

**STUDENTS' PREPAREDNESS FOR ONLINE LEARNING OF
MATHEMATICS IN NAIROBI COUNTY**

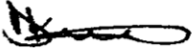
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**RESEARCH PROJECT REPORT SUBMITTED IN PARTIAL
FULFILLMENT OF THE REQUIREMENT FOR THE AWARD OF
POST GRADUATE DIPLOMA IN EDUCATION OF THE
UNIVERSITY OF NAIROBI**

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DECLARATION

This research project is my original work and has not been presented for an award in any other university.


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DEDICATION

I dedicate this research project to my parents Mr. and Mrs. Kirianki for the support they accorded to me during the entire period.

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I am grateful to Almighty God for the successful completion of this research. My sincere appreciation to the University of Nairobi for the opportunity to pursue the Postgraduate Diploma in Education. My special appreciation and gratitude to my supervisor Dr. Naomi Mwangi for her guidance, supervision and follow up on every progress.

I am thankful to the school principals in Kangemi Boys High School and Ngara Girls High School for allowing me to extract data from their institutions despite the tight schedule they had to cover syllabus. Big appreciation to the students who took their time to go through the questionnaires and responded to the questions.

I am grateful to my colleagues and friends who did not hesitate to offer a helping hand whenever I reached out, may God bless you abundantly.

ABSTRACT

The purpose of this study was to investigate the preparedness of secondary school students on online learning of mathematics in Nairobi County. The study was guided by the following objectives: to determine the knowledge of learners in the use of computers, to establish the availability of computer devices to the learner and to identify the learner access to internet. The study focused on two selected secondary schools in the County and particularly those in the suburbs of the city. These schools were, Kangemi High School and Ngara Girls High School. The respondents included learners in all levels of study from form one to form four. The study targeted a sample of at least 80 respondents including both male and female learners in the specified group. Data collected was then be subjected to descriptive and inferential statistics for analysis. The findings indicated that students' preparedness for online learning of mathematics was still wanting. This data has helped the researcher make conclusions that students need to be equipped with knowledge on the use of computer devices and that the ministry of education together with school management need to provide students with the access to internet both in school and at home for online learning of mathematics. This is because most of the students didn't have the knowledge on the use of computers, and those who had smartphones, most of them had no internet access. In addition, there is need to avail school computers to students for online learning of mathematics.

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CHAPTER ONE.

INTRODUCTION

1.1 Background of the study

The onset of covid-19 pandemic affected the world in many ways in the year 2019 and majorly the year 2020. The pandemic was later discovered spread from one person to another through coughing, sneezing or contact with an infected person. Key areas that were marked prone to allow the virus in the body were the eyes, nose and mouth. They were therefore to be kept safe by avoiding any unhealthy contact with them (Ministry of Health Kenya, 2020). This made most of the governments in the world to come up with most convenient ways to curb the spread of the deadly virus. Many rules and regulations were put in place, which included sanitizing hands regularly, wearing of facemasks and keeping distance from one another. To help reduce crowded places, most governments bared worship centers from carrying out their routine gatherings and advised school closure to prevent infections spreading in schools.

The closure of schools in many countries was indefinite and was issued to help governments control the disease in their countries. Therefore, learners went home without the knowledge of when they would resume their normal learning systems. Kenya, just like the many other countries, followed suite. The most affected levels of learning in the world were the primary education and the secondary education. The tertiary education mostly shifted to online learning in some universities in the world. Although some schools in the world have well established online learning for high school students, many countries in Africa did not have this program for the high school learners. Kenya being part of the many developing countries in the world did not have a well-structured online learning programme for high school learners as well.

After some weeks of school closure, some teachers in few schools in Kenya decided to teach their student through online platforms. This was the novel and the only way that would keep students active in studies and discussions with their teachers. Although some students agreed to have achieved a lot from the online classes, there were others who did not attend the online

classes organized by their teachers. Some of the learners who did not participate in the online lessons did so due to various reasons.

To mitigate the challenge of partial participation in online classes for high school learners in future, a lot has to be done by the stakeholders. This opens the avenue for research to be conducted to establish how well prepared are the high school students for online learning, and particularly learning mathematics.

1.2 Statement of the problem

This research therefore, sought to establish the preparedness of high school students for online learning of mathematics in particular, by studying some of the factors that might hinder them from participating in the online learning wholly.

From the 2020 KCSE done in 2021 March and April, some candidates had revised for the exam through online study by the help of their parents and teachers while others relied entirely on the physical materials for revision. To be precise, the latter waited until schools resumed for them to engage teachers in their revisions. Simiyu Wanjala, the top student in the 2020 KCSE, in an interview with the standard media reporters, told that during the long unanticipated holiday he used a tablet bought for him by his father to go online and seek assistance of his teachers (Gachane, 2021). This eventually helped him emerge the top student in the national examinations that were held in 2021 in the midst of the covid-19 pandemic.

The challenge remain for those who could not manage to study online during the holiday; they stand disadvantaged among the learners who had the privilege to engage their teachers during their revision. To curb this challenge, something needs to be done to create a fair competition ground for all learners.

