FATHER PHUTHEGO

THE EFFECTS OF DIGITAL DIVIDE IN EDUCATION DURING THE COVID-19 PANDEMIC CASE OF BOTSWANA

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M.Sc. THESIS

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Approval

We certify that we have read the thesis submitted by Father PHUTHEGO titled **"The effects of digital divide in education during the covid-19 pandemic, case of Botswana**" and that in our combined opinion it is fully adequate, in scope and in quality, as a thesis for the degree of Master of Software Engineering.

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Declaration

I hereby declare that all information, documents, analysis and results in this thesis have been collected and presented according to the academic rules and ethical guidelines of Institute of Graduate Studies, Near East University. I also declare that as required by these rules and conduct, I have fully cited and referenced information and data that are not original to this study.

Father Phuthego

10/02/2022

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Father Phuthego

Abstract

The Effects Of Digital Divide In Education During The Covid-19 Pandemic, Case Of Botswana

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COVID-19's shift from offline to online learning is expected to have a negative impact on students, who may struggle to adjust to the new educational setting. Existing educational inequities are projected to be exacerbated as a result of the move. During this emergency, more susceptible pupils, like those from less advantaged homes, are likely to fall behind. These learners are less likely to have access to appropriate digital learning tools and an effective learning atmosphere at home. Furthermore, institutions may contribute to this gap because children from more privileged homes are likely to attend schools which have better ICT-based infrastructures and educators with technological abilities.

As the use of web - based modalities increases during COVID-19, it is pertinent to evaluate their effectiveness in terms of teaching and learning from key stakeholders. As a result, the current study investigates teachers and learner perceptions on access to required resources, limitations, and recommendations for online learning in Botswana's government and government-aided senior secondary schools. The findings will aid in determining the efficacy of online learning with the current setup, making it more practical and worthwhile for potential changes.

The study was conducted through two questionnaires, for teacher and students. 10 schools approved participation and in total 144 learner and 132 teacher responses were received. The results confirmed that having no access to digital devices, limited technological competency and no internet connection was detrimental to performance.

Keywords: School management systems; Covid-19; online learning; emergency remote learning; digital divide

Özet

Kovid-19 Pandemisi Sırasında Eğitimde Dijital Bölünmenin Etkileri, Botsvana Örneği

Phuthego, Father ; Assoc.Prof.Dr. Boran Şekeroğlu

Yüksek Lisans , Yazılım Mühendisliği Bölümü
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COVID-19'un çevrimdışı öğrenmeden çevrimiçi öğrenmeye geçişinin, yeni eğitim ortamına uyum sağlamakta zorlanan öğrenciler üzerinde olumsuz bir etkisi olması bekleniyor. Mevcut eğitim eşitsizliklerinin bu hareketin sonucu olarak daha da kötüleşmesi bekleniyor. Bu acil durum sırasında, daha az avantajlı evlerden gelenler gibi daha hassas öğrencilerin geride kalması muhtemeldir. Bu öğrencilerin uygun dijital öğrenme araçlarına ve evde etkili bir öğrenme ortamına erişme olasılıkları daha düşüktür. Ayrıca, daha ayrıcalıklı evlerden gelen çocukların daha iyi BİT tabanlı altyapıya sahip okullara ve teknolojik becerilere sahip eğitimcilere sahip olmaları muhtemel olduğundan, kurumlar bu boşluğa katkıda bulunabilir.

COVID-19 sırasında web tabanlı yöntemlerin kullanımı arttıkça, kilit paydaşlardan öğretme ve öğrenme açısından etkinliklerini değerlendirmek önemlidir. Sonuç olarak, mevcut çalışma, Botsvana'nın devlet ve devlet destekli liselerinde çevrimiçi öğrenme için gerekli kaynaklara, sınırlamalara ve önerilere erişim konusunda öğretmen ve öğrenci algılarını araştırmaktadır. Bulgular, mevcut kurulumla çevrimiçi öğrenmenin etkinliğini belirlemeye yardımcı olacak ve potansiyel değişiklikler için daha pratik ve değerli hale getirecek.

Çalışma, öğretmen ve öğrencilere yönelik iki anket aracılığıyla gerçekleştirilmiştir. 10 okul katılımı onayladı ve toplamda 144 öğrenci ve 132 öğretmen yanıtı alındı. Sonuçlar, dijital cihazlara erişimin olmamasının, sınırlı teknolojik yetkinliğin ve internet bağlantısının olmamasının performansa zarar verdiğini doğruladı.

Anahtar Kelimeler: Okul yönetim sistemleri; Kovid19; çevrimiçi öğrenme; acil uzaktan öğrenme; dijital bölünme

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List Of Abbreviations

WHO:	World Health Organisation
BGCSE:	Botswana General Certificate of Secondary Education
BEC:	Botswana Examination Council
MoBE:	Ministry of Basic Education
DL	Distance Learning
3G	Third Generation Network
4G	Fourth Generation Network
5G	Fifth Generation Network
MBPS	Megabytes Per Second
SSS	Senior Secondary School
SMS	School Management Systems
ERT	Emergency Remote Teaching
SPSS	Statistical Package for the Social Sciences
R	R Programming Language
SCORM	Shareable Content Object Reference Model
LMS	Learning Management Systems
ASP.NET	Active Server Pages Network Enabled Technologies

CHAPTER 1
Introduction

This chapter details the research's challenges, objectives, significance, limits, and other details.

COVID-19 was declared a global public health emergency of international concern by the World Health Organization (WHO) on January 30, 2020. On March 11, 2020 it was announced as a pandemic (WHO Director-General's opening remarks at the media briefing on COVID-19 - 11 March 2020, 2020). In order to mitigate the situation, the government of Botswana effected a state of emergency. Initially, a 28-day lockdown was enforced on 2nd April 2020, following a report of the first confirmed three covid cases on 30 March 2020 by the Minister of Health Dr Lemogang Kwape (Botswana records first 3 cases of coronavirus - health minister, 2020). During this lockdown, only essential services remained in operation. Educational institutions were not included in these exempted services. This meant that for the duration of the lockdown, school across the country remained closed.

The first 28-day period was eventually extended for another three weeks. The Government of Botswana later relaxed the lockdown conditions. This allowed for the opening of educational institutions in July 2020 in a phased manner. Examinations level classes commenced first, followed shortly after by the lower level classes (Early school Closures, 2020). In the year 2021, Botswana experienced the second wave of covid-19 infections, now from a variant referred to as the Delta. As the country confronts its deadliest COVID-19 epidemic, Botswana's President Mokgweetsi Masisi said on July 12th, 2021 that his administration has decided to close schools from July 15th to August 16th, 2021 following the deaths of 64 teachers due to the virus (Arrangements of early school closures, 2021). The Minister of Basic Education issued directives to educational institutions to begin planning for distance learning (DL), reschedule ongoing term exams, and provide frequent online assistance to their students until schools reopen (Xinhua, 2021). The initial reopening date of the 16th August was further pushed to 30th August 2021, this delay was to facilitate for the vaccination of teachers across the

country. Following the resumption of schools, parents and caregivers were advised to keep children at home and seek medical attention for those who were sick or had flu-like symptoms. The self-isolation lasted for ten days if the above were experienced. With this request, there was a lot of absenteeism, and in most cases, the entire class was put on isolation for the specified period. On the 7th of September 2021 MoBE published the BGCSE 2021 examination timetable which scheduled the first examination on the 8th of October 2021. This meant that schools had roughly four weeks to prepare for examination.

In a large-scale representative sample of Botswana senior secondary school students and teachers, the current contribution empirically explores numerous aspects connected to material access. First, it evaluates the devices that are used to access the Internet, as well as who owns those equipment that make Internet use more convenient. The study ties the various devices to major personal and positional classifications and materials to get a basic notion of who is utilizing them.

Then, for those who have it, it shall be determined if a consistent Internet connection was maintained to ensure an efficient online learning session . The study also aims to determine the types of subjects available online. Finally, to ascertain the general perspectives of key stakeholders on learning during the Covid-19 pandemic.

Thesis Problem

The need to continue with the mandate of education during this pandemic was identified by the ministry of education hence the deployment of online learning. However, it is worth noting that no one anticipated the pandemic therefore leaving the possibility of unpreparedness in dealing with it. The same applies in education, where they prepared for the pandemic? Over the years, student low performance has been linked with inadequate resources like books, classroom furniture and the likes. Today's 'new normal' is now introducing the need for yet another resources, technology, which has proven to be the core driver in continual operation of industries. Therefore, there is a need to understand constraints that come with the new normal

as called for by the pandemic in the education sector. More specifically, the following research questions need to be addressed.

i. Do schools and learners have the required equipment and connectivity to conduct lessons remotely?
ii. What are the current learning strategies/practices for both those with access to and without access to technology as needed for the new normal?
iii. Is there a performance difference in learners who have access to technology and those learners without access to technology?

