PERCEPTION OF SECONDARY SCHOOL STUDENTS ON THE USE OF COMPUTERS IN THE LEARNING OF MATHEMATICS IN BOSSO LOCAL GOVERNMENT AREA, MINNA, NIGER STATE

BY

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Abstract

This research explored perceptions of secondary school students on the use of computers in the learning of mathematics in Bosso Local Government Area, Minna, Niger State. To this end, a survey of 150 SSII and SSIII students, from five randomly selected public secondary schools in Minna metropolis was conducted. The survey was carried out using a questionnaire of 20 questions, divided into five different sections. The survey provided data concerning the perception of the male and female students on the use of computers in the learning of mathematics and students usage of computers and perception on the importance of computers in learning mathematics. The reliability scales (Cronbach's Alpha values) for the survey instrument was 0.67. The analysis of data included percentage distribution, correlation between male and female students' perception on the use of computers in the learning of mathematics and correlation between the use of computer and its importance in learning of mathematics. Results revealed a significant positive correlation (.389 at p>0.05) was found between the perception of male and female students on the use of computers in the learning of mathematics and a positive significant positive correlation (.515 at p>0.05) was found between the use of computer and its importance n learning of mathematics. Adequate technological facilities should be made available to public secondary schools, there should be constant light or stand-by generators in schools where there are computers available and also, the government should match policies with action regarding ICT compliant mathematics classrooms.

CHAPTER ONE

INTRODUCTION

1.1 Background of the Study

The field of mathematics is progressively becoming more multi-faceted. Mathematical activities integrate social, cultural and scientific contents and objectives that influence the activities of a lot of persons, organizations, etc., the world over. Education in mathematics must reflect its multi-disciplinary nature, and provide flexibility in its settings and methodologies. Different types of learning and instructional technologies are being utilized in mathematics depending on the particular context and audience being addressed (Slavit, Nelson and Lesseig, 2016. The ability to use appropriate software to meet students' mathematical needs and prepare them to assume future societal roles have become an issue of utmost concern and at the same time attracted increased attention among researchers and practitioners in mathematics education (Weber, 2017).

Several streams have integrated in school mathematics like set theory, numerical calculation, measurement of length, perimeter, area and volume of two dimensional and three dimensional objects, drawing 2D and 3D figures, equation solving and graphical representation, transformation, trigonometric, exponential and logarithm functions related calculation and problem solving, operations of matrix and determinant, vector, statistics and so on. These concepts are really difficult to teach by the use of board and marker only, hence varieties of digital devices can be used for its effectiveness (Dirgha, 2016).

Research in mathematics education in Nigeria shows that a good number of the mathematics teachers that teach mathematics in both Primary and Secondary schools in

Nigeria are not skilled on the use of computers, because enough provisions were not made for their training on the use of computers in their programmes of study at the Nigeria Certificate in Education (NCE) or Bachelor's degree level in mathematics education (Awofala, 2016). Apart from a small percentage of pupils/students who undergo their Primary/Secondary education in private schools in the country, majority of the products of these levels of education graduate without being skilled in the use of computers. Nigeria wants to become one of the world's most technologically developed nations by the year 2020 (Ngozi et al, 2014). This ambition would not be achieved if the youths of the country are not being exposed to the use of Information and Communication Technology. Traditional classrooms have remained the main setting for education in Nigeria and many countries in Africa, while advances in technology in an increasingly globalized world followed further progress into improved access to information and educational activities (Tikly et al 2018). Paisley and Rao (2016) pointed out that information and communication technologies have greater potentials in reaching more people. Thus, with information and communication technology (ICT) learning can take place in the field, as well as in the in the office using internet and computer-based research.

With the many positive views mathematics educators have about the feasible role of computers in the learning of mathematics (Thomas & Holton, 2013), there has been levels of uncertainties that have arisen as well, as to whether computers have any real worth in learning (Crook, 2018) and whether the current teacher use is qualitatively and quantitatively adequate to promote any benefits that might exist. Computer in education is a broad and changing term due to the breadth of the area of study and the rapid and ever-changing nature of technology. It does not help to learn to use technology in isolation, especially when technology changes quickly and dramatically. The learning of technology must be integrated in daily classroom teaching activities within the context of educational goals for it to be meaningful (Burns et al, 2019).

