103819. https://doi.org/10.1016/j.compedu.2020.103819.

Bonk, C., J., Lee, M. M., Kou, X., Xu, S., & Sheu, F. R. (2015). Understanding the self-directed online learning preferences, goals, achievements, and challenges of MIT OpenCourseWare subscribers. *Journal of Educational Technology & Society*, 18(2), 349-368. https://www.jstor.org/stable/10.2307/jeductechsoci.18.2.349?seq=1&cid=pdf-reference#reference_tab_contents.

Borup, J., & Evmenova, A. S. (2019). The effectiveness of professional development in overcoming obstacles to effective online instruction in a college of education. *Online Learning*, 23(2), 1-20. https://doi.org/10.24059/olj.v23i2.1468.

Bose, S. (2018). Learning theories: Implications for ICT. *IGNOU*, 53-69. https://www.egyankosk.ac.in.

Bourne, P. A. (2019a). Mathematics performance in Jamaica. *International Journal of History and Scientific Studies,* 1(4), 8-31. https://ijhssr.org.

Bourne, P. A., & Owen-Wright, R. (2018b). Education in Jamaica: A need for redefinition and a changing of the old philosophy of education. *International Journal of Research in Humanities and Social Studies*, 5(2), 36-41. https://www.ijrhss.org/papers/v5-i2/5.pdf.

Boyraz, S., & Ocak, G. (2021). Connectivism: A literature review for the new pathway of pandemic driven education. *International Journal of Innovative Science and Research Technology*, 6(3), 1122-1129. https://orchid.org/0000-0001-6483-1397.

Bradley, R. L., Browne, B. L., & Kelley, H. M. (2017). Examining the influence of self-efficacy and self-regulation in online learning. *College Student Journal*, 51(4), 518-530. https://www.researchgate.net/profile/rachel-bradley-4/publication/325743793_measuring_sel_efficacy_and_self_regulation_in_online_learning.

Brandl, J., Kozica, A., Pemkopf, K., & Schneider, A. (2019). Flexible work practices: Analysis from a pragmatist perspective. *Historical Social Research*, 44(1), 73-91. https://www.jstor.org/stable/26566415

Brissett, N. O. M. (2019). *Evolution of educational inclusion policy discourse in Jamaica: From colonialization to globalization*. Achieving Inclusive Education in the Caribbean and Beyond: From Philosophy to Praxis, Springer International Publishing, 17-33. https://doi.org/10.1007/978-3-030-15769-2_2.

British Council (2021). Continuing professional development (CPD) training: Jamaica. *British Council.* https://www.caribbean.britishcouncil.org.

Brown, C., Guillet de monthoux, P., & McCullough, A. (1976). *The access-casebook: Social scientists account for how to get data for field research*. Stockholm.

Brown, J. D. (2011). Likert items and scales of measurement? *Skiken: JALT Testing & Evaluation SIG Newsletter*, 15(1), 1—14. https://www.hosted.jalt.org/test/pdf/Brown.34.pdf.

Bryman, A. (2016). *Social research methods.* Oxford University Press, New York. https://www.ktpu.kpi.au/wp-content/uploads/2014/02/social-research-methods-alan-bryman.pdf.

Bubb, S., & Jones, M. (2020). Learning from the COVID-19 home-schooling experience: Listening to pupils, parents/carers and teachers. *Improving Schools,* 23(3), 209-222. https://www.doi.org/10.1177/1365480110958797.

Buchanan, J., Pressick-Kilborn, K, & Maher, D. (2019). Promoting environmental education for primary school-aged students using digital technologies. *EURASIA Journal of Mathematics, Science and Technology Education*, 15(2), 1-15. https://doi.org/10.29333/ejmste/100639.

Burkle, M., & Cobo, C. (2018). Redefining knowledge in the digital age. *Journal New Approaches in Educational Research, 7(2),* 79-80. https://doi.org/10.7821/neer.2018.294.

Butler-Adam, J. (2018). The fourth industrial revolution and education. *South African Journal of Science,* 114(5-6), 1. https://doi.org/10.17159/sajs.2018/a0271.

Buyukbaykal, C. I. (2015). Communication technologies and education in the information age. *Procedia-Social and Behavioural Sciences, 174*, 636-640. https://doi.org/10.1016/j.sbspro.2015.01.594.

BUZZ Writer (2020). Education Ministry partners with One on One and FLOW to expand online learning options. *BUZZ*. https://buzz-caribbean.com/news/education-ministry-partners-with-one-on-one-and-FLOW-to-expand-online-learning-options/

Cabrero, R. S., & Roman, O. C. (2018). Psychopedagogical predecessors of connectivism as a new paradigm of learning. *International Journal of Educational Excellence*, 4(2), 29-45. https://doi.org/10.18562/IJEE.037

Camilleri, M. A., & Camilleri, A. C. (2017). Digital learning resources and ubiquitous technologies in education. *Technology, Knowledge and Learning*, 22(1), 65-82. https://doi.org/10.1007/s10758-016-9287-7.

Campbell, S., Greenwood, M, Shearer, T., Walken, K., Young, S., Bywater, D., & Walker, K. (2020). Purposive sampling: Complex or simple? Research case examples. *Journal of Research in Nursing*, 25(8), 652-661. https://doi.org/10.1177/1744987120927206.

Caribbean Policy Research Institute (2021). Improving Jamaica's education: Options for using report cards to measure performance & improve accountability. *Caribbean Policy Research Institute* (CaPRI), 1-42. https://www.capricaribbean.org.

Caribbean Education Foundation (2021). Education challenges, issues, and solutions. *CEF, Washington, US*. https://www.educatechild.org/jamaica-challenge.php.

Caribbean National Weekly (2021). Only one-third of Jamaica's students accessing online classes based on sample. *Caribbean National Weekly CNW*.: https://caribbeannationalweekly.com.

Carr, A., & Gruda, M. (2015). Reflecting on flexible and blended TVET in Jamaica. *Connections,* 20(2), 11. https://dspace.col.org.

Carter, J. (2015). Cost of education hurting parents. *Jamaica Observer*. https://www.jamaicaobserver.com/news/cost-of-education-hurting-parents_19228557.

Casanova, D. & Price, L. (2018). Moving towards sustainable policy and practice- A five level frameworks for online learning sustainability. *Canadian Journal of Learning and Technology, 44(3).*https://wwwcjlt.ca.

Cha, H., Park, T., & Seo, J (2020). What should be considered when developing ICT-integrated classroom models for a developing country? *Sustainability MDPI*, *12(2967),* 1-19. https://mdpi.com/journal/sustainability.

Chachashvili-Bolotin, S., Milner-Bolotin, M., & Lissitsa, S. (2016). Examination of factors predicting secondary students' interest in tertiary STEM education. *International Journal of Science education, 38*(3), 366-390. https://doi.org/10.1080/09500693.2016.1143137.

Charlton-Laing, C., & Grant, G. (2012). What are the dynamic capabilities needed for a national e-learning implementation? A Jamaican e-learning case study. *University of the West Indies,* 1-29.

https://www.citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.689.7753&rep=rep1&type=pdf.

Charmaz, K. (2006a). *Constructionism and the Grounded theory method*. In J. A. Holstein & J, F. Gubrium (Eds.), Handbook of Constructionist Research, New York, The Guilford Press. https://www.sxf.uevora.pt/wp-content/uploads/2013/03/charmaz_2008-apdf.

Charmaz, K. (2016b). The power of Grounded theory for critical inquiry. *Qualitative Inquiry*, 23(1), 1-28. https://www.doi.org/10.77/1077800416657105.

Charmaz, K. (2017c). Special invited paper: Continuities, contradictions, and critical inquiry in Grounded theory. *International Journal of Qualitative Methods*, 16, 1-8. https://www.doi.org/10.1177/16094069177719350.

Charmaz, K., & Thornberg, R. (2021d). The pursuit of quality in grounded theory. *Qualitative Research in Psychology,* 18(3), 305-327. https://www.doi.org/10.1080/14780887.2020.1780357.

Chatelier, G., & Voicu, I. (2018). E-Learning within the framework of UNESCO. *Assumption University, Thailand.* https://www.ijcim.th.org/SpecialEditions/v26n1page6.pdf.

Chattopadhyay, S., & Das, R. (2022). A framework for testing the reliability and validity of a non-invasive digital biomarker instrument using statistical techniques: A case study with Lyfas. *Transactions on Machine Learning and Artificial Intelligence*, 10(2), 1-13. https://www.doi.org/10.14738/tmlai.102.11845.

Chaudhuri, J. D. (2019). Stimulating intrinsic motivation in millennial students: A new generation, a new approach. *Anatomical Sciences Education*, 13(2), 250-271. https://doi.org/10.1002/ase.1884.

Chawinga, W. D. (2016). Increasing access to higher education through open and distance learning: Empirical findings from Mzuzu University, Malawi. *International Review of Research in Open and Distributed Learning*, *17(4),* 1-20. https://doi.org/10/19173/irrodil.v1714.2409.

Chen, T., Peng, L., Jing, B., Wu, C., Yang, J., & Cong, G. (2020). The impact of the COVID-19 pandemic on user experience with online education platforms in China. *Sustainability*, 12, 1-31. https://www.doi.org/10.3390/su12187329.

Chinapah, V., & Odero, J. O. (2016). Towards inclusive, quality ICT-based learning for rural transformation. *Journal of Education and Research*, 5.2(6.1), 107-125. https://dx.doi.org/10.3126/jer.v5i2.15729.

Chong, C. H., & Yeo, K. J. (2015). An overview of Grounded theory design in educational research. *Asian Social Sciences*, 11(12), 258-268. https://www.doi.org/10.5539/ass.v11n12p258.

Chyung, S. Y., Roberts, K., Swanson, I., & Hankinson, A. (2017). Evidence-based survey design: The use of a midpoint on the Likert scale. *Performance Improvement*, 56(10), 15-23. https://www.doi.org/10.1002/p6.21727.

Ciocca, D. R., & Delgado, G. (2017). The reality of scientific research in Latin America; an insider's perspective. *Cell Stress and Chaperones*, 22(6), 847-852. https://www.doi.org/10.1007/s12192-017-0815-8.

Cleary, Y. (2021). Fostering communities of inquiry and connectivism in online technical communication programs and courses. *Journal of Technical Writing and Communication*, 51(1), https://doi.org/10.1177/0047281620977138

Clark, R. M., & Hakim, S. (2017). Physical cyber security, Protecting critical infrastructure at the State and local level. *In Cyber-Physical Security,* 1-17. https://www.doi.org/10.1007/978-3-319-32824-9.

Clark, L. A., & Watson, D. (2016). Constructing validity: Basic issues in objective scale development. *Methodological Issues and Strategies in Clinical Research,* 187-203. https://www.doi.org/10.1037/14805-012.

Clarke, D. (2021). Online but no line: The challenges of virtual learning in Jamaica. *My Island Jamaica Digest.* https://www.my-island-jamaica.com/

Clarke, V. (2015). Virtual shock: Adult students' perceptions of their emotional experience on an online learning undergraduate degree at a regional Caribbean university (Doctoral Dissertation, University of Southampton). *University of Southampton*, 1-291. https://eprints.soton.ac.uk.

Coates, H. (2006). *Student engagement in campus-based and online education: University connections*. Routlege. https://scholar.google.com

Colins, A., & Halverson, R. (2018). *Rethinking education in the age of technology: The digital revolution and schooling in America*. Second edition. Teachers College Press, Columbia University, New York and London. https://scholar.google.com.

Commonwealth of Learning (2017). Open schooling: Addressing the challenge of out-of-school youth. *Commonwealth of Learning*, 1-8. Https://oasis.col.org.

Conrod, D., & Openo, J. (2018*). Assessment strategies for online learning: Engagement and authenticity,* Athabasca University Press. https://www.scholar.google.com

Constantinides, P., Henfridsson, O., & Parker, G. G. (2018). Introduction-platforms and infrastructures in the digital age. *Information Systems Research*, 29(2), 381-400. https://doi.org/10.1287/isre.2018.0794.

Cook, B. R., & Babon, A. (2017). Active learning through online quizzes: Better learning and less (busy) work. *Journal of Geography in Higher Education* 41(1), 24-38. https://www.doi.org/10.1080/03098265.2016.1185772.

Corbett, F., & Spinello, E. (2020). Connectivism and leadership: Harnessing a learning theory for the digital age to redefine leadership in the twenty-first century. *Heliyon*, 6(1), 1-9. https://www.doi.org/10.1016/j.heliyon.2020.e03250.

Cornish, F. (2009). A pragmatist approach to the problem of knowledge in health psychology. *Journal of Health Psychology*, 14(6), 800-809. https://doi.org/10.11177/1359105309338974

Correa, T., Pavez, I., & Contreras, J. (2018). Digital inclusion through mobile phones?: A comparison between mobile-only and computer users in internet access, skills and use. *Information, Communication & Society*, 13, 1-21. https://doi.org/10.1080/1369118X.2018.1555270.

Coy, A., James-Williamson, S., Bramwell-Lalor, S., Sadler-McKnight, N., McLean, N., Penugonda, V. R., & Rainford, M. A review of a tertiary level institutions initiative for enhancing education in STEM at the secondary school level. *Journal of*

Education and Development in the Caribbean, 18(1), 132-182. https://www.researchgate.net.

Craig, J., & Harindranath, G. (2015). An examination of the impacts of a learning management system: A case from Jamaica. *21st America Conference on Information Systems*, 1-18. https://core.ac.uk/download/pdf.7729723.pdf.

Crawford, J., Butler-Henderson, K., Rudolph, J., Malkawi, B., Glowatz, M., Burton, R., Magni, P. A., & Lam, S. (2020). COVID-19: 20 countries' higher education intra-period digital pedagogy responses. *Journal of Applied Learning & Teaching*, *3(1),* 9-28. https://doi.org/10.37074/jalt.2020.3.1.7.

Crawley, E., Loades, M., Feder, G., Logan, S., Redwood, S., & Macleod, J. (2020). Wider collateral damage to children in the Uk because of the social distancing measures designed to reduce the impact of COVID-19 in adults. *BMJ Paediatrics Open*, 4(1), 1-4. https://doi.org/10.1136/bmjpo-2020-000701.

Creamer, E. G. (2016). A primer about mixed methods research in an educational context. *International Journal of Learning, Teaching, and Educational Research*, 15(8), 1-13. https://www.researchgate.net/profile/elizabeth-creamer/publication/303541823_a_primer_about_mixed_methods_for_research_in_an_educational_context.

Cronbach, L. J., & Meehl, P. E. (1955). Construct validity in psychological tests. *Psychological Buletin*, 52(4), 281-302. https://doi.org/10.1037/h0040957.

Cronk, B. C. (2019). *How to use SPSS: A step-by-step guide to analysis and interpretation*. Routledge. https://www.scholar.google.com.

Cross, D. I., Hong, J., Williams-Johnson, M. (2011). Its not better or worse, its just different: examining Jamaican teacher's pedagogical and emotional experiences. *Teacher Development*, 15(4), 499-515. https://doi.org/10.1080/13664530.2011.635269.

Cui, S., Zhang, C., Wang, S., Zhang, X., Wang, L. Zhang, L., Yuan, Q., Huang, C., Cheng, F., Zhang, K., & Zhou, X. (2021). Experiences and attitudes of elementary school students' and parents towards online learning in China during the COVID-19 pandemic: Questionnaire study. *Journal of Medical Internet Research,* 23(5), 1-12. https://www.preprints.jmir.org/preprint/24496.

Dalati, S., & Marx Gomez, J. (2018). *Surveys and questionnaires*. *Modernizing the Academic Teaching and Research Environment: Methodologies and Cases in Business Research.* Springer International Publishing, 175-186. https://doi.org/10.1007/978-3-319-74173-4_10

Daly, M. C., Buckman, S. R., & Seitelman, L. M. (2020). The unequal impact of COVID-19: Why education matters. *FRBSF Economic Letter*, 1-5. https://frbsf.org/economic-research/file/el2020-17.pdf.

Danchikov, E. A., Prodanova, N. A., Kovalenko, Y. N., &Bondarenko, T. G. (2021). The potential of online learning in modern conditions and its use at different levels of education. *Linguistics and Culture Review,* 5(S1), 578-586. https://www.doi.org/10.37028/lingcure.v5nS1.1442.

Daniel, J. (2016). Making sense of flexibility as a defining element of online learning. *World Conference on Online Learning Teaching in the Digital Age*, 1-11. https://teachingonline.ca.

DATA VIZZES (2018). Correlation in tableau. *DATA VIZZEZ*. https://www.Vizzingdata.com.

Dawadi, S., Shrestha, S., &Giri, R. A. (2021). Mixed-methods research: A discussion on its types, challenges, and criticisms. *Journal of Practical Studies in Education*, 2(2), 25-36. https://www.doi.org/10.46809/jpse.v2i2.20.

Dawkins, P., Hurley, P., & Noonan, P. (2019). Rethinking and revitalizing tertiary education in Australia. *Mitchell Institute, Melbourne*. https://www.mitchellinstitute.org.au.

Darwish, T., Korouri, S., Pasini, M., Cortez, M. V., & Ishak, W. W. (2021). Integration of advanced health technology within the healthcare system to fight the global pandemic: Current challenges and future opportunities. *Innovations in Clinical Neuroscience,* 18(1-3), 31-34. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC8195559/

De Freitas, S., Morgan, J., & Gibson, D. (2015). Will MOOCs transform learning and teaching in higher education? Engagement and course retention in online learning provision. *British Journal of Educational Technology*, 46(3), 455-471. https://doi.org/10.1111/bjet.12268.

De Leeuw, E. D., & Hox, J. J. (2018). *Internet surveys as part of a mixed-mode design*. Department of Methodology and Statistics, The Netherlands. https://scholar.google.com.

Deane, K., Wamoyi, J., Mgunga, S., &Changalucha, J. (2019). Why me? Challenges associated with recruiting participants for a study focusing on “wealthy Men”: Reflections from fieldwork conducted in Tanzania. *International Journal of Qualitative Methods*, 18, 1-9. https://doi.org/10.1177/1609406919849318.

Deming, D. J., Goldin, C., Katz, L.F., & Yuchtman, N. (2015). Can online learning bend the higher education cost curve? *NBER Working Series*, 1-13. https://www.nber.org/papers/w20890.

Deng, R., Benckendorf, P., & Gannaway, D. (2020). Learner engagement in MOOCs: Scale development and validation. *British Journal of Educational Technology*, 51(1), 245-262. https://doi.org/10.1111/bjet.12810.

Dennis, J. (2020). Languaging network learning: The emergence of connectivism in architectonic thought. *The International Review of Research in Open and Distributed Learning*, 21(3), 304-318. https://doi.org/10.19173/irrodl.v21i3.4718

Denzin, N. K. (1978). *The research act: A theoretical introduction to sociological methods*. Taylor & Francis, London and New York. Retrieved from: https://www.doi.org/10,4324/9781315134543.

Dewan, M. A., Murshed, M., & Lin, F. (2019). Engagement detection in online learning: A review. *Smart Learning Environments,* (6)1, 1-20. https://doi.org/10.1186/s40561-018-0080-z.

Dewey, J. (2020). John Dewey quotes. *Goodreads*. https://www.goodreads.com

Dhawan, S. (2020). Online learning: A panacea in the time of COVID-19 crisis. *Journal of Educational Technology Systems,* 49(1), 5-22. https://doi.org/10.1177/0047239520934018.

Ding, X., Zhao, M., Qiu, X., Wang, Y., & Ru, Y. (2022). The optimization of mix proportion design for SCC: Experiemntal study and Grey relational analysis. *Materials*, 2022, 15, 1305. https://doi.org/10.3390/ma.15041305.

Dodman, J. (2021). The best glass? Equitable access to quality education in inner-city, Kingston, Jamaica. *Sage Publication*, 33(1), 83-93. https://doi.org/10.1177/0956247820983665.

Don, M. A. M., Rosli, M. R., Senin, M. S. B. M., Ahmad, M. F., & Rahmat, N. H. (2022). Exploring connectedness in online learning. *International Journal of Asian Social Science*, 12(4), 135-146. https://scholar.google.com/scholar?hl=en&as_sdt=0%2C5&q=don+2022+online+learning&btnG=

Dong, C., Cao, S., & Li, H. (2020). Young children's online learning during COVID-19 pandemic: Chinese parent' beliefs and attitudes. *Children's and Youth Services Review*, 118. https://www.doi.org/10.1016/j.childyouth.2020.105440.

Doolittle, P. E., & Hicks, D. (2003). Constructivism as a theoretical foundation for the use of technology in Social Studies. *Theory and Research in Social Education, 31(1)*, 72-104. https://doi.org/10.1080/00933104.2003.10473216.

Dotterer, G., Hedges, A., & Parker, H. (2016). The digital divide in the age of the connected classroom: How technology helps bridge the achievement gap. Netref, *Fourth in a Series Exploring the Impact of and Challenges Surrounding Technology in Schools,* 1-5. https://www.net-ref.com/wp-content/uploads/2016/01/Bridging-the-Digital-Divide-NetRef-White-Paper-FINAL.pdf.

Downes, S. (2019). Recent work in connectivism. *European Journal of Open, Distance and e-Learning*, 22(2), 112-131. https://www.files.eric.ed.gov/fulltext/EJ1245809.pdf.

Dube, B. (2020). Rural online learning in the context of COVID-10 in South Africa: Evoking an inclusive education approach. *Multidisciplinary Journal of Educational Research*, 10(2), 135-157. https://doi.org/10.447/remie.2020.5607.

Dubyna, N., Kholiarko, N., Zhavoronok, A., Sarfonor, Y., Krylor, D., & Tochylina, Y. (2023). The ICT sector in economic development of the countries of Eastern Europe: A comparative analysis. *Wseas Transactiona on Business and Economics*, 19, 1-7. https://doi.org/10.3739/23207.2022.19.18.

Duhoe, A. A. A., Owusu-Afriyie, R., & Kumi, E. (2020). Examining the significance of online and distance learning management in response to crisis in education. *Research Journal in Comparative Education*, 1(1), 1-16. https://royalliteglobal.com/rjce/article/view/313.

Dung, D. T. H. (2020). The advantages and disadvantages of virtual learning. *IOSR Journal of Research & Method in Education (IOSR-JRME)*, 10(3), 45-48. https://doi.org/10.9790/7388-1003054548.

Dunn, H. S. (2016a). Global information society watch 2008: Country report-Jamaica. Caribbean Program in Telecommunications Policy and Management, University of the West Indies. *Global Information Society Watch 2008*, 1-8. https://uwispace.sta.uwi.edu/dspace/

Dunn, H. S. (2016b). Learning smart: Enhancing education through technology. *Norma Darling Foundations' Day*, 1-26. https://uwispaces.sta.uwi.edu/

Dunn, H., Williams, R., & Johnson-Brown, S. (2016c). Promoting media literacy in Jamaican schools: Broadcasting regulator embracing a new role. *Global Citizens in a Digital World. MILID Yearbook* 2014, 1-30. https://uwispace.sta.uwi.edu/dspace/bitstream/handle/2139/43293/Promoting-Media-Dunn-UWIMona-CARIMAC-Collection.pdf?sequence=1.

Dziuban, C., Graham, C. R., Moskal, P. D., Norberg, A., & Sicilia, N. (2018a). Blended learning: the new normal and emerging technologies. *International Journal of Educational Technology in Higher Education,* 15(3), 1-16. https://doi.org/10.1186/s41239-017-0087-5.

Dziuban, C., Moskal, P., Thompson, J., Kramer, L., DeCantis, G., & Hermsdorfer, A. (2015b). Student satisfaction with online learning: Is it a psychological contract? *Online Learning, 19*(2), 2. https://eric.ed.gov/?id=EJ1062943.

Dziubaniuk, O., Ivanova-Gongne, M., & Nyholm, M. (2023). Learning and teaching sustainable business in the digital era: a connectivism theory approach. Int J Educ Technol High Educ 20(20), 1-23. https://doi.org/10.1186/s41239-023-00390-w.

Eason, J., & Lamoni, I. A. (2015). Jamaica: Educating for the future. *World Food Prize*, 1-7. https://www.worldfoodprize.org.