The Aim Of The Thesis

The objective of this research will be to provide a comprehensive review of current technological advancement and its effect on education amidst the covid19 pandemic as pupils are advised to study remotely. The specific ones are:

i. To analyse performance of learners in rural and urban areas
ii. To review current practices of education instruction amidst COVID 19 pandemic
iii. To identify the relationship between technology advancement and learner performance during COVID 19 pandemic.
iv. To outline the solution

The Importance Of The Thesis

The result of this study will be valuable to both parents and Ministry of Education on technology investment as well as related software developers for the development of non-internet-based education systems.

Limitations Of The Study

This study heavily relied on teacher and learner response data, this meant that a questionnaire was to be issued. Upon the first request with one of the school heads to give consent to institution participation, it was rejected as all research work to be carried out in schools is to be granted permission by regional director of MoBE. This meant that for all the 10 regions which were to be covered in this study, an application had to be made to their offices,

this was going to be a financial and time constraint. Therefore, a research permit from the Permanent Secretary of MoBE which covered all regions was requested and granted however despite this, most school heads approached still rejected centre participation saying they wanted regional permission.

The other limitation faced was that, the permit was issued out late. It was released two weeks away from scheduled final BGCSE results, because of this, most targeted learners and teachers rejected participation in the study due to their preparations for the exam seating.

Finally, the initial intention was to cover all regions of the country. The researcher is based in the south east region , other regions like north east, north west, Gantsi are around 1000 km away. These posed a huge financial burden in terms of travel and lodging costs when collecting data, therefore other regions were deliberately left out to curb costs.

CHAPTER 2
Literature Review

This chapter provides research-related conceptual definitions, descriptions, and information on the subject that already exists in the literature.

Online Learning and Online Learning Systems

The term "online learning" refers to education processes that occur over the internet. It's also known as "e-learning,". Online learning, on the other hand, is merely one form of "distance learning," which refers to any learning that takes place at a distance rather than in a traditional classroom setting (Stern). According to Stern, educators in the years past had to develop their virtual classrooms, with limitations of coding skills this often led to bad designs alternatively not serving the intended purpose. However, in the current days, an industry has immerged to offer institutions this service, there are commercial and free online learning systems or school management systems. Online learning systems are web-based applications that distribute, track, and manage classes over the Internet. It entails the use of technological advancements to direct, design, and deliver learning content, as well as to enable two-way interaction between students and teachers (Mukhtar, Javed, Arooj, & Sethi, 2020) . They may be institution-specific, allowing teachers to construct and deliver their classes within a flexible structure that combines a variety of tools for learning and communication. The core functions enable teachers to deliver teaching material, communicate with students, and perform learner evaluations. SMS's most common tools are: announcements, syllabus, modules, homework, discussion forums, private messages, tests, and grades (Chatziralli, et al., 2020). (Ntshwarang , Malinga, & Losike-Sedimo, 2021) stated in their paper that in Botswana, higher educational institutions use Moodle, Google Meet, Blackboard, and Microsoft Teams as their learning management systems, together with their video conferencing applications. Zoom, Skype for Business, WebEx, and Adobe Connect are some other popular video conferencing solutions used. Ntshwarang, et al mentioned that some of these systems require special facilities like electronic boards, e-classrooms, highspeed performance network to curb video buffering etc. (Castelo, 2020) summarised the things needed

for an effective e-learning program to four factors. Castelo said to ensure that learners continue to have a voice and a desire in their education even when it takes place outside of classroom walls, institutions must firstly ensure that learners have access to devices and the internet, as some students might very well not have access to a computer, laptop, or smartphone to access e-learning activities at home. Secondly, personalize online learning to the needs and capabilities of your students. As a result, they should think about how e-learning might look for non-technical students who may not have much experience with blended or online learning prior to the engagement. Thirdly, not to overlook professional development. Schools cannot merely computerize a classroom experience and make it available online unless professional development is provided to support the process. Teacher training in online teaching or delivery is required, and external or in-house IT persons should work collaboratively with teaching staff to transition them to a blended or fully online classroom. Finally, data privacy and security must be prioritized. One of the most important issues for schools considering remote learning is determining how to stay safe online. During online learning, schools may notice a significant increase in phishing efforts, malware, and spyware frauds. Student information should be secured in the same way that it would be in a regular classroom.

Digital Divide

According to (Steele, 2019),digital divide is the difference in access to modern information and communication technologies between those who have it and those who do not. There exist three major stages that have an impact on global digital inequality. Digital inequality exists between urban and rural communities, as well as between socioeconomic groups, less economically developed countries and more economically developed ones, and learned and uneducated people. A similar text by (Fang, et al., 2019) they have identified gender as another influence to efforts of internet access. According to their survey, the gender gap on the internet usage is particularly pronounced in underdeveloped countries. While mobile connectivity is rapidly expanding, it is not spreading evenly. Women continue to lag behind. In low-income countries, men are 90 percent more likely than women to own a cellphone. This equates to 184 million women who do not have access to a cell phone. Furthermore 1.2 billion women in low

and middle-income nations do not have access to the internet, despite possessing mobile phones. In certain countries, Internet penetration has reached as high as 95 percent by 2021. The internet has become a basic service for social inclusion in nations with these kind of high Internet connection rates. In Africa, where only about a third of the population has internet access, obtaining inclusive, inexpensive, and high-quality internet access by year 2030 will necessitate a $100 billion investment. This is according to a report released at the World Bank Group's Annual Meetings, which urges for immediate action to eliminate the internet access gap while also giving a roadmap to achieve this lofty goal (Senges, 2019). Botswana being part of Africa is also experiencing this inequality. Still on this notion (Jam van Deursen & AGM van Dijk, 2019) lamented that the "digital divide" discourse reflects debates about the Internet and its implications on social inclusion, with the premise that having access to the Internet gives benefits and that not having access to the Internet has negative consequences. Jam van Deursen argues that, with rising internet connectivity rates, most of the focus in digital divide research has shifted away from indicators associated to having an Internet access (known as the first-level digital divide) and toward indications of the second-level digital gap, meaning internet skills and its usage. Until recently, focus has shifted to material access, which includes computer hardware (e.g., laptops, tablets), software (subscriptions), and ancillary equipment required to maintain this internet use over time (e.g., printers, external storage). The third level of the digital divide was born as a result of this.

Offline E-Learning

Learning Management Systems that offer offline access to content are listed in the eLearning Industry's Top LMS Software directory. An institution that uses online SMS will have to establish a time each day when the teacher and students will assemble at the same time to learn, which will impede production because everyone's access to the internet or resources will not be guaranteed at the same time (Sohn, Park, & Chang, 2009). The LMS's offline learning mode, on the other hand, solves this problem. It enables students to download courseware anytime network connectivity is available and then engage in self-paced offline study at their leisure (Offline Learning – The Power of Anytime, Anywhere, Any Device Access

to E-learning!, n.d.). When students reconnect, their data will be synchronized. This offline learning function works in the same way as a two-way sync between the offline player and the LMS, ensuring that one's offline progress is reflected in the LMS.

CHAPTER 3

Material And Methodology

The research design, participants/sample, data collecting and analysis processes, as well as how the findings are analysed, are all covered in this chapter.

Study Area Description

The study area covered all senior secondary schools from the ten regions. These regions constitute urban and rural areas. All schools from the said regions were directly impacted by the school closures between the period of 2020 to 2021. They all observed the declaration by the President to close their campuses.