1.2 Statement of Problem

The vision 20:20 of Nigeria, is targeted at the country being one of the technologically advanced countries by the year 2020, but the actualization of this vision is bent on the acceptance of this technology by the populace. Nigeria, made up of millions of youths, who quest continuously for the achievement of knowledge, most especially, technological knowledge, seems not ready for this advancement she seems to be entering into, as there is no full implementation of this technology in her educational system. To be able to know the level of readiness of the populace, this research is designed to view the perception of secondary school students on the use of computers in the learning of mathematics. Mathematics, as a subject is seen as a necessary and integral aspect of any technological advancement. It is believed that the acceptance and adoption of computers in mathematics, means an acceptance of technology in all other fields and walks of life, hence the need for this study.

1.3 Aim and Objectives of the Study

The aim of this study is to explore the perception of secondary school students on the use of computer application in the learning of mathematics.

The following objectives have been outlined, in order to achieve the aim of the study. They are:

i. To determine the perception of male and female students on the use of computers in learning mathematics.

ii. To determine students usage of computers and perception on the importance of computers in learning mathematics.

1.4 Research Question

1. What is the perception of male and female students on the use of computers in learning mathematics?
2. What is the computer usage of students and their perception on the importance of computers in learning mathematics?

1.5 Research Hypothesis

In order to achieve the objectives of this study, the following hypotheses were formulated for the study to be tested at 0.05 alpha levels.

H_{o1} - There is no significant difference between the male and female students perception on the use of computers in learning mathematics.

H_{o2} – There is no significant difference between the use of computers and its importance in learning mathematics.

1.6 Scope of the Study

This study entails the perception of secondary school students on the use of computers in learning mathematics. The study covers some public schools within Bosso local government of Niger state, reason being that there is limited time and financial constraints to carry out this research on a much broader scale. Also, due to the time constraints, not much topics would be covered, to assess the student's perception.

1.7 Significance of the Study

The significance of this present study is to use computers in mathematics to change the student's perception towards mathematics. Computers can provide students with the opportunity to practice and develop their understanding of math concepts and skills in an interesting and exciting way. This 21st century is the age of technology, it is one of the basic needs of everyone, and this research will be helpful to students, teachers, educators, policy makers and so on. By the use of computers, images can be used easily in teaching and improving the retentive memory of students, also teachers can easily explain complex instructions and ensure students' comprehension as well as teachers are able to create interactive classes and make the lessons more enjoyable, which could improve student attendance and concentration.

1.8 Definition of Terms

Perception: A person's attitude to an idea or object determines what the person thinks, feels and how the person would like to behave towards that idea or object.

Computer: A computer is an electronic device which accepts data, processes the received data into usable and meaningful information.

CHAPTER TWO

LITERATURE REVIEW

2.0 Introduction

This chapter reviews relevant literatures, gives the conceptual framework and presents the theoretical framework for the study.

2.1 Conceptual Framework

Computers are one of the most valuable resources in a classroom because they serve so many useful functions. With computers and the internet, students today have a wealth of information at their fingertips that can help them develop their research and communication skills while preparing them for a future career in a workforce that is increasingly reliant on computer technology. One of the most common applications of computers in education today involves the ongoing use of educational software and programs that facilitate personalized online instruction for students (Anshari et al, 2017). Programs like iReady use computers to assess students in reading and math. Students then work on interactive reading and math lessons that are designed to target the specific academic needs identified during diagnostic testing. Educational software like this makes it easier to differentiate instruction so that lessons meet each student's unique learning needs (Nortvedt and Buchholtz, 2018). These tools also provide a wealth of useful data and resources that teachers can use to work with their students in the classroom and maximize learning. Online assessments are more efficient than traditional paper testing because it allows for more immediate feedback and data (Nilson, 2016).