1.3 Purpose of the study

The purpose of this study was to investigate the preparedness of students for online learning of mathematics.

1.4 Objectives of the study

This study was guided by the following objectives.

- i) To determine computer knowledge of the learner for online learning of mathematics in Nairobi county.
- ii) To determine the availability of computers for online learning of mathematics in Nairobi county.
- iii) To assess the connectivity of internet to the learner for online learning of mathematics in Nairobi county.

1.5 Research questions

The study sought to answer the following questions.

- 1) What knowledge do students have on the use of a computer for online learning of mathematics?
- 2) Is there a significant relationship on the availability of a computer to a learner on online learning of mathematics?
- 3) Is there a significant relationship on the availability of internet connection to the learner on online learning of mathematics?

1.6 Significance of the study

The findings in this study may be significant in the sense that it might help the schools involved, the county and the ministry of education to improve the use of online learning of mathematics in secondary school for maximum learning and utilization of the available technology devices in the country. Eventually, higher performance in mathematics would reflect the essence of online learning of the same.

These findings also create a good foundation for further research on how to improve online learning of mathematics.

1.7 Delimitation of the study

The study focused on two secondary schools in Nairobi County. Which is a representative of the entire population. Under normal circumstances, the study would have been carried out in the entire country to ascertain the matter.

1.8 Limitation of the study

This study was carried out in two secondary schools in Nairobi County and therefore it does not reflect the preparedness of students in online learning of mathematics from other counties and sub counties and the country as a whole. These being two sub county secondary schools, the study may lack some relevant data, which may be found from other secondary schools in other counties and part of the country.

1.9 Assumptions of the study

This study assumed that;

- All respondents gave varied feedback without exaggeration.
- All learners had the capacity to learn mathematics online.
- All teachers of mathematics had the ability to teach mathematics online.

1.10 Definitions of significant terms

Online learning: this involves the art of getting academic knowledge and information from the comfort of your home or elsewhere by the means of an electronic device from internet or either a teacher but separated by distance.

Technology devices: these are the digital electronic devices that have the capacity to access internet and display information. Eg, desktop computer, laptop computer, tablet/iPads and/or smart mobile phones

Learner: a person who is looking for academic knowledge from a teacher, books or the internet.

Teacher: a person who guides and gives academic knowledge to a learner.

Student preparedness: this means how well a student is equipped with the required knowledge, skills and materials for participation in online learning of mathematics.

Internet connectivity: it means the availability of means to connect to other computers globally. The availability of Wi-Fi or mobile data bundles.

CHAPTER TWO.

LITERATURE REVIEW

2.1 Introduction

The aim of this chapter was to review related literature on online learning in general, for high school learners and in particular on mathematics. The review comprised both the international and local reports on the topic.

2.2 Knowledge on computer use on online learning of mathematics

The first full online learning course was achieved in 1981 and it proved a great potential in its delivery (Shane Dawson, 2015). This mode of learning involved learning anytime any place and was observed to be viable for use to any level of study.

Distance learning has developed over the years and has been mostly used in higher learning institutions where learners from different geographical locations interact with their teachers virtually using technology and technological devices. According to (University, 2016), distance learning began in the 1800's in the University of Chicago United States of America where learners from different locations tried to connect. Consequently, the development of radio waves and use of radios opened an avenue for distance learning.

In the mid-20th century, televisions began to blossom making it possible for people to see pictures in motion associated with their audio (CinemaSource, 2002). (University, 2016) This took digital learning a notch higher enabling learners to link the audio to the pictures in motion. The world experienced yet another growth in technology when the world-wide-web emerged. This made it possible for people to store information in a centralized location where it could be accessed from anywhere in the world (University, 2016). The famous internet has really promoted the growth of distance and digital learning today.

Although open and distance learning was not so much in Africa, students in Africa had started taking courses from abroad which could be offered online (Jackline K. A. Nyerere, 2012). Challenges that hindered the implementation of distance learning in Africa and particularly in Kenya were many. These included the cost of acquiring personal computers, poor network

connection, minimal electricity connection and lack of knowledge to use the devices (Mildred A. Ayere*, 2010).

The program has however over the recent years been used in higher learning institutions but there have been minimal use of digital and distance learning in secondary schools in Kenya (Mildred A. Ayere*, 2010). (SESSIONAL PAPER 1 , 2005) Recommended the use of open and distance learning to all levels of education unlike the act, which previously recommended it for adults learning.

The knowledge on the use of computers and other technological devices remains key to the implementation of online learning in mathematics. Surprisingly, the bigger percentage of young population remains to be computer illiterate despite the rapid growth in the information communication technology (Computer Literacy Statistics – 2020, 2020). In the year 2020, Sri Lanka reported a population of about 40% among the secondary age students were having the basic computer knowledge. This means that 60% of the secondary age students lacked the required basic computer knowledge to participate in online learning. Contrary to the secondary age population in Sri Lanka, the college age population lead in computer literacy according to the statistics with about 60% having the basic computer knowledge and about 40% lacking the basic knowledge on computer use (Computer Literacy Statistics – 2020, 2020).