Egan, A. & Tiernan, P. (2022). It wasn't all zoom and gloom: Irish post-primary teacher and student experiences of online learning during COVID-19. *Dublin City University, Ireland* 1-18. https://scholar.google.com

Egielewa, P., Idogho, P. O., Ilyalomhe, F. O., & Cirella, G. T. (2022). COVID-19 and digitized education: Analysis of online learning in Nigerian higher education. *E-Learning and Digital Media,* 19(1), 19-35. https://doi.org/10.1177/20427530211022808

El Turk, S., & Cherney, I. D. (2016). Perceived online education barriers of administrators and faculty in a U.S. university in Lebanon. *Creighton Journal of Interdisciplinary Leadership*, 2(1), 15-31. https://www.doi.org/10.17062/CJIL.v2i1.30.

Elfil, M., & Negida, A. (2017). Sampling methods in clinical research; an educational review. *Emergency*, *5(1),* 52. https://ncbi.nlm.nih.gov/pmc/articles/PMC5325924/

E-LLearning Jamaica Company Limited (2020). E-Learning Jamaica's philosophy. *E- Learning Jamaica Company Limited*. https://elearningja.gov.jm/e-ljam-mandate-2/.

Erlingsson, C., & Brysiewicz, P. (2017). A hand-on guide to doing content analysis. *African Journal of Emergency Medicine,* 7, 391-382. https://www.doi.org/101016/j.afjem.2017.08.001.

Etikan, I., & Bala, K. (2017a). Sampling and sampling methods. *Biometrics & Biostatistics International Journal,* 5(6), 1-4. https://www.doi.org/10.13406/bbij.2017.05.00149.

Etikan, I., Musa, S. A., Alkassim, R. S. (2016b). Comparison of convenience sampling and purposive sampling. *American Journal of Theoretical and Applied Statistics*, 5(1), 1-4. https://www.doi.org/10.11648/j.ajtas.20160501.11.

Fadina, T., Bellini, F., Wang, R., & Wei, Y. (2021). Parametric of variability induced by risk measures. *University of Essex Research Repository*, 1-30. https://www.arxiv.org/abs/2012.05219.

Farrand, K., & Wells, T. (2019). Strategies for success with online learning: Preparing pre-service special education teachers. In Markelz, (Ed.), TED 2019 Conference Proceedings: Unmask your potential. *Teacher Education Division of the Council for ExceptionalChildren*, 42-46. https://tedcec.org/sites/deflaut/files/2020-12/TED-2019-Conference-Proceedings-1.pdf#page=42.

Farrell, A. M., & Rudd, J. (2009). Factor analysis and discriminant validity: A brief review of some practical issues. *IN: ANZMAC 2009 Conference Proceedings,* 1-9. https://www.publications.aston.ac.uk/id/eprint/7644/1/factor_analysis_ANZMAC_2009.pdf

Feraria, P. J. (2016). Engendering curriculum pedagogy for alternative pathways to secondary education in Jamaica. *Caribbean Teaching Scholar,* 6(1), 81-99. https://journals.sta.uwi.edu/ojs/index.php/cts/article/view/819/

Ferguson, A. (2020a). Many students are being left behind – COVID-19 ignites need for national distance learning policy. *The Gleaner Jamaica W.I., 1*. https://jamaica-gleaner.com/article/lead-stories/20200503/.

Ferguson, A. (2021b). Access points must be shared with the community – USF boss. *The Gleaner.* https://www.jamaica-gleaner.com/article/news/20210217/access-pointt-must-be-shared-community-usf-boss.

Florian, T. P. & Zimmerman, J. P (2015). Understanding by design, Moodle and blended learning: A secondary school case study. *Merlot Journal of Online Learning and Teaching*, 11(1), 120-128. https://jolt.merlot.org/vol11no1/florian_0315.pdf.

Focacci, C. N., & Perez, C. (2022). The importance of education and training policies in supporting technological revolutions: A comparative and historical analysis of UK, US, Germany, and Sweden (1830-1970). *Technology in Society*, 70, 1-13. https://doi.org/10.1016/j.techsoc.2022.102000.

Forbes, D. (2019). Digital technologies and online learning in primary education (New Zealand). *Bloomsbury Education and Childhood Studies*, 1-5. https://doi.org/10.5040/9781350995932.0027.

Foroughi, A. (2015). The theory of connectivism: Can it explain and guide learning in the digital age? *Journal of Higher Education Theory and Practice, 15(5)*, 11. https://scholar.google.com.

Francescucci, A, &Rohani, L. (2018). Exclusively synchronous online (VIRI) learning: The impact on student performance and engagement outcomes. *Journal of Marketing Education*, 41(1), 60-69. https://doi.org/10.1177/0273475318818864.

Fredericksen, E. E. (2017). A national study of online learning leaders in US higher education. *Online Learning* 21(2), 1-24. https://doi.org/10.24059/olj.v2i2.1164.

Frost, M. H., Reeve, B. B., Liepa, A. M., Stauffer, J. W., & Hays, R. D. (2007). What is sufficient Evidence for the reliability and validity of patient-reported outcome measure? *Value in Health*, 10(2), 594-603. https://www.doi.org.10.1111/j.1524-4733.2007.00272.x.

Furdu, I., Tomozei, C., & Kose, U. (2017). Pros and cons gamification and gaming in classroom. *Broad Research in Artifical Intelligence and Neuroscience*, 8(2), 56-62. Retrieved from: https://arxiv.org/abs/1708.09337.

Fusch, P., Fusch, G. E., & Ness, L. R. (2018). Denzin's paradigm shift: Revisiting triangulation in qualitative research. *Journal of Social Change*, 10(1), 19-32. https://www.doi.org/10.5590/JOSC.2018.10.1.02.

Garbe, A., Ogurlu, U., Logan, N., & Cook, P. (2020). COVID-19 and remote learning: Experiences of parents with children during the pandemic. *American Journal of qualitative Research*, 4(3), 45-65. https://www.doi.org/10.29333/ajqr/8471.

Gardiner, C., McDermott, C., & Hulme, C. (2019). Costs of family caregiving in palliative care (COFAC) questionnaire: Development and piloting of a new survey tool. *BMJ Supportive & Palliative Care,* 9(3), 300-306. https://www.doi.org/10.1136/bmjspcare-2016-001202.

Garzon-Artacho, E., Solas-Martinez, T., Romero-Rodriquez, J. M. (2021). Teachers' perceptions of digital competence at the lifelong learning stage. *Heliyon,* 7(7), 1-8. https://www.doi.org/10.1016/j.heliyon.2021.e07513.

Gay, G. H. E. (2016a). An assessment of online instructor e-learning readiness before, during, and after course delivery. *Journal of Computing in Higher Education, 28*(2), 199-220. https://doi.org/10.1007/s12528-016-9115-z.

Gay, H. E., & Betts, K. (2020b). From discussion to emeetings: Integrating high touch strategies to increase student engagement, academic performance, and retention in large online courses. *Online Learning*, 24(1), 92-117. https://eric.ed.gov/?id=EJ1249245.

George, N. A. (2015). Technology-enabled learning in the Commonwealth Caribbean countries: A baseline study. *Commonwealth of Learning*, 1-94. https://oasis.col.org.

Gherhes, V., Stoian, C. E., Farcasiu, M. A., & Stanici, M. (2021). E-Learning vs. face-to-face learning: Analyzing students' preferences and behaviors. *Sustainability*, 13(8), 4381. https://doi.org/10.3390/su13084381

Ghavifekr, S., & Mahmood, H. (2017a). Factors affecting use of e-learning platform (SPcCTRUM) among university students in Malaysia. *Education and Information Technologies, 22*(1), 75-100. https://doi.org/10.1007/s10639-015-9435-z.

Ghavifekr, S., & Rosdy, W. A. W. (2015b). Teaching and learning with technology: Effectiveness of ICT integration in schools. *International Journal of Research in Education and Science, 1(2),* 175-191. https://eric.gov/?id=EJ1105224.

Giddings, S. (2015). Self-directed learning (SDL) in higher education: A necessity for 21st century teaching and learning. *ResearchGate*, 1-16. https://www.scholar.google.com/scholar?q=behaviourist+view+on+skill+training+and+online+learning&hl=en&as_sdt=0%2C5&as_ylo=2015&as_yhi=.

Gilbert, B. (2015). Online learning revealing the benefits and challenges. *Education Masters*, Paper 303, 1-34. https://www.libguides.sjfc.edu/education_ETD_masters.

Gil-Flores, J. Rodriguez-Santero, J., & Torres-Gordillo, J. (2017). Factors that explain the use of ICT in secondary-education classrooms: The role of teacher characteristics and school infrastructure. *Computers in Human Behaviour*, *68*, 441-449. https://dx.doi.org/10.1016/j.chb.2016.11.057.

Gillet-Swan, J. (2017). The challenges of online learning: Supporting and engaging the isolated learner. *Journal of Learning Design,* 10(1), 20-30. https://eprints.qut.edu.au/102750/.

Gleason, B. & Von Gillern, S. (2018). Digital citizenship with social media: Participatory practices of teaching and learning in secondary education. *Journal of Educational Technology & Society, 21*(1), 200-212. https://www.jstor.org/stable/26273880.

Gobby, B., & Millei, Z. (2017). Schooling, its history and power. *In Powers of Curriculum: Sociological Perspectives on Education*, 37-59. https://researchgate.net/publication/321491194_schooling_its_history_and_power

Goldie, J. G. S. (2016). Connectivism: A knowledge learning theory for the digital age. *Medical Teacher*, 38(10), 1064-1069. https://www.doi.org/10.3109/0142159X.2016.1173661.

Golossenko, A., Pillai, K. G., & Aroean, L. (2020). Seeing brands as humans: Development and validation of a brand anthropomorphism scale. *International Journal of Research in Marketing*, 37(4), 737-755. https://doi.org/10.1016/j.ijresmar.2020.02.007

Gonzalez, A. (2018). Turning a traditional teaching setting into a feedback-rich environment. *International Journal of Educational Technology in Higher Education,* 15(32), 2-21. https://doi.org/10.1186/s41239.018.0114.1.

Goodman, J., Melkers, J., & Pallais, A. (2019). Can online delivery increase access to education? *Journal of Labor Economics* 37(1), 1-34. https://nber.org.

Gordon, G. Bourne, P. A., Quarrie, V. L., Peterkin, V. M. S., Burke, M., & Foster, C. (2021). COVID-19 and its influence on academic performance and health status of tertiary level students in Jamaica. *International Journal of Transformation in English and Education*, 6(1), 12-28. https://www.scholar.google.com.

Government of Jamaica (2018a). ICT transformation. *Government of Jamaica*. https://www.cabinet.gov.jm.

Government of Jamaica (2021b). E-Powering Jamaica: National Information and Communications Technology Strategy 2007-2012. *Government of Jamaica*. https://www.ictentcomp1220uwi.weebly.com.

Graham, D. A. (2019). Benefits of online teaching for face-to-face teaching at historically black colleges and universities. *Online Learning*, 23(1), 144-163. https://www.doi.org/10.24059/olj.v23i1.1435.

Grant, C., & Osanloo, A. (2016). Understanding, selecting, and integrating a theoretical framework in dissertations research: Creating the Blueprint for your "house". *Administrative Issues Journal: Connecting Education, Practice, and Research*, 4(2), 12-26. https://doi.org/10.5929/2012.4.2.9.

Gray, J. A., & Diloreto, M. (2016). The effects of student engagement, student satisfaction, and perceived learning in online learning environments. *NCPEA International Journal of Educational Leadership Preparation,* 11(1), 1-20. https://www.ncpeapublications.org.

Green, J. K., & Huntington, A. D. (2016). Online professional development for digitally differentiated nurses: An action research perspective. *Nurse Education in Practice*, 2-31. https://www.doi.org/10.1016/j.nepr.2016.11.009.

Griffith, S. A. (2018). Piloting the concurrent teaching of a graduate program at multiple sites and its value to the University of the West Indies. *International Journal of Technology and inclusive Education (IJTIE)*, 8(1), 1410-1418. https://infonomics-society.org/wp-content/upload/.

Gulpers, E. E. (2013). Teacher accountability in an era of financial scarcity: The case of Jamaican primary education reform. *Global Managerial Education Reforms and Teachers*, 37-51. https://scholar.google.com/scholar?hl=en&as-sdt=8%2C5&q=teacher+shortage+in+jamaica&btnG=

Gunawan, J. (2015). Ensuring trustworthiness in qualitative research. *Belitung Nursing Journal,* 1(1), 10-11. http://belitungraya.org/BRP/index.php/bnj/

Habibi, A., Mukminin, A., Riyanto, Y., Prasojo, L. D., Sulistiyo, U., Sofwan, M., & Saudagar, F. (2018). Building an online community: Student teachers' perceptions on the advantages of using social networking services in a teacher education program. *Turkish Online Journal of Distance Education,* 19(1), 46-61. https://doi.org/10.17718/tojde.382663.

Hadi, M. A. (2016). Ensuring rigour and trustworthiness of qualitative research in clinical pharmacy. *International Journal of Clinical Pharmacy*, 38(3), 641-646. https://www.doi.or/10.1007/s11096-015-0237-6.

Halili, S. H. (2019). Technological advancements in education 4.0. *The Online Journal of Distance Education and e-Learning,* 7(1), 63-69. https://www.tojdel.net.

Hamad, M. (2017). Pros & cons of using blackboard collaborate for blended learning on students learning outcomes. *Higher education Studies*, 7(2), 7-16. https://file.eric.ed.gov/fulltext/EJ1138165.pdf.

Hamilton, H. G. (2010*). Measuring household ICT access and individual use: Jamaica's experience*. United Nations UN. https://mdgs.un.org/unsd/economic_stat/ICT-Korea/Documents/Hamilton_Jamaica.pdf.

Han, C. (2023). Interrogating the predictive validity of aptitude testing for interpreting: A systematic methodological review. *Taylor and Francis Online*, 17(1), 7-28. https://doi.org/10.1080/1750399X.2023.2170049

Han., X, Zhou, Q., Shi, W., & Yang, S. (2021). Online learning in vocational education of China during COVID-19: Achievements, challenges, and future developments. *Journal of Educational Technology Development and Exchange (JETDE)*, 13(2), 60-82. https://aquila.usm.edu/jetde/vol13/iss2/4.

Harris, B., Regan, T., Schueler, J., & Fields, S. A. (2020). Problematic mobile phone and smartphone use scales: A systematic review. *Psychology for Clinical Settings*, 11, 1-24. https://doi.org/10.3389/fpsyg.2020.00672.

Harper, L., Herbst, K. W., & Kalfa, N. (2018). Ethical issues in research: Human and animal experimentation. *ELSEVIER*, 14, 287-288. https://www.doi.org/10.1016/j.jpurol.2017.12.012.

Harvey, L. (2007). Epistemology of quality. *Perspectives in Education, 25(3)*, 1-13. https://journals.co.za/doi/abs/10.10520/EJC87440.

Hashim, H. (2018). Application of technology in the digital era education. International Journal of Research in Counseling and Education, 2(1), 1-5. https://doi.org/10.24036/002za0002.

Halverson, L. R. & Graham, C. R. (2019). Learner engagement in blended learning environments: A conceptual framework. *Online Learning*, 23(2), 145-178. https://eric.ed.gov/?id=EJ1218398.

Hawes, M., & Dixon, G. (2021). Wilderness support opinion poll 2021. *Roy Morgan Research Ltd. 1-9*. https://www.scholar.google.com.

Head, G. (2020). Ethics in educational research: Review boards, ethical issues and researcher development. *European Educational Research Journal*, 19(1), 72-83. https://www.doi.org/10.1177/1474904118796315.

HEART/NSTA (2021). Digital acceleration through education: A partnership between HEART/NSTA Trust & Cisco Networking Academy. *HEART/NSTA*. Https://www.heart-nsta.org/heart-nsta-trust-strengthens-its-partnership-with-cisco-networking-academy-in-jamaica.

Hendrikz, J. (2018). *Open innovative schooling: Presentation to the Ministry of Education Youth and Information – Jamaica*. Commonwealth of Learning. https://oasis.col.org.

Heng, K. & Sol, K. (2021). Online learning during COVID-19: Key challenges and suggestions to enhance effectiveness. Cambodian Journal of Educational Research, 1(1), 3-16. https://scholar.google.com/scholar?as_ylo=2019&q=definition+of+online+learning&hl=en&as_sdt=0.5

Henriksen, D., Mishra, P., &Fisser, P. (2016). Infusing creativity and technology in 21st century education: A systemic view for change. *Journal of Educational Technology & Society*, 19(3), 27-37. https://scholar.google.com.

Hernandez, R. M. (2017). Impact of ICT on education: Challenges and perspectives. *Propositos Y Represntaciones*, *5(1)*, 325-347. https://doi.org/10.20511/pyr2017.v5nl.149.

Hibbert, K. (2020). Teachers share struggles of distance learning. *Jamaica Observer*. https://www.jamaicaobserver.com/news/teacher.

Hoffman, S., Wiben, A., Kruse, M., Jacobsen, K. K., Lembeck, M., & Astrid, E. (2020). Predictive validity of PRISMA-7 as a screening instrument for frailty in a hospital setting. *BMJ Open,* 10(10), 1-7. https://doi.org/10.1136/bmjopen-2020-038768

Hofmeister, C., & Pilz, M. (2020). Using e-learning to deliver in-service teacher training in the vocational education sector: Perception and acceptance in Poland, Italy, and Germany. *Education Sciences,* 10(70), 182. https://doi.org/10.3390/educsci10070182.

Holmes, W., Bialik, M., & Fadel, C. (2019). *Artificial intelligence in education: Promises and implications for teaching and learning*. Center for Curriculum Redesign, Boston, MA. https://curriculumredesign.org.

Home, O. E. C. D. (2020). Education and COVID-19: Focusing on the long-term impact of school closures. *OECD*, 1-7. https://oecd.org/coronavirus/policy-responses/education-and-COVID-19-focusing-on-the-long-term-impact-of-school-closures-2cea-926e/

Horzum, M. B. (2017). Interaction, structure, social presence, and satisfaction in online learning. *Eurasia Journal of Mathematics, Sciences and Technology Education*, 11(3), 505-512. https://www.ejmste.com.

Huda, M., Maseleno, A., Atmotiyoso, P., Siregar, M., Ahmad, R., Jasmi, K. A., Muhamd, N. H., Mustari, M. I., & Basiron, B. (2018). Big data emerging technology: Insights into innovative environment for online learning resources. *International Journal of*

*Emerging Technologies in Learning,*13(1), 23-36. https://doi.org/10.3991/ijet.v13i01.6990.

Hughes, C. (2021). Jamaica's education system transformation program. *Borgen Magazine*. https://www.borgenmagazine.com/jamaica-educational-system-transformational-program/.

Hunter, A., Murphy, K., Grealish, A., & Casey, D. (2011). Navigating the Grounded theory terrain. Part 1. *Nurse Researcher*, 18(4), 6-10. https://www.doi.org/10.7748/nr2011.07.18.4.6.c8636.

Husin, N., Ismail, S., Mohamad, M., Din, N. A. C., Samsir, S. Q., & Rahmat, Noor H. (2021). Learning Malay cultures and cosmology online using kabukos: What di the learners need? *Journal of Academic Research in Business and Social Sciences*, 11(11), 1133-1153. https://doi.org/10.6007/IJARBSS/v11-i11/11325

Hutton, D. M., & Dixon, R. A. (2016). Technical and vocational education and training (TVET) and its integration into general education at the university level. *Caribbean Curriculum*, 24, 100-126. https://journals.sta.uwi.edu/ojs/index.php/cc/article/viewFile/778/772.

Hylton, K., & Hylton-Fraser, K. (2022). An evaluation of the "every child can learn, every child must learn" mantra alignment with educational policies in Jamaica. *Equity in Education and Society*, 1(1), 163-181. https://www.doi.org/10.1177/27526461211066497.

Information and Telecommunications Department Office of the Prime Minister (2011). Information and Communications Technology (ICT) policy. *Government of Jamaica (GOJ)*, 1-52. https://www.japarliament.gov.jm.

Ingraham, K. L. (2015). Cloud computing technologies and management for improving efficiency in small and medium-sized enterprises in Jamaica. *Faculty of Social Technologies, Digital Technologies Institute, MykoloRomerio University*. https://www.vb.mruni.eu/object/elaba:8614861.

Internet World Stats (2019a). Usage and population statistics: Internet usage and population in the Caribbean. *Internet World Stats*. https://www.internetworldstats.com/stats11.htm.

Internet World Stats (2023b). Usage and population statistics. *Miniwatts Marketing Group*. https://www.internetworldstats.com/carib/.htm#jm.

Isaacs, S. (2015). *Technical & vocational skills development monitoring and evaluation report*. ResearchGate, University of Johannesburg. https://www.researchgate.net/

Iuspa, F. (2019). Infusing a collaborative international online learning experience into the curriculum: A United States and Mexico collaboration. *Collaborative Online Learning Experience,* 12(2), 1-14. https://schlar.google.com.

Ives, C., & Walsh, P. (2021). Perspectives of Canadian Distance Educators on the move to online learning. *Canadian Journal of Higher Education*, 51(1), 28-40. https://search.proquest.com/scholarly-journals/perspectives-canadian-distance-educators-on-move/docview/2522190154/se-2?accountid=188730.

Iyare, N. F., James, J., & Amonde, T. M. (2018). The effectiveness of integrating interactive technology in reading comprehension: A case study of Jamaica's grade school. *Journal of Information Technology Education: Research*, 17, 227-246. https://doi.org/10.28945/4098.

Jakobsdottir, S., & Jakobsdottir, P. (2018). The development of online and blended learning in primary and secondary education in Iceland. *Handbook of Research on K-12 Online and Blended Learning,* 646-664. https://scholar.google.com.

Jamaica Education Transformation Commission (2021). The state and evaluation of education in Jamaica. *Jamaica Green Paper*, 1-30. https://opm.gov.jm/wp-content/uploads/flipbook/jetc-summary-of-recommendations-2021/PDF.pdf

Jamaica Information Service (2008a). E-Learning project Targets Secondary Schools. *Jamaica information Service (JIS)*. https://jis.gov.jm/e-learning-project-tartgets-secondary-schools-2/

Jamaica Information Service (2019b). Government to launch major ICT initiative in March. *The Jamaica Information Service (JIS)*. https://jis.gov.jm.

Jamaica Information Service (2021c). ICT policy for education sector. *The Jamaica Information Service (JIS)*. https://jis.gov.jm/ict-policy-for-education-sector/

James, S., Swan, K., & Daston, C. (2016). Retention, progression and the taking of online courses. *Online Learning, 20(*2), 75-96. https://files.eric.ed.gov/fulltext/EJ1105922.pdf.

Jentoft, N., & Olsen, T. S. (2019). Against the flow in data collection: how data triangulation combined with a slow interview techmique enriches data. *Qualitative Social Work*, 18(2), 179-193. https://doi.org/10.1177/1473325017712581

Jennings, Z. (2018). Intervention in school's curricula to achieve quality learning: Experiences from the Commonwealth Caribbean. *Compare: Journal of Comparative and International Education,47*(6), 818-834. https://doi.org/10.1080/03057925.2017.1331120.

Jerrim, J., & De Vries, R. (2015). The limitations of quantitative social science for public policy. *Evidence & Policy: A Journal of Research, Debate and Practice*, 1(1), 117-133. https://www.doi.org/10.1332/174426415X14431000856662.

Jones, I. S., & Blankenship, D. (2017). Student perceptions of online courses. *Research in Higher Education Journal,* 32, 1-10. https://www.files.eric.ed.gov/fulltext/EJ1148916.pdf.

Joo, Y. J., Park, S., & Lim, E. (2018). Factors influencing preservice teachers' intention to use technology: TPACK, teacher self-efficacy, and technology acceptance model. *Educational Technology & Society*, 21(3), 48-59. https://www.jstor.org/stable/26458506.

Joshi, A., Kale, S., Chandel, S., & Pal, D. K. (2015). Likert scale: Explored and explained. *British Journal of Applied Science & Technology*, 7(4) 396-403. https://www.doi.org/10.9734/BJAST/2015/14975.

Kaliyadan, F., & Kulkarni, V., (2019). Types of variables, descriptive statistics, and sample size. *Indian Dermatology Online*, 10(1), 82-86. https://www.doi.org/10.4103/idoj.IDOJ_468_18.

Kamau, G. N. (2022). ICT4D research in developing countries: A call for pragmatism approach. *International Journal of Computer and Information Systems*, 3(2), 51-55. https://doi.org/10.29040/ijcis.v3i2.67.

Kamble, S., S., Gunasekaran, A., Kumar, V., Belhadi, A., & Foropon, C. (2021). A machine learning based approach for predicting blockchain adoption in supply chain. *Technological Forecasting and Social Change*, 163, 12465. https://doi.org/10.1016/j.techfore.2020.120465.