Many studies conducted across the globe on the use of technology in classrooms have reported that computers can be an effective tool in supporting learning and teaching in class, for example;

School net programme in South Africa promotes teaching and learning through the use of computers, (Simonson et al, 2019). However integration of computers in Pedagogy as a project in 3rd world countries has failed to a large extent than other instructional initiatives in schools (Kaye and Rumble 2018). The high rate of failed or in complete ICT projects negatively impacts schools teaching, learning and performance with immeasurable consequences to national development. (Iqbal and Bhatti, 2015).

The benefits of using computers in the classroom go beyond more efficient assessment and opportunities for online learning. Mobile devices and technologies are an inevitable part of society, but that does not mean that students naturally understand how to use those technologies appropriately (McKnight et al 2016). Using computers in the classroom gives teachers an opportunity to teach digital citizenship skills that demonstrate ways to use technology correctly and responsibly. Computers also help maximize student engagement (Chun et al, 2016). Modern students are regularly exposed to technology outside of the classroom. Most use and enjoy smart phones and other mobile devices, which is why they are more likely to engage in the learning process if it involves something to which they are already accustomed and enjoy (Kuznekoff et al, 2015).

2.1.1.1 Teacher Use of Computers in the Classroom

Computers have revolutionized the teaching profession in multiple ways. Teachers use computers to record grades, calculate averages, and manage attendance and access data on student performance in online programs and assessments (Akhtar et al, 2017). Computers have also made it easier for teachers to vary their instructional delivery. Instead of lecturing at the front of the room for an entire class period, teachers can incorporate technology into their lessons to keep students engaged while appealing to a variety of learning styles (Zhou et al, 2017). From using computers to create presentations on a topic to showing video clips that complement the lesson at hand, technology helps teachers make the content easier for students to understand (Hunter and Storksdieck, 2017).

2.1.1.2 Disadvantages of Computers in the Education Field

While the benefits of using computers in education are plentiful, it also has some disadvantages. Some worry that computers are distracting because they provide students with temptations like games, videos or chats that can take them off task (Nguyen, 2017). It’s true that some students might be lured off task by these tempting features, but luckily there are settings available that can help teachers and parents set restrictions to help minimize distractions. Another disadvantage of computers in the classroom is over-reliance on technology (Katz, 2016). Critics argue that spell check and other computer features that automatically correct errors in spelling and punctuation make students too lazy to learn and apply the rules themselves. These features, however, help point out where students went wrong and offer valuable learning opportunities that can help students enhance their understanding of appropriate spelling and punctuation. The benefits of using computers in the classroom outweigh any disadvantages that may accompany it (Sharp et al, 2017).

2.1.1.3 Psychological Aspects of the Application of Computers in Teaching Mathematics

Taking into account that in initial learning of mathematics children are at a level of concrete operations it is necessary to base teaching on concrete experience without formal definitions which have no stronghold in a child's real experience (Giffen, 2017). Nowadays psychological and pedagogical researches are aimed at improving the quality of teaching as well as efficiency of learning as the basis of teaching in schools, and also the development of learning with children (Norton, 2018). "In psychological circles thinking is defined as solving problems. It is necessary to create such conditions in which students would learn through understanding and feel that thinking operations participate in the learning process (Slavin, 2019).

Computers, with its peripheral equipment, can meet different needs of students expressed through their general and specific abilities, most frequently expressed by the intelligence quotient, and which other technical equipment cannot provide. Emotional characteristics are also very important to follow. In an exact example of applying computers in teaching they are usually expressed in different reactions to new acoustic, cognitive and other effects (Slavin, 2019).