Table 1:

Botswana Senior Secondary Schools & Regions (GOV, 2020)

No.	Centre Number	School Name	Region
1.	BW820	Letlhakane SSS	Central Region
2.	BW816	Lotsane SSS	Central Region
3.	BW813	Madiba SSS	Central Region
4.	BW824	Matshekge Hill SSS	Central Region
5.	BW800	Moeng College SSS	Central Region
6.	BW815	Selibe-Phikwe SSS	Central Region
7.	BW806	Shashe River SSS	Central Region
8.	BW825	Shoshong SSS	Central Region
9.	BW801	Swaneng Hill SSS	Central Region
10.	BW812	Mc'Connel SSS	Central Region
11.	BW952	Nata SSS	Central Region
12.	BW953	Mmadinare SSS	Central Region
13.	BW827	Ghanzi	Gantsi Region

Table 2: (continued)

No.	Centre Number	School Name	Region
14.	BW823	Matsha SSS	Kgalagadi Region
15.	BW807	Molefhi SSS	Kgatlheng Region
16.	BW810	Kgari-Sechele SSS	Kweneng Region
17.	BW951	Mogoditshane SSS	Kweneng Region
18.	BW814	Maun SSS	North West Region
19.	BW818	Francistown SSS	North East Region
20.	BW826	Masunga SSS	North East Region
21.	BW805	Mater Spei SSS	North East Region
22.	BW811	Lobatse SSS	South Region
23.	BW802	Gaborone SSS	South East Region
24.	BW819	Kagiso SSS	South East Region
25.	BW817	Ledumang SSS	South East Region
26.	BW804	Moeding College SSS	South East Region
27.	BW822	Naledi SSS	South East Region
28.	BW803	St' Josephs SSS	South East Region
29.	BW950	Goodhope SSS	Southern Region
30.	BW821	Moshupa SSS	Southern Region
31.	BW808	Seepapitso SSS	Southern Region
32.	BW954	Shakawe SSS	North West Region
33.	BW955	Tsabong Unified SSS	Kgalagadi Region

Secondary Data Collection

Official Document and Literature

Because the covid-19 pandemic impacted several industries worldwide, scholars from all over the world are working on comparable projects. This study benefited from the

documentation from the aforementioned studies. For the literature review, many books and magazines connected to online learning were used. Annually after the release of the BGCSE results, BEC research department develops a provisional report which makes multiple performance analysis inter alia , performance by gender , performance by centre , performance by subject , top 10 centres to mention but a few. This report was used as point of reference when analysing the research results, basis of causal-comparison.

Experts Suggestions

During the preliminary stages of acquiring the research permit, the researcher was able to meet officials in the educational sector thus education region directors, school heads and BEC research coordinators who willingly shared their expertise in the form of advice.

- Mrs. C Modungo of BEC made me understand that their interpretation of syllabus coverage prior examination seating is 80%. Where above 80 is acceptable and positioned candidates in a confident state of writing their examination whereases anything less than 80 disadvantages candidates in their setting. So, she advised that the data collection tool should seek to determine syllabus coverage with relevance to the said 80%.

- The school head of Moshupa Senior Secondary School advised on tool dissemination and collection to be able to cover greater geographical area. Given the magnitude of the proposed research and intended research subjects, reaching all schools around the country was going to be a financial burden and also experience time constraints, therefore with the knowledge of urban and rural regions, he suggested the use of online questionnaires which will be accessed by schools within urban areas by opening a shared link. As for schools in rural areas, hardcopy questionnaires should be couriered through local courier companies.

- Suggestion of Ms G. Ramokapane was helpful in the analysis and discussion of the research results. Use of R , SPSS and google form inbuilt analysis tool.

Primary Data Collection

The research's core data gathering took place during the school visits. It was gathered through questionnaires.

Selection Of Sampling Schools And Subjects

Fifteen schools with each region represented were selected through simple sampling. Furthermore, the study was seeking teacher and student opinions, therefore teachers and students were selected through stratified random sampling from each school. It is worth noting that of the two class levels found in senior schools, students and teacher participants selection was already restricted to Form 5 students and their subject teachers, which are the school leaving/examination class. Besides the fact that they are an examination class, the restriction was made because this is the level which experienced school closures as Form 4s in 2020 during the first and second lockdowns and as Form 5s during the third lockdown just before their national school leaving examinations (BGCSE)

Number Of Subjects Used

There was an intention to distribute 40 questionnaires to teachers and 30 questionnaires to students in each school. But due to lack of time and consideration that all schools by the period of the study were in preparation of the BGCSE examinations which were a week or two away from starting, only 15 student and 20 teacher participants were used for the study per school.

Tool Used – Questionnaire

Two questionnaires were used to collect data, teacher survey and student survey. Urban areas were sent a link to access an online questionnaire developed through google forms whereas schools in remote areas received hardcopy questionnaires. The researcher

physically dropped some copies while others were couriered to schools with prior communication with the school head.

Please see the two questionnaires as appendix 1 and appendix 2

Ethical Consideration

Before the study began, participants were asked to sign a consent form. They were told that their comments would be kept private and that their identities would be kept anonymous. In all published and written data emerging from the study, individual privacy shall be maintained. This study was conducted entirely on a voluntary basis, with no danger or monetary incentive for participants. All participant were above the legal age of 18, therefore no third party (parental) consent was required. Please refer to appendix 3 to view the participant consent form and appendix 4 a confirmation from one of the schools that the research was conducted in an ethical way.

CHAPTER 4

Results & Discussion

This chapter summarizes the findings based on the data gathered. It also includes a discussion of these findings in relation to other studies in the field.

Of the thirty three targeted schools only Fifteen administrators agreed to centre participation in the study. 200 teacher questionnaires were shared and only 132 responses were received. For student opinions, 150 questionnaires were shared and only 144 responses were recorded. Thus, an average of 82% response rate.

Figure 1:

The Types Of Schools In Different Areas Of Botswana

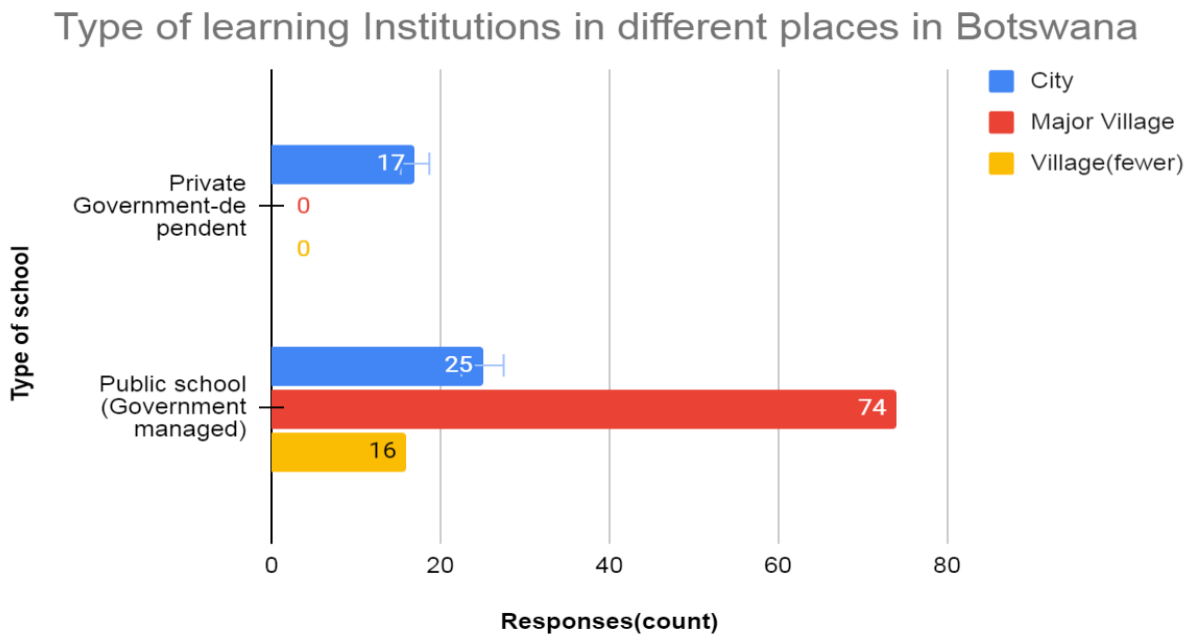


Table 3:

Botswana Area Classification According To Population (Population by gender and census-district, 2020)

Population	**Classification**
Over 100 000	City
50 000 to 100 000	Town
10 000 to 50 000	Major Village
Fewer than 10 000	Village

The results of the study carried out indicates that, majority of the schools were located in major villages which can be said to be rural. A cross relation of school type and location revealed that, private government aided institutions were found in the city and that public schools were prominent in villages and major villages. According to (Reddy, 2008) public government schools are institutions in which the government owns and controls everything. The government has the responsibility of these schools' funding, curriculum, learning resources, pricing structure, syllabus, assessments, and so on. A private government aided school, on the other hand, is managed by a private organisation but receives government aid. Both the private management and the government contribute to the funding of these schools. Private government aided schools especially located in the city may have better technology advancement over government ones as they have control over their budget, procurement of adequate resources may always be achieved.

Relating the above to the report from (Botswana Examination Council, 2020), as shown by Table 3 below. Nineteen candidates were identified as the country's top achievers for attaining at least 6A* grades. Of the 19 candidates 38% are from schools located in cities, 5% in towns , 57% in major village and no learner from a school located in a village attained at least 6A* grades. It is worth noting that, if we are to observe the candidate performance rank, the top three best students came from educational institutions which are located in cities. From the same

data, it can be gathered that the top two students are from a private government aided school, the same centre has the highest number of candidates identified within the 19.