Developing countries have had a challenge in implementing online learning due to their state of economy. Senegal, which is among the developing countries in Africa, has a higher population of its citizen lacking the basic academic knowledge and thus considered illiterate (Tellis, 2009). The 2009 report by (Tellis, 2009) recorded that only about 39% of the population in the country could read and write. This shows the extreme to which the challenges of online learning could emerge.

In Kenya, online learning programs have been conducted in several universities for tertiary education with minimal participation of the same in secondary schools. This could be attributed to various challenges that associate with developing countries, which include economic challenges, power connectivity, internet affordability and more precisely lack of basic knowledge on the use of computers by the secondary age population in the country.

2.3 Availability of computers and technological devices on online learning of mathematics

Computers, internet, smart phones and all technology devices keep on changing the way of doing things in the world today. Other than the basic mode of communication, improvements in the communication technology has created a source of very important information that is useful to many (Richard Wike, 2007). While computers continues to be a necessity in many countries, some countries are advancing at a slower pace in the ownership of computers and computer devices. According to (Richard Wike, 2007), united states, Canada and western Europe top in the list of computer ownership and usage with about 80% of their population being involved. Nevertheless, some Arab countries and most of African countries close the list with the lowest computer owners and users as well.

Although desktops and laptop computers are not owned by many, smart mobile phones, which have the ability to work like a computer to a greater percentage, are owned by a very big population in the world. According to statistics, over 4 billion people in the world use smartphones as of the year 2020. This is about 61% of the people in the world (Ash Turner , 2021). This is estimated to be about 40% increase in the ownership of smartphones from the year 2016 to the year 2021. The author of the same website also projects that by the year 2025 about 75% of the world population would be owning smartphones.

Although Africa is not leading in the ownership of smartphones in the world, South Africa tops the list with about 51% of its population using smartphones. Ghana has about 35%, Nigeria 32% and Tanzania 13% of its population using and owning a smartphone (Johnson, 2018).

Smartphones are generally used for communication purpose and browsing. They play a key role in information seeking especially in internet and social media platforms, which are designed for social interactions and engagements.

Ownership of smartphones is bigger than that of desktop and laptop computers due to several reasons. Smartphones are easier to use compared to computers, they are cheap to acquire and they are more portable because of their small size.

In Kenya, the state is not different from that of other African countries. Kenya being a developing country with an average economy, most of its population live below the average earning limit. This can be considered as the major hindrance to many households obtaining either a personal laptop or a home computer. Moreover, the usage and ownership of technology devices can be divided between the urban dwellers and the rural areas residents. The urban population leads by a higher percentage in ownership of computers and the use of the same (MARGARET NYAMBURA NDUNG’U, 2019). According to the Kenya National Bureau of Statistics (KNBS), the rural parts of the country lags behind in academic literacy and technology use as well. This is supposed to have been influenced by the economic status of the people in the upcountry, the electricity connectivity the network and other factors that associate with interior undeveloped regions of a country.

As of 2020, many teens in Kenya had access to smartphones. Although normally it is not possible for a teen to acquire a phone by him/herself due to registration of the sim card, many parents bought their teenage children smartphones for several reasons, which include learning as various teachers, recommended. The indefinite closure of schools for an unknown period made some teachers to advice their learners to get a smartphone that would enable them carry on with their academic studies online. Some parents depending on their financial status bought their children phones and they were able to receive they lessons from their teachers online.

This move to encourage phones for the youths must have raised the percentage of phone ownership among the youths from a research that recorded 40% of teens used smartphones in the year 2014 (Lundén, 2015). Although earlier smartphones were a source of entertainment and socializing, the covid-19 pandemic has unearthed a key and important use of smartphones among teen learners.

2.4 Internet connectivity on online learning of mathematics

Having a computer or a smartphone is one thing while havening internet connection is another. This is because without internet access it is not possible for a computer owner or a smartphone owner to participate in an online lesson. Internet enables an owner or user of a computer to

connect to the broadband internet system where they get full access to global information (Lundén, 2015) (Johnson, 2018). Combined with the knowledge to use the technological devices and access to the devices, internet and network connectivity helps to make a maximum utilization of technology in education for learners.

The continent of Asia is the leading continent in the world in the usage of internet. Asia tops the list where about 54% of the world population-using internet is found. It is followed by Europe where about 14% of the world's population using internet is. The continent with the lowest internet users is Australia where about 0.6% of the world population use internet (Miniwatts Marketing Group, 2021). Africa ranks at the third position in internet usage with an approximate 11% of the world population using internet in the continent as of march 2021 (Miniwatts Marketing Group, 2021).

Although the internet users in the world are many in Asia, Asia stands at the second last position on internet penetration in the continent. It is approximated that Asia has about 63% of internet penetration. Surprisingly, Africa, which is among the continents where internet is widely used, it has only about 43% of internet penetration (Miniwatts Marketing Group, 2021). The leading continent in internet penetration is North America with about 93% penetration. In the world continents, Africa is the continent where internet connectivity is poor with a less than half penetration of internet in the continent. Factors that could be the cause of poor internet connectivity in Africa include the economic status of the African countries where many countries are the third world countries or developing countries, thus having poor economic background that can enable massive internet connection.