New technologies enable integration of visual, auditory and written material so as to transfer information to students as efficiently as possible. Students learn with more understanding when a learning matter is presented through carefully chosen corresponding words, images and animations, than when that same matter is presented only in words. Motivational characteristics of use of computers in teaching are fully expressed here (Skinner, 2016). Depending on the level of knowledge of students, that is, their prior knowledge and abilities, there is a certain volume and form of help within the content, form of work, idea and other modes of stimuli, guidance and mimicking their affinities and interests, given to students by computers (Wankat and Oreovicz, 2015). A computer in teaching enables differentiation of teaching matter and measurement of students' individual potential forces by adequately assisting them, taking into consideration their individual differences (Strati et al, 2017). Special attention should be paid to students and their inner characteristics which will incite them to actively and creatively participate in the teaching process. Students with different inner motivation are more likely to strive for creative learning, require more frequent control, and quicker feedback (Strati et al, 2017). They seek for help and cooperation in learning which comprises incitement and improvement of abilities, motivation and characteristics of personality in new forms of learning (Green and Batool, 2017). One of the main goals of modern education is individualization, independent work of students assisted by teachers. We are aware of what various negative effects in the development of a child's personality an experience of failure may cause, especially when failures are frequent and when they are experienced in the course of gaining primary education. Frequent failures have destructive consequences upon a child's personality. This is the reason why more and more psychological researches are organized in order to create conditions and possibilities of removing these failures to enable each individual to evolve freely and in accordance with their abilities. The help of computers is necessary to this end because it supports a completely individualized work of a user (Strati et al, 2017).

2.1.2 Electronic Media in Education

Electronic media and tools are spreading in educational contexts, among which is mathematics teaching and learning (Crompton and Burke, 2018). Applets are used in mathematics education for almost a decade now, where educational sites use them to offer tools with which users are expected to work in order to learn new mathematical topics or solve mathematical tasks and problems. Cellular phones are rather new as devices that students learn mathematics with. Cellular phones use educational software programs called midlets which are similar, in their interface and some of their functions, to applets, but differ from applets in that they enable users to communicate their working screen to other users (Drijvers, 2015). Researchers have investigated the use of applets in the mathematics classroom but few researches have been done regarding the use of cellular phones in mathematics education though some research was done on using cellular phones in education.

Jackson-Butler (2016) describes some advantages of mobile learning: mobile devices can engage individuals in learning at times they would have been doing something else; mobile devices motivate learners because of their attractiveness; they enable communication from anywhere; formal learning can suit existing patterns of self publishing and online participation; mobile learning enables multitasking. Bikumalla et al, (2017) describes the following disadvantages of mobile devices that affect mobile learning: small screen size, limited memory size, small keyboards, limited battery life, high costs, possibility for mobile devices to be misplaced or stolen, and difficulty to use mobile devices in noisy environments. Tabunshchyk et al. (2017) describes some advantages and disadvantages of web applets: They are freely and easily found on the web and offer students visualization and interactivity, but they are not accompanied with detailed documentation and activities to guide students' use and have problems regarding their portability.

2.1.2.1 Mathematical Objects, Visual Representation, Mental Image

Mathematics is considered as a domain of knowledge that is concerned with "mathematical objects", that is to say with objects with certain specific properties. Mathematical objects are abstract objects; indeed mathematics objects are not amenable to any concrete imagination or manipulation; they are immaterial, not tangible and accessible only tour thinking. In mathematics learning, differently from the physical concrete world, the learning object cannot be shown in an ostensive way, can be only conjured up by means of the use of external representations (Cellucci, et al, 2017). There is not the possibility of directly accessing that "thing" that we can supposed to be the meaning of the representations (Iori, 2017).

Mathematical concepts such as numbers, functions, vectors, (which are not objects in a usual manner, but which embody relationships) are not directly accessible through everyday experience nor within intuitive perception, as for instance real or physical objects are, but they have to be represented by signs or symbols (Rudrauf, 2017). This is true also in the case of Euclidean geometrical learning (as we will see in section 4), where the perception involved in managing external representations (drawings) can be also an obstacle for the construction of a mental image, theoretically founded, of the correspondent geometrical object (figure) (Kirsh, 2019).

Representations and symbols of mathematics establish a semiotic system which is of fundamental importance for any mathematical activity. According to this epistemological position mathematical knowledge is not simply a readymade product that can be directly introduced into processes of teaching and learning (Abramovich, 2018). The new mathematical knowledge will only be actively constructed, in social interaction, by the student in his or her learning process within an activity (Le et al, 2015).