Table 4:

2020 BGCSE Outstanding Performance Candidates By Schools And Their Locations (Botswana Examination Council, 2020)

Rank	Centre Number	Name	School Type	Location Type	Grades
1.	BW803	St. Joseph's College	Private government aided school	City	11A*
2.	BW803	St. Joseph's College	Private government aided school	City	9A* 1A 1C
3.	BW822	Naledi SSS	Public government school	City	9A* 1B
4.	BW826	Masunga SSS	Public government school	Major village	9A*
5.	BW815	Selibe-Phikwe SSS	Public government school	Major village	9A* 1B
6.	BW827	Ghanzi SSS	Public government school	Major village	8A* 1B
7.	BW821	Moshupa SSS	Public government school	Major village	8A* 2B
8.	BW808	Seepapitso SSS	Public government school	Major village	7A* 3A
9.	BW803	St. Joseph's College	Public government school	City	7A* 2A 1B
10.	BW805	Mater Spei College	Public government school	Town	7A* 1A 2B

Table 5: (continued)

Rank	Centre Number	Name	School Type	Location Type	Grades
11.	BW816	Lotsane SSS	Public government school	Major village	7A* 1B 1C
12.	BW824	Matshekge Hill SSS	Public government school	Major village	6A* 2A 1C
13.	BW951	Mogoditshane SSS	Public government school	City	6A* 2A 1C
14.	BW808	Seepapitso SSS	Public government school	Major village	6A* 2A 1B
15.	BW826	Masunga SSS	Public government school	Major village	6A* 2A 1B
16.	BW803	St. Joseph's College	Public government school	City	6A* 1A 3B
17.	BW822	Naledi SSS	Public government school	City	6A* 1A 1B 1C
18.	BW806	Shashe River SSS	Public government school	Major village	6A* 3B 2D
19.	BW808	Seepapitso SSS	Public government school	Major village	6A* 2B 1D

Table 6 :

Student's Technical Ability Based On Gender

		Do you have technical skills?		Total
		Yes	No	
What is your Gender?	Male	53	0	53
	Female	42	49	91
Total		95	49	144

A cross tabulation of data from questions 3 and 10 of the student questionnaire which confirmed the gender and technical ability of the subject respectively indicated that all males who participated in the study are computer literate. Of the 91 female participants, 49 indicated that they lack technical skills, this was slightly higher than those who possess them. The implications of this may be observed in Table 5 below, which demonstrates that girls surpassed their male counterparts in grade C percent, with 31.19 percent compared to 28.91 percent for males. Females scored 96.67 percent at grade G or higher, while males scored 95.20 percent. Females scored 76.13 percent in grade E or higher, compared to 72.93 percent for males. Males, on the other hand, marginally outperformed females at grade B or better, with 11.52 percent compared to 11.47 percent for females. They continued to outperform females in grades A and A*. This differs from other years because the method of instruction for the period, which was the use of technology placed them at an advantage over the females.

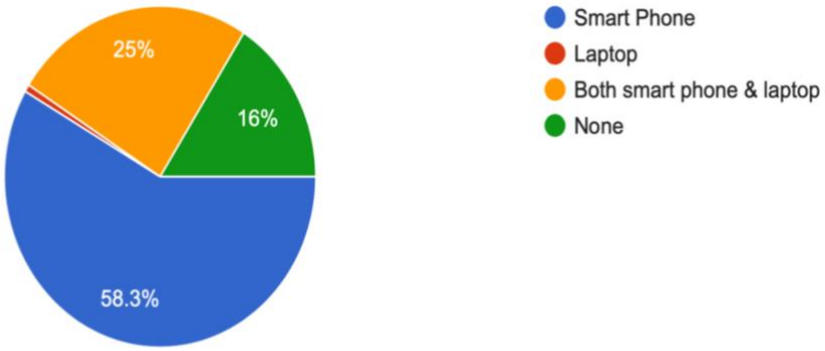
Table 7 :

BGCSE 2020 Performance By Gender (Botswana Examination Council, 2020)

	Grades	**A***	**A**	**B**	**C**	**D**	**E**	**F**	**G**	**U**
Overall	Awarded	Cum %	Cum %	Cum %	Cum %	Cum %	Cum %	Cum %	Cum %	Cum %
F	128,787	0.63	2.58	11.47	31.19	56.94	76.13	88.74	96.67	100
M	98,025	0.91	3.08	11.52	28.91	56.76	72.93	86.27	95.20	100

Figure 2:

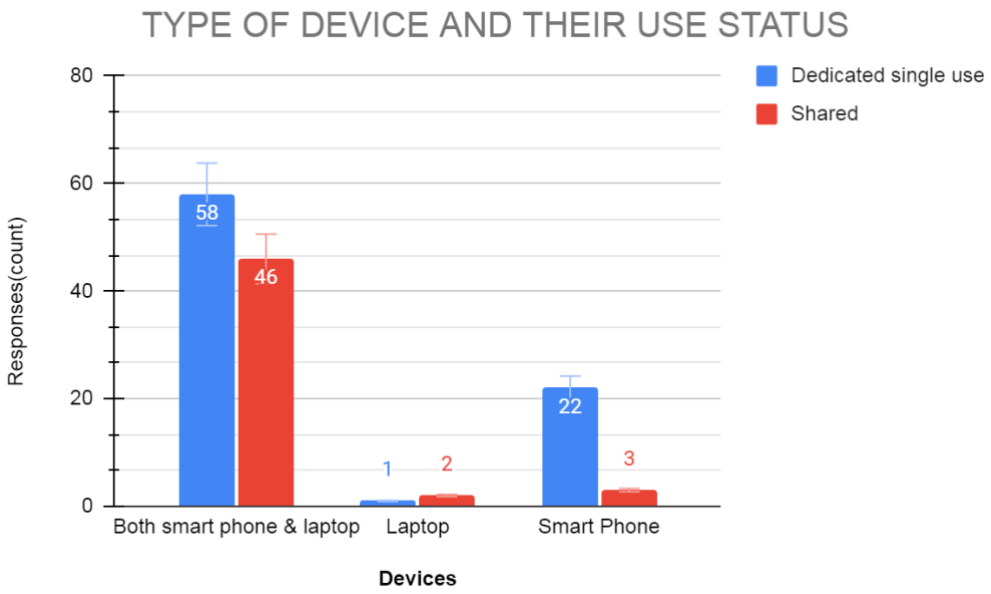
The Kind Of Device Participants Have Access To At Home



Study showed that, of the 144 students a significant number does have access to a device at home being either a laptop or a smart phone. Only 16% didn't have any device. Below in Figure 3 we look at the crosstabulation of these devices which learners had access to against the type of access they had. Thus, to say, if a participant says they are having a device, is the said device only used by them or they share it with other people in the household.

Figure 3:

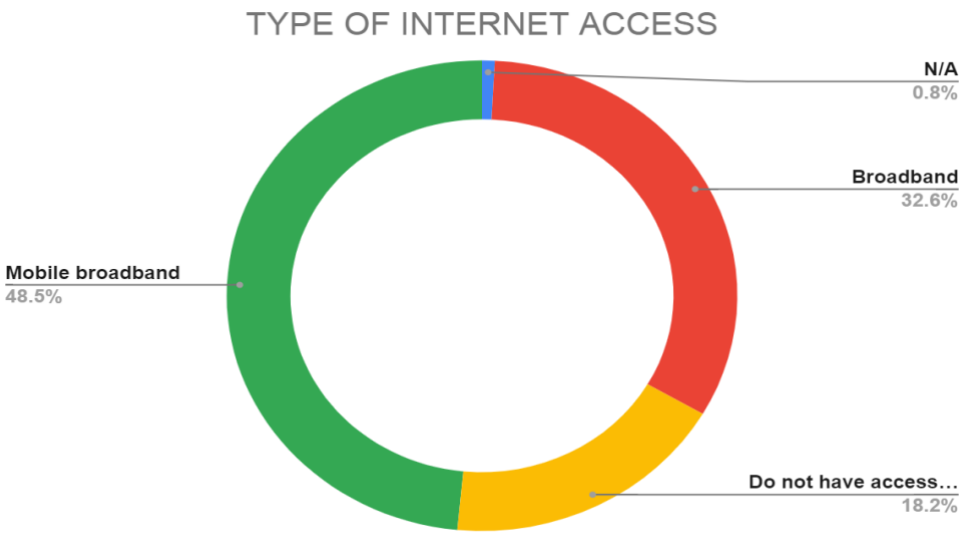
Type Of Device And Its Access/Use Status



The results revealed that, for those who indicated having access to a device, there is a slight difference between those who were the sole users of the device and those who shared the device. Students from less privileged families are more likely to be subjected to a stressful home environment during the lockdown. Limitations such as sharing a restricted amount of space and share a limited quantity of digital gadgets with other household members especially if they have school going siblings who also need online learning for the duration of the lockdown, may cause such stress. Furthermore, parents in these families are likely not in the best position to help their children in these circumstances, since they may be under financial and job security stress as a result of the COVID-19 situation. However, it can be drawn from the study results that on average, learners did not share a device in their household.