However, network-provider companies have eased the cost of internet service in Africa and particularly in Kenya by providing cheap premium subscriptions that assist citizens access internet with as little as 20 Kenyan shilling (MARGARET NYAMBURA NDUNG'U, 2019). This makes it possible for both the high income earners and low income earners to afford the cost of internet without discrimination.

CHAPTER THREE.

RESEARCH METHODOLOGY

3.1. Introduction

This chapter highlights the relevant study methodologies that were considered in the research study. It highlights the research design, study population, sample size, sampling techniques, research instruments, data analysis and ethical considerations. The study was carried out in two secondary schools in Nairobi County. The justification of the schools which were considered was their location in the city with the assumption that they were directly affected by the technological needs which helps to facilitate online learning of mathematics. The study was expected to cut across all the levels of study from form one to form four. The survey research was carried out through collection of data by administering questionnaires to the target group. The data collected was then analyzed using the descriptive and inferential statistics.

3.2. Research design

The researcher adopted a descriptive survey design on the study due to its applicability in the study. The effectiveness and easiness of the descriptive approach made it most appropriate for the study. With the guide of a questionnaire, the researcher was able to analyze the data collected for proper reporting and conclusion on the study.

3.3. Target population

The target population for this research was the secondary school students in all levels of study from form one to form four in at least two secondary schools in Nairobi County. Nairobi County is the county that has the Kenya's capital city and thus the researcher expected the county to have a remarkable progress in online learning of mathematics among the learners. However, the schools selected were those that were located at the suburbs of the city center.

3.4 Sample Size and Sampling procedure

From the population, sampling without bias was done using stratified random sampling to incorporate all levels of studies and all learners with different home backgrounds. This included 80 samples with 40 from each selected school and 10 from each level of study. This was to help the researcher analyze the entire population with ease and with a proper representation from each school and level of study. The gender of the learners was also a factor to consideration too.

3.5. Methods of data collection

The researcher consider the use of questionnaires for data collection. A questionnaire was appropriate to collect quantitative data and again it was easier to administer to the respondent and allowed credibility of the feedback since it helped reduce the influence of the interviewer to the respondent. The results were also easily compared objectively.

3.6. Data analysis

The data collected was then be expressed in percentage (%) form and then both descriptive and inferential statistics were used appropriately to analyze it. This makes it easier for any reader to comprehend the report from the collected data due to the simplicity of the statistics analysis tools chosen. It also made it easier to recommend on the findings of the study.

CHAPTER FOUR

DATA ANALYSIS, PRESENTATION AND INTERPRETATION

4.1 Introduction

This chapter presents the findings of the data collected from respondents on the subject 'students' preparedness on online learning of mathematics'. The data was collected from Nairobi county, Westland's sub county and starehe constituency in Kangemi high school and Ngara girls high school. The findings were recorded according to the objectives of the research.

4.2 Response rate

This is the breakdown of the demographic data according to the gender and level of study of the respondents. The study involved 80 questionnaires, which targeted 80 respondents distributed evenly with respect to the gender and level of study of the learner. Among the targeted 40 male respondents, only 37 questionnaires were received back. This is a 92.5% response of the targeted 100%. For the female respondents, among the targeted 40 only 33 of the total was received for analysis. This is an 82.5% response of the expected 100%. The total response rate of the targeted sample was 70 of the expected 80. This makes it 87.5% of the targeted population. This data response rate is adequate for analysis and because it involved all the characteristics that were targeted.

4.3 Background of characteristics of the students respondents

The background information of the students targeted their social status, their level of study and exposure to the contemporary world of technology. These are the main factors that determine the preparedness of a student for online learning.

4.4 Distribution of students according to their level of study

Students considered for the study were from all level of study according to the class (form 1-4). Genders were targeted uniformly although the response rate differed slightly. The table below shows the distribution of learners according to the level of study.

Table 1. Distribution according to the level of study.

CLASS	GENDER DISTRIBUTION		FREQUENCY PER CLASS	FREQUENCY %
	M	F		
FORM 1	M	8	15	21.4%
	F	7		
FORM 2	M	10	18	25.7%
	F	8		
FORM 3	M	10	18	25.7%
	F	8		
FORM 4	M	9	19	27.1%
	F	10		
TOTAL	M	F	70	100.0%
	37	33		

Key:

M- Male

F- Female

%- percentage

According to the table above, the response rate was high from the form four which comprised a 27.1% while form two and three had equal response rate of 25.7% and form one had the least response rate of 21.4% of the total sample.

4.5 Distribution of students according to their knowledge on the use of computer

From the total data collected, 35 of 70 agreed to have knowledge on how to use a computer. This is a 50% of the respondents.

The table below shows a detailed distribution of the respondents on their knowledge to use a computer.

Table 2. Distribution of students according to their knowledge on the use of computer.