2.1.2.2 Information visualization and mathematics learning

The design or the use of a computer-based system for mathematics learning requires careful consideration of the conditions under which the characteristics of form and interactivity of a system can develop, within an activity, a dynamic relationship between external representation and mental image which is effective for learning (Crook, 2018).

According to Wilke and Portmann (2016), we use the term information visualization to intend the use of computer supported, interactive, visual representation of abstract data to amplify cognition. This definition is particularly appropriate when it refers to the teaching and learning processes of mathematics. As previously pointed out, mathematical objects are not amenable to any visual perception or manipulation. The traditional approach to mathematics knowledge is a symbolic re-constructive approach and it is developed inside the interaction between the student and the teacher, usually according to a transmissive teaching strategy. In this approach students have few opportunities of exploring the functionality of the symbolic representation at hand and of reflecting on the properties and characteristics of its structure. The prescriptive character of the mathematical discourse that emerges in the classroom focuses the attention on the system of rules attached to the symbolic representation at hand and leaves in the background the construction of a mental image of the mathematical object involved in the activity.

Information visualization can allow the student to access mathematical knowledge integrating the symbolic re-constructive approach with a motor perceptive one. This latter approach involves actions and perceptions and produces learning based on doing, touching, moving and seeing (Kuzle, 2015). As already pointed out by Kuzle (2015), a visual representation system based on direct manipulation interface is an interactive medium which responds to the user's action and which offers the possibility to create new notational systems or to introduce a new dimension, movement, within traditional ones.

Information visualization offers the concrete possibility to implement better and more easily classical visual representation mathematics formats (graphs, drawings, tables, etc.) but also to enrich them with additional features such as movement and interactivity and to integrate in the same environment (or in interconnected environments) multiple formats of representations (Koparan, 2017). Within the context of use of the system, information visualization can support different didactical functions which are crucial in the teaching and learning processes of mathematics.

Information visualization can offer ways which allow students to explore the knowledge domain, embedded in the system (exploratory function). Systems that present these features have been demonstrated to be very effective for learning mathematics: they are defined as micro world based systems (Abdalla, 2019). The pedagogical objective of micro worlds is to offer students a space in which they can use visualization supported by the computer in order to explore and manage freely an environment designed to address the construction of some mathematical knowledge. Other systems that\ present these features are systems for simulation (Bray and Tangney, 2017).

Another important didactical function of information visualization is to offer expressive ways to allow students to externalize their own knowledge of a domain (expressive function). This function is present when representative tools, which student can easily control both on an operative and a conceptual level, are made available within a system (Bray and Tangney, 2017).

2.1.2.3 The Use of ICT in Education

Information and communication technology is a chief driver in our world today, (Kozma, 2005) of which the instant cost for educational practice can be experiential (Hill and Hannafin, 2001). Following this development, quite a few authors (Figueiredo and Afonso, 2005 and Pelgrum, 2001) have mentioned the need to move from the traditional classroom scenery, where the student is seen as a passive punter of educational knowledge, to a classroom in which learners are considered active participants and where association and division of information in a resource-rich environment is given priority.

According to this transformation to a more technology-enhanced learning approach, Hattie (2013) has indicated that: "An analysis of the meta analyses of computers in schools indicates that computers are used effectively (a) when there is a diversity of teaching strategies; (b) when there is a pre-training in the use of computers as a teaching and learning tools; (c) when there are multiple opportunities for learning (e.g. deliberative practice, increasing time on task); (d) when a student, not teacher, is in "control" of learning; (e) when peer learning is optimized; and (f) when feedback is optimized." (Hattie, 2013). In other words, Hattie (2013) claimed that the following conditions should be fulfilled in order to integrate technology into the classroom; namely the role of the teacher, the need of professionalization, and the need of adapted teaching and learning approaches.