Figure 4:

Type Of Internet Access At Home



Mobile 'broadband' uses 3G, 4G, or 5G to connect straight to the internet via a mobile operator's network. Broadband is your home internet access that runs via a wire (Martin, 2021). You won't be able to constantly get 20-50 mbps with mobile data. So, if your work requires you to download/upload large files frequently, run data-intensive programs, or link your mobile network to several devices for work, mobile data is not a trustworthy supply of internet for you.

Broadband connections, on the other hand, are often recognized as a plausible option for work due to their consistency, reliability, and high speed. According to customer feedback, those that have a fibre connection never experienced network failures, slow connection, or limited bandwidth. In broadband, the network provides a wide range of connecting options, allowing various devices to connect without experiencing speed drops (Briglauer & Gugler , 2019). In relation to this, data obtained from the study indicates that 48.5% participants use mobile broadband and 32.6% use broadband with the remaining 19% did not have any form of internet connection. Results of question 19 of the students' questionnaire which was seeking further commentary regarding the participants' learning during covid-19 pandemic communicated some of the challenges listed above. Most participants mentioned that, though they had connection to mobile internet, the packages were of limited data bundles. They indicated that though they had subscribed to a month package, because the data is limited it can be depleted before the month period elapse due to excessive use or working with large files. Some learners said they experienced slow connections especially during the day, this may be due to traffic during the peak hours, mobile internet can experience connection drops. Because of these, most students though connected to the network could not effectively engage with their work.

Figure 5:

The Percentage Of Students Reached By Teachers During Online Lessons

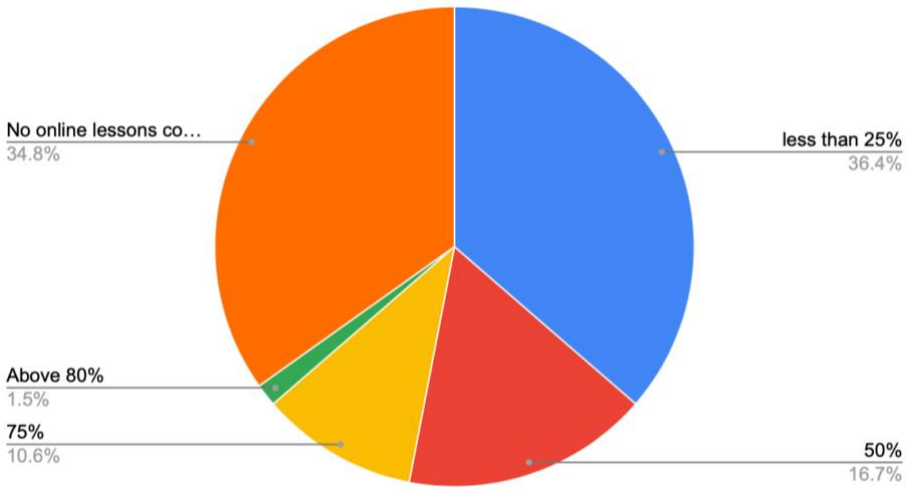


Figure 5 results indicate that 34.8% of teachers did not engage in any form of online learning. For those teachers who conducted online lessons a significant 36.4% only managed to reach 25% of learners enrolled in their classes, 16.7% of the instructors had interaction with 50% of the learners in their class while 10.6% managed to reach 75% of the learners. Only 1.5% of the teachers had good attendance of over 80% of their registered learners in their class. These figures clearly communicate that a lot remained desired when it came to learner engagement over online platforms. It can be concluded that on average about 30% of the student's population was reached by teachers.

Table 8:

Teaching Strategies Used By Institutions Who Either Used Online Teaching Or Not

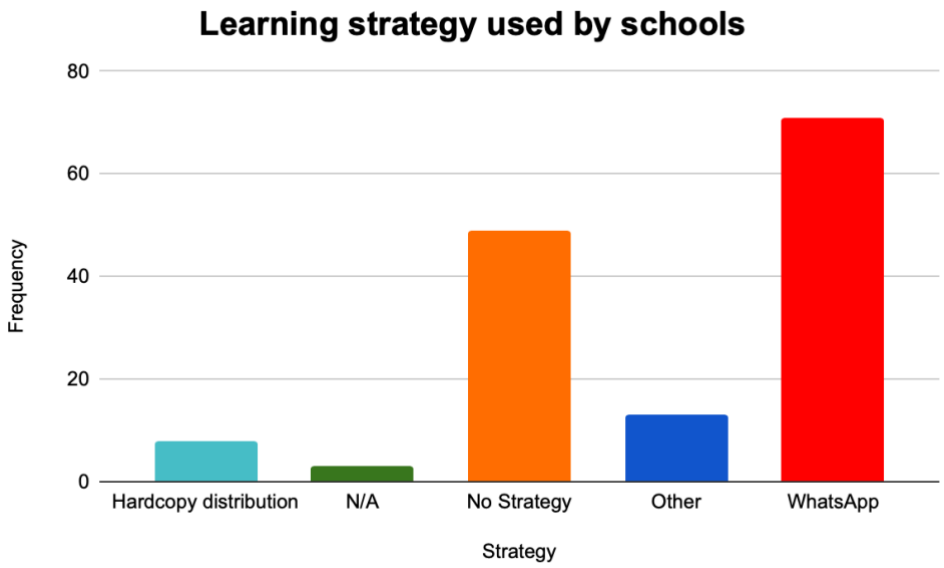
Comparisons of Column Proportions			
		11. Government recommended online learning, did your learning institution deploy this method during the pandemic?	
		No (A)	Yes (B)
12. What learning strategy was deployed	Hardcopy distribution	B	
	N/A		
	No Strategy	B	
	Other		A
	WhatsApp		A

The results received from running a chi-square test on the responses received from questions 11 and 12 of the teacher questionnaire indicate that for participants who said their institutions did not carry out any online learning, they either received work as hardcopy before

departure or no learning took place at all. As for those who said their schools had online learning as per government recommendation, they presented use of WhatsApp and other platforms like YouTube, websites, zoom as the strategies they used.

Figure 6:

Learning Strategies Carried Out By Schools During Closure

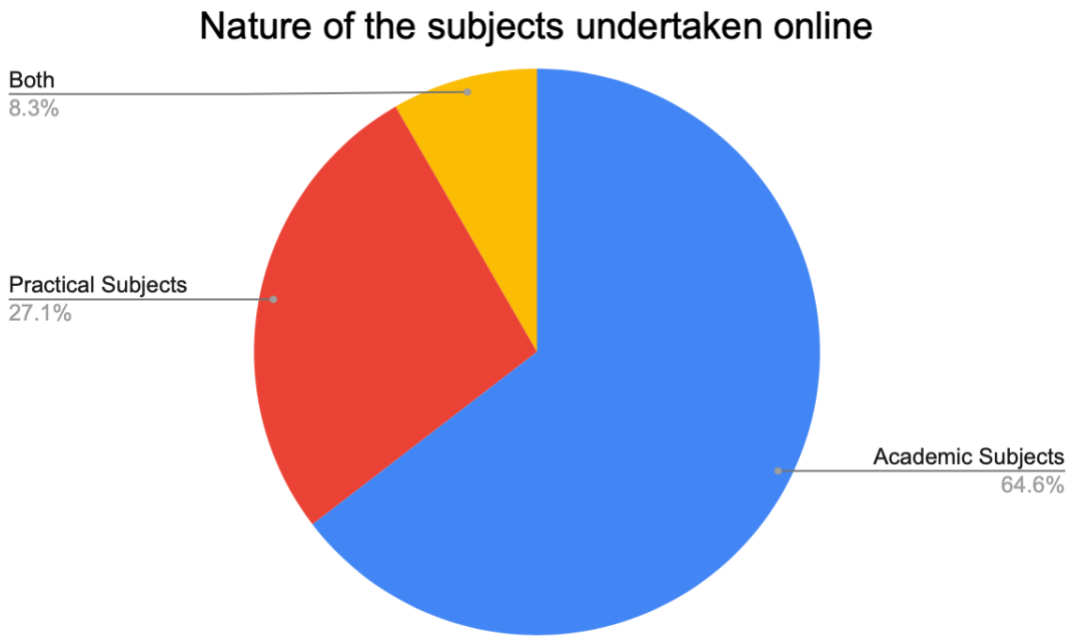


Data communicates that almost 80% of the institutions which had online engagement with their learners used WhatsApp platform to conduct their lessons. This can call for a hotly debate of whether social media can be classified as online learning. The researcher concludes that no “online learning” took place during the school closure but rather emergency remote teaching took place. As (Chatziralli, et al., 2020) has indicated in their paper, online learning systems have the following features to offer; announcements, syllabus, modules, homework, discussion forums, private messages, tests, and grades whereas the platform WhatsApp in discussion does not offer them , e.g., no online assessment/test can be carried out on WhatsApp. The authors who introduced ERT said, ERT is a momentary shift in instructional delivery to a different mode in response to emergency situations. It entails the use of entirely remote teaching solutions for instruction or education that would ordinarily be offered face-to-face or as blended