CLASS	GENDER		TOTAL	% FREQUENCY
	M	F		
FORM 1	4	6	10	28.6%
FORM 2	6	6	12	34.3%
FORM 3	4	3	7	20.0%
FORM 4	3	3	6	17.1%
TOTAL	17	18	35	100.0%

According to table 2 above, more learners in form two were knowledgeable on the use of computers than others with a 34.3%. Form one students followed with 28.6% while form three had 20.0% while form four had only 17.1%.

On the distribution according to gender, more girls had the knowledge on the use of computers than boys with a 51.4% as the boys had a 48.6%.

4.6 The availability of computers at the learners' home.

The table below shows the distribution of computers to the respondents' home. This includes the desktop and laptop computers. This section targeted only the functional computers excluding the availability of internet connection.

Table 3. Distribution of learners according to availability of computer at home

CLASS	GENDER		TOTAL	% FREQUENCY
	M	F		
FORM 1	2	2	4	19.0%
FORM 2	2	2	4	19.0%
FORM 3	1	3	4	19.0%
FORM 4	4	5	9	42.9 %
TOTAL	9	12	21	100.0%

From table 3 above, more form four students had access to computers at their home than learners in other levels of study. The availability of computers to the form four students' home stood at 42.9% while other levels of study had 19.0% of the total sample size.

The distribution of computers based on gender, more female learners had computer access at their home compared to the males. This was a 57.1% of the total while the male had a 42.9% of the total sample size.

4.7. Distribution of smartphone ownership among the respondents.

The study sought to determine the availability of smartphone to learners since smartphones are viable for use on academic studies when used appropriately.

The table below shows the distribution of smartphone ownership among the respondents based on their level of study and gender. The study did not seek to establish how the learner acquired the phone.

Table 4. Distribution of respondents according to ownership of smartphone

CLASS	GENDER		TOTAL	% FREQUENCY
	M	F		
FORM 1	5	3	8	14.5%
FORM 2	7	7	14	25.5%
FORM 3	10	7	17	30.9%
FORM 4	8	8	16	29.1%
TOTAL	30	25	55	100.0%

From the table above, more form three students own smartphone with a 30.9% of the total population that owns smartphones from the study. The form four follow closely with a 29.1% while form two has 25.5% and form one 14.5% of the total.

In addition to this, more male students own smartphones compared to female learners. The male respondents lead with a 54.5% while the female respondents have a 45.5% of the total smartphones owned by the sample selected.

4.8. Distribution of electricity connection at the respondents' home

The table below shows the distribution of respondents' home that have electricity connection.

Table 5. Distribution of learners according to electricity connection at their home

CLASS	GENDER		TOTAL
	M	F	
FORM 1	8	7	15
FORM 2	10	8	18
FORM 3	10	8	18
FORM 4	9	10	19
TOTAL	37	33	70

From the table above, all the respondents in the study admitted their homes had electricity connectivity. However, the study did not inquire about back up power to the electricity in instances of blackout.

4.9. Distribution of respondents according to their access to internet at home

Of the total sample size, only 15 respondents accepted to have internet access at their home. This is a 21.4% of the total sample size. A big percentage of 78.6 has no internet access at home.

Table 6. Distribution of respondents according to their access to internet at home

CLASS	GENDER		TOTAL	% FREQUENCY
	M	F		
FORM 1	1	2	3	20%
FORM 2	2	2	4	26.7%
FORM 3	1	3	4	26.7%
FORM 4	2	2	4	26.7%
TOTAL	6	9	15	100.0%

From the table above, more female students have internet access at home compared to their male counterpart. They stand at a 60% of the total while the male students occupy the remaining 40%.

Class wise, fewer form one students have internet access at home compared to other levels of study. They are represented by a 20% of the total distribution, while form two, three and four have a distribution of 26.7% each.

4.10. Distribution of respondents based on the overall factors affecting their participation in online learning of mathematics.

The research sought to establish the extent which some of the factors affecting online study of mathematics was.

On this section, learners were asked to answer the questions on a scale point, either the strongly disagree, disagree, chose not to say, agree or strongly agreed.

STATEMENT	RESPONSE									
	Strongly-disagree		disagree		Choose-not-to-say		agree		Strongly agree	
	F	%	F	%	F	%	F	%	F	%
I am knowledgeable in using a computer.	0	00.0%	4	26.7%	1	6.7%	7	46.7%	3	20.0%
I frequently use school computers to study mathematics.	7	46.7%	5	33.3%	3	20.0%	0	00.0%	0	00.0%
There is strong internet access for study at home.	0	00.0%	3	20.0%	6	40.0%	3	20.0%	3	20.0%
I regularly use a smartphone to study mathematics	3	20.0%	5	33.3%	3	20.0%	3	20.0%	1	6.7%
I have attended several mathematics virtual lessons from home organized by my teacher.	2	13.3%	4	26.7%	3	20.0%	5	33.3%	1	6.7%

Table 7. Distribution among the form one respondents (overall factors)

Key:

F- Frequency

%- percentage of the frequency

From table 7 above, there were no students who strongly disagreed to the statement 'I am knowledgeable in using a computer' while 26.7% disagreed to the statement. 6.7% chose not to respond to the statement as 46.7% and 20.0% agreed and strongly agreed to the statement respectively.