Kang, B. (2021). How the COVID-19 pandemic is reshaping the education service. *Springer*, 1, 15-36. https://doi.org/10.1007/978-981-33-4126-5_2.

Kano, H. M. (2017). Enhancing access to tertiary education through open and distance education. *International Journal of Education and Evaluation, 3*(5), 28-33. https://iiardpub.org.

Kanwar, A., & Daniel, J. (2020). Report to Commonwealth education ministers: From response to resilience. *Commonwealth of Learning*, 1-16. https://oasis.col.org/handle/11599/3592.

Karaoglan-Yilmaz, F. G., Ustun, A. B., & Yilmaz, R. (2020). Investigation of pre-service teachers' opinion on advantages and disadvantages of online formative assessment: An example of online multiple-choice exam. *Journal of Teacher*

Education & Lifelong Learning (TELL), 2(1), 10-19. https://dergipark.org.tr/tr/pub/tell.

Kauffman, H. (2015). A review of predictive factors of student success in and satisfaction with online learning. *Research in Learning technology, 23*, 1-13. https://doi.org/10.3402/rlt.v23.26507.

Kaushik, S. (2016). An introduction to clustering and different methods of clustering. *Analytics Vidhya,* 3. https://www.analyticsvidhya.com.

Kaushik, V., & Walsh, C. A. (2019). Pragmatism as a research paradigm and its implications for social work research. *Social Sciences*, 8(9), 255. https://doi.org/10.3390/soci809255

Kebritchi, M., Lipschuetz, A., & Santiague, L. (2017). Issues and challenges for teaching successful online courses in higher education: A literature review. *Journal of Educational Technology,* 46(1), 4-29. https://doi.org/10.1177/0047239516661713.

Keep, E. (2012). Education and industry taking two steps back and reflecting. *Journal of Education and Work, 25(4)*, 357-379. https://doi.org/10.1080/13639080.2012.708727.

Keles, M. K., & Ozel, S. A. (2016). *A review of distance learning and learning management systems.* Virtual Learning. https://www.doi.org/10.5772/65222.

Kelly, M., Dowling, M., & Miller, M. (2018). The search for understanding: The role of paradigms. *Nurse Researcher*, 25(4), 9-13. https://www.doi.org/10.7748/nr.2018.e1499.

Kelly-Williams, S., Berson, I. R., & Berson, M. J. (2017). Tablet nuff but life still rough. Technology for early childhood sustainable development in Jamaica. *Discourse and Communication for Sustainable Education*, 8(1), 1-14. https://doi.org10.1515/dcse-2017-0001.

Kennedy, H. & Nagarjuna, K. (2020). Identification of factors influencing online learning for behavioural competencies. *MaktShabd Journal*, 1-12. https://shabdbook.com/gallery/190-may2020.pdf.

Kentnor, H. E. (2015). Distance education and the evolution of online learning in the United States. *Curriculum and Teaching Dialogue*, 17(1), 21-34. https://digitalcommons.du.edu/law_facpub/24.

KeyCaribe (2023). Which Caribbean countries speak English? *KeyCaribe.* https://magazine.keycaribe.com/lifestyle/which-caribbean-countries-speak-english/

Khalaf, B. K., & Zin, Z. B. M. (2018). Traditional and inquiry-based learning pedagogy: A systematic critical review. *International Journal of Instruction*, 11(4), 545-564. https://doi.org/10.12973/iji.2018.11434a.

Khan, F. N., & Majeed, M. T. (2020). ICT and e-government as the sources of economic growth in information age: Empirical evidence from South Asian economies. *South Asian Studies*, 34(1), 227-249. https://111.68.103.26/journals/index.php/IJSAS/article/view/3237.

Khlaisang, J., & Songkram, N. (2017). Designing a virtual learning environment system for teaching twenty-first century skills to higher education students in ASEAN.

Technology, Knowledge and Learning, 24, 41-63. https://doi.org/10.1007/s10758-017-9310-7.

Kilag, O. K. T., Abalo, S. J. R., Retes, G. P., & Dalogdog, L. G. (2023). Enhancing student learning through the integration of connectivism theory in blended learning environments. European Journal of Innovation in Nonformal Education, 3(6), 1-10. https://inovatus.es/index.php/ejine/article/view/1768.

Kingsbury, I. (2021). Online learning: How do brick and mortar schools stack up to virtual schools? *Education and Information Technologies*, 1-22. https://doi.org/10.1007/s10639-021-10450-1.

Kirkpatrick, I. C. M., Horvat, T., & Bobek, V. (2020). Improving competitiveness between EU rural regions through access to tertiary education and sources of innovation. *International Journal of Diplomacy and Economy,* *6*(1), 26-40. https://doi.org/10.1504/IJDIPE.2020.109633.

Kitchenham, B., Pickard, L., & Pfleeger, S. L. (1995). Case Studies for method and tool evaluation. *IEEE Software*, 12(4), 52-62. https://www.doi.org/10.1.1.467.367.

Kivunja, C., & Kunyini, A. B. (2017). Understanding and applying research paradigms in educational contexts. *International Journal of Higher Education*, 6(5), 26-41. https://www.doi.org/10.5430/ijhe.v6n5p26.

Kizilcec, R. F., Davis, G. M., & Cohen, G. L. (2017). Towards equal opportunities in MOOCs: Affirmation reduces gender & Social-Class Achievement Gaps in China. *Proceedings of the Fourth ACM Conference on Learning @ Scale*, 121-130. https://doi.org/10.1145/3051457.3051460.

Kizito, R. N. (2016). Connectivism in learning activity design: Implications for pedagogical-based technology adoption in Africa higher education contexts. *International Review of Research in Open and Distributed Learning*, 17(2), 19-39. https://doi.org/10.19173/irrodl.v17i2.2217.

Kleinhekksel, A. J., Rockich-Winston, N., Tawfik, H., & Wyatt, T. R. (2020). Demystiying content analysis. *American Journal of Pharmeceutical Education*, 84(1), 7113. https://www.ajpe.org.

Knight, J., & Rapley, J. (2007). Educational reform in Jamaica: Recommendations from Ireland, Finland, and Singapore. *Caribbean Policy Research Institute (CaPRI)*, 1-30. https://www.capricaribbean.org.

Knox, J., Williamson, B., & Bayne, S. (2020). Machine behaviourism. *Learning Media and Technology*, 45(1), 31-45. https://doi.org/10.1080/17439884.2019.1623251.

Korey, J. L. (2013). Introduction to research methods in political science. *Online Course Materials.* https://www.cpp.edul~jlkorey/POWERMUTT PROJECT/index.html .

Korstjens, I., & Moser, A. (2017). Series: Practical guidance to qualitative research. Part 2: Context, research questions and designs. *European Journal of General Practice*, *23(1),* 274-279. https://doi.org/10.1080/13814788.2017.1375090.

Kovacs, P. T., Rozinaj, G., Murray, N., Sulema, Y., & Rybarova, R. (2015). Application of immersive technologies for education: State of the art. *International Conference on Interactive Mobile Communications Technologies and Learning (IMCL)*, 283-288. https://www.researchgate.net.

Kriksciuniene, D., Sakalauskas, V., & Lewandowski, R. (2019). Evaluating the interdependent effect for Likert scale items. *In International Conference on Business Information Systems*, 26-38. https://www.doi.org/10.1007/978-3-030-36691_3.

Krull, G., & Duart, J. M. (2017). Research trends in mobile learning in higher education: A systematic review of articles (2011-2015). *International Review of Research in Open and Distributed Learning*, 18(7), 1-24. https://www.doi.org/10.19173/irrodl.v18i7.2893.

Kulshreshta, U., & Misra, M. (2020). Unit -4 introduction to measures of variabilikty. *Indira Ghandi National Open University, New Delhi*. https://www.scholar.google.com.

Kumatongo, B., & Muzata, K. K. (2021). Resear paradigms and designs with their application in education. *Journal of Lexicography and Terminology*, 5(1), 16-32. https://www.journals.unzo.zm/index.php/jlt.

Kuong, H. C. (2015). Enhancing online learning experience: From learners' perspective. *Procedia-Social and Behavioural Sciences,* 191, 1002-1005. https://doi.org/10.1016/j.sbspro.2015.04.403.

Kyngas, H., Kaariainen, M, & Elo, S. (2020). Trustworthiness of content analysis. *Content Analysis in Nursing Science Research,* 41-48. https://www.doi.org/10.1007/978-3-030-30199-6_5.

Lancaster, H. (2019). Jamiaca – telecoms, mobile and broadband – statistics and analyses. *Paul Budde Communication Pty Ltd 1-65.*https://search.proquest.com/docview/2404629908?accountid=188730.

Lao, S. S. W., & Chair, S. Y. (2022). The feasibility of smartphone-based application on cardiac rehabilitation for Chinese patients with percutaneous coronary intervention in Macau: A qualitative evaluation. *International Journal of Qualitative Studies on Health and Well-being*, 17(1), 1-12. Retrieve from: https://www.doi.org/10.1080/17482631.2021.2023940.

Lavidas, K., Petropoulou, A, Papadakis, S., Apostolou, Z., Komis, V., Jimoyiannis, A., & Gialamas, V. (2022). Factors affecting response rates of the Web survey with teachers. *Computers*, 11(9), 127. https://doi.org/10.3390/computers11090127

Leppink, J., & Perez-Fuster, P. (2019). We need more replication research – A case for test-retest reliability. *Perspectives on Medical Education*, 6, 158-164. https://www.doi.org/10.1007/s40037-017-0347-z.

Likert, R. (1974). *A method of constructing an attitude scale*: *A Sourcebook for behavioural Scientists.* New Brunswick, USA and London. https://www.books.google.com.

Larionova, V., Brown, K., Bytrova, T., & Sinitsyn, E. (2018). Russian perspective of online learning technologies in higher education: An empirical study of a MOOC. *Research in Comparative and International Education,* 13(1), 70-91. https://doi.org/10.177/1745499918763420.

Latif, M. Z., Hussain, I., Saeed, R., Qureshi, M. A., & Maqsood, U. (2019). Use of smart phones and social media in medical education: Trends, advantages, challenges and barriers. *Journal of Academy of Medical Sciences*, 27(2), 133-138. https://doi.org/10.5455/aim.2019.27.133-138

Lederman, N. G. & Lederman, J. S. (2015). What is a theoretical framework? A practical answer. *Journal of Science Teacher Education*, 26(7), 593-597. https://doi.org/10.1007/s10972-015-9443-2

Leeder, T. M. (2022). Behaviourism, Skinner, and operant conditioning: considerations for sport coaching practice*. A Journal for Physical and Sport Educators*, 35(3), 27-32. https://doi.org/10.1080/08924562.2022.2052776

Lefevre, H., Moro, M. R., & Lachal, J. (2019). Research in adolescent healthcare. The value of qualitative methods. *Pediatrics Archives*, 26(7), 426-430. https://doi.org/10.1016/j.arcped.2019.09.012

Lehdonvirta, V., Oksanen, A., Rasanen, P., & Blank, G. (2020). Social media, Web, and panel surveys: Using non-probability samples in social and policy research. *Policy & Internet*, 13(1), 134-155. https://www.doi.org/10.1002/poi3.238.

Lentz, J., Kennett, M., Perlmutter, J., & Forrest, A. (2016). Paving the way to a more effective informed consent process: Recommendations from the clinical trials transformation initiative. *Contemporary Clinical Trials*, 49, 65-69. https://www.doi.org/10.1016/j.cct.2016.06.005.

Likert, R. (2017). The method of constructing an attitude scale. *In Scaling, Routledge*, 233-242. https://www.scholar.google.com.

Lincoln, Y. S., & Guba, E. G. (1985). *Naturalistic inquiry.* Sage Publication, Thousand Oaks. https://www.ethnographicworksshop.file.wordpress.com/2014/11/lincoln-guba-1985-establishing-trustworthiness-naturalistic-inquiry.pdf.

Lingard, L., Albert, M., & Levinson, W. (2018). Grounded theory, mixed methods, and action research. *BMJ,* 337. https://www.doi.org/10.1016/S0820-5930(09)60112-2.

Liu, Q., Li, C., Wanga, V., & Shepherd, B. E. (2018). Covariate-Adjusted Spearman's rank correlation with probability-scale residuals. *Biometrics,* 74(2), 595-605. https://www.doi.org/10.1111/biom.12812.

Loannidis, J. P. A. (2018). Meta-research: Why research on research matters. *PLos Biology* 16(3). https://www.doi.org/10.1371/journal.pbio.2005468.

Lock, I., & Seele, P. (2015). Quantitative content analysis as a method for business ethics research. Business Ethics: A European Review, 24(1), 24-40. https://doi.org/10.1111/beer.12095.

Locke, E. A. (2007). The case of inductive theory building. *Journal of Management,* 33(6), 867-890. https://scholar.google.com.

Ly, A., Marsman, M., Wagenmakers, E. J. (2018). Analytic posteriors for Pearson's correlation coefficient. *Statistics Netherland*, 72(1), 4-13. https://www.doi.org/10.1111/stan.12111.

Lydgaard, S. (2020). Extending models of self-regulated learning to working adults: Implications for inline advance skill training. *Georgia Institute of Technology*, 1-89. https://hdl.handle.net/1853/64128.

Maarouf, H. (2019). Pragmatism as a supportive paradigm for the mixed research approach: conceptualizing the ontological, epistemological, and axiological

stances of pragmatism. *International Business Research*, 1(9), 1-12. https://doi.org/10.5539/ibr.v12n9p1

Maharaj-Sharma, R., Sharma, A., & Sharma, A. (2017). Using ICT-based instructional technologies to teach science: Perspectives from teachers in Trinidad and Tobago. *Australian Journal of Teacher Education*, 42(10), 23-35. https://www.doi.org/10.14221/ajte.2017v442n10.2.

Maheshwari, S., Kumar, S., Gill, R., & Rathore, V. S. (2021). Analysis of augmented course delivery and assessment of undergraduate computer engineering programming courses with the use of ICT. *In rising threats in expert applications and solutions. Advances in intelligent systems and computing*, Springer, 1187, 481-488. https://doi.org/10.1007/978-981-15-6014-9_55

Mahmud, M. M., Yaacob, Y., Ramachandiran, C. R., Ching, W. S., Ismail, O. (2018). Theories into practices: Bloom's taxonomy, comprehensive learning theories (CLT) and e-assessments. *International Conference on Educational Assessment and Policy*, 2(2), 22-27. https://www.scholar.google.com

Maila, P., & Ross, Eleanor (2018). Perceptions of disadvantaged rural matriculants regarding factors facilitating and constraining their transition to tertiary education. *South African Journal of Education, 38*(1). 1-12. https://doi.org/10.15700/saje.v38n1a1360.

Majid, U. (2018). Research fundamentals: Study design, population, and sample size. *Undergraduate Research in Natural and Clinical Science and Technology Journal*, 2, 1-7. https://www.doi.org/10.26685/urncst.16.

Malhotra, L., & Bhatia, H. K. (2021). From walls to clouds: SWOCs of online learning from voices of prospective teacher educators in India in response to COVID-19. *The Online Journal of Distance Education and e-Learning*, 9(1), 92-105. https://orcid.org/0000-001-7677-9274.

Malhortra, A, Sharma, R, Srinivasan, R, & Matthew, N. (2018). Widening the arc of indigenous communication: Examining potential for use of ICT in strengthening social and behaviour change communication effort with marginalized communities in India. *The Electronic Journal of Information Systems in Developing Countries*, *84(4),* 1-15. https://doi.org/10.1002/isd2.12032.

Malik, S. (2021). The implication of behaviourism in online learning. *Worldwide Journal of Multidisciplinary Research and Development*, 7(4), 78-82. https://www.jmrd.com

Malterud, K., Siersma, V. D., &Guassora, A. D. (2016). Sample size in qualitative interview studies: Guided by information power. *Qualitative Health Research*, 26(13), 1-8: https://www.doi.org/10.1177/104973231561744.

Mangel, L., Suss, J., & Lande, B. (2020). Police expertise and use of force: Using a mixed-methods approach to model expert and novice use-of-force decision-making. *Journal of Police and Criminal Psychology*, 35(3), 294-303. https://www.doi.org/10.1007/s11896-020-09364-4.

Mann, S. (2016). *Research interview: Reflective practice and reflexivity in research processes*. Palgrave MacMillan, New York. https://www.ndl.ethernet.edu.et/bitstream/123456789/59192/1/136.pdf.pdf.

Mantock, C. (2020). Transitioning to online learning in Jamaica. *Mantock's Guide*. https://mantocksguide.com/

Marczyk, G. R., DeMatteo, D., & Festinger, D. (2021). *Essentials of research design and methodology*. John Wiley & Sons, Inc. https://www.dspace.vnbrims.org:1300/jspui/bitstream/123456789/4650/1/essentialsofresearchdesignandmethodology2005.pdf.

Marius, M. (2020). 5 e-learning challenges Caribbean countries are likely to experience in going back to school. *ICTPULSE*. Https://www.ict-pulse.com/2020/08/5-e-learning-challenges-caribbean-countries-are-likely-to-experience-in-going-back-to-school.

Markey, K., Tilki, M., & Taylor, G. (2014). Reflecting on the challenges of choosing and using a grounded theory approach. *Nurse Researcher*, 22(2), 16-22. https://www.doi.org/10.7748/nr.22.2.16.e1272.

Markham, J. M., Gentile, D., & Graham, D. (2017). Social media for networking, professional development, and patient engagement. *American Society of Clinical Oncology Educational*, 37, 782-787. https://www.ascopub.org/doi/full/10.1200/EDBK_180077.

Martin, F., & Bolliger, D. U. (2018a). Engagement matters: Student perceptions on the importance of engagement strategies in the online learning environment. *Online Learning,* 22(10), 205-222. https://www.eric.ed.gov/?id=EJ1179659.

Martin, F., Budhrani, K., & Wang, C. (2019b). Examining faculty perception of their readiness to teach online. *Online Learning*, 23(3), 97-119. https://www.doi.org/10.24059/olj.v23i3.1555.

Martinez-Mesa, J., Duquia, R. P., & Bastos, J. L. (2016). Sampling: How to select participants in my research study. *Brazilian Dermatology Clinics*, 91, 326-330. https://www.doi.org/10.1590/abd1806-4841.20165254.

Marwecki, C. (2021). *Innovating technical and vocational education and training: A framework for institutions.* UNESCO and UNESCO-UNEVOC International Centre for Technical and Vocational Education and Training, France and Germany. https://unesdoc.unesco.org/ark:/48223/pf0000374887/PDF/374887eng.pdf.multi.

Masethe, M. A., Masethe, H. D., & Odunaike, S. A. (2017). Scoping review of learning theories in the 21st century. *In Proceedings of the World Congress on Engineering and Computer Science, San Francisco, CA, EUA*, 1. : https://www.iaeng.org/publication/WCECS2017/WCECS2017_pp227-231.pdf.

Masino, M. (2015). Integration of blackboard in the online learning environment. *Journal of Instructional Pedagogies, 16*, 1-10. https://eric.ed.gov/?id=EJ1069393.

Masrur, R., & Shah, I. (2017). Instrumentation in educational research. *Allama Iqbal Open University*. https://www.scholar.google.com.

Mayer, R. E. (2019). Thirty years of research on online learning. *Applied Cognitive Psychology*, 33(2), 152-159. https://www.doi.org/10.1002/acp.3482.

Mayne, H., & Dixon, R. A. (2020). The epistemological dilemma: Student teachers shared experiences of Jamaica's National Standards Curriculum (NSC). *Journal of Curriculum and Teaching,* 9(4), 29-39. https://www.doi.org/10.5430/jct.v9n4p29.

MacLellan, D. (2022). Connectivism applied to English as an additional language students. In R. Power (Ed.), integration of Instructional Design and Technology, 2, 4—44. Power Learning Solutions. https://idandtech.pressbooks.com/chapter/connectivism-ap-plied-to-english-as-an-additional-language-students/

McCulloch, T., & Webb, S. (2020). What the public think about social services. *British Journal of Social Work*, 50(4), 1146-1166. https://doi.org/10.1093/bjsw/bcz090.

McDaniels, M., Pfund, C., & Barnicle, K. (2016). Cresting dynamic learning communities in synchronous online courses. One approach from the Center for the Integration of Research, Teaching and Learning (CIRTL). *Online Learning*, 20(1), 110-129. https://eric.ed.gov/?id=EJ1096380.

McGarry, D. E., Green, J. A., & Fowler, C. (2018). Snowballing via Facebook: A novel way to recruit millennial nursing student research participants. *Sigma Nursing Repository*, 1-5. https://www.hdl.handle.net/10755/624013

McKim, C. A. (2017). The value of mixed methods research: A mixed methods study. *Journal of Mixed Methods Research*, 11(2), 202-222. https://www.doi.org/10.1177/1558689815607096.

McLean, G. N. (2017). Adult learning theories: Implications for online instruction. *European Journal of Training and Development*, 4(7), 593-609. https://www.doi.org/10.1108/EJTD-02-2017-0014.

McLean, E. G. (2020). Understanding the causes for Jamaican dropouts from the Career Advancement Program. *Walden University*, 1-265. https://www.scholar.google.com.

McLeod, S. A. (2019). Qualitative vs quantitative research. *Simply Psychology*. https://www.simplypychology.org/qualitative-quantitative.hml.

McNeish, D. M., & Stapleton, L. M. (2016). The effect of small sample size on two-level model estimates: A review and illustration. *Educational Psychology Review*, 28(2), 295-314. Https://www.doi.org/10.1007/s10648-014-9287-x.

Means, B., Bakia, M., & Murphy, R. *Learning online: What research tells us*. Routledge, Taylor & Francis, New York and London. https://pdfs.semanticscholar.org/e220/2a139b9243ca3b2ecf98ac07a55464c581c9.pdf.

Meier, E. (2015). Beyond a digital status quo: Re-conceptualizing online learning opportunities. *Bank Street Occasional Paper Series*, 34(2), 4-19. : https://www.bankstreet.edu/occassional-paper-series/

Mellieon, H. I. (2016). Faculty perceptions of condensed online learning in higher education. *LSU Digital Commons*, 1-197. https://scholar.google.com.

Meylani, R., Bitter, G., & Legacy, J. (2015). Desirable characteristics of an ideal online learning environment. *Journal of Educational and Social Research*, 5(1), 203-216. https://www.doi/10.5901/jesr.2015.v5n1p203.

Miller-McLemore, B. (2016). The theory-practice distinction and the complexity of practical knowledge. *HTS Teologiese studies/Theological Studies, 72(4)*, 1-8. http://doi.org/10.4102/hts.v72i4.3381

Miller, P. (2015). Leading remotely: Exploring the experiences of principals in rural and remote school communities in Jamaica. *International Journal of Whole Schooling*,11(1), 35-53. https://files.eric.ed.gov/fulltext/EJ1061016.pdf.

Miller, W. (2015). Understanding grounded theory. *Clinical Laboratory Science, 28(3*), 197-200. https://clsjournal.ascls.org/content/ascls/28/3/197.full.pdf

Miller, P., Kirkman, G., Banerjee, R., Panicker, A., Nelson, K., Jones, A., Timmins, S., & Ochen, E. (2022). Getting past gatekeeper: Cultural competence, field access and researching gender-based violence – evidence from four countries. *Power and Education*, 1-14. https://www.doi.org/10.1177/17577438221092274.

Minhat, H. S. (2015). An overview on the methods of interviews in qualitative research. *International Journal of Public Health and Clinical Sciences*, 2(1), 210-214. https://www.scholar.google.com.

Ministry of Education Jamaica (2012a). National education strategic plan: 2011-2020. *Ministry of Education Jamaica*, 1-90. https://www.mona.uwi.edu/cop/sites/default/files/Jamaica_NESP_2011-2020.pdf.

Ministry of Education and Youth (2017b). Gov't targeting increased use of technology in education. *Ministry of Education and Youth, Jamaica*. https://moey.gov.jm/govt-targeting-increased-use-of-technology-in-education/

Ministry of Education and Youth (2021c). CSEC/CAPE 2021 external exam results. *Ministry of Education and Youth Jamaica* 1-11. https://moey.gov.jm/external-exam-results

Ministry of Education and Youth (2021d). MOEYI partners with One On One and FLOW to expand online learning options. *Jamaica Information Service*. https://jis.gov.jm/moeyi-partners-with-one-on-one-and-flow-to-expand-online-learning-options.