or hybrid classes, with the intention of returning to that format after the crisis or emergency has passed. The major goal in these situations is to give temporary access to education and instructional aids in a way that is easy to put up and reliable during an emergency or crisis, rather than to re-create a comprehensive educational ecosystem (Hodges, Moore, Lockee, Trust, & Bond, 2020). Responses gathered from Question 18 of the students questionnaire mostly confirms the challenges of using WhatsApp for learning. Some learners indicated that they easily got distracted from school work as they used the same social medium were friends and family reach them through. Another concern was that, learners did a lot of self-study because they only frequently received content in the form of notes and past papers and less discussion from the class and the instructors. Therefore, they studied or revised the material on their own. Weeks of notes writing was not accompanied by assessment of progress as no test writing nor feedback could be carried out in the WhatsApp groups.

Figure 7:

The Nature Of The Subjects That Were Taught Online During School Closures

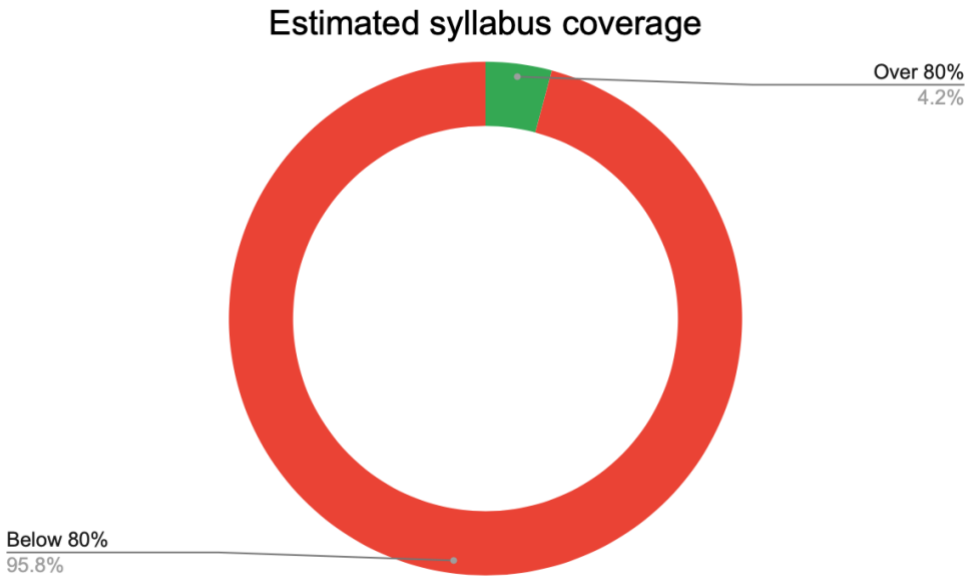


The study shows that for the lessons carried out during the online sessions, 64.6% were academic subjects whereas 27.1% were practical subjects. Academic subjects are those subjects based on theory or hypothesis these include English , Science , Mathematics to mention a few. Practical subjects on the other hand are those based on action or practice and a candidate as part of their module is expected to demonstrate their practical ability in an exam series, these may include physical education , art , home economics , food & nutrition etc. The study confirms the challenges that may have occurred in trying to conduct practical lessons online especially if WhatsApp was used. They question posed could be, how will learners be taught how to cook, how will conditions be monitored and how will the instructor taste the dish for feedback?

Implications of this are evident on the provisional results report from BEC which stated that despite having a performance of over 70% at grade E or above in Food & Nutrition as well as Fashion & Fabrics, only around 30% of students continue to attain credit grades in Home Management, compared to about 50% in Food & Nutrition (Botswana Examination Council, 2020) . This discrepancy could be due to the fact that these disciplines are part of a group of practical subjects that include a project component in their curriculum and that its instructors were unable to teach learners online as communicated by the 27.1% representation of practical subjects from the study results.

Figure 8:

Teacher's Estimates Of Syllabus Coverage During The Lockdown Period



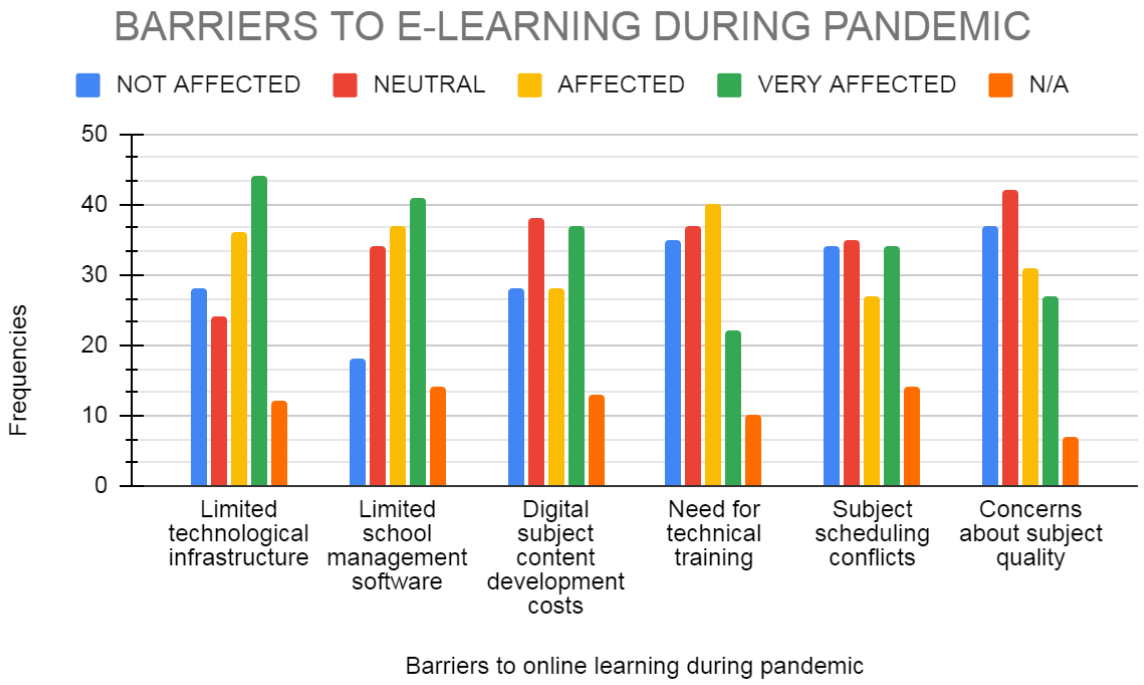
This data is intertwined or rather it confirms all other responses which communicated the challenges both learners and teachers had in conducting online lessons. The responses show that 95.8% of the teachers estimated to have not satisfactorily completed the syllabus, that the content covered is under 80%. A staggering 4.2% of the teachers on the other hand estimated to have covered over 80% material of the syllabus during the pandemic. It is worth noting that BEC considers 80% syllabus coverage to be a fair content progress for an examination seating candidate. This findings can be cross referenced with some responses gathered from Question 18 of the students questionnaire, one response quoted saying;

> "It was horrible and not fun. To be honest I was not getting all concepts per subject so in preparation of my BGCSE most of the time I was cramming the content because we did not have enough time of studying and learning"

Clearly, not much was covered even before learners wrote the country's final school leaving examinations.

Figure 9:

Factors That Affected The Implementation Of Online Learning During The Pandemic



The results from the study indicate that from the five factors which were presented as possible barriers of online learning , limited technological infrastructure emerged the prominent hurdle to online learning. As a result of quickly changing technologies, the wide range of devices available to the general population, and the fact that not all devices offer the same online learning opportunities, digital divide emerges. We should take into account not only the devices used to access the Internet, but also the possession of peripheral devices that make Internet use much more suitable for learning. These peripheral devices may include mic for clear audibility, web camera for visuals capturing or video capture during lessons, graphics tablet for use in practical lessons like art or mathematical demonstrations. Participants communicated that they had no such devices at home nor their institutions had such infrastructure to facilitate effective online learning.