46.7% and 33.3% strongly disagreed and disagreed respectively to the statement, 'I frequently use school computers to study mathematics' as 20.0% chose not to say on the statement. There were no students who either agreed or strongly agreed to use school computers to study mathematics among the form one.

On strong internet connectivity at home for study, there was no student who strongly disagreed to the statement although 20.0% disagreed and 40.0% chose not to say. However, 20.0% agreed and another 20% strongly agreed to have strong internet for study at home.

On regular use of smartphones to study mathematics, 20.0% of the students strongly disagreed while 33.3% disagreed to the statement. 20.0% chose not to say while another 20.0% agreed to the statement as 6.7% strongly agreed.

13.3% strongly disagreed to have attended several mathematics virtual lessons from their homes organized by their teachers. 26.7% disagreed while 20.0% chose not to say on the statement. 33.3% and 6.7% agreed and strongly agreed to the statement respectively.

Table 8. Distribution among the form two respondents (overall factors)

STATEMENT	RESPONSE									
	Strongly-disagree		disagree		Choose-not-to-say		agree		Strongly agree	
	F	%	F	%	F	%	F	%	F	%
I am knowledgeable in using a computer.	1	5.6%	2	11.1%	3	16.7%	9	50%	3	16.7%
I frequently use school computers to study mathematics.	5	27.8%	11	61.1%	2	11.1%	0	00.0%	0	00.0%
There is strong internet access for study at home.	1	5.6%	5	27.8%	5	27.8%	3	16.7%	4	22.2%
I regularly use a smartphone to study mathematics	3	16.7%	5	27.8%	6	33.3%	3	16.7%	1	5.6%
I have attended several mathematics virtual lessons from home organized by my teacher.	0	00.0%	13	72.2%	5	27.8%	0	00.0%	0	00.0%

Key:

F- Frequency

%- percentage of the frequency

From the table above, 5.6% of the form two students strongly disagreed to the statement 'I am knowledgeable in using a computer'. 11.1% disagreed to the statements and 16.7% chose not to say. However, 50% and 16.7% agreed and strongly agreed to the statement accordingly.

On the frequent use of school computers to study mathematics, 27.8% strongly disagreed as 61.1% disagreed to the statement. Only 11.1% chose not to say while no one agreed or strongly agreed to use the school computers frequently to study mathematics.

5.6% strongly disagreed to have strong internet connection at home for use to study mathematics and 27.8% disagreed. 27.8% chose not to say while 16.7% and 22.2% agreed and strongly agreed to have strong internet connection at home.

27.8% and 16.7% disagreed and strongly disagreed to the statement, 'I regularly use a smartphone to study mathematics'. 33.3% chose not to say but 16.7% and 5.6% agreed and strongly agreed to use smartphone for mathematics studies respectively.

72.2% disagreed on the statement, 'I have attended several mathematics virtual lessons from home organized by my teacher' although no one strongly disagreed. 27.8% chose not to say while no one either agreed or strongly agreed to the statement.

Table 9. Distribution among the form three respondents

STATEMENT	RESPONSE									
	Strongly-disagree		disagree		Choose-not-to-say		agree		Strongly agree	
	F	%	F	%	F	%	F	%	F	%
I am knowledgeable in using a computer.	2	11.1%	7	38.9%	2	11.1%	6	33.3%	1	5.6%
I frequently use school computers to study mathematics.	3	16.7%	7	38.9%	6	33.3%	2	11.1%	0	00.0%
There is strong internet access for study at home.	1	5.6%	2	11.1%	7	38.9%	4	22.2%	4	22.2%
I regularly use a smartphone to study mathematics	3	16.7%	4	22.2%	7	38.9%	2	11.1%	2	11.1%
I have attended several mathematics virtual lessons from home organized by my teacher.	2	11.1%	9	50.0%	5	27.8%	2	11.1%	0	00.0%

Key:

F- Frequency

%- percentage of the frequency

From the table above, 11.1% of the form three students strongly disagreed to the statement 'I am knowledgeable in using a computer'. 38.9% disagreed to the statements and 11.1% chose not to say. However, 33.3% and 5.6% agreed and strongly agreed to the statement accordingly.

On the frequent use of school computers to study mathematics, 16.7% strongly disagreed as 38.9% disagreed to the statement. Only 33.3% chose not to say while 11.1% agreed to use the school computers frequently to study mathematics although no one strongly agreed to this.

5.6% strongly disagreed to have strong internet connection at home for use to study mathematics and 11.1% disagreed. 38.9% chose not to say while 22.2% and 22.2% agreed and strongly agreed to have strong internet connection at home respectively.

22.2% and 16.7% disagreed and strongly disagreed to the statement, 'I regularly use a smartphone to study mathematics'. 38.9% chose not to say but 11.1% and 11.1% agreed and strongly agreed to use smartphone for mathematics studies respectively.