Ministry of Education and Youth (2022e). Draft Stakeholder engagement plan: Jamaica education project. *Jamaica Green Paper*, 1 36. https://moey.gov.jm/resources/?dc-division-unit=0&doc-category=231

Ministry of Education and Youth (2022f). Primary exit profile. *Ministry of Education and Youth Jamaica,* 1-13. https://moey.gov.jm/primary -exit-profile/

Ministry of Education and Youth (2023g). Education minister report success with 'yard to yard' find a child initiative. *Ministry of Education and Youth Jamaica*. https://moey.gov.jm/education-minister-report-success-with-yard-to-yard-find-a-child-initiative.

Ministry of Science, Energy and Technology (2019). Technology Policies. *Ministry of Science, Energy and Technology, Jamaica.* https://www.mest.gov.jm.

Miranda, J., Navarrrete, C., Noguez, J., Molina-Espinosa, J. M., Ramirez-Montoya, M. S.,

Navarro-Touch, S. A., Bustamante-Bello, M., Rosas-Fernandez, J., & Molina, A. (2021). The core components of education 4.0 in higher education: Three core studies in engineering education. Computer & Electrical Engineering. 93, 107278. https://doi.org/10.1016/j.compeleceng.2021.107278

Mircioiu, C., & Atkinson, J. (2017). A comparison of parametric and non-parametric methods applied to a Likert scale. *Pharmacy*, 5(2), 1-26. https://www.doi.org/10.3390/pharmacy5020026.

Misra, P. K. (2018). MOOCs for teacher professional development: Reflections, and suggested actions. *Open Praxis, International Council for Open and Distance Education*, 10(1), 67-77. https://www.doi.org/10.5944/openpraxis.10.1.780.

Mitchell, A. (2018). A review of mixed methods, pragmatism and abduction techniques. *The Electronic Journal of Business Research Methods,* 16(3), 103-116. https://www.ejbrm.com

Mitchell, K. A. (2016). Jamaica community experiences: Exploring the Jamaica social investment fund and rural economic development initiatives. *International Journal of Research in Engineering and Social Sciences*, 6(10), 1-11. https://www.indusedu.org.

Modestino, A. S. (2016). The importance of middle-skill jobs. *Issues in Science and Technology*, 33(1), 41-46. https://www.scholar.google.com.

Mohamad, M. M., Sulaiman, N. L., Sern, L. C., Salleh, K. M. (2015). Measuring the validity and reliability of research instruments. *Social and Behavorial Sciences*, 204(24), 164-171. https://doi.org/10.1016/j.sbspro.2015.08.129

Mohan, G., Mccoy, S., Carroll, E., Mihut, G., Lyons, S., & Mac Domhnaill, C. (2020). Learning for all? Second-level education in Ireland during COVID-19. *Economic & Social Research Institute,* 92, 1-111. https://esri.ie/pubs/sustat92.pdf.

Mohajan, H. (2017). Two criteria for good measurements in research: Validity and Reliability. *Annuals Spiral Haret University, Economics Series*,17)4), 59-82. https://www.mpra.ub.uni-muenchen.de/83458.

Mohsin, A. (2016). A manual for selecting sampling techniques in research. *University of Karachi and Iqra*, 1-57. https://mpra.ub.uni-muenchen.de/70218/

Montrieux, H., Vanderlinde, R., Schellens, T., & DeMarez, L. (2015). Teaching and Learning with mobile technology: A qualitative explorative study about the introduction of tablet devices in secondary education. *PLoS ONE* 10(2). https://doi.org/10.1371/journal.pone0144008.

Moore, R., Vitale, D., & Stawinoga, N. (2018). The digital divide and educational equity: A look at students with very limited access to electronic devices at home. *Insights in Education and Work, ACT Inc,* 1-14. https://www.fils.eric.ed.gov/fulltext/ED593163.pdf.

Moosa, R. (2020). Critical attributes of effective classrooms: Insights from classroom engagement. *Perspectives in Education,* 37(1), 87-100. https://doi.org/10.18820/2519593X/pie.

Morris, A, (2019). PEP results are available. *Jamaica Information Service*. https://jis.gov.jm/pep-results-are-

available/#:~text=the%20results%20for%20the%20first%20cohort%20gradesixGSAT%20

Morris, F. (2020). Accessible and inclusive city: Can Kingston Jamaica measure up? *Disability Studies Quarterly*, 40(2). https://dsq-sds.org/article/view/6682/5566.

Morris, F., & Henderson, A. (2017). ICTs and empowerment of children with disabilities: A Jamaican case study. *Communication and Information Technologies Annual (Studies in Media and Communications),* 12, 3-24. https://dx.doi.org/10.1108/S2050-20602016000012003.

Muller, C., & Mildenberger, T. (2021). Facilitating flexible learning by replacing classroom time with an online learning environment: A systematic review of blended learning in higher education. *Educational Research Review*, 34, 1-16. https://doi.org/10.1016/j.edurev.2021.100394.

Munro, M. (2018). The complicity of digital technologies in the marketisation of UK higher education: Exploring the implications of a critical discourse analysis of thirteen national digital teaching and learning strategies. *International Journal of Educational Technology in Higher Education,* 15(11), 1-20. https://doi.org/10.1186M1239-018-0093-2.

Murtonen, M., Gruber, H., &Lehtinen, E. (2017). The return of behaviourist epistemology: A review of learning outcomes studies. *Educational Research Review*, 22, 114-128. https://www.doi.org/10.1016/j.edurev.2017.08.001.

Muthuprasad, T., Aiswarya, S., Aditya, K. S., & Jha, G. K. (2021). Student's perception and preference for online education in India during COVID-19 pandemic. *Social*

Science & Humanities Open, 3(1), 1-11. https://www.doi.org/10.1016/j.ssaho.2020.100101.

Myrie, S. (2017). An exploration of factors that contribute to drug use among dropout girls in inner city communities in Kingston and St. Andrew, Jamaica. *University of Saskatchewan,* 1-357. https://www.scholar.google.com.

Nambiar, D. (2020). The impact of online learning during COVID-19: Students' and teachers' perspective. *The International Journal of Indian Psychology*, *8(2),* 783-793. https://doi.org/10.25215/0802.094.

Nancy, P., Currie, W., & Whitley, E. A. (2016). Entangled stakeholder roles and perceptions in health information systems: A longitudinal study of the UK NHS N3 network. *Journal of the Association for Information systems*, 17(2), 1-76. https://www.doi.org/10.17705/1jais.00421.

Napier, R. (2016). Evaluation of early intervention program for children (aged 0-6) with disabilities in a Caribbean country from a parent perspective. *Capella University, ProQuest Dissertation Publishing*. https://proquest.com/openview/

Nash, J. A. (2015). Future of online education in crisis: A call to action. *The Turkish Online Journal of Educational Technology,* 14(2), 80-88. https://files.eric.ed.gov/fulltext/EJ1057370.pdf.

Nasution, M. K. M., & Aulia, I. (2019). Design of the research problem statement. *In Journal of Physics Conference Series*, 1235(1), 1-8. https://www.doi.org/10.1088/1742-6596/1235/1/012115.

Nayak, N. R., Kumar, S., Gupta, D., Suri, M., & Soni, M. (2021). Network mining technologies to analyse the risk of the occupational accident via Bayesian network. *Int J Assur Eng Manag 13 (Suppl 1),* 633-641. https://doi.org/10.1007/s13198-021-01574-1/

Nazari, B., Hussin, A. R. B. C., & Niknejad, N. (2021). Connectivism: Promising constructs to the e-learning systems success*. In 2021 International Congress of Advanced Technology and Engineering (ICOTEN)*, 1-6. https://doi.org/10.1109/ICOTEN52080.2021.9493566.

Ng, B. (2018). The neuroscience of growth mindset and intrinsic motivation. *Brain Sciences*, 8(2), 1-10. https://doi.org/10.3390/brainsci8020020.

Nguyen, T. (2015). The effectiveness of online learning: Beyond no significant difference and future horizons. *Merlot Journal of Online Learning and Teaching, 11*(2), 309-319. https://jolt.merlot.org/vol11no2/Nguyen_0615.pdf.

Nguyen, V. N., Troung, T. A., Ly, T. T., &Dagamac, N. H. A. (2021). Perception of environmental science and management students on synchronous online teaching of environmental policies: Learning experience from Southeast Asian Cohort. *Pedagogical Research*, 6(1), 1-11. https://doi.org/10.29333/pr/9287.

Nie, Y. (2017). Combining narrative analysis, Grounded theory and qualitative data analysis software to develop a case study research. *Journal of Management Research*, 9(2), 53-70. https://www.doi.org/10,5296/jmr.v9i2.10841.

Nikolopoulou, K., Glalamas, V., & Lavidas, K. (2020). Acceptance of mobile phone by university students for their studies: an investigation applying UTAUT2 model.

Education and Information Technologies, 25, 4139-4155. https://doi.org/10.1007/s10639-020-10157-9.

Nkula, K, & Krauss, K. (2014). The integration of ICT's in marginalized schools in South Africa: Considerations for understanding the perceptions of in-service teachers and the role of training. *In International Development Informatics Associations (IDIA) Conference*, 241-261. https://developmentinformatics.org/conferences/2014/papers/20_Nkula_Kristen.pdf.

O'Doherty, D., Dromey, M., Lougheed, J., Hannigan, A., Last, J., &McGarth, D. (2018). Barriers and solutions to online learning in medical education – an integrative review. *BMC Medical Education*,18, 130. https://www.doi.org/10.1186/s12909-018-1240-0.

O'maley, D., & Kak, A. (2018). "Free Internet" and the costs to media pluralism: The hazards of zero-rating the news. *Center for International Media Assistance*, 1-25. https://www.scholar.google.com.

Oberhelman, S. M.., & Dunn, C. A. (2019). Globally networked learning in a university classroom: A pilot program. *Athens Journal of Education*, 6(1), 1-12. https://doi.org/10.30958/aje.6-1-1.

Organization of Economic Co-operation and Development (2018a). Cases studies on leaving no one behind: A companion volume to the development co-operation report 2018. *OECD*, 1-152. https://www.oecd-library.org/

Organization of Economic Co-operation and Development (2020b). Effective policies, successful schools: PISA 2018 results. *PISA, OECD Publishing, Paris*, 5, 1-330. Retrieved from:https://doi.org/10.1787/ca768d40-en.

Organization of Economic Co-operation and Development OECD (2022c). *Education at a glance 2022: OECD indicators*. OECD Publishing Paris, 1-462. https://doi.org/10.1787/3197152b-en

Organization of Economic Co-operation and Development (2023d). Education at a glance 2022: OECD indicators. *OECD*. https://oecd-library.org/sites/3197152b-en/1/3/1/index

Organization of Economic Co-operation and Development (2023e). Tertiary education rates reach record high with more efforts needed to expand vocational education and training. *OECD*. https://oecd.org/education/tertiary=education-rates-reach-record-high-with-more-efforts-needed-to-expand-vocational-education-and-training.htm

Okagbue, H. I., Pelumi, E. O., Obasi, & Akhmetshin, E.M. (2021). Trends and usage pattern of SPSS and Minitab software in Scientific research. *In Journal of Physics: Conference Series*, 1741(1), 1-7. https://www.doi.org/10.1088/1742-6596/1734/012017.

Oke, A., & Fernandes, F. A. P. (2020). Innovations in teaching and learning: Exploring the perceptions of the education sector on the 4th industrial revolution (4IR). *Journal of Open Innovation: Technology, Market, and Complexity*, 6(31), 1-22. https://www.doi.org/10.3390/joitmc6020031.

Oktavaia, R., Mentari, M., & Mulia, I. S. (2018). Assessing the validity and reliability of questionnaires on the implementation of Indonesian curriculum K-13 I STEM education. *Journal of Physics*, 1088(1), 2-8. https://www.doi.org/10.1088/1742-6596/1088/1/012014.

Omair, A. (2015). Selecting the appropriate study design for your research: Descriptive study designs. *Journal of Health Specialties*, 3(3), 153-156. https://www.scholar.google.com.

Omodan, B. I. (2023). Analysis of connectivism as a tool for posthuman university classrooms. *Journal of Curriculum Studies Research*, 5(1), 1-12. https://doi.org/10.46303/jcsr.2023.2

Onyefulu, C., & Roofe, C. (2019a). Characteristics, technology capabilities, and experiences of in-service teachers on the use of online/blended learning at a tertiary institution in Jamaica. *Open Access Library Journal*, 6(1), 1-21. Https://doi.org/10.4236/oalib.1105147.

Onyefulu, C., Hughes, G., & Hamil, S. (2016b). A situational analysis report of the e-learning tablets in schools pilot project in Jamaica. *University of Technology, Jamaica*, 1-183. https://www.elearningja.gov.jm/wp-content/uploads/2019/10/Situational-Analysis-Final-Report-March-2016-elj.pdf.

Ortiz, M. K. P., Melad, K. A. M., Araos, N. V. V., Orbeta, J. A. C., & Reyes, C. M. (2019). Process evaluation of the Universal Access to Quality Tertiary Education Act (RA 10931): Status and prospects for improved implementation. *Philippine Institute for Development Studies.* https://hdl.handle.net/11540/11543.

Oxman, A. D. (1994). Checklists for review articles. *BMJ*, 309, 648-51. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC2541456/pdf/bmj00456-0034.pdf.

Ozerbas, M. A., & Erdogan, B. H. (2016). The effect of the digital classroom on academic success and online technologies self-efficacy. *Journal of Educational Technology & Society,* 19(4), 203-212. https://www.jstor.org/stable/10.2307/jeductechsoci.19.4.203?seq=1&cid=pdf-reference#reference_tab_contents.

Padgett, J., Cristancho, S., Lingard, L., Cherry, R., & Haji, F. (2019). Engagement: What is it good for? The role of learner engagement in healthcare simulation context. *Advances in Health Sciences Education*, 24, 811-825. https://doi.org/10.1007/s10459-018-9865-7.

Palau, R., Fuentes, M., Mogas, J., & Cebrian, G. (2021). Analysis of the implementation of teaching and learning at Catalan schools during the COVID-19 lockdown. *Pedagogy and Education*, 30(1), 183-199. https://www.doi.org/10.1080/1475939X.2020.1863855.

Palinkas, L. A., Horwitz, S. M., Green, C. A., Wisdom, J. P., Duan, N., and Hoagwood, K. (2015). Purposeful sampling for qualitative data collection and analysis in mixed method implementation. *Administration and Policy in Mental Health*, 42(5), 533-544. https://www.doi.org/10.1007/s10488-013-0528-y.

Palvia, S., Aeron, P., Gupta, P., Mahapatra, D., Parida, R., Rosner, R., & Sinhi, S. (2018). Online education: Worldwide status, challenges, trends, and implications. *Journal*

of Global Information Technology Management, 21(4), 233-241. https://doi.org/10.1080/1097198X.2018.1542262.

Pandey, P., & Pandey, M. M. (2021). *Research methodology tools and techniques.* Bridge Center, Romania. https://www.scholar.google.com.

Pandolfini, V. (2016). Exploring the impact of ICTs in education: Controversies and challenges. *Italian Journal of Sociology of Education*, *8(2),* 28-53. https://doi.org/10.14658/pupj-ijse-2016-2-3.

Pange, A., & Pange, J. (2011). E-learning based on learning theories? A literature review. *International Journal of Education and Pedagogical Sciences*, 5(8), 932-936. https://www.scholar.google.com.

Panigrahi, R., Srivastava, P. R., & Sharma, D. (2018). Online learning: Adoption, continuance, and learning outcome-a review of literature. *International Journal of Information Management*, 43, 1-14. https://doi.org/10.1016/j.ijifomgt.2018.05.005.

Parker, C., Scott, S., & Geddes, A. (2019). Snowball sampling. *SAGE Research Methods Foundation.* https://www.doi.org/10.4135.

Parveen, N., & Zamir, S. (2020). Factors affecting behavioural intentions in the use of mobile learning in higher education. *International Journal of Distance Education and E-Learning, 1(1)*, 198-216. https://scholar.google.com.

Pat Research (2020). All about the education industry: Key segments, trends and competitive advantage. *PAT RESEARCH*. https://www.predicitveanalyticstoday.com/what-is-education-industry/

Patel, P., & Patel, N. (2017). ICT pedagogy for effective learning, education, and quality evaluation. *International Journal of Computer & Mathematical Sciences*, *6(5),* 101-107. https://d1wqtxts1xzle7.cloudfront.net/53536672/f201705241495594671.pdf.

Patino, C. M., & Ferreira, J. C. (2016). Developing research questions that make a difference. *JornolBrasileiro de Pneumologia*, *43(1),* 403. https://doi.org/10.1590/s1806-37562016000000324.

Patterson, C. (2019a). Recommendations on national minimum wage to be submitted by end of January. *JIS Daily Newspaper*. https://jis.gov.jm/recommendations-on-national-minimum-wage-to-be-submitted-by-end-of-january.

Patterson, C. (2022b). Incorporating technology in teaching and learning permanent – Minister. *The Jamaica Information Service*. https://jis.gov.jm/oncorporating-technology-in-teaching-and-learning-permanent-minister/

Paulenson, J., & McCormick, A. C. (2020). Reassessing disparities in online learner student engagement in higher education. *Educational Researcher*, 49(1), 20-29. https://doi.org/10.3102/0013189X19898690.

Peled-Raz, M., Tzafrir, S. S., Enosh, G., Efron, Y., & Doron, I. (2020). Ethics review boards for research with human participants: Past present, and future. *Qualitative Health Research*, 31(2) 590-599. https://www.doi.org/10.1177/104973230972333.

Perazzo, M. (2021). What works better in your survey – Likert scales or yes/no questions. *ResearchGate*. Retrieved from: https://www.researchgate.net.

Perry, D., & Steck, A. (2019). Changes in faculty perceptions about online instruction: Comparison of faculty groups from 2002 and 2016. *Journal of Educators Online*, 16(2), 1-15. https://www.eric.ed.gov/?id=EJ1223933.

Peters, M. A., & Britez, R. G. (2019). *Open education and education for openness*. Sense Publishers, Rotterdam, Taipei. https://www.researchgate.net.

Pham, K. T. (2021). The concept of pragmatism and its impact on education in the Vietnamese context. *Review of International Geographical Education*, 11(4), 1453-1466. https://www.doi.org/10.48047/rigeo.11.04.137.

Picciano, A. (2017). Theories and frameworks for online education: Seeking an integrated model. *Online Learning, 21(3)*, 166-190. https://eric.ed.gov/?id=EJ1154117.

Pieper, I., & Thomson, C. (2016). Beneficence as a principle in human research. *Monash Bioetrics Review*, 34(2), 117-135. https://www.eprints.qut.edu.au/107716.

Pilgrim, M., Hornby, G., & Inniss, T. (2018). Selective secondary school education in Barbados: The need for change. *Journal of International and Comparative Education*, 7(2), 111-126. https://www.doi.org/10.14425/jice.2018.7.2.111.

Plummer, R., Witkowski, S., Smits, A., & Dale, G. (2021). The issue of performance in higher education institution – community partnerships: A Canadian perspective. *Journal of Higher Education, Policy and Management,* 43(5), 537-556. https://www.doi.org/10.1080/1360080X.2020.1858386.

Potdar, K., Pardawala, T. S., & Pai, C. D. (2017). A comparative study of categorical variable encoding techniques for neural network classifiers. *International Journal of Computer Applications*, 175(4), 7-9. https://www.scholar.google.com.

Powell, A., Roberts, V., & Patrick, S. (2015a). Using online learning for credit recovery: Getting back on track to graduation. Promising practices in blended and online learning series. *International Association for K-12 Online Learning,* 1-25. https://www.eric.ed.gov/?id=eD560789.

Powell, A., Watson, J., Staley, P., Patrick, S., Horn, M., Fetzer, L., Hibbard, L., Oglesby, J., & Verma, S. (2015b). Blending learning: The evolution of online and face-to-face education from 2008-2015. *International Association for K-12 Online Learning*, 1-20. https://files.eric.ed.gov/fulltext/ED560788.pdf.

Pozzo, M. I., Borgobello, A., & Pierella, M. P. (2019). Using questionnaires in research on universities: Analysis of experiences from a situated perspective*. Journal of Innovation and Research in Education*, 12(2), 1-16. https://www.doi.org/10.1344/reire2019.12.227010.

Protogerou, C., & Hagger, M. S. (2019). A case for a study quality appraisal in survey studies in psychology. *Frontier in Psychological*, 9, 1-7. https://www.doi.org/10.3389/fpsyg.2018.02788.

Purcarea, A. A., Popesca, M., & Gheorghe, S. (2018). Research on modern methods of adopting and implementing e-learning within companies. *International Conference e-Learning*, 177-181. Retrieved from: https://files.eric.ed,gov/fulltext/ED590269.pdf.

Queiros, A., Faria, D., & Almeida, F. (2017). Strengths and limitations of qualitative and quantitative research methods. *European Journal of Education Studies*, 3(9), 369-387. https://www.doi.org/10.5281/zenodo.887089.

Queiros, D. R., & de Villers, M. R. (2016). Online learning in South African Higher Education Institution: Determining the right connections for the student. *International Review of Research in Open and Distributed Learning,* 17(5), 165-185. https://www.doi.org/10.19173/irrodl,v17i5.2552.

Quesada-Pallares, C., Sanchez-Marti, A., Ciraso-Cali, A., & Pineda-Herrero, P. (2019). Online vs, classroom learning: Examining, motivational and self-regulated learning strategies among vocational education and training students. *Frontier in Psychology*, 10, 1-13. https://www.doi.org/10.3389/fpsyg.2019.02795.

Rahli, S. (2017). Research design and methods: A systematic review of research paradigms, sampling issues and instruments development. *International Journal of Economics and Management Sciences,* 6(2), 1-5. https://www.doi.org/10.4172/2162-6359.1000403.

Rahman, M. S. (2020). The advantages and disadvantages of using qualitative and quantitative approaches and methods in language “Testing and Assessment” research: A literature review. *Journal of Education and Learning*, *6(1),* 102-112. https://doi.org/10.5539.jel.v6n1p102.

Rai, U. S., & Basnet, H. B. (2021). The perception of the teachers towards virtual class and obstacles during Covid-19 lockdown phase. *Journal of Research and Development,* 4(3), 43-58.

https://scholar.google.com/scholar?hl=en&as_sdt=0,5&as_ylo=2009&q=rai+and+basnet+2021+online+learning

Rajabalee, Y. B. & Santally, M. I. (2020). Learner satisfaction, engagement, and performances in an online module: Implications for institutional e-learning policy. *Education and Information Technologies*, 26, 2623-2656. https://doi.org/10.1007/s10639-020-10375-1

Rasmussen, M. L. (2017). The role of theory in research. *The BERA/SAGE Handbook of Educational Research*, 53-71. https://scholar.google.com.

Raymond, A., Jacob, D., & Lyons, J. (2016). Peer learning a pedagogical approach to enhance online learning: A qualitative exploration. *Nurse Education Today*, 44, 165-169. https://doi.org10.1016/j.nedt.2016.05.016.

Reddy, P., Chaudhary, K., Sharma, B., & Chand, D. (2021). Contextualizing game-based intervention for digital literacy for Pacific Islands. *Education and information Technologies,* 26, 5535-5562. https://www.doi.org/10.1007/s10639-021-10534-y.

Reese, S. A. (2015). Online learning environments in higher education: Connectivism vs. dissociation. *International Journal of Instructional Technology and Distance Learning*, 10(5), 35-43. https://www.itdl.org/journal/may_13/May_13.pdf#page=39.

Reeves, S., Fletcher, S., McLoughlin, Yim, A., & Patel, K. D. (2017). Interprofessional online learning for primary healthcare: Findings from a scoping review. *BMJ Open*, 7(8), 1-9. https://doi.org/10.1136/bmjopen-2017-016872.

Reiger, K. L. (2018). Discriminating among grounded theory approaches. *Nursing Inquiry*, 26(1), 1-12. https://www.doi.org/10.1111/nin.12261

Richard, V., & Belanger, M. (2018). Accepting research: Teachers' representations of participation in educational research projects. *International Journal of Educational Methodology*, 4(2), 61-73. https://www.doi.org/10.12973/ijem.4.2.61.

Richardson, A. J. (2018). The discovering of cumulative knowledge: Strategies for designing and communicating qualitative research. *Accounting, Auditing & Accountability Journal*, 31(2), 1-3. https://www.emerald.com/insight/content/doi/10.1108/AAAJ-08-2014-1808.