The second highlighted or common barrier to all subjects was , limited school management system. Most participants identified the lack of a school management system to be a hinderance to online teaching. Earlier in the text we communicated the features and importance of SMS's, which WhatsApp application could not provide.

The third common barrier amongst participant was, digital subject content development costs. Cross referencing this with results from Question 15 of the teacher's questionnaire which was asking teachers how they engaged with their work during lockdown. It was gathered that most teachers sent past exam papers to learners through WhatsApp or notes as pictures captured. They simply used old existing material, no new material as per the demands , planning and assessment of a particular class session was created. In a traditional classroom, a teacher has a lesson plan clearly stating lesson objectives, teaching aids and exercise to test if the lesson objectives were met. The same could be mimicked online by creating lesson specific content however resources needed for that may be special peripherals, laptops and even digital publications, all these require a financial commitment which clearly majority of the teachers could not meet.

The need for technical training was identified as the fourth common impediment of online teaching/learning. Many seemed to lack digital competence in curricula delivery and assessment. The rate at which this shift to online learning was implemented was unprecedented and astounding. This was a reaction to a pandemic that no one could have predicted hence no preparations were put in place. The majority of the teachers are not from a technological era and are used to teaching in a traditional manner. Many of them are unfamiliar with using computers or being creative while creating digital content (Emmanuel, 2020). The study participants recognise the need for technical training of both teachers and learners for an effective implementation of online learning and teaching.

Lesson scheduling weirdly seemed to be of less concern to most participants, contrary to the fact that they used WhatsApp application which had no lesson scheduling features.

Furthermore, device and internet access couldn’t have been guaranteed for all at the same given time.

CHAPTER 5
Conclusion & Recommendations

This chapter includes conclusions based on the research findings in relation to the research's main objective and sub-goals, as well as recommendations.

Conclusion

When the covid-19 pandemic hit our country, it called for social distancing and closure of some of the industries like education. It was critical to maintain learning even during these closures hence the sudden move to online learning was implemented. The paper refers to this as the ERT. When this decision was first made, the outlook was pretty bleak. The pandemic, on the other hand, has exposed our sensitivity to disasters and revealed how fragile and intertwined Botswana's education system is. The results of the study have revealed the following:

- Nothing was put in place for those learners who had no access to online learning.
- Learners in urban areas had an advantage over those in rural areas when it came to access to resources which allowed for online learning hence their dominance in the top 19 best performance list.
- Practical subjects recorded bad performance because their subjects could not be successfully carried out online.
- Male students outperformed female students due to the advantage presented by their technical competency .
- The syllabus was not completed at a satisfactory level.
- A significant number of institutions did not carry out online learning as recommended by the government.

Recommendations

Following the findings of the research the following recommendations are made;

- Pandemics aren't the only cause of massive disruptions like the one we have just experienced; natural, political, economic, and environmental disasters can also cause massive disruptions. Governments' foresight, readiness, and preparedness will determine our ability to respond effectively and efficiently in the future. Therefore, the MoBE should consider introducing online blended education, where both traditional and partial online learning ran parallel. This will not only ensure a seamless transition of traditional to full online learning when the need arises but also it would mean, resources and skills would have been acquired overtime.
- Offline SMS's should be considered, these shall cater for students in remote areas where access to affordable, reliable Internet remains a challenge. This will ensure that no learner is left out during school closures as they will access educational content offline with no need for Internet connection.
- Government should move towards providing digital gadgets like tablets for all instead of physical textbooks, these devices present more advantages than physical textbooks when faced by modern problems. The devices can be loaded with digital textbooks, school management systems etc. This move shall release the burden from financially incapable parents to buy their children gadgets. With this initiative, at least the government knows that if they are to recommend for online learning, all learners are to have a base opportunity.

Future work recommendations:

- More research on availability of offline school management systems.
- The development of an offline school management system as a solution to pupils in remote areas.

The system will be built to SCORM standards, which will ensure that it is interoperable with various online and offline learning systems. A number of bits of data are monitored when a SCORM course is being taken. The following data will be tracked and sent back to the LMS: lesson progress (where the learner left off), bookmark with specific information), learner status (pass, fail, complete, incomplete), time taken per session, score attained, interactions etc.

The development will comprise of two parts, that's the system architecture which defines how it shall operate and sub-module design which is the system's core. This narrows down to each function of the system.

An initial development of web browser system will be developed using ASP.Net technology because of its excellent customization capabilities. Later an android version will be created.

The core sub-module will entail the following

1. Courseware integration sub-system – To be used for the classification , streaming and access of media files in the offline state.
2. Encryption sub-system – This will be used to protect integrity of course process or content through log in. If the system is to track progress and asses work, use is to be linked to an authenticated user.
3. Downloading and installation of offline package sub-system – Automatically detect and avail offline courseware package for download and changing of state from online to offline.
4. Synchronization sub-system – It shall exist to achieve unification once the learning reconnects to the internet. A synchronous update of online data and offline data.

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Appendices

Appendix 1: Student Questionnaire

NEAR EAST UNIVERSITY

FACULTY OF INSTITUTE OF APPLIED SCIENCES

DEPARTMENT OF SOFTWARE ENGINEERING

Effects of digital divide in Education during Covid 19 Pandemic

Survey

Thank you for participating in the Study, this is a voluntarily engagement.

- Please provide information based on the timeframe of National lockdown period
- Provide valid and honest details
- Do not include information about planned strategies but rather strategies already implemented
- Respondents may skip any questions they wish, but answering all will be highly appreciated.
- All responses will be held in strictest confidence and at no point will they be identified by name.

1. What is your center number ? _____

2. You are a :

   ☐ Student ☐ Teacher

3. What is your gender ?

   ☐ Female ☐ Male

4. What type of device do you have at home ?
   - ☐ Smart Phone
   - ☐ Laptop
   - ☐ Both smart phone & laptop
   - ☐ None

5. If you have access to a device, what is its access status?
   ☐ Dedicated single use ☐ Shared use

6. How many school going siblings do you have? _____

7. What type of internet access do you have at home?
   - ☐ Broadband
   - ☐ Mobile broadband
   - ☐ Do not have access to internet

8. If you do not have internet access, is there somewhere else that you could go to safely access the internet ? i.e., neighbour's house ☐ No ☐ Yes

9. Are your parents/guardians employed ? ☐ No ☐ Yes

10. Do you have technical skills ? ☐ No ☐ Yes

11. Government recommended online learning, did your learning institution deploy this method during the pandemic? ☐ No ☐ Yes

12. What learning strategy was deployed by the institution during the lockdown period ?

_____

_____

_____

13. As an individual were you able to implement/partake in the deployed strategy? ☐ No ☐ Yes

14. How did you engage with your work during the national lockdown?

_____

_____

_____

_____

15. The nature of the subjects that students took online during the national lockdown can be described as.

☐ Academic subjects (maths , physics, history etc)

☐ Practical subjects (Home economics, art , PE etc)

☐ Both

16. What is your best estimate of the syllabus content coverage for the period of lockdown?

☐ below 80% percent

☐ above 80% percent

17. Please indicate how much of a barrier the following areas were in offering online learning during the pandemic.

	Not affected	Neutral	Affected

	1	2	3	4	5
Concerns about subject quality	☐	☐	☐	☐	☐
Need for technical training	☐	☐	☐	☐	☐
Limited technological infrastructure	☐	☐	☐	☐	☐
Limited school management software	☐	☐	☐	☐	☐
Subject scheduling conflicts	☐	☐	☐	☐	☐
Digital subject content development costs	☐	☐	☐	☐	☐

18. In the space provided, feel free to make any other comments regarding your learning during the covid 19 pandemic.

_____

_____

_____

_____

_____

Thank you for completing this survey. Your time is highly appreciated.

This study is in Partial Fulfilment of the Requirements for the Degree of Master of Science in Software Engineering. There are no known risks associated with participation, only the researcher will have access to the data and its analysis bearing no names will be submitted to Near East University. Questions regarding the conduct of the survey can be directed to Phuthego by email *20203293@std.neu.edu.tr*

Appendix 2: Teacher Questionnaire

NEAR EAST UNIVERSITY

FACULTY OF INSTITUTE OF APPLIED SCIENCES

DEPARTMENT OF SOFTWARE ENGINEERING

Effects of digital divide in Education during Covid 19 Pandemic

Survey

Thank you for participating in the Study, this is a voluntarily engagement.

- Please provide information based on the timeframe of National lockdown period
- Provide valid and honest details
- Do not include information about planned strategies but rather strategies already implemented
- Respondents may skip any questions they wish, but answering all will be highly appreciated.
- All responses will be held in strictest confidence and at no point will they be identified by name.