While it can be argued that the use of technology during classes can prop up constructivist approaches (Linn, 1998 and Sandholtz, Ringstaff, and Dwyer, 1997) implementing technology into classes does not mean a major change of the didactics (Stoddart and Niederhauser, 1993 and Van Dusen and Worthen, 1995). According to Yelland (2006), learning with technology needs more than making learning activities digital, it is also about creating ‘contexts for authentic learning that use new technologies in integrated and meaningful ways to enhance the production of knowledge and the communication and dissemination of ideas’ (Yelland, 2006)

2.1.3 Students' perceptions of their learning

Wells (2015) says, "Understanding students’ perceptions of accounting is an important first step in the effort to attract the best to the accounting profession." It is then thought that understanding students' perception of mathematics learning using mobile phones is an important step to understand how to attract middle school students to learn mathematics in this new environment (Bano et al, 2018). This understanding would help us know what factors influence students' learning of mathematics using mobile phones and how to motivate them to do this learning successfully and with enjoyment (Bano et al, 2018).

Tarhini et al, (2017) studied students' perceptions of online and distance learning and found that students perceive online learning to have a significant relative advantage to traditional learning. These advantages include saving their time, fitting better in their schedules, and enabling them to take more courses. The students did not believe that they learn more in online learning courses. In additions, they had some concerns related to being able to contribute to the forum discussions.

2.1.3.1 Authentic learning

Savery (2015) claims that students better understand and apply studied materials when they are engaged in real world issues and situations. Wlodkowski and Ginsberg (2017) points out that authentic situations and scenarios provide a stimulus for students' learning and thus create greater motivation and excitement for this process. This ref. also states that representing and simulating real-world problems, provides an important context for students' thinking. Regarding the contribution of online education to authentic learning, Delgado, (2016) asserts that technology and online instruction can facilitate learning by providing simulation of real-life context in order to simplify and illustrate it for the learners who face solving complex authentic problems. Regarding using mobile devices in authentic learning, Shadiev et al, (2018) declares that mobile devices extend the learning environment in which the students work, and integrate it in real life situations where learning can occur in authentic contexts. Aguayo et al, (2017) says, "Mobile learning can guide a learner to an authentic learning context and incorporate the field objects with closely related information in the handheld device to initiate the process of knowledge acquisition."

2.2 Theoretical Framework

Various theoretical models have been used in the literature to explain the unintended consequences of use of technology (Anderson, 2016). It was argued by Burbules (2018) that new solutions to any problem could result in unexpected consequences or create problems which did not exist before. According to Surry and Baker III (2016) the social context of unintended consequences do not result from the flawed implementation of technology but law of unintended consequences is always in place at all times and place whenever a new innovation, idea or practice is adopted for use. Merton (1936) was the first to explain the causes of unintended consequences. Merton explained that unintended consequences could result from a number of factors such as ignorance, error, desire to implement processes with a purpose to obtain quick results, values of individuals implementing technology or self-defeating prophecy of individuals who seek solutions without properly understanding problems. Carbonilla Gorra and Bhati (2016) attribute unintended consequences to lack of careful and sustained analysis of participants and context in which they operate. They identified many factors which could result in unintended consequences. These are – all participants not clear about the goals of group activity, some participants may have more effect on process than others, outside influence on group activity, failure to examine the context of activity. All these influences could result in a failure to anticipate an alternative result of use of technology.

Anderson (2016) explains unintended consequences of use of technology in terms of Chaos theory. Chaos theory suggests, according to Anderson (2016), that organizations are complex, dynamic and adaptive. They exhibit stages of stability and chaos. When institutions adopt new technology for teaching and learning, a slight change in the system of education and learning could cause effect of unintended consequences. These consequences may not be easy to predict or eliminate altogether although with time the unintended consequences of technology could be reduced or minimized.

McCoy (2016) regards that educational technology is mainly disruptive and causes distraction from the teaching and learning activity. McCoy (2016) stated that, educational technology has become "primarily a distraction" from what matters most – effective learning and good teaching. The author continued to state that these unintended effects of technology are manifested in higher education, middle and high schools, and even elementary schools and thus, may carry additional implications for teaching and learning in these settings. Junco (2015) found that the level of laptop use was negatively related to measures of student learning and caused disruption in understanding of course material and course performance. Barry et al