Richardson, J. W., Hollis, E., Pritchard, M., & Lingat, J. E. M. (2020). Shifting teaching and learning in online spaces: An investigation of a faculty online teaching and learning initiative. *Online Learning,* 24(1), 67-91. https://doi.org/10.24059/olj.v24i1.1629.

Rienties, B., &Toetenel, L. (2016). The impact of learning design on student behaviour, satisfaction and performance. A cross-institutional comparison across 151 modules. *Computers in Human Behaviour* 60, 333-341. https://doi.org/10.1016/j.chb.2016.02.074.

Robinson, M. G. (2019). Continuing professional development and special librarians in Jamaica. *Library Management*, 40(6/7), 416-427. https://www.doi.org/10.1108/LM-12-2018-0093.

Robinson, L., Schulz, J, Dodel, M., Correa, T., Villanueva-Mansilla, E., Leal, S., Magallanes-Blanco, C, Rodriguez-Medinia, L., Dunn, H. S., Levine, L. McMahon,

R., & Khilnani, A. (2020). Digital inclusion across the America and the Caribbean. *Social Inclusion*, *8(2),* 244-259. https://doi.org/10.17645/si.v8i2.2632.

Robinson, G., Lee, E., Lecking, B, Silburn, S., & Milford, R. (2022). Validity and reliability of resiliency measures trialed for the evaluation of preventative resilience-promoting social-emotional curriculum for remote Aboriginal school students. *PLoS ONE,* 17(1), 1-21. https://www.doi.org/10.1371/journal.pone.0262406.

Roulston, K. (2018). Triangulation in qualitative research. *Qualpage*. https://www.qualpage.com/2018/01/18/triangulation-in-qualitative-research/

Roddy, C., Amiet, D. L., Chung, J., Holt, C., Shaw, L., McKenzie, S., Garivaldis, F., Lodge, J. M., & Mundy, M. E. (2017). Applying best practices online learning, teaching, and support to intensive online environments: An integrative review. *Frontiers in Education, Digital Education,* 1-10. https://www.doi.org/10.3389/feduc.2017.00059.

Roll, I., & Wylie, R. (2016). Evolution and revolution in artificial intelligence in education. *International Artificial Intelligence in Education Society*, 26(2), 582-599. https://wwwdoi.org/10.1007/s40593-016-0110-3.

Rose, L. C., & Bugher, W. K. (1983). PER (Prioritizing and evaluating recommendations). *Phi Delta Kappa, Bloomington*, 1-18. https://www.file.eric.ed.gov/fulltext/ED238909.pdf.

Rubio, D. M., Berg-Weger, M., Tebb, S. S., Lee, E. S., & Rauch, S. (2003). Objectifying content validity: Conducting a content validity study in social work research. *Social Work Research,* 27(2), 94-104. https://www.doi.org.10.1093/swr/27.2.94.

Sadeghi, M. (2019). A shift from classroom to distance learning: Advantages and limitations. *International Journal of Research in English Education*, 4(1), 1-9. https://www.ijreeonline.com

Sahu, P. K., Dalcik, H., Dalcik C., Gupta, M. M., Chattu, V. K., & Umakanthan, S. (2022). Best practices for effective implementation of online teaching and learning in medical and health professions education: During COVID-19 and beyond. *AIMS Public Health*, 9(2), 278-292. https://doi.org/10.3934/publichealth.2022019

Saleh, A. (2017). Examining factors impacting online survey response rates in educational research: Perceptions of graduate students. *Journal of MultiDisplinary Evaluation*, 13(29), 63-74. https://www.jmde.com.

Salem, O., & Kiss, M. (2022). The impact of perceived service quality on customers' repurchase intention: Mediation effect of price perception. *Innovative Marketing*, 18(4), 1-12. https://doi.org/10.2151/im.18(4).2022.01

Salimi,E. A., & Safarzadeh, M. M. (2019). A model and questionnaire of language education glocalization in Iran. *International Journal of Instruction*, 12(1), 1640-1652. https://www.file.eric.ed.gov/fulltext/EJ1201180.pdf.

Samms, J. (2017). Inclusion in Jamaican primary schools: Teachers' self-efficacy, attitudes, and concerns. *Walden Dissertations and Doctoral Studies*, 1-203. https://scholarworks.waldenu.edu/dissertations/3367.

Samuels, S. (2020). Addressing the learning needs of out-of-school children and youths through the expansion of open schooling. *Commonwealth of Learning*, 2-288. https://oasis.col.org/

Samuels, A. I., Emmanuel, A., Odigwe, I, A., & Felly-Njoku, F.C. (2017). A comparative study of regression analysis and artificial neural network methods for medium-term load forecasting. *Indian Journal of Science and technology*, 10(10), 1-7. https://www.doi.org/10.17485/ijt/2017/v10i/86243.

Sanchez-Gordon, S., & Lujan-Mora, S. (2016). How could MOOCs become accessible? The case of edX and the future of inclusive online learning. *Journal of Universal Computer Science*, 22(1), 55-81. https://jucs.org/jucs_22_1/how_could_moocs_become/jucs_22_01_0055_0081_gordon.pdf.

Sari, F. M. (2020). Exploring English learners' engagement and their roles in the online language course. *Journal of English Language Teaching and Linguistic (JELTL)*, 5(3), 2503-1848. https://www.jeltl.org.

Sarikaya, A., & Gleicher, M. (2017). Scatterplots: Tasks, data, and designs. *IEEE Transactions on Visualization and Computer Graphics*, 24(1), 402-412. https://www.ieeexplore.ieee.org/abtract/document/8017602.

Schneider, F., Buser, T., Keller, R., Tribaldos, T., & Rist, S. (2019). Research funding programs aiming for societal transformations: Ten key stages. *Science and Public Policy,* 46(3), 463-478. https://www.doi.org/10.1093/scripol/scy074.

Schober, P., Boer, C., & Schwarte, L. A. (2018). Correlation coefficients: Appropriate use and interpretation. *Anesthesia & Analgesia*, 126(5), 1763-1768. https://www.doi.org/10.1213/ANE.0000000000002864.

Schroeder, R. (2012). Emerging open online distance education environment. *Continuing Higher Education Review*, 76, 90-99. http://eric.ed.gov/?id=EJ1000655

Schoonenboom, J., & Johnson, R. B. (2017). How to construct a mixed methods research design. *Koln Z Soziol*, 69, 107-131. https://www.doi.org/10.1007/s11577-017-0454-1.

Searle, S. (2017). Comparing and contrasting special education services in the United States and Jamaica. *Senior Honors Thesis*, 1-37. https://digitalcommons.liberty.edu/honours/722.

Secore, S. (2017). Social constructivism in online learning: Andragogical influence and the effectual educator. *E-Mentor*, 3(70), 4-9. https://www.doi.org/10.15219/em70.1300.

Sedgwick, P. (2015). Multistage sampling. *BMJ*, 351. https://www.doi.org/10.1136/bmj.h4155.

Selvakumar, V. & Maran, K. (2019). Role of e-learning practices for teaching faculty on enhancing institutional climate at self-finance engineering colleges at Chennai city. *The Journal of Distance Education and e-Learning,* 7(1), 51-62. https://www.tojdel.net.

Seraji, F., Attaran, M., & Azizi, S. M. (2019). Blended learning research in Iran: Several fundamental criticisms. *Digital Education Review*, 36, 190-206. https://greav.ub.edu/der/.

Setia, M. S. (2016). Methodology series module 5: sampling strategies. *Indian Journal of Dermatology*, *61(5*), 505-509. https://doi.org/10.4103/0019-5154.190118.

Sharma, G. (2017). Pros and cons of different sampling techniques. *International Journal of applied research*, 3(7), 749-752. https://www.allresearchjournal.com.

Shea, P. (2019). Bridges and barriers to teaching online college courses: Study of experienced online faculty in thirty-six colleges. *Online Learning,* 11(2),.73-128. https://doi.org/10.24059/olj.v11i2.1728.

Sherifff, V. (2018). Evaluating pre-existing qualitative research data for secondary analysis. *Forum Qualitative Social Research,* 19(2), 7. https://www.doi.org/10.17169/fgs-19.2.2821.

Shetgovekar, S., Kulshreshta, U., &Misra, M. (2020*). Block-2 measures of central tendency and variability*. School of Social Sciences, IGNOU, New Delhi. https://www.scholar.google.com.

Shi, K. (2022). Contrasting behaviorist and constructivist perspectives on learning for students with emotional and behahvioral disorders. *Pschology Research and Practice*, 1(1), 43-52. https://doi.org/10.37155/2972-3086-0101-4

Schimmack, U. (2021). The validation crisis in psychology. *Meta-Psychology*, 5, 1-9. https://www.doi.org/10.15626/MP.2019.1645.

Shiohira, K. (2021). *Understanding the impact of artificial intelligence on skills development*. UNESCO-UNEVOC International Centre for Technical and Vocational Education and Training, Germany. https://unesdoc.unesco.org/ark:/48223/pf0000376162/PDF/376162eng.pdf.multi.

Shorten, A., & Smith, J. (2017). Mixed methods research: Expanding the evidence base. *Evidence-Based Nursing*, 20(3), 74-75. https://www.doi.org/10.1136/eb-2017-102699.

Shou, Y., Seilbom, M., & Chen, H. F. (2021). Fundamentals of measurement in clinical psychology. *Comprehensive Clinical Psychology,* 4, 13-35. https://www.doi.org/10.1016/B978-0-12-818697-8.00110-2.

Shreaves, D. (2020). Faculty perceptions of online teaching at a mid-sized liberal arts university. *Online Learning,* 24(3), 106-127. https://doi.org/10.24059/olj.v24i3.2199.

Shreffler, J., & Huecker, M. R. (2021). Types of variables and commonly used statistical designs. *StatPearls Publishing*. https://www.ncbi.nlm.nih.gov/books/NBK557882.

Shrivastava, A. (2018). Using connectivism theory and technology for knowledge creation in cross-cultural communication. *Research in Learning Technology, 26,* 1-16. https://dx.doi.org/10,25304/rlt.v26.2061.

Shufutinsky, A. (2020). Employing use of self for transparency, rigor, trustworthiness, and credibility in qualitative organizational research methods. *OD Practitioner*, 52(1), 50-58. https://www.scholar.google.com.

Shvshkins, M. (2018). Holistic approach to training of ICT skilled educational personnel. *arXiv Preprint arXiv*, *1000*, 436-445. https://arXiv.1807.08717v1.

Sidney, P. (2015). Evaluating a behaviourist and constructivist learning theory for 21st century learners. *Georgia Educational Research Association Conference*, 17. https://www.digitalcommons.georgiasouthem.edu/gers/2015/2015/17.

Siegel, D., Acharya, P., &Sivo, S. (2017). Extending the technology acceptance model to improve usage & decrease resistance toward a new technology by faculty in hgher education. *Journal of Technology Studies*, 43(2), 58-69. https://www.jstor.org/stable/90023142.

Siemens, G. (2017). Connectivism. *Foundations of Learning and Instructional Design Technology*. Chapter 19. PressBooks. https://lidtfoundations.pressbooks.com.

Sil, A., & Das, N. K. (2016). Informed consent process: Foundation of the researcher-participant bond. *Indian Journal of Dermatology*, 62(4), 380-386. https://www.doi.org/10.41003/ijd.IJD_272_17.

Sim, J., Saunders, B., Waterfield, J., & Kingstone, T. (2018). Can sample size in qualitative research be determined a priori? *International Journal of Social Research Methodology*, 21(5), 619-634. https://www.doi.org/10.1080/13645579/2018.1454643.

Simister, N. (2017). Basic tools for data collection. *Intrac for Civil Society*. https://www.intrac.org/wpcms/wp-content/

Simms, L. J., Zelazny, K., Williams, T. F., & Bernstein, L. (2019). Does the number of response options matter? Psychometric perspective using personality questionnaire data. *American Psychological Association*, *31(4),* 557. https://dx.doi.org/10.1037/pas0000648.

Sinatra, G. M., Heddy, B. C., & Lombardi, D. (2015). The challenges of defining and measuring student engagement in science. *Educational Psychologist*, 50(1), 1-13. https://doi.org/10.1080/00461520.2014.1002924.

Singh, A. S. (2017). Common procedures for development, validity and reliability of a questionnaire. *International Journal of Economics, Commerce and Management*, 5(5), 790-801. https://www.ijecm.co.uk/

Singh, S., & Estefan, A. (2018). Selecting a Grounded theory approach for nursing research. *Global Qualitative Nursing Research*, 5, 1-9. https://www.doi.org/10.1177/2333393618799571.

Spector-Bagdady, K., & Lombardo, P. (2018). From in vivo to invitro: How the Guatemala STD experiments transformed bodies into biospecimens. The *Milbank Quarterly*, 96(2), 244-271. https://www.doi.org/10.1111/1448-0009.12318.

Spicker, P. (2018). The real dependent variable problem: The limitations of quantitative analysis in comparative policy studies. *Social Policy & Administration*, 52(1), 216-228. https://www.doi.org/10.1111/spol.12308.

Statistical Institute of Jamaica (2017a). *Education statistics*. Statistical Institute of Jamaica. https://www.statinja,gov.jm.

Statistical Institute of Jamaica (2017b). Information & Communication Technology. *STATIN, Jamaica.* https://www.statinja.gov.jm/ICT.aspx.

Statistics Solution (2021). Correlation (Pearson, Kendall, Spearman). *Statistic Solutions*. Retrieved from: https://www.statisticsolution.com.

Statsworks (2021). Content analysis. *Statsworks.* https://www.statsworks.com.

Stewart, M. (2021). *Understanding learning: Theories and critique*. *In University Teaching in Focus2nd Edition*. London, Routledge. https://www.scholar.google.com.

Stone, C. (2017a). Opportunity through online learning: Improving students' access, participation and success in Higher education. National Center for Student Equity in Higher Education (NCSEHE). https://wwwdoi.org/APO-94591.

Stone, C., Freeman, E., Dyment, J. E., Muir, T., & Milthorpe, N. (2019b). Equal or equitable? The role of flexibility within online education. *Australian and International Journal of Rural Education*, 29(2), 26-40. https://www.doi.org/10.3316/informit.639619709196818.

Stone, C., O'Shea, S., May, J., Delahunty., & Partington, Z. (2016c). Opportunity through online learning: Experiences of first-in-family students in online open-entry higher education. *Australian Journal of Adult Learning*, 56(2), 146-169. https://files.eric.ed.gov/fulltext/EJ1107574.

Story, D. A. (2019). Survey research. *Anesthesiology,* 130(2), 192-202. https://www.doi.org/10.1097/ALN.0000000000002436.

Sulaiman, S., & Halamy, S. (2021). ICT education as a catalyst to bridge digital divide: The roles of UiTM Sarawak in rural areas. *International Journal of Advance Research in Education and Society*, 3(2), 174-181. https://www.myjms.mohe.gov.my/index.php/ijares/articles/view/14576.

Sun, A., & Chen, X. (2016). Online education and its effective practice: A research review. *Journal of Information Technology Education: Research*, 15, 157-190. https://www.informingscience.org/publications/3502 .

Sunday, J. (2017). Systems theory: An approach to mass-damper-spring and mass-nondamper-spring systems. *General Letters in Mathematics*, 3(3), 169-176. http://www.refaad.com

Sureddi, M., & Devi, A. A. (2020). Teacher's awareness towards uses of information and communication technology in teaching learning process at secondary school level. *International Journal of Multidisciplinary Advanced Research Trends (IJMART)*, 7(1), 1-8. https://www.ijmart.in.

SurveyMonkey (2021). SurveyMonkey enterprise. *SurveyMonkey*. https://www.surveymonkey.com/mp/enterprise.

Susilawati, S., & Supriyatno, T. (2020). Online learning through whatsapp group in improving learning motivation in the era and post pandemic COVID-19. *Journal of Education, Theory, Research, and Development*, 5(6), 852-859. https://www.scholar.google.com.

Sutton, J., & Austin, Z. (2015). Qualitative research: Data collection, analysis, and management. *The Canadian Journal of Hospital Pharmacy*, 68(3), 226-231. https://www/doi.org/10.4212/cjhp.v6i3.1456.

Sweany, N.W. (2020). From theory to practice: Evidence-based strategies for designing and developing engaging online courses. *Syracuse L. Rev*. 70, 17-180. https://scholar.google.com/scholar.

Tadesse, S., & Muluye, W. (2020). The impact of COVID-19 pandemic on education system in developing countries: A review. Open Journal of Social Sciences, 8, 10, 159-17-. https://doi.org/10.4236/jss.2020.810011

Taft, S. H., Keston, K., & El-Banna, M. M. (2019). One size does not fit all: Towards an evidence-based framework for determining online course enrollment sizes in higher education. *Online Learning,* 23(3), 188-233. https://doi.org/10.24059/olj.v23i3.1534.

Taherdoost, H. (2016a). Sampling methods in research methodology; how to choose a sampling technique for research. *ResearchGate,5(2),* 18-27. https://doi.org/10.2139/ssm.3205035.

Taherdoost, H. (2016b). Validity and reliability of the research instrument; How to test the validation of a questionnaire/survey in research. *International Journal of Academic Research in Management (LJARM)*, 5(3), 28-36. https://www.elvdit.com.

Taherdoost, H. (2018c). A review of technology acceptance and adoption models and theories. *Procedia Manufacturing,* 22, 960-967. https://www.doi.org/10.1016/j.promfg.2018.03.137.

Talimbekas, M. P., & Arifani, Y. (2022). Students' perspective on online learning during Covid-19 at rural area Thailand. *IDEAS: Journal on English Language Teaching and Learning Linguistics and Literature*, 10(1), 249-259. https://scholar.google.com/scholar?hl=en&as_sdt=0%2C5&as-ylo=2009&q=talimbekas+and+arifani+2022&btnG=

Tandi, L. I., Ifunanya, O., & Ibrahim, A. (2020). Assessment of learning engagement among senior secondary school students during online learning programs in Rivers

State. *International Journal of Multidisciplinary Research,* 6(10), 9-13. https://doi.org/10.36713/epra2013.

Tang, B, Coret, A., Qureshi, A., Barron, H., Ayala, A. P., & Law, M. (2018). Online lectures in undergraduate medical education: Scoping review. *JMIR Medical Education*, 4(1). https://doi.org/10.2196/medeu.9091.

Tang, S. & Patrick, M. E. (2018). Technology and interactive social media use among 8th and 10th graders in the US and associations with homework and school grades. *Computers in Human Behaviour* 86, 34-44. https://doi,org/10.1016/j.chb.2018.04.025.

Tareen, H., &Haand, M. T. (2020). A case study of UiTM post-graduate students' perceptions on online learning: Benefits & challenges. *International Journal of Advanced Research and Publications*, 4(6), 86-94. https://www.ijarp.org.

Tate, T., & Warshauer (2022). Equity in online learning. *Educational Psychologist*, 57(3), 192-206. https://doi.org/10.1080/00461520.2022.2062597.

Taylor, P. C. S., & Medina, M. N. D (2013). Educational research paradigms from positivism to multi-paradigmatic. ResearchGate. *Journal for Meaning Centered Education, 1,* 1-14. https://doi.org.10.13140/2.1.3542.0805.

Taysum, A., & Abery, V. M. (2017). Shifts in education policy, administration and governance in Guyana 1831-2017. Seeking 'A political' agenda for equity and renewal. Italian *Journal of Sociology of Education*, 9(2), 55-87. https://www.doi.org/10.14658/pupj-ijse-2017-2-4.

Terro, M., Dawish, S., & Al Batsaki, N. (2021). Immediate transformation to online teaching of the Kingdom University as a consequence of COVID-19. *History and philosophy of Science*, 26(2), 35-48. https://doi.org/10.5281/zendo.4678846.

Terry, W. (2016). Solving seasonality in tourism? Labour shortages and guest worker programs in the USA. *Area* 48(1), 111-118. https://www.doi.org/10.1111/area.12242.

Thirumalai, C., Chandhini, S., & Vaishnavi, M. (2017). Analysing the concrete compressive strength using Pearson and spearman. *In 2017 International Conference of Electronics, Communication and Aerospace Technology (ICECA),* 2, 215-218. https://www.https://www.scholar.google.com.

Thomas, G. (1997). What's the use of theory? *Harvard Educational Review*, 67(1), 75-105. https://doi.org/10.17763/haer.67.1.1x807532771w5u48

Thomas, B. (2022). The role of purposive sampling technique as a tool for informal choices in Social Sciences in research methods. *Just Agriculture Multi-Disciplinary eNewsletter*, 2, 5, 1-8. https://asww.justagriculture.in.

Thomas, C. (2022). PM urges transformation of education sector for digital workforce. *The Gleaner.* https://jamaicagleaner.com/article/news/20220321/pm-urges-transformation-of-education-sector-for-digital-workforce.

Thompson, C. S., Moore, S., McCarthy-Curvin, A., Bailey, D., Sameul-Lee, L. Ming, D., & Montgomery, A. (2023). Exploring push and pull factors and policy options. *Journal of Thought*, 53-79. https://journalofthought.com/up-content/uploads/2023/12/08thompsonetal-1.pdf

Thurab-Nkhosi, D. (2018). Implementing/online learning policy on a face-to-face campus: Perspectives of administrators and implications for change. *Journal of Learning for Development – JL4D*, 5(2), 133-147. https://file.eric.ed.gov/fulltext/EJ1185885.pdf.

Tie, Y. C., Birks, M., & Francis, K. (2019). Grounded theory research: A design framework for novice researchers. *SAGE Open Medicine*, 7,1-8. https://www.doi.org/10.1177/2050312118822927.

Tinidigarukayo, J. K. (2014). The impact of rural-urban influx on Jamaican society. International Journal of Humanities and Social Science, *4(9)*, 35-40. http://iijhssnet.com/journals/Vol_4_9_1_July_2014/5.pdf.

Tobin, G. A., & Begley, C. M. (2004). Methodological rigour within a qualitative framework. *Journal of Advance Nursing*, 48(4), 388-396. https://doi.org/10.1111/j.1365-2648.2004.03207.x

Tondeur, J., Aeaert, K., Prestridge, & Consuegra, E. (2018). A multilevel analysis of what matters in the training of pre-service teacher's ICT competences. *Computers & Education*, 122, 134-150. https://www.doi.org/10.1016/j.compedu.2018.03.002.

Toyne, M. F., Briley, J. E., & Jalbert, T. (2019). Comparing learning outcomes on face-to-face and online teaching platforms: Evidence from major field test scores. *Business Education & Accreditation,* 11(1), 61-69. https://www.BEA-V11N1-2019-5.pdf.

Tricco, A. C., Lillie, E., Zarin, W., Obrien, K. K., Colquhoun, H., Levac, D., Moher, D., Peters, M. D., Horsley, T., Weeks, L., Hempet, S., Akl, E. A., Chang, C., McGowan,

J., Stewart, L., Hartling, L., Aldcroft, A., Wilson, M. G., Garritty, … & Straus, S. E. (2018). PRISMA extension for scoping reviews (PRISMA-ScR): Checklist and explanation. *Annals of Internal Medicine*, 16(7), 467-473. https://www.doi.org/10.7326/M18-0850.

Trines, S. (2019). Education in Jamaica. *World Education News and Reviews (WENR).* https://wenr.wes.org/2019/09/education-in-jamaica.

Trucano, M. (2005). Knowledge maps: ICT in education. *Washington, DC:infoDev/World Bank*, 1-77. https://www.infodev.org/en/Publication.8.html.

Trust-West, E. (2020). Education equity in crisis: The digital divide. *The Education Trust-West*. https://www.west.edtrust.org/resource/education-equity-in-crisis-the-digital-divide/

Tularam, G, & Machisella, P. (2018). Traditional vs non-traditional teaching and learning strategies – the case of e-learning. *International Journal for Mathematics Teaching and Learning,* 19(1), 129-158. https://cimt.org.uk/ijmtl/index.php/UMTL/article/view/21.

Turhan, N. S. (2019). Qualitative research designs: Which one is the best for your research? *European Journal of Special Education Research*, 4(2), 124-136. https://www.doi.org/10.5281/zenodo.3234969.

Tutz, G. (2021). Hierarchical models for the analysis of Likert scales in regression and item response analysis. *International Statistical Review*, 89(1), 18-35. https://www.doi.org/10.1111/insur.12396.