50% disagreed on the statement, 'I have attended several mathematics virtual lessons from home organized by my teacher' although 11.1% strongly disagreed. 27.8% chose not to say while 11.1% agreed, although no one strongly agreed to the statement.

Table 10. Distribution among the form four respondents (overall factors)

STATEMENT	RESPONSE									
	Strongly-disagree		disagree		Choose-not-to-say		agree		Strongly agree	
	F	%	F	%	F	%	F	%	F	%
I am knowledgeable in using a computer.	4	21.1%	8	42.1%	1	5.3%	5	26.3%	1	5.3%
I frequently use school computers to study mathematics.	5	26.3%	9	47.4%	4	21.1%	1	5.3%	0	00.0%
There is strong internet access for study at home.	2	10.5%	4	21.1%	5	26.3%	4	21.1%	4	21.1%
I regularly use a smartphone to study mathematics	2	10.5%	6	31.6%	5	26.3%	4	21.1%	2	10.5%
I have attended several mathematics virtual lessons from home organized by my teacher.	3	15.8%	5	26.3%	9	47.4%	2	10.5%	0	00.0%

Key:

F- Frequency

%- percentage of the frequency

From the table above, 21.1% of the form four students strongly disagreed to the statement 'I am knowledgeable in using a computer'. 42.1% disagreed to the statements and 5.3% chose not to say. However, 26.3% and 5.3% agreed and strongly agreed to the statement accordingly.

On the frequent use of school computers to study mathematics, 26.3% strongly disagreed as 47.4% disagreed to the statement. Only 21.1% chose not to say while 5.3% agreed to use the school computers frequently to study mathematics although no one strongly agreed to this.

10.5% strongly disagreed to have strong internet connection at home for use to study mathematics and 21.1% disagreed. 26.3% chose not to say while 21.1% and 10.5% agreed and strongly agreed to have strong internet connection at home respectively.

31.6% and 10.5% disagreed and strongly disagreed to the statement, 'I regularly use a smartphone to study mathematics'. 26.3% chose not to say but 21.1% and 10.5% agreed and strongly agreed to use smartphone for mathematics studies respectively.

26.3% disagreed on the statement, 'I have attended several mathematics virtual lessons from home organized by my teacher' although 15.8% strongly disagreed. 47.4% chose not to say while 10.5% agreed, although no one strongly agreed to the statement.

CHAPTER FIVE

SUMMARY OF FINDINGS, CONCLUSION AND RECOMMENDATIONS

5.1 Introduction

This chapter discusses the findings of the study with the objective of unravelling the preparedness of secondary school students on online learning of mathematics. It focuses on the knowledge of learner on the use of computer, availability of computer devices to the learner for mathematics study and the access to internet connection for the learner to study mathematics online.

5.2 Summary of findings

5.2.1 Learner knowledge on the use of computer for online study of mathematics.

For any online activity to take place there has to be the use of computer or any other electrical device that can link to the internet and allow virtual interaction of participants. On this note, online learning of mathematics is not exempted from this reality. This study sort to determine how well secondary school learners were versed with the use of computers. It is only with some good knowledge on the use of computer that a learner can link up to a virtual mathematics class and participate fully.

From the study, more than half of the form four students were not knowledgeable on how to use a computer. Of the entire form four who participated in the study, only about 31% had the knowledge to use a computer. With this percentage, it is not effective to conduct an online mathematics lesson for the form four class. This is because over 60% of the class will miss out.

Form three students had about 38% of learners who knew how to use computers. This class also was not ready for virtual mathematics lessons. More than half of the class will eventually miss. Although form three and four had the least number of students with computer knowledge, the case was different for the form two and form one. More than 60% of form ones and form twos had the required knowledge to use a computer. It could therefore be possible to conduct a virtual mathematics lesson for form one and two. This can be effective only when other factors are held constant. These factors include and not limited to; availability of the computers, electricity power connection, internet access among others.

5.2.2 Availability of computer to the learner for online learning of mathematics.

As stated from the above section, computer knowledge alone cannot be relied upon to achieve full online study participation. This section discusses the availability of computers.

The schools considered in this study were the ones located in the capital city of Kenya and therefore it would be expected or thought of that almost all learners had access to computer at home. On the contrary, the study unveiled that more learners had no computer access compared to those who had.

From the entire population, only 30% had access to computers at home. This implies more than half of the students had no access to computers and therefore despite their knowledge in computer use, they cannot participate in online learning of mathematics due to this limitation. If there were another indefinite closure of learning institutions, as was the case during the covid-19 outbreak, this would imply impracticability of online learning among secondary school learners.

Nonetheless, the study also sought to establish the usage of school computers to study mathematics. The response however showed that many students do not use school computers to study mathematics. Only 5.3% of the form four students agreed to use school computers to study mathematics as 11.1% of the form three students also agreed. Disappointingly, there was no single student in form one or form two who agreed to use school computers to study mathematics.

The reason for low participation in using school computers to study mathematics was not established in this study however. It was discussed and approved in (SESSIONAL PAPER 1 , 2005) that all learners in the country should be allowed to participate in technology and computer studies to give them opportunity to use technology devices to study. This brought about the necessity to equip all learning institutions with computers to allow digital learning. The researcher therefore assumed that all schools had computers for students.