1. What is your center number ? _____

2. You are a :
   ☐ Student
   ☐ Teacher

3. Your learning institution is located in which area type
   ☐ A city (over 100 000 population)

☐ A town (50 000 to 100 000 population)

☐ A major village (10 000 to 50 000 population)

☐ A village (fewer than 10 000 population)

4. What type of school is your learning institution ?

   ☐ Private independent

   ☐ Private Government-dependent

   ☐ Public school (Government managed)

5. What type of device do you have at home ?

   ☐ Smart Phone

   ☐ Laptop

   ☐ Both smart phone & laptop

   ☐ None

6. If you have access to a device, what is its access status?

   ☐ Dedicated single use ☐ Shared use

7. What type of internet access do you have at home?

   ☐ Broadband

   ☐ Mobile broadband

   ☐ Do not have access to internet

8. If you do not have internet access, is there somewhere else that you could go to safely access the internet ? i.e., neighbour's house

   ☐ No

   ☐ Yes

9. Do you have technical skills ?

☐ No
☐ Yes

10. Government recommended online learning, did your learning institution deploy this method during the pandemic?

☐ No
☐ Yes

11. What learning strategy was deployed by the institution during the lockdown period ?

_____
_____
_____
_____

12. How effective was the strategy?

Not Effective		Neutral	Effective	
1	2	3	4	5
☐	☐	☐	☐	☐

13. As an individual were you able to implement/partake in the deployed strategy?

☐ No
☐ Yes

14. When you implemented the online studies, what percentage of your learners did you manage to reach?
    - ☐ below 25% percent
    - ☐ 50% percent
    - ☐ 75% percent
    - ☐ above 80% percent
    - ☐ online lessons not implemented

15. How did you engage with your work during the national lockdown?

    _____

    _____

    _____

    _____

    _____

16. The nature of the subjects that students took online during the national lockdown can be described as.
    - ☐ Academic subjects (maths , physics, history etc)
    - ☐ Practical subjects (Home economics, art , PE etc)
    - ☐ Both

17. What is your best estimate of the syllabus content coverage for the period of lockdown?
    - ☐ below 80% percent
    - ☐ above 80% percent

18. Please indicate how much of a barrier the following areas were in offering online learning during the pandemic.

	Not affected		Neutral	Affected	
	1	2	3	4	5
Concerns about subject quality	☐	☐	☐	☐	☐
Need for technical training	☐	☐	☐	☐	☐
Limited technological infrastructure	☐	☐	☐	☐	☐
Limited school management software	☐	☐	☐	☐	☐
Subject scheduling conflicts	☐	☐	☐	☐	☐
Digital subject content development costs	☐	☐	☐	☐	☐

19. In the space provided, feel free to make any other comments regarding your learning during the covid 19 pandemic.

_____

_____

_____

_____

_____

_____

Thank you for completing this survey. Your time is highly appreciated.

This study is in Partial Fulfilment of the Requirements for the Degree of Master of Science in Software Engineering. There are no known risks associated with participation, only the researcher will have access to the data and its analysis bearing no names will be submitted to Near East University. Questions regarding the conduct of the survey can be directed to Phuthego by emailing *20203293@std.neu.edu.tr*

Appendix 3: Informed participant consent form

NEAR EAST UNIVERSITY

FACULTY OF INSTITUTE OF APPLIED SCIENCES

DEPARTMENT OF SOFTWARE ENGINEERING

INFORMED CONSENT FORM TO TAKE PART IN RESEARCH

Tittle : *The effects of digital divide in education during covid 19 pandemic* – the case of senior secondary schools in Botswana

Dear Participant,

This questionnaire is part of a research study that I am carrying out in order to understand if there is any relationship between access to/no access to technology and student performance. The data collected through this questionnaire will be used to understand how students and teachers engaged with their work during the period of school closure, focus being on whether they had the resources to conduct the remote lessons and how it might have affected their performance . By filling in the following questionnaire, you agree to participate in this study.

Please note that your participation in the study is voluntary and whether you agree to participate or not will have no impact on your grades for the courses you are/were enrolled in. Your identity will not be revealed in any case to third parties. The data collected during the course of this study will be used for academic research purposes only and may be presented at national/international academic meetings and/or publications. You may quit participating in this study at any time by contacting us. If you opt out of the study, your data will be deleted from

our database and will not be included in any further steps of the study. In case you have any questions or concerns, please contact us using the information below.

This study is in Partial Fulfilment of the Requirements for the Degree of Master of Science in Software Engineering. There are no known risks associated with participation, only the researcher will have access to the data and its analysis bearing no names will be submitted to Near East University. Questions regarding the conduct of the survey can be directed to Mr Phuthego by email 20203293@std.neu.edu.tr or fatherphuthego@gmail.com

I …….. voluntarily agree to participate in this research study.

- I understand that even if I agree to participate now, I can withdraw at any time or refuse to answer any question without any consequences of any kind.
- I understand that I can withdraw permission to use data from my interview within two weeks after the interview, in which case the material will be deleted.
- I have had the purpose and nature of the study explained to me in writing and I have had the opportunity to ask questions about the study.
- I understand that participation involves providing information by answering a questionnaire.
- I understand that I will not benefit directly from participating in this research. I will not be paid to participate
- I agree to my participation being through filling a questionnaire.
- I understand that all information I provide for this study will be treated confidentially.
- I understand that in any report on the results of this research my identity will remain anonymous. This will be done by not mentioning my name and disguising any details of my information which may reveal my identity or the identity of people I speak about.

- I understand that disguised extracts from my interview may be quoted in an academic dissertation.
- I understand that signed consent forms and written questionnaire will be retained by the researcher until the exam board confirms the results of their dissertation. After which they will dispose of them correctly.
- I understand that under freedom of information legalisation I am entitled to access the
- information I have provided at any time while it is in storage as specified above.
- I understand that I am free to contact any of the people involved in the research to seek further
- clarification and information

By signing below, you agree to participate in the research

Signature of research participant

---------- ----------

Signature of participant Date

Signature of researcher

I believe the participant is giving informed consent to participate in this study

---------- ----------

Signature of researcher Date

Appendix 4: MoBE Research Permit issued

TELEPHONE: 3655400/3655483
TELEX: 2944 THUTO BD
FAX: 3914271

REPUBLIC OF BOTSWANA

MINISTRY OF BASIC EDUCATION
PRIVATE BAG 005
GABORONE, BOTSWANA

REF: DPRS 7/1/5 TEMP (03) PEO-Research

21st October 2021

Mr Father Phuthego
P.O. Box 604
Metsimotlhabe

RE: PERMIT TO CONDUCT A RESEARCH STUDY

This serves to grant you permission to conduct your study in the sampled areas in Botswana to address the following research objectives/questions /topic: **Effects of digital divide in education during the covid-19 pandemic-case of Botswana senior secondary schools.**

It is of paramount importance to liaise with Regional Directors, School Heads and teachers in sampled schools. We hope that you will conduct your study as stated in your proposal and that you will adhere to research ethics. Failure to comply with the above stated, will result in immediate termination of the research permit.

You are also encouraged to adhere to health protocols amidst **COVID 19** by considering conducting data collection remotely thereby minimising contact with participants.

The validity of the permit is from **22nd October 2021 to 22nd October 2022. Kindly submit a copy of your final report as stated in the Research Guidelines (para 4.5 - 4.6, 2007) to the Ministry of Basic Education, Department of Educational Planning and Research Services, Botswana.**

Thank you.

Yours faithfully

Onalenna Senwedi
For/Permanent Secretary

Appendix 5: Centre confirmation of ethical conduct

TELEPHONE: (267) 3952587
FAX: (267) 3911048

Naledi Senior Secondary School
P O Box 20527
GABORONE
BOTSWANA

Republic Of Botswana

MINISTRY OF BASIC EDUCATION

14th February 2022

TO WHOM IT MAY CONCERN:

This communique serves to confirm that Father Phuthego of Student Identification Number 20203293 requested to administer his research questionnaires based on **"THE EFFECTS OF DIGITAL DIVIDE IN EDUCATION DURING THE COVID-19 PANDEMIC** "to some of our learners and some staff members who were his target group in the year 2021.

We do confirm he worked with us collecting his data and that the assistance we rendered enabled him to successfully complete his research project and his studies. We further confirm that this research conducted ethically and no participant's rights were violated.

It was indeed a wonderful experience working with him.

Yours Faithfully

Selefo Sera
For/School Head

Naledi Senior Sec. School
P. O. Box 20527, Gaborone
Tel: 3952587, Fax: 3911048
14 FEB 2022
HOH - Giraffe

Appendix 6: Similarity Report