Umanailo, M. C. (2019). Overview of phenomenological research. *Frenxiv Papers*, 1-6. https://scholar.google.com/scholar?start=10&q=data+triangulation+techniques&hl=en&as_0.5&as_ylo=2019

Uncef (2023). Secondary education. *Unicef*. https://dataunicef.org/topic/education/secondary-education/

United Nations Development Programme (2017a). A roadmap for SDG implementation in Jamaica. *United Nations Development Program (UNDP)*, 1-56. https://www.jm.undp.org.

United Nations Development Programme (2021b). JMD 11.6 million investment in technology centres& tablets bolsters access to virtual learning. *UNDP, Jamaica*. https://www.jmundp.org.

United Nations Educational, Scientific, and Cultural Organization (2015a). Education 2030: Incheon Declaration and Framework for action towards inclusive and equitable quality education and lifelong learning for all. *UNESCO*. https://wwwunesco.org.

United Nations Educational, Scientific, and Cultural Organization (2017b). ICT in education. United Nations Educational, Scientific and Cultural Organization. *United Nations Educational, Scientific, and Cultural Organization*. https://www.en.unesco.org.

United Nations Educational, Scientific, and Cultural Organization (2019c). New methodology shows that 258 million children, adolescents and youth are out of

school. *United Nations Educational, Scientific, and Cultural Organization*, 56, 1-16. https://uis.unesco.org.

United Nations Educational, Scientific, and Cultural Organization (2020d). Teacher development for online and blended learning to ensure quality education during COVID-19 in Jamaica. *UNESCO Cluster Office for the Caribbean*. : https://www.en.unesco.org/news/

United Nations Educational, Scientific, and Cultural Organization (2020e). Technical and Vocational Education and Training (TVET) transition into the post COVID-19 era in Jamaica. *UNESCO Cluster Office for the Caribbean.* https://en.unesco.org/news/technical-and-vocational-educational-and-training-tvet-transition-post-covid-era-jamaica.

United Nations Educational, Scientific, and Cultural Organization (2021f). *Accountability in education: Meeting our commitments; global education monitoring report, 2017/8*. UNESCO Digital Library, 1-508. https://www.unesco.org.

United Nations Educational, Scientific, and Cultural Organization (2021g). Inclusive education: Overcoming barriers to technology. *UNESCO.Org.* https://www.iiep.unesco.org/en/inclusive-education-overcoming-barriers-to-technology-13705.

United Nations Educational, Scientific, and Cultural Organization (2021h). Sustainable development goals: Information and communication technologies (ICT). *UNESCO*. https://wwwunesco.org.

United Nations Educational, Scientific, and Cultural Organizationundp (2021i). *290 million students out of school due to COVID-19: UNESCO releases first global numbers and mobilizes response*. UNESCO Publishing, Paris France. https://www.unesco.org.

Unicaf University in Zambia (2021). Unicaf research ethics application forms guidelines doctoral studies. *Unicaf University in Zambia*, 1-18. https://www.zm-vle-uu.unicaf.org.

United Nations Children's Fund (2020a). Reimagine education in a world facing a learning crisis, digital learning should be an essential service. *UNICEF*. https://unicef.org/reimagine/education.

United Nations Children's Fund (2021b). Lifelong learning our vision: quality education for all children. *UNICEF*. Retrieved from: https://www.unicef.org/jamaica/lifelong-learning.

United Nations Children's Fund (2023c). Monitoring the situation of children and women: Jamaica education. *Unicef.* https://data.unicef.org/country/jam/#education.

United Nations (2015a). The millennium development goals report. *New York, United Nations*. https://un.org/millenniumgoals/2015.

United Nations (2020b). UN-E-Government knowledgebase. *United Nations.*https://publicadministration.un.org/egovkb/en-us/data/country-information/id/84-Jamaica

United Nations (2023c). Permanent mission of Jamaica to the United Nations. *United Nations*. https://www.un.int/jamaica/about/

Universal Service Fund (2021a). Bridging the information gap: Internet access for everyone. *Universal Service Fund (USF).* https://www.usf.gov.jm.

Universal Service Fund (2021b). Universal Service Fund encourages responsible use of public Wi-Fi hotspots. *Jamaica Information Service (JIS)*. https://www.jis.gov.jm/universal-service-fund-encourages-responsible-use-of-public-wifi-hotspots.

University of Technology, (2018). A pioneering past and a bright future of impactful research and scholarly achievements: A research technology and innovation day 2018. *University of Technology Jamaica*, 1-26. https://www.utech.edu.jm/publications/rtid2018/#zoom=z.

University of the West Indies Open Campus (2021). Open campus heritage. *University of the West Indies, Open Campus*. https://www.open.uwi.edu/about/hertiage.

Utecht, J., & Keller, D. (2019). Becoming relevant again: Applying connectivism learning theory to today's classrooms. *Critical Questions in Education*, 10(2), 107-119. https://eric.ed.gov/?id=EJ1219672.

Van de Weil, M. W. J. (2017). Examining expertise using interviews and verbal protocols. *Frontline Learning Research*, 5(3), 112-140. https://www.eric.ed.gov/?id=EJ1148364.

Van Lancker, W. V., & Parolin, Z. (2020). COVID-19, school closures, and child poverty: A social crisis in the making. *The Lancet Public Health*, *5(5),* 243-244. https://doi.org/10.1016/S2468-2667(20)30084-0.

Van Popta, E., Kral, M., Camp, G., Martens, R. L., & Simons, P. R. J. (2017). Exploring the value of peer feedback in online learning for the provider. *Educational Research Review*, 20, 24-34. https://www.doi.org/10.1016/j.edurev.2016.10.003.

Vanderlinde, R., Asaert, K., &Braak, J. (2014). Institutionalized ICT use in primary education: A multilevel analysis. *Computers & Education*, *72*, 1-10. https://doi.org/10.1016/j.compedu.2013.10.007.

Vaske, J. J., Beaman, J., & Sponarski, C. C. (2017). Rethinking internal consistency in Cronbach's alpha. *An Interdisciplinary Journal*, 39(2), 163-173. https://doi.org/10.1080/01490400.2015.1127189

Verger, A., Steiner-Khamsi, G., &Lubienski, C. (2017). The emerging global education industry: Analysing market-making in education through market sociology. *Globalisation, Societies and Education, 15(3)*, 325-340. https://dx.doi.org/10.1080/14767724.2017.1330141.

Vishkaie, R. (2020). The pandemic, war, and sanctions: Building resilience for the digital divide in education. *Interactions*, 27(4), 36-37. https://www.doi.org/10.1145/3407232.

Vision 2030 Jamaica (2009). Information and Communications Technology (ICT). *Vision 2030 Jamaica*, 1-84. Retrieved from: https://www.mset.gov.jm.

Vivolo, J. (2016). Understanding and combating resistance to online learning. *Science Progress*, 99(4), 399-412. https://doi.org/10.3184/003685016X14773090197742.

Voskogluo, M. (2022a). Influence of the digital technologies to the process of learning. *WSEAS Transactions on Advances in Engineering Education*, 19, 72-79. https://doi.org/10.37394/232010.2022.19.8

Voskogluo, M. G., & Salem, A. B. M. (2020b). Benefits and limitations of the artificial with respect to the traditional learning of Mathematics. *Mathematics*, 8(4), 1-15. https://doi.org/10.3390/math8040611.

Wacker, J. G. (1998). A definition of theory: Research guidelines for different theory-building research methods in operations management. *Journal of Operations Management, 16*, 361-385. https://wackerpaper.pdf.

Waheed, H., Hassan, S. U., Alijohani, N. R., Hardman, J. (2020). Predicting academic performance of students from VLE big data using deep learning models. *Computers in Human Behaviour*, 104, 1-35. https://doi.org/10.1016/j.chb.2019.106189.

Walton, E. (2018). Decolonizing (through) inclusive education? *Educational Research for Social Change*, 7, 31-45. https://doi.org/10.17159/2221-4070/2018/v7i0a3.

Wang, Y., Liu, X., & Zhang, Z. (2018). An overview of e-learning in China: History, challenges and opportunities. *Comparative & International Education*, 13(1), 195-210. https://doi.org/10.1177/1745499918763421.

Waseh, S., & Dicker, A. P. (2019). Telemedicine training in undergraduate medical education: Mixed-methods review. *JMIR Medical Education*, 5(1). https://doi.org/10.2196/12515.

Wasserman, E., & Migdal, R. (2019). Professional development: Teachers' attitudes in online and traditional training course. *Online Learning*, 23(1), 132-143. https://www.doi.org/10.24059/olj.v22i1.1299.

Watson, P. (2013). *Every click matters: Leadership and followership in the Caribbean: Perceptions, practices, and paradigms.* Symposium Books Ltd., Oxford, United Kingdom. https://scholar.google.com/scholar?hl=en&as_sdt=0%2C5&q=ICT+education+policy+in+jamaica&btng=

Weakley, J., Morrison, M., Garcia-Ramos, A., James, L., & Cole, M. H. (2021). The validity and reliability of commercially available resistance training monitoring devices: A systematic review. *Sports Medicine*, 51, 443-502. https://www.10.1007/s40279-020-01382.

Weller, M., & Jordan, K. (2018). Mapping the open education landscape: Citation Network Analysis of historical open and distance education research. *Open Praxis, 10(2)*, 109-126. https://doi.org/10.5944/openpraxis.10.2.822.

White, S. J. (2017). Assessing cyber threats and solutions for municipalities. *In Cyber-Physical Security*, 49-65. https://www.doi.org/10.1007/978-3-319-32824-9_3.

White, L. J., McGowan, H. W., & McDonald, A. C. (2018). The effce of content delivery style on student performance in anatomy. *Anatomical Sciences Education,* 12(1), 43-51. https://doi.org/10.1002/ase.1787.

Wikandaru, R., Cathrin, S., Husin, H., Listiana, I., Pantas, P. E. Widyoningsih, W., … & Indah, A. V. (2021). The contribution of the pragmatism educational philosophy in

the implementation of Pancasila education during distance learning. *Kne Social Sciences*, 552-566. https://scholar.google.com/scholar?hl=en&as_sdt=0%2C5&as_ylo=2009&q=WIKANDARU+ET+AL+2021&btnG=

Wikitravel (2021). Map of Jamaica. *MediaWiki*. https://www.wikitravel.org/en/Jamaica.

William, F. (2022). Education sector on the road to full digitization by 2025. *Jamaica Observer ePaper.* https://jamaicaobserver.com/columns/education-sector-on-the-road-to-full-digitization-by-2025/

Williams, J. J., Kim, J., Rafferty, A., Maldonado, S., Gajos, K., Lasecki, W. S., & Heffernan, N. (2016). Generating explanations at scale with learnersourcing and machine learning. *In Proceedings of the Third ACM Conference on Learning@ Scale*, 379-388. https://www.doi.org/10.1145/2876042.

Williams, R. (2023). National minimum wage moves to $13 000 June 1. *Jamaica Information Service*. https://www.jis.gov.jm/national-minimum-wage-move-to-13000-june-1/

Williamson, B. (2021). Making markets through digital platforms: Pearson, edu-business, and the evaluation of higher education. *Critical Studies in Education*, 31(2), 1-20. https://doi.org/10.1080/17508487.2020.1737556.

Willis, L., & Exley, B. (2018). Using online social media space to engage parents in student learning in the early years: Enablers and impediments. *Digital Education Review,* 33, 87-104. https://greav.ub.edu/der/

Willits, F. K. (2016). Another look at Likert scales. *Journal of Rural Social Sciences,* 31(3), 126-139. https://www.egrove.olemiss.edu/jrss/vol31/iss3/6

Wordu, H., & Azery, J. U. (2021). Teaching and learning in a smart classroom for the 21st century schools in Nigeria: The connectivist approach. *International Journal of Social Science and Education Research*, 3(2), 44-47. https://www.socialsciencejournals.net

World Education News Review (2019). Education in Jamaica. *WENR.* https://wenr.wes.org/2019/09/education-in-jamaica.

World Health Organization (2018). World Health Organization country cooperation strategy at a glance:Jamaica. *World Health Organization*, 1-2. https://www.whoint/countries/en/

Wright, K. B. (2017). Researching Internet-based populations: Advantages and Disadvantages of online survey research, online questionnaire authoring software packages, and Web survey services. *Journal of Computer-Mediated Communication*, 10(3). https://www.doi.org/10.1111/j.1083-6101.2005.tb00259.x.

Xing, W., Ao, L., Xiao, H., Cheng, L., Liang, Y., & Wang, J. (2018). Nurses' attitude towards and needs for online learning: Differences between rural and urban hospitals in Shanghai, East China. *International Journal of Environmental Research and Public Health,* 15(7), 1-11. https://doi.org/10.3390/ijerph15071495.

Xu, H., & Deng, Y. (2017). Dependent evidence combination based on Shearman coefficient and Pearson coefficient. *IEEE Access*, 6, 11634-11640. https://www.doi.org/10.1109/ACCESS.2017.2783320.

Yaddanapudi, S., & Yaddanapudi, L. N. (2019). How to design a questionnaire. *Indian Journal of Anaesthesia*, 63(5), 335-337. https://www.https://www.doi.org/10.4103/ija.IJA_334_19.

Yarbrough, J. R. (2018). Adapting adult learning theory to support innovative, advanced, online learning – WVMD model. *Research in Higher Education Journal*, 35, 1-15. https://www.files.eric.ed.gov/fulltext/EJ1194405.pdf.

Yilmaz, R. (2016). Knowledge sharing behaviours in e-learning community: Exploring the role of academic self-efficacy and sense of community. *Computers in Human Behavior*, 63, 373-382. https://www.doi.org/10.1016/j.chb.2016.05.055.

You, X., Zhang, C. Tan, X., Jin, S., & Wu, H. (2019). Al for 5G: Research directions and paradigms. *Science China information Sciences*, 62(2), 1-13. Https://www.arxiv.org/pdf/1807.08671.pdf.

Yuselturk, E., & Bulut, S. (2009). Gender differences in self-regulated online learning environment. *Educational Technology & Technology*, 12(3), 12-22. https://www.jstor.org/stable/10.2307/jeduetechsoei.

Yursa, A., Neviyarni, S., & Erianjoni, E. (2022). A review of behaviorist learning theory and its impact on the learning process in schools. *International Journal of Educational Dynamics (IJEDs)*, 5(1), 81-91. https://doi.org/10.24036/ijeds.v5i1.373

Zhu, M., Bonk, C. J., & Sari, A. R. (2018). Instructor experiences designing MOOCs in higher education. Pedagogical, resource, and logistical considerations and

challenges. *Online Learning*, 22(4), 203-241. https://doi.org/10.24059/olj.v22i4.1495.

Zollinger, R., & DiCindio, C. (2021). Community ecology: Museum education and the digital divide during and after COVID-19. *Journal of Museum Education*, 46(4), 481-492. https://www.doi.org/10.1080/10598650.2021.1983711.

Zohrabi, M. (2013). Mixed method research: Instruments, validity, reliability, and reporting findings. *Theory and Practice in Language Studies*, 3(2), 354-262. https://www/doi.org.104304/tpls.3.2.254-262.

Zukauskas, P., Vveinhardt, J., & Andriukaitiene, R. (2018). Philosophy and paradigm of scientific research. *Management Culture and Corporate Social Responsibility*, 121. https://www.doi.org/10.5772/intechopen.70628.

Zylfiu, B. G., & Rasimi, A. (2020). Challenges and advantages of online learning: The case of Kosovo. *International Journal of Management*, 11(10), 1873-1880. https://doi.org/10.34218/IJM.11.10.2020.175.

APPENDICES

Appendix A

Table A1

PEP Score Ranges by Subject (Ministry of Education and Youth Jamaica, 2022)

Subject	Beginning	Developing	Proficient	Highly Proficient
Language Arts	<251	251 - 276	277 - 326	>326
Mathematics	<267	267 - 293	294 - 347	>347
Science	<257	257 - 293	294 - 323	>323
Social Sciences	<265	265 - 292	293 - 327	>327

Appendix B

Figure B1

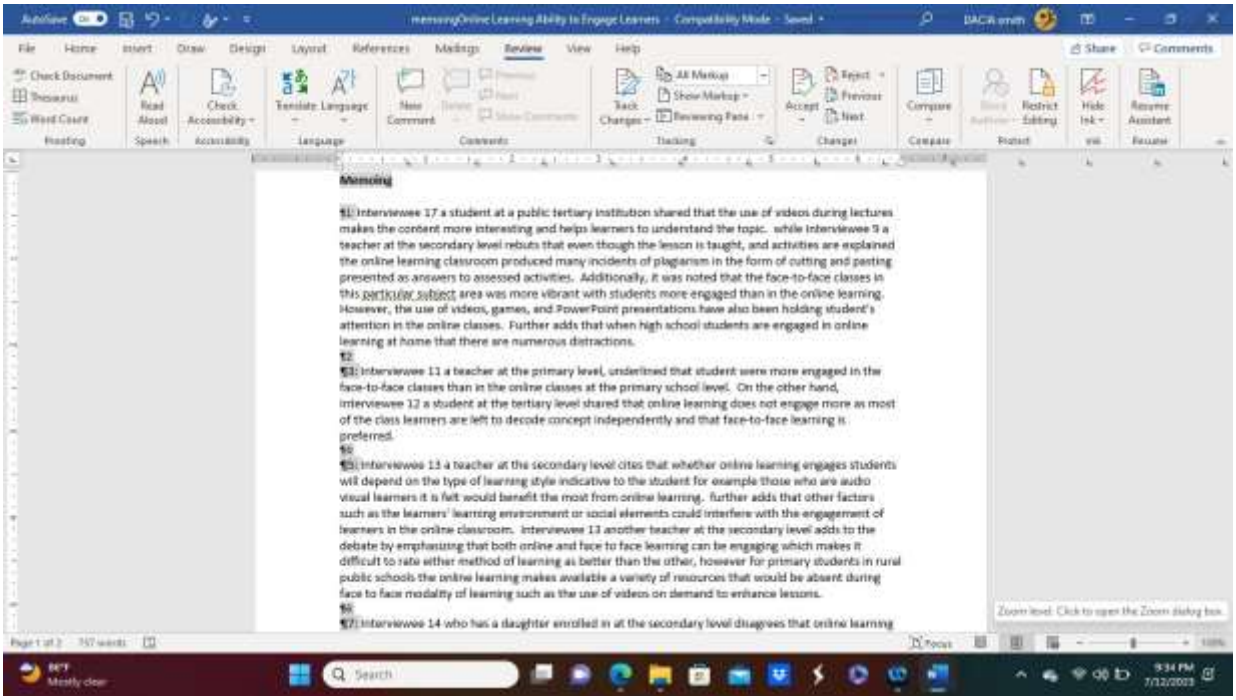
Initial Qualitative Data Analysis Codes Applied to Interview Transcripts

- **Demography**
  - Age
  - County
    - location
      - Rural
      - urban
    - Urban Areas
  - Employment Duration
  - Gender
    - Female
    - Male
  - Occupation - Position
  - Primary Schools
  - Secondary Schools
  - Tertiary
- Engages Student
  - Does not Engage
  - Public Institutions
    - Employment Duration
    - Occupation - Position
    - Primary Schools
    - qualification
    - Resources
      - Attitude of learners ro online learning
      - Availability of devices
      - Availability of online learning in rural Jamaican Public schools
        - primary
        - secondary
        - Tertiary
      - Competence of the instructors
      - Do not prefer online learning
      - Online learning platforms
      - Provision of CPD for teachers
      - Reliable Internet service
      - resources available to students
      - students
      - teachers
    - School's Attitudes
      - Primary Schools Views
      - Secondary Schools
      - Secondary Schools Views
      - Tertiary Schools Views
      - Schools offering online learning
      - Training Duration
- Impeding Factors
  - Admin Resistance
  - Cost
  - ICT Infrastructure
    - unreliable Internet service
      - for teachers
      - unreliable Internet service
        - for teachers
        - to students

to students
Internet Connectivity
Lack of CPD
Lack of Funding
Location
MOE Resistance
Negative attitudes
Parent supervision
Power Outage
Prospective Learner's Resistance
Student Competency
Lack of devices for online learning
Student's Resistance
Resistance of teachers to online learning
Supervision
Teacher Competency
Teacher's Resistance
Inclusive Online Learning
Online Learning Comprehensively
Online Learning Access
Decreased Access
Does not Engage
Increased in Enrollment
Learner Engagement
Online learning offered
Positive attitudes
Skills Training
School's Attitudes
Admin Resistance
Attitude of primary institutions
Attitude of tertiary institutions
Student's Resistance
Resistance of teachers to online learning
Negative attitudes
Positive attitudes
Primary Schools Views
Prospective Learner's Resistance
Secondary Schools
Secondary Schools Views
Student's Resistance
Resistance of teachers to online learning
Teacher's Resistance
Tertiary Schools Views

Figure B2

An Excerpt Showing Memoing Used in the Qualitative Analysis



Appendix C

Interview Scheduled Use to Organize the Interviews Conducted for the Study.

Code Name	Date	Time	Groups	Data Collection Tools
Interviewee 1	October 14	4:00 pm	2	Zoom & Audio Recorder
Interviewee 2	October 14	7:00 pm	2	Zoom & Audio Recorder
Interviewee 3	October 14	8:00 pm	4	Zoom & Audio Recorder
Interviewee 4	October 14	8:30 pm	2	Zoom & Audio Recorder
Interviewee 5	October 14	9:00 pm	2	Zoom & Audio Recorder
Interviewee 6	October 15	7:00 pm	4	Zoom & Audio Recorder
Interviewee 7	October 15	8:00 pm	5	Zoom & Audio Recorder
Interviewee 8	October 16	2:00 pm	5	Zoom & Audio Recorder
Interviewee 9	October 16	6:00 pm	2	Zoom & Audio Recorder
Interviewee 10	October 16	7:00 pm	5	Zoom & Audio Recorder
Interviewee 11	October 16	8:30 pm	5	Zoom & Audio Recorder
Interviewee 12	October 17	2:00 pm	5	Zoom & Audio Recorder

Interviewee 13	October 17	2:30 pm	5	Zoom & Audio Recorder
Interviewee 14	October 17	4:00 pm	3	Zoom & Audio Recorder
Interviewee 15	October 17	6:00 pm	2	Zoom & Audio Recorder
Interviewee 16	October 17	6:30 pm	2	Zoom & Audio Recorder
Interviewee 17	October 18	7:00 pm	2	Zoom & Audio Recorder
Interviewee 18	October 18	8:00 pm	5	Zoom & Audio Recorder
Interviewee 19	October 19	7:00 pm	2	Telephone & Audio Recorder
Interviewee 20	October 20	7:30 pm	2	Zoom & Audio Recorder
Interviewee 21	October 22	1:15 pm	2	Zoom & Audio Recorder
Interviewee 22	October 22	4:00 pm	5	Zoom & Audio Recorder
Interviewee 23	October 22	4:30 pm	3	Zoom & Audio Recorder
Interviewee 24	October 22	5:00 pm	2	Zoom & Audio Recorder
Interviewee 25	October 22	8:00 pm	5	Zoom & Audio Recorder
Interviewee 26	October 24	12:30 pm	3	Zoom & Audio Recorder

Interviewee 27	October 24	10:00 pm	3	Zoom & Audio Recorder
Interviewee 28	October 25	11:30 am	2	Zoom & Audio Recorder
Interviewee 29	October 27	4:00 pm	2	Zoom & Audio Recorder
Interviewee 30	October 27	7:30 pm	3	Zoom & Audio Recorder
Interviewee 31	November 21	5:00 pm	3	Zoom & Audio Recorder
Interviewee 32	November 21	7:58 pm	2	Zoom & Audio Recorder
Interviewee 33	November 23	6:15 pm	2	Zoom & Audio Recorder
Interviewee 34	November 23	8:00 pm	3	Zoom & Audio Recorder
Interviewee 35	November 23	8:30 pm	3	Zoom & Audio Recorder
Interviewee 36	November 24	6:00 pm	2	Zoom & Audio Recorder
Interviewee 37	November 24	7:30 pm	2	Zoom & Audio Recorder
Interviewee 38	November 24	8:00 pm	3	Zoom & Audio Recorder
Interviewee 39	November 25	8:00 pm	5	Zoom & Audio Recorder
Interviewee 40	November 27	2:00 pm	2	Zoom & Audio Recorder

Interviewee 41	November 29	6:15 pm	3	Zoom & Audio Recorder
Interviewee 42	November 29	3:00 pm	2	Zoom & Audio Recorder
Interviewee 43	November 29	4:00 pm	2	Zoom & Audio Recorder
Interviewee 44	November 29	8:00 pm	2	Zoom & Audio Recorder

Appendix D

Appendix D1

Group 2 Survey Questionnaire for Student Participants Aged 15-18 Years.