5.2.3 Learner access to internet connection for online learning of mathematics.

A computer device may help to store and access the stored data, but with internet connection, the device enables the user to access data from all over the world through the World Wide Web connection. It is this access to internet that enables a learner to link up to his teacher's computer and interact virtually from the comfort of their homes.

With the network provider companies, it has been easy to access internet in the country such that with either five Kenyan shillings one can purchase some data bundles that can enable one to browse through internet.

However, it would be wrong to say all students have access to internet. This is because there is need for a device that will enable them to link up. Thanks to technology you do not need to have a computer to access internet, with a smartphone it is very possible to link up to internet and browse through or attend a virtual meeting or even a classroom. It is with this reason that despite many students not having computers at home, they have internet access which is enabled by the smartphones they use.

Of the entire sample size, 78.6% of the learners agreed to own smartphones. This is a good number that shows the viability of the use of online learning among the secondary school students.

The challenge however is at the access to internet. Access to internet access was found to be at 41.4% on average of the sample size. Although the learners have the device that can facilitate online learning, more than half of them lack the internet that acts as an enabler to online learning participation.

On average, only 15.4% of the sample size agreed to have participated in a virtual mathematics classroom organized by their teachers. This is really wanting since less than a quarter of each class on average is not a good number to call it a class.

5.3 Conclusion of the study

Many factors affect secondary school learners' participation in online learning of mathematics. Only three of them have been established in this study.

The findings indicate that half of the secondary school learners need computer knowledge to enable them participate in online learning of mathematics.

Although there are more than half of the learners lacking computer access at their homes. Most of them have smartphones that could serve same purpose as computers when it comes to online learning of mathematics. This is indeed a great thing in the digital epoch.

Nonetheless, internet access is really a quagmire to the learners. Probably because of their economic status, most of the learners had no internet access at home.

5.4 Recommendations

Based on the findings, there are quite a number of things school administration and the ministry of education need to address in order to promote online learning of mathematics.

The ministry of education and the curriculum developer body should provide a curriculum that gives secondary school learners an opportunity to learn basics of using a computer device. This will increase the number of online study of mathematics participation. Knowledge is power and it goes beyond the limit. If the government could reinforce the digital program that was started by the jubilee government, which involved giving primary school learners laptops for study, then by the time these learners get to high school, they would be knowledgeable in using a computer.

In addition to this, it would be effective if school administration came up with a way of providing internet access to their learners during their break so that they can participate in online learning easily. This method has been used by safaricom company which is the biggest network provider in the country. Safaricom gave customized data bundles to learners during the long unanticipated break of 2020. The only to ensure is that this internet access should be restricted to

only the necessary internet sites. With this method, no student will miss online mathematics lessons on the basis of lack of internet.

Several other factors need to be researched on in order to maximize online learning of mathematics and other subjects among secondary school students. These could include; the knowledge of teachers on use of technology to teach online, availability of resources to teach online and many others.

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APPENDICES

APPENDIX I: INTRODUCTION LETTER

Kirianki Dennis Kimathi

Reg No: L40/36228/2019

University of Nairobi,

Department of Education,

School of Open and Distance Learning,

P.O Box 30197

Nairobi.

Dear sir/ madam,

RE: LETTER OF INTRODUCTION

As part of my course of study for the Postgraduate Diploma in Education in the University of Nairobi, I would like to carry out a research study on the preparedness of secondary school students on online learning of mathematics in selected secondary schools in Nairobi County. I am seeking your permission to administer questionnaires to students to gather data on the above topic. This is purely academic and the respondents identity will not be featured anywhere.

Thank you in advance.

Yours faithfully,

Kirianki Dennis Kimathi

APPENDIX II: STUDENTS' QUESTIONNAIRE

SECTION A. BIO-DATA

This appreciates the background information of the respondent (student) in the research study.

Tick where appropriate

- 1) What is your level of study?
 - a) Form one
 - b) Form two
 - c) Form three
 - d) Form four
- 2) What is your gender?
 - a) Male
 - b) female
- 3) Do you know how to use a computer?
 - a) Yes
 - b) No
- 4) Is there a functional computer or a laptop at your home?
 - a) Yes
 - b) No
- 5) Do you have a smartphone at home?
 - a) Yes
 - b) No
- 6) Is your home connected to electricity power?
 - a) Yes
 - b) No
- 7) Do you have internet access at your home?
 - a) Yes
 - b) No

SECTION B. SUBSTANTIVE DATA

Use the following to fill in the table on this section,

Strongly disagree=1, disagree=2, choose-not-to-say=3, agree=4, strongly agree=5.

STATEMENT	RESPONSE				
	Strongly-disagree	disagree	Choose-not-to-say	agree	Strongly agree
I am knowledgeable in using a computer.					
I frequently use school computers to study mathematics.					
There is strong internet access for study at home.					
I regularly use a smartphone to study mathematics					
I have attended several mathematics virtual lessons from home organized by my teacher.					

THANK YOU FOR YOUR TIME