Data Collection Tool

Future Education: Online Learning to Increase Access to Training and Educational Programs in Jamaica

Survey Questionnaire

(Group 2 student participants aged 15-18 years)

You are invited to complete the following questionnaire which aims at examining the topic "Enabling access to education in the 21st century: Is online learning is a solution for Jamaica's public education system. The purpose of the research is to determine the extent to which ICT tools are being used to increase participation in education within Jamaica. Additionally, to deduce ICT's effectiveness in engaging learners and to determine the factors impeding its instructional approaches through online learning. You have been selected to receive this questionnaire because you are an instructor, administrator, student, educational policy maker, or educational leader associated with the public educational institutions in Jamaica. The significance of the study is to provide information about the advantages and disadvantages connected to the comprehensive use of ICT tools in increasing access to learning through online instruction in Jamaica. In so doing provide an alternative way for Jamaicans to acquire skills and knowledge to promote economic prosperity.

The questionnaire should take 10 minutes to complete, and it includes 25 questions. Your responses are anonymous and will not be identified with you in any way. Your answers will be treated confidentially by the researcher and will only be published as part of a statistical analysis. Individual answers will not be shared except in an aggregate format. By participating in this questionnaire, you are indicating that you understand that your responses are anonymous and will not identified with you in any way. You may skip any questions that you find intrusive or offensive, but it will help me if you respond to as many questions as you feel comfortable with. You have the right to withdraw at any stage (prior or post the completion) of the research without any consequences and without providing any explanation. In this case, the data collected will be deleted.

Select one of the options:

Yes. I consent voluntarily to be a participant in this study
No. I do not consent voluntarily to be a participant in this study

Section A

Please complete all questions by circling one of the options below. You are only allowed to choose one option.

1. What is your gender?
   A. Male
   B. Female
   C. Other _____
   D. Prefer not to answer

2. What is your main occupation?
   A. Student
   B. Teacher
   C. Administrator
   D. Educational leader/policymaker

3. In which of the following areas do you work/enrolled in currently? Choose one option.
   A. Primary Institution
   B. Ministry of Education office
   C. Secondary Institution
   D. Tertiary Institution

4. How many years have you been in training/school? _____

5. What is your age? Please write your exact age in years. _____

6. In which county in Jamaica do you reside? Choose one and write the parish on the line.
   A. Cornwall County _____
   B. Middlesex County _____
   C. Surrey County _____
   D. Prefer not to answer

7. What is the highest degree or level of education you have completed? Choose one option.
   A. Some School
   B. High School
   C. Primary School
   D. Tertiary School

8. How does your school offer instruction to learners? Choose one option.
   A. Virtual Learning (Live classes online)
   B. Hybrid Learning (Live online classes and face-to-face classes)
   C. Face-to-Face (Classes held on the school campus)
   D. Asynchronous Learning (self-directed learning online)

Section B

To what extent do you agree or disagree with these statements relating to online learning for Jamaican public schools? Using the scale 1 – 5:

- **5 – Strongly Agree**
- **4 – Agree**
- **3 – Neutral**
- **2– Disagree**
- **1 – Strongly Disagree**

Please put an *X* in the box provided for the option you have selected for each question below. You should select only one of the options for each question.

	SD	D	N	A	SA
	1	2	3	4	5
1. Public schools in Jamaica adequately supply online learning.					
2. **Public schools in Jamaica can offer online learning to learners nationally.**					
3. **You are willing to learn using online classrooms.**					
4. **Your performance has improved in online classrooms.**					
5. You prefer online learning over face-to-face learning.					
6. Online learning is available equally in rural and urban public schools in Jamaica.					
7. Internet connectivity is readily available to your school in Jamaica.					
8. Online resources are readily available to learners.					
9. Devices to access online learning are readily available to learners.					
10. Learners have access to a reliable Internet connection.					
11. Online learning provides access to learning for persons with disability.					
12. Online learning provides access to learning for persons wishing to enroll in continuing education.					

13. Online learning provides opportunity for learners to access tertiary education.	
14. Learners are more engaged in online lessons than in face-to-face.	
15. Learners' attendance to online classes is greater than that for face-to-face normally	
16. Online learning can increase the availability of skills training across Jamaica.	
17. I recommend online learning for public schools in Jamaica.	

Appendix D2

Groups 1, 3, 4, and 5 Participants Survey Questionnaire Aged 19-65-Years.

Data Collection Tool

Future Education: Online Learning to Increase Access to Training and Educational Programs in Jamaica

Survey Questionnaire

(Groups 1, 3, 4, and 5 participants aged 19-65 years)

You are invited to complete the following questionnaire which aims at examining the topic "Enabling access to education in the 21st century: Is online learning is a solution for Jamaica's public education system". The purpose of the research is to determine the extent to which ICT tools are being used to increase participation in education within Jamaica. Additionally, to deduce ICT's effectiveness in engaging learners and to determine the factors impeding its instructional approaches through online learning. You have been selected to receive this questionnaire because you are an instructor, administrator, student, educational policy maker, or educational leader associated with the public educational institutions in Jamaica. The significance of the study is to provide information about the advantages and disadvantages connected to the comprehensive use of ICT tools in increasing access to learning through online instruction in Jamaica. In so doing provide an alternative way for Jamaicans to acquire skills and knowledge to promote economic prosperity.

The questionnaire should take 10 minutes to complete, and it includes 35 questions. Your responses are anonymous and will not be identified with you in any way. Your answers will be treated confidentially by the researcher and will only be published as part of a statistical analysis. Individual answers will not be shared except in an aggregate format. By participating in this questionnaire, you are indicating that you understand that your responses are anonymous and will not identified with you in any way. You may skip any questions that you find intrusive or offensive, but it will help me if you respond to as many questions as you feel comfortable with. You have the right to withdraw at any stage (prior or post the completion) of the research without any consequences and without providing any explanation. In this case, the data collected will be deleted.

Select one of the options:

Yes. I consent voluntarily to be a participant in this study
No. I do not consent voluntarily to be a participant in this study

Section A

Please complete all questions by circling one of the options below. You are only allowed to choose one option.

1. What is your gender?
   A. Male
   B. Female
   C. Other _____
   D. Prefer not to answer

2. What is your main occupation?
   A. Student
   B. Teacher
   C. Administrator
   D. Educational leader/policymaker

3. In which of the following areas do you work/enrolled in currently? Choose one option.
   A. Primary Institution
   B. Ministry of Education office
   C. Secondary Institution
   D. Tertiary Institution

4. How many years have you been in training/school?
   _____

5. What is your age? Please write your exact age in years.
   _____

6. In which county in Jamaica do you reside? Choose one and write the parish on the line.
   A. Cornwall County _____
   B. Middlesex County _____
   C. Surrey County _____
   D. Prefer not to answer

7. What is the highest degree or level of education you have completed? Choose one option.
   A. Some high school
   B. High school
   C. Bachelor's Degree
   D. Master's Degree
   E. Doctoral Degree

8. Which of these public institutions in your area offer online instruction to learners? Choose one option and write the amount in number.

   A. Primary Institution _____
   B. Secondary Institution _____
   C. Tertiary _____

Section B

To what extent do you agree or disagree with these statements relating to online learning for Jamaican public schools? Using the scale 1 – 5:

- **5 – Strongly Agree**
- **4 – Agree**
- **3 – Neutral**
- **2– Disagree**
- **1 – Strongly Disagree**

Please put an *X* in the box provided forthe option you have selected for each question below. You should select only one of the options for each question.

	SD **1**	**D** **2**	**N** **3**	**A** **4**	**SA** **5**
4. Learners are not willing to learn using online classrooms.					
5. Public schools in Jamaica adequately supply online learning.					
6. Public schools in Jamaica can offer online learning to learners nationally.					
7. Learners are willing to learn using online classrooms.					
8. Online instruction offerings have increase student enrollment in public institution for your school?					
9. Students' performance has improved in online classrooms.					
10. Online learning is preferred over face-to-face learning.					
11. Online learning is available equally in rural and urban public schools in Jamaica.					
12. There is a strong relationship between online learning and increased enrollment to training					

	SD 1	D 2	N 3	A 4	SA 5
and educational programs in Jamaica.					
13. Instructors are comfortable teaching online classes.					
14. Online classroom resources are readily available to teachers.					
15. Internet connectivity is readily available to public schools in Jamaica.					
16. Online resources are readily available to learners.					
17. Devices to access online learning is readily available to learners.					
18. Learners have access to a reliable Internet connection.					
19. Online learning provides access to learning for persons with disability.					
20. Online learning provides access to learning for persons wishing to enroll in continuing education.					
21. Online learning provides opportunity for learners to access tertiary education.					
22. Learners are more engaged in online lessons than in face-to-face.					
23. Learners' attendance to online classes is greater than that for face-to-face normally					
24. Instructors are provided adequate opportunities for professional development for online instruction.					
25. Online learning can increase the availability of skills training across Jamaica.					
26. There is a high percentage of teacher and student resistance to online instruction in your institution or area.					
27. Jamaica is able to offer inclusive online learning nationally.					
28. I recommend online learning for public schools in Jamaica.					

Section C

To what extent do you agree or disagree with the statements below which are related to the progress of online instruction in Jamaica and learner engagement? Using the scale 1 – 5:

- **5 – Strongly Agree**
- **4 – Agree**
- **3 – Neutral**
- **2– Disagree**
- **1 – Strongly Disagree**

Please put an *X* in the box provided for the option you have selected for each question below. You should select only one of the options for each question.

2. Rate the factors listed below on a scale of 1 - 5; which would most impede the progress of online instruction in Jamaica?

	SD **1**	**D** **2**	**N** **3**	**A** **4**	**SA** **5**
G. Lack of Internet Connectivity					
H. Lack of devices					
I. Teacher Resistance					
J. Lack of ICT Infrastructure					
K. Lack of Online Learning Resources					
L. Lack of Funding for Online Education					

3. Rate the factors listed below on a scale of 1 - 5; which element of learning engages learners more in your institution or area?

	SD **1**	**D** **2**	**N** **3**	**A** **4**	**SA** **5**
A. Educational Software					

B. Virtual Lessons					
C. Self-paced Learning					
D. Interactive Learning Software					
E. Face-to-face Lectures					
F. Hybrid classroom learning					

Appendix D3

Groups 1, 2, 3, 4, and 5 participants polling opinionnaire.

Data Collection Tool

Future Education: Online Learning to Increase Access to Training and Educational Programs in Jamaica

Polling Opinionnaire

(Groups 1, 2, 3, 4, and 5 participants)

You are invited to complete the following opinionnaire which aims at examining the topic "Enabling access to education in the 21st century: Is online learning is a solution for Jamaica's public education system. The purpose of the research is to determine the extent to which ICT tools are being used to increase participation in education within Jamaica. Additionally, to deduce ICT's effectiveness in engaging learners and to determine the factors impeding its instructional approaches through online learning. You have been selected to receive this opinionnaire because you are an instructor, administrator, student, educational policy maker, or educational leader associated with the public educational institutions in Jamaica. The significance of the study is to provide information about the advantages and disadvantages connected to the comprehensive use of ICT tools in increasing access to learning through online instruction in Jamaica. In so doing provide an alternative way for Jamaicans to acquire skills and knowledge to promote economic prosperity.

The opinionnaire should take 10 minutes to complete, and it includes 30 questions. Your responses are anonymous and will not be identified with you in any way. Your answers will be treated confidentially by the researcher and will only be published as part of a statistical analysis. Individual answers will not be shared except in an aggregate format. By participating in this opinionnaire, you are indicating that you understand that your responses are anonymous and will not identified with you in any way. You may skip any questions that you find intrusive or offensive, but it will help me if you respond to as many questions as you feel comfortable with. You have the right to withdraw at any stage (prior or post the completion) of the research without any consequences and without providing any explanation. In this case, the data collected will be deleted.

Select one of the options:
Yes. I consent voluntarily to be a participant in this study
No. I do not consent voluntarily to be a participant in this study

Section A

Please complete all questions by circling one of the options below. You are only allowed to choose one option.

1. What is your gender?
   A. Male
   B. Female
   C. Other _____
   D. Prefer not to answer

2. What is your main occupation?
   A. Student
   B. Teacher
   C. Administrator
   D. Educational leader/policymaker

3. In which of the following areas do you work/enrolled in currently? Choose one option.
   A. Primary Institution
   B. Ministry of Education office
   C. Secondary Institution
   D. Tertiary Institution

4. How many years have you been in training/school?
   _____

5. What is your age? Please write your exact age in years.
   _____

6. In which county in Jamaica do you reside? Choose one and write the parish on the line.
   A. Cornwall County _____
   B. Middlesex County _____
   C. Surrey County _____
   D. Prefer not to answer

7. What is the highest degree or level of education you have completed? Choose one option.
   A. Some high school
   B. High school
   C. Bachelor's Degree
   D. Master's Degree
   E. Doctoral Degree

8. Which of these public institutions in your area offer online instruction to learners? Choose one option and write the amount in number.

A. Primary Institution _____
B. Secondary Institution _____
C. Tertiary _____

Section B

To what extent do you agree or disagree with these statements relating to online learning for Jamaican public schools? Using the scale 1 – 5:

- **5 – Strongly Agree**
- **4 – Agree**
- **3 – Neutral**
- **2– Disagree**
- **1 – Strongly Disagree**

Please put an *X* in the box provided beside the options you have selected for each question below. You should select only one of the options for each question.

	SD **1**	**D** **2**	**N** **3**	**A** **4**	**SA** **5**
1. Learners are not willing to learn using online classrooms.					
2. Public schools in Jamaica adequately supply online learning.					
3. Public schools in Jamaica can offer online learning to learners nationally.					
4. Learners are willing to learn using online classrooms.					
5. Online instruction offerings have increase student enrollment in public institution for your school?					
6. Students' performance has improved in online classrooms.					
7. Online learning is preferred over face-to-face learning.					
8. Online learning is available equally in rural and urban public schools in Jamaica.					
9. There is a strong relationship between online learning and increased enrollment to training and educational programs in Jamaica.					

	SD 1	D 2	N 3	A 4	SA 5
10. Instructors comfortable teaching online classes.					
11. Online classroom resources are readily available to teachers.					
12. Internet connectivity is readily available to public schools in Jamaica.					
13. Online resources are readily available to learners.					
14. Devices to access online learning is readily available to learners.					
15. Learners have access to a reliable Internet connection.					
16. Online learning provides access to learning for persons with disability.					
17. Online learning provides access to learning for persons wishing to enroll in continuing education.					
18. Online learning provides opportunity for learners to access tertiary education.					
19. Learners are more engaged in online lessons than in face-to-face.					
20. Learners' attendance to online classes is greater than that for face-to-face normally					
21. Instructors are provided adequate opportunities for professional development for online instruction.					
22. Online learning can increase the availability of skills training across Jamaica.					

Appendix D4

Groups 1, 3, 4, and 5 Participants Interview Guide.

Data Collection Tool

Phone/Video Conferencing Interview Questionnaire

(Groups 1, 3, 4 and 5 participants)

You are invited to orally respond to the following questionnaire which aims at examining the topic "Enabling access to education in the 21st century: Is online learning is a solution for Jamaica's public education system. The purpose of the research is to determine the extent to which ICT tools are being used to increase participation in education within Jamaica. Additionally, to deduce ICT's effectiveness in engaging learners and to determine the factors impeding its instructional approaches through online learning.

You have been selected for this interview because you are an instructor, administrator, student, educational policy maker, or educational leader associated with the public educational institutions in Jamaica. The significance of the study is to provide information about the advantages and disadvantages connected to the comprehensive use of ICT tools in increasing access to learning through online instruction in Jamaica. In so doing provide an alternative way for Jamaicans to acquire skills and knowledge to promote economic prosperity.

The interview should take 15 minutes to complete, and it includes 27 questions. Your responses are anonymous and will not be identified with you in any way. Your answers will be treated confidentially by the researcher and will only be published as part of a statistical analysis. Individual answers will not be shared except in an aggregate format.

By participating in this interview, you are indicating that you understand that your responses are anonymous and will not identified with you in any way. You may skip any questions that you find intrusive or offensive, but it will help me if you respond to as many questions as you feel comfortable with.

You have the right to withdraw at any stage (prior or post the completion) of the research without any consequences and without providing any explanation. In this case, the data collected will be deleted.

Candidate_____**Date** _____

Interviewer_____**Time** _____

This form will be filled in by the interviewer with the answers provided by the candidate interviewed.

1. What is your gender?
   A. Male
   B. Female
   C. Other _____
   D. Prefer not to answer

2. What is your main occupation?
   A. Student
   B. Teacher
   C. Administrator
   D. Educational leader/policymaker

3. In which of the following areas do you work/enrolled in currently? Choose one option.
   A. Primary Institution
   B. Ministry of Education office
   C. Secondary Institution
   D. Tertiary Institution

4. How many years have you been in training/school?
   _____

5. What is your age? Please write your exact age in years.
   _____

6. In which county in Jamaica do you reside? Choose one and write the parish on the line.
   A. Cornwall County _____
   B. Middlesex County _____
   C. Surrey County _____
   D. Prefer not to answer

7. What is the highest degree or level of education you have completed? Choose one option.
   A. Some high school
   B. High school
   C. Bachelor's Degree
   D. Master's Degree
   E. Doctoral Degree

8. Which of these public institutions in your area offer online instruction to learners? Choose one option and write the amount in number.

   A. Primary Institution_____
   B. Secondary Institution_____
   C. Tertiary_____

9. Does your institution offer online learning? For how long

☐ Yes ☐ No ☐ Somewhat

_____

10. Are learners willing to learn using online classrooms in your area? Give reasons your answer.

☐ Yes ☐ No ☐ Somewhat

_____

_____

11. Did online instruction offerings increase student enrollment in public institution in the (1) short term or (2) long term? Give a reason for your answer.

☐ Yes ☐ No ☐ Somewhat

_____

_____

12. Are students' performance improved in online classrooms? How?

☐ Yes ☐ No ☐ Somewhat

-

_____

_____

13. Is there a preference for online learning/instruction over face-to-face? Give a reason for your answer.

☐ Yes ☐ No ☐ Somewhat

_____

_____

14. Is online learning availability the same in rural and urban public schools in Jamaica? give a reason for your answer.

☐ Yes ☐ No ☐ Somewhat

_____

_____

15. Is there a strong relationship between online learning and increased enrollment to training and educational programs in Jamaica? Give a reason for your answer.

☐ Yes ☐ No ☐ Somewhat

_____

_____

16. Are instructors comfortable teaching online classes in your institution or area? Give a reason for your answer.

☐ Yes ☐ No ☐ Somewhat

_____

_____

17. Are online classroom resources readily available to teachers in your institution or area? Explain your answer.

☐ Yes ☐ No ☐ Somewhat

_____

_____

18. Are online resources readily available to learners in your institution or area? Explain.

☐ Yes ☐ No ☐ Somewhat

_____

_____

19. Is a reliable Internet access available in your institution or area? Explain.

☐ Yes ☐ No ☐ Somewhat

_____

_____

20. Do learners have access to reliable Internet service in your institution or area? Explain.

☐ Yes ☐ No ☐ Somewhat

_____

_____

21. Are learners more engaged in online lessons than in face-to-face lessons in your institution or area? Explain.

☐ Yes ☐ No ☐ Somewhat

_____

_____

22. Are the number of learners in attendance to online classes more than that for face-to-face normally in your institution or area? Give reasons for your answer.

☐ ☐ ☐

Yes No Somewhat

_____

_____

23. Which factor would most impede the progress of online instruction in Jamaica? Explain your answer.

_____

_____

24. What element of online learning engages learners more than face-to-face learning in your institution or area? Give reasons your answer.

_____

_____

25. Would you recommend online learning for public schools in Jamaica? Why?

_____

_____

26. Is Jamaica able to offer inclusive online learning nationally? Justify your answer

_____

_____

27. Is there a high percentage of teacher and student resistance to online instruction in your institution or area? Give reasons your answer.

_____

_____

Signature of Interviewer _____

Signature of Candidate _____

Appendix D5

Checklist Used for the Review of Documents for the Secondary Research.

Data Collection Tool

Checklist applied to archived reports

Section A

The review of archive reports will be conducted by the researcher who will complete the checklist based on the data gathered from each report.

1. Title of document _____
2. Institution/ Ministry of Education Office: _____
3. Number of Years in operation education: _____
4. Parish where institution is located: _____
5. Level of educational institution: _____
6. Year the report was compiled _____
7. Number of years the institution offered online learning _____

8. Author of the report

_____

9. Research approach used in the study

_____

10. Research design used to conduct the study

_____

11. Data collection tools used

_____

12. Date analysis used

_____

13. Type of publication

_____

Section B

14. Institution offers online learning.	Yes	No	☐
15. Online instruction increased student enrollment.	Yes	No	☐
16. Students' performance has improved in online classrooms.	Yes	No	☐
17. Learners willing to learn using online classrooms.	Yes	No	☐
18. There is a preference for online instruction.	Yes	No	☐
19. Online learning is availability in rural public schools.	Yes	No	☐
20. Online learning is available in urban public schools.	Yes	No	☐

21. There is a strong relationship between online learning

and increased enrollment to training and educational programs in Jamaica? Yes ☐ No ☐

22. Instructors are comfortable teaching online classes. Yes ☐ No ☐

23. Online classroom resources readily available to teachers. Yes ☐ No ☐

24. Online resources readily available to learners. Yes ☐ No ☐

25. Reliable Internet access available in the institution. Yes ☐ No ☐

26. Learners have access to reliable Internet service. Yes ☐ No ☐

27. Learners are more engaged in online lessons than in face-to-face lessons? Yes ☐ No ☐

28. The number of learners in attendance to online classes is more than that for face-to-face normally. Yes ☐ No ☐

Signature of Researcher _____

Appendix E

UREC's Approval for Conducting the Research.

UNICAF UNIVERSITY

UREC's Decision

Student's Name: DACIA MERVULIN SMITH

Student's ID #: R1812D7131264

Supervisor's Name: Dr. Tanya Hathaway

Program of Study: UUZ: PhD Doctorate of Philosophy

Offer ID /Group ID: O18621G17558

Dissertation Stage: 1

Research Project Title: Future Education with the Integration of Information and Communication Technology (ICT) as Tools to Increase Access to Training and Educational Programs.

Comments:

Decision: A. Approved without revision or comments

Date: 11-Aug-2020

Appendix F

Figure F1

An Excerpt of the Combined Coded 15-to-18-years-old and Opinionnaire Survey Responses

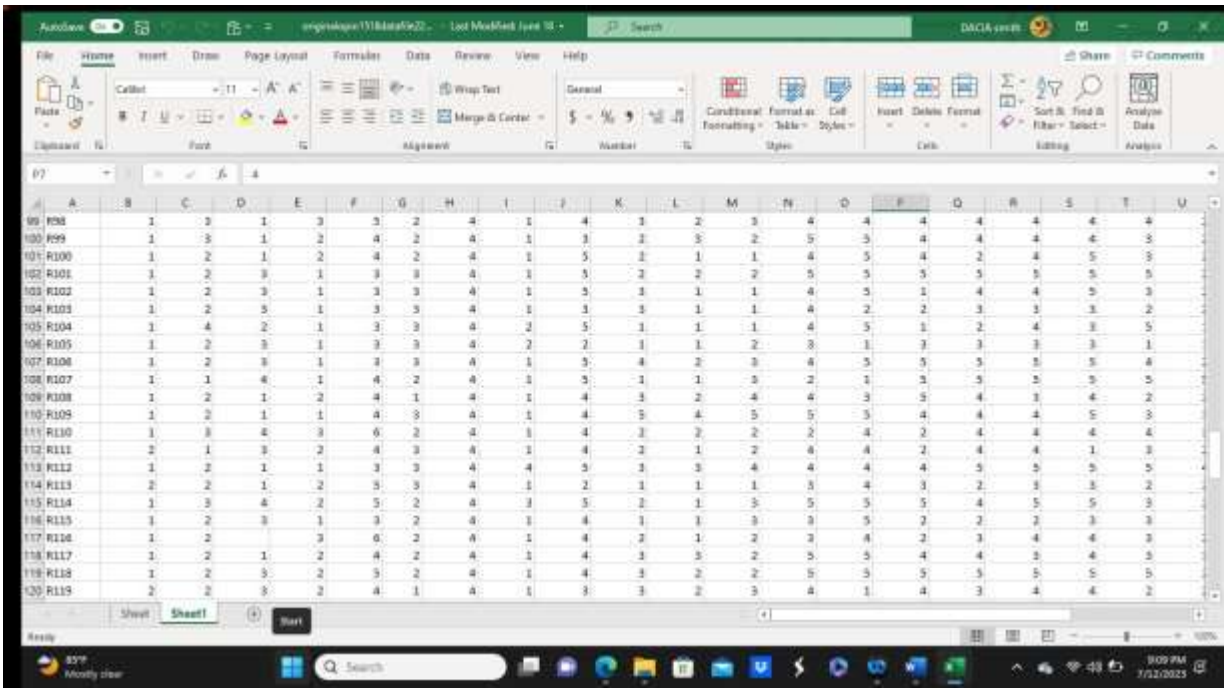
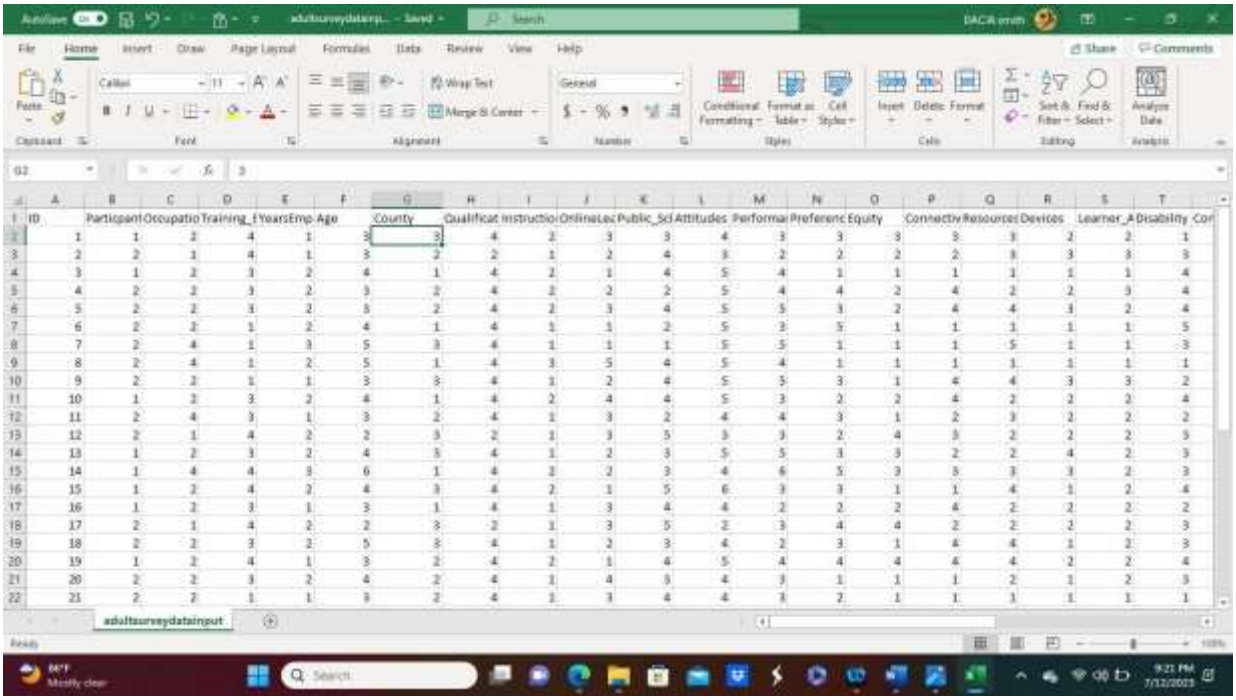


Figure F2

An Excerpt of the Combined Coded 19-to-65-years-old Opinionnaire Survey Responses



ID	Participant	Occupatio	Training_I	YearsEmp	Age	County	Qualificat	Instructio	OnlineLac	Public_Scl	Attitudes	Performa	Preferenc	Equity	Connectiv	Resources	Devices	Learner_A	Disability	Cor
1	1	2	4	1	3	3	4	2	3	3	4	3	3	3	3	3	2	2	1	
2	2	1	4	1	3	2	2	1	2	4	3	2	2	2	2	3	3	3	3	
3	1	2	3	2	4	1	4	2	1	4	5	4	1	1	1	1	1	1	4	
4	2	2	3	2	3	2	4	2	2	2	5	4	4	2	4	2	2	3	4	
5	2	2	3	2	3	2	4	2	2	3	4	5	5	3	2	4	4	3	2	4
6	2	2	1	2	4	1	4	1	1	2	5	3	5	1	1	1	1	1	1	5
7	2	4	1	3	5	3	4	1	1	1	5	5	1	1	1	5	1	1	1	3
8	2	4	1	2	5	1	4	3	5	4	5	4	1	1	1	1	1	1	1	1
9	2	2	1	1	3	3	4	1	2	4	5	5	3	1	4	4	3	3	2	
10	1	2	3	2	4	1	4	2	4	4	5	3	2	2	4	2	2	2	4	
11	2	4	3	1	3	2	4	1	3	2	4	4	3	1	2	3	2	2	2	
12	2	1	4	2	2	3	2	1	3	5	3	3	2	4	3	2	2	2	3	
13	1	2	3	2	4	5	4	1	2	3	5	5	3	3	2	2	4	2	3	
14	1	4	4	3	6	1	4	2	2	3	4	6	5	3	3	3	3	2	3	
15	1	2	4	2	4	3	4	2	1	5	6	3	3	1	1	4	1	2	4	
16	1	2	3	1	3	1	4	1	3	4	4	2	2	2	4	2	2	2	2	
17	2	1	4	2	2	3	2	1	3	5	2	3	4	4	2	2	2	2	3	
18	2	2	3	2	5	3	4	1	2	3	4	2	3	1	4	4	1	2	3	
19	1	2	4	1	3	2	4	2	1	4	5	4	4	4	4	4	2	2	4	
20	2	2	3	2	4	2	4	1	4	3	4	3	1	1	1	2	1	2	3	
21	2	2	1	1	3	2	4	1	3	4	4	3	2	1	1	1	1	1	1	

Appendix G

Table G1

The Cronbach Alpha Reliability Rating for the 5-point Likert Scales Items

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Squared Multiple Correlation	Cronbach's Alpha if Item Deleted
Adequacy	46.05	83.289	.257	.314	.831
Capacity	45.05	81.575	.348	.279	.827
Willingness	44.55	80.309	.427	.428	.823
Performance	45.24	80.756	.356	.333	.827
Preference	46.02	76.331	.518	.378	.817
Equity	46.46	80.581	.349	.264	.827
Connectivity	45.92	75.943	.533	.470	.816
Resources	45.89	77.787	.475	.355	.820
Devices	46.23	77.123	.568	.505	.815
Learner-Internet	46.43	77.432	.614	.559	.813
Disability.	45.51	83.467	.194	.211	.837
Contd. Edu.	44.68	84.261	.240	.279	.831
Tertiary	44.56	83.926	.346	.339	.827
Engagement	46.39	78.541	.533	.494	.817
Attendance	46.51	77.698	.546	.386	.816
Skills	45.44	79.353	.445	.361	.822
Recommend	45.97	76.039	.584	.536	.813

Note: The total item statistics resulting from the reliability test using Cronbach's alpha has indicated good rating for of the items on the measurement instruments. This has confirmed the reliability of the instruments for gathering data relative to the proposed theoretical construct for the study. It is indicating a high inter-item correlation using 1 to -1, where 1 represents the highest rate and -1 the lowest.

Table G2

The Cronbach Alpha Reliability Rating for the Item Total Statistics Results

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Squared Multiple Correlation	Cronbach's Alpha if Item Deleted
Rate - Connectivity	29.50	84.500	1.000	.	.776
Rate - Devices	29.50	112.500	1.000	.	.800
Rate - Teacher Resistance	30.00	200.000	-1.000	.	.950
Rate - Infrastructure	29.50	112.500	1.000	.	.800
Rate - Resources	30.00	98.000	1.000	.	.782
Rate- Funding	30.00	98.000	1.000	.	.782
Rate - Virtual Lessons Engages	29.00	98.000	1.000	.	.782
Rate - Self-paced Lessons Engages	31.00	128.000	1.000	.	.825
Interactive - Software Lessons Engages	30.00	162.000	-1.000	.	.885
Traditional - Lectures Engages	28.00	128.000	1.000	.	.825
Hybrid - Engages	28.50	112.500	1.000	.	.800

Note: The total item statistics resulting from the reliability test using Cronbach's alpha has indicated good rating for of the 11 items on the adult survey rating scale. This has confirmed the reliability of the instrument for gathering data relative to the proposed theoretical construct for the study. It is indicating a high inter-item correlation using 1 to -1, where 1 represents the highest rate and -1 the lowest.

Appendix H

Table H1

The Pearson's Correlations Level of Significance Indicating Convergent and Discriminant Validity Test of the 5-point Likert Scale Items

		Adequacy	Capacity	Willingness	Performance	Preference	Equity	Connectivity	Resources	Devices	Learner-Internet	Disability	Contd. Edu.	Tertiary	Engagement	Attendance	Skills	Recommend
Adequacy	**Pearson r**	1	.268**	-.049	.056	.066	.338**	.290**	.190**	.359**	.362**	.074	-.088	-.131*	.050	.154*	-.037	.110
Capacity	**Pearson r**	.268**	1	.347**	.224**	.189**	.141*	.130*	.192**	.142*	.182**	.006	.092	.054	.170**	.196**	.136*	.341**
Willingness	**Pearson r**	-.049	.347**	1	.495**	.320**	-.018	.189**	.264**	.126*	.165**	.004	.191**	.297**	.312**	.210**	.337**	.388**
Performance	**Pearson r**	.056	.224**	.495**	1	.354**	.007	.170**	.254**	.156*	.169**	-.057	.089	.157*	.247**	.190**	.132*	.316**
Preference	**Pearson r**	.066	.189**	.320**	.354**	1	.211**	.310**	.226**	.236**	.325**	.077	.060	.222**	.472**	.388**	.267**	.498**
Equity	**Pearson r**	.338**	.141*	-.018	.007	.211**	1	.292**	.205**	.379**	.300**	.135*	-.003	.098	.142*	.248**	.156*	.204**
Connectivity	**Pearson r**	.290**	.130*	.189**	.170**	.310**	.292**	1	.449**	.528**	.611**	.035	.084	.184**	.232**	.289**	.251**	.306**
Resources	**Pearson r**	.190**	.192**	.264**	.254**	.226**	.205**	.449**	1	.481**	.461**	.101	.182**	.124*	.200**	.234**	.160*	.174**
Devices	**Pearson r**	.359**	.142*	.126*	.156*	.236**	.379**	.528**	.481**	1	.611**	.174**	.151*	.116	.244**	.328**	.269**	.264**
Learner-Internet	**Pearson r**	.362**	.182**	.165**	.169**	.325**	.300**	.611**	.461**	.611**	1	.207**	.109	.085	.344**	.378**	.231**	.340**
Disability	**Pearson r**	.074	.006	.004	-.057	.077	.135*	.035	.101	.174**	.207**	1	.345**	.160*	.121*	.204**	.119*	.032
Contd. Edu.	**Pearson r**	-.088	.092	.191**	.089	.060	-.003	.084	.182**	.151*	.109	.345**	1	.389**	.112	.154*	.173**	.094

Tertiary	**Pearson r**	-.131*	.054	.297**	.157*	.222**	.098	.184**	.124*	.116	.085	.160*	.389**	1	.242**	.229**	.413**	.283**
Engagement	**Pearson r**	.050	.170**	.312**	.247**	.472**	.142*	.232**	.200**	.244**	.344**	.121*	.112	.242**	1	.525**	.352**	.589**
Attendance	**Pearson r**	.154*	.196**	.210**	.190**	.388**	.248**	.289**	.234**	.328**	.378**	.204**	.154*	.229**	.525**	1	.346**	.385**
Skills	**Pearson r**	-.037	.136*	.337**	.132*	.267**	.156*	.251**	.160*	.269**	.231**	.119*	.173**	.413**	.352**	.346**	1	.451**
Recommend	**Pearson r**	.110	.341**	.388**	.316**	.498**	.204**	.306**	.174**	.264**	.340**	.032	.094	.283**	.589**	.385**	.451**	1

Note: Good convergent validity is shown through the high correlations between similar constructs while low correlation is shown between dissimilar constructs in the measurement instrument using the two-tailed significance levels of .01** and .05*, relative to a 205-sample size, and the Pearson correlational coefficient. There is support for the evidence and theoretical framework based on the interpretations made from the responses from the respondents.

Table H2

The Spearman's Correlations Level of Significance Indicating Convergent and Discriminant Validity Test

		Adequacy	Capacity	Willingness	Performance	Preference	Equity	Connectivity	Resources	Devices	Learner-Internet	Disability	Contd. Edu.	Tertiary	Engagement	Attendance	Skills
Adequacy	**rho**	**1**	.249**	-.070	.053	.079	.385**	.314**	.228**	.387**	.398**	.080	-.117*	-.158*	.054	.156*	-.041
Capacity	**rho**	**.249****	1	.353**	.205**	.218**	.096	.129*	.196**	.142*	.183**	.048	.159*	.078	.194**	.221**	.160*
Willingness	**rho**	**-.070**	.353**	1	.454**	.312**	-.015	.188**	.241**	.116*	.159*	.070	.291**	.289**	.338**	.211**	.338**
Performance	**rho**	**.053**	.205**	.454**	1	.347**	.005	.160*	.237**	.167**	.175**	-.040	.099	.124*	.231**	.168**	.141*
Preference	**rho**	**.079**	.218**	.312**	.347**	1	.216**	.317**	.243**	.231**	.337**	.055	.092	.241**	.487**	.407**	.265**
Equity	**rho**	**.385****	.096	-.015	.005	.216**	1	.346**	.242**	.461**	.378**	.137*	-.039	.099	.158*	.290**	.152*
Connectivity	**rho**	**.314****	.129*	.188**	.160*	.317**	.346**	1	.453**	.529**	.612**	.024	.041	.185**	.239**	.303**	.234**
Resources	**rho**	**.228****	.196**	.241**	.237**	.243**	.242**	.453**	1	.495**	.475**	.102	.163**	.104	.222**	.252**	.150*
Devices	**rho**	**.387****	.142*	.116*	.167**	.231**	.461**	.529**	.495**	1	.612**	.165**	.129*	.093	.233**	.322**	.227**
Learner-Internet	**rho**	**.398****	.183**	.159*	.175**	.337**	.378**	.612**	.475**	.612**	1	.200**	.088	.075	.343**	.411**	.189**
Disability	**rho**	**.080**	.048	.070	-.040	.055	.137*	.024	.102	.165**	.200**	1	.329**	.157*	.117*	.165**	.110
Contd. Edu.	**rho**	**-.117***	.159*	.291**	.099	.092	-.039	.041	.163**	.129*	.088	.329**	1	.450**	.129*	.108	.219**
Tertiary	**rho**	**-.158***	.078	.289**	.124*	.241**	.099	.185**	.104	.093	.075	.157*	.450**	1	.228**	.194**	.388**

Engagement	**rho**	**.054**	.194**	.338**	.231**	.487**	.158*	.239**	.222**	.233**	.343**	.117*	.129*	.228**	1	.606**	.358**
Attendance	**rho**	**.156***	.221**	.211**	.168**	.407**	.290**	.303**	.252**	.322**	.411**	.165**	.108	.194**	.606**	1	.341**
Skills	**rho**	**-.041**	.160*	.338**	.141*	.265**	.152*	.234**	.150*	.227**	.189**	.110	.219**	.388**	.358**	.341**	1
Recommend	**rho**	**.118***	.342**	.377**	.298**	.513**	.239**	.318**	.192**	.277**	.386**	.043	.116*	.285**	.615**	.441**	.451**

Note: Good convergent validity is shown through the high correlations between similar constructs while low correlation is shown between dissimilar constructs in the measurement instrument using the 1-tailed significance levels of .01** and .05* and the Spearman Correlational coefficient (rho). There is support for the evidence and theoretical framework based on the interpretations made from the responses from the respondents.

Appendix I

Table I1

KMO Results and Bartlett's Test

KMO and Bartlett's Test		
Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.830
Bartlett's Test of Sphericity	Approx. Chi-Square	1026.266
	df	136
	Sig.	<.001

Note: The KMO and Bartlett's test show good results of .830 and significance level below the threshold of .05 indicating validity of the instruments.

Table I2

Exploratory Factor Analysis for Convergent and Discriminant Validity Testing

Component Matrix[a]					
	Components				
	1	2	3	4	5
Learner-Internet	.694				
Recommend	.691				
Devices	.648				
Engagement	.644				
Attendance	.640				
Connectivity	.637				
Preference	.626				
Resources	.560				
Skills	.549				
Willingness	.516				
Performance	.452				
Adequacy		-.615			
Tertiary		.463			
Equity	.424				
Disability			.663		
Contd. Edu.			.618		
Capacity					.643

Note: All factor loadings from the five components extracted using Varimax Kaiser method are above the .4 threshold of acceptability for validity taking into consideration a sample size of 205.

Table I3

Communalities Factor Loadings Results

Communalities		
	Initial	Extraction
Tertiary	1.000	.564
Contd. Edu.	1.000	.714
Skills	1.000	.492
Disability	1.000	.628
Attendance	1.000	.539
Equity	1.000	.475
Willingness	1.000	.696
Capacity	1.000	.758
Performance	1.000	.602
Preference	1.000	.520
Adequacy	1.000	.673
Recommend	1.000	.687
Connectivity	1.000	.664
Engagement	1.000	.647
Learner-Internet	1.000	.693
Resources	1.000	.631
Devices	1.000	.684

Note: All factor loadings using the Principal Component Analysis method, are above the .5 threshold of acceptability for validity, except two, showing .475 and .492 respectively.

Table I4

Variance Spread Using Exploratory Factor Analysis

Total Variance Explained									
Component	**Initial Eigenvalues**			**Extraction Sums of Squared Loadings**			**Rotation Sums of Squared Loadings**		
	Total	**Variance%**	**Cumulative%**	**Total**	**Variance%**	**Cumulative%**	**Total**	**Variance%**	**Cumulative %**
1	4.852	28.539	28.539	4.852	28.539	28.539	2.970	17.471	17.471
2	2.037	11.985	40.525	2.037	11.985	40.525	2.763	16.254	33.725
3	1.531	9.004	49.529	1.531	9.004	49.529	1.867	10.984	44.709
4	1.231	7.241	56.770	1.231	7.241	56.770	1.640	9.649	54.358
5	1.015	5.973	62.743	1.015	5.973	62.743	1.426	8.385	62.743
6	.896	5.272	68.015						
7	.733	4.310	72.325						
8	.627	3.687	76.011						
9	.622	3.662	79.673						
10	.596	3.504	83.177						
11	.521	3.068	86.244						
12	.474	2.790	89.034						
13	.455	2.679	91.713						
14	.407	2.397	94.110						
15	.384	2.260	96.369						
16	.321	1.886	98.256						
17	.297	1.744	100.000						

Note: Using the Principal Component Method of extraction the exploratory factor analysis has shown a relatively small spread of variance from the mean of the measurement instrument suggesting good content validity.

Table I*5*

Factor Loading and Sample Size Table Threshold

Factor Loadings	**Sample Size**
0.30	300
0.35	250
0.40	200
0.45	150
0.50	120
0.55	100
0.60	85
0.65	70
0,70	60
0.75	50

Appendix J

Table J1

Predictive validity test of the 5-point Likert scale items

		Adequacy	Capacity	Willingness	Performance	Preference	Equity	Connectivity	Resources	Devices	Learner-Internet	Disability	Cont d. Edu.	Tertiary	Engagement	Attendance	Skills	Recommend	Total
Adequacy	Pearson r		268**	.049	056	066	338**	290**	190**	359**	362**	074	.088	.131*	050	154*	.037	110	355**
Capacity	Pearson r	268**		347**	224**	189**	141*	130*	192**	142*	182**	006	092	054	170**	196**	136*	341**	441**
Willingness	Pearson r	.049	347**		495**	320**	.018	189**	264**	126*	165**	004	191**	297**	312**	210**	337**	388**	512**
Performance	Pearson r	056	224**	495**		354**	007	170**	254**	156*	169**	.057	089	157*	247**	190**	132*	316**	455**
Preference	Pearson r	066	189**	320**	354**		211**	310**	226**	236**	325**	077	060	222**	472**	388**	267**	498**	611**
Equity	Pearson r	338**	141*	.018	007	211**		292**	205**	379**	300**	135*	.003	098	142*	248**	156*	204**	453**

Connectivity	Pearson r	290**	130*	189**	170**	310**	292**		449**	528**	611**	035	084	184**	232**	289**	251**	306**	624**
Resources	Pearson r	190**	192**	264**	254**	226**	205**	449**		481**	461**	101	182**	124*	200**	234**	160*	174**	568**
Devices	Pearson r	359**	142*	126*	156*	236**	379**	528**	481**		611**	174**	151*	116	244**	328**	269**	264**	643**
Learner-Internet	Pearson r	362**	182**	165**	169**	325**	300**	611**	461**	611**		207**	109	085	344**	378**	231**	340**	677**
Disability	Pearson r	074	006	004	.057	077	135*	035	101	174**	207**		345**	160*	121*	204**	119*	032	312**
Contd. Edu.	Pearson r	.088	092	191**	089	060	.003	084	182**	151*	109	345**		389**	112	154*	173**	094	328**
Tertiary	Pearson r	.131*	054	297**	157*	222**	098	184**	124*	116	085	160*	389**		242**	229**	413**	283**	412**
Engagement	Pearson r	050	170**	312**	247**	472**	142*	232**	200**	244**	344**	121*	112	242**		525**	352**	589**	607**
Attendance	Pearson r	154*	196**	210**	190**	388**	248**	289**	234**	328**	378**	204**	154*	229**	525**		346**	385**	622**
Skills	Pearson r	.037	136*	337**	132*	267**	156*	251**	160*	269**	231**	119*	173**	413**	352**	346**		451**	533**

Recommend	Pearson r	110	341**	388**	316**	498**	204**	306**	174**	264**	340**	032	094	283**	589**	385**	451**		661**

Note: Good predictive validity is shown among the items in the measurement instrument using the 2-tailed significance levels of .01** and .05* and the Pearson Correlational coefficient. There is support for the evidence and theoretical framework based on the interpretations made from the responses from the respondents. Additionally, the Pearson r in the table show is greater than the critical values at .05; p = .138 and .01; p = .180. Hence depicting a high significance and validity of the measurement instrument.

Appendix K

Table K1

Pearson's Correlational Coefficient (r) Values (Wahyuni & Purwanto, 2020)

Range of Coefficient	Rate of Relationship
0.80 – 1.000	Very Strong
0.60 – 0.799	Strong
0.40 – 0.599	Moderate
0.20 – 0.399	Weak
0.00 – 0.199	Very Weak

Table K2

Spearman Correlational Coefficient Ranked (rho) Values (Selala et al., 2019)

Range of Coefficient	Ranked Relationship
0.81 – 1.00	Very Strong
0.61 – 0.80	Strong
0.41 – 0.60	Moderate
0.21 – 0.40	Weak
0.00 – 0.20	Very Weak

Appendix L

Table L1

Cronbach Alpha values

Range of Coefficient	Ranked Relationship
0.90 ≤ 1.00	Excellent
0.80 ≤ 0.90	Good
0.70 ≤ 0.80	Acceptable
0.60 ≤ 0.70	Questionable
0.50 ≤ 0.60	Poor
0.00 ≤ 0.50	Unacceptable

Appendix M

Table M1

Cross-tabulation Analysis Results Research Question 2

	Preference			Performanc			Willingness			Capacity			Adequacy			Equity			Totals		
	SD/D	**N**	**A/SA**	**SD/D**	**N**	**A/SA**	**SD/D**	**N**	**A/SA**	**SD/D**	**N**	**A/SA**	**SD/D**	**N**	**A/SA**	**SD/D**	**N**	**A/SA**	**SD/D**	**N**	**A/SA**
Students	48%	28%	25%	28%	4%	26%	17%	22%	61%	13%	26%	61%	28%	46%	26%	44%	31%	24%	33%	30%	37%
Institutions	54%	26%	20%	19%	32%	49%	3%	16%	81%	16%	26%	58%	59%	32%	9%	77%	11%	12%	40%	24%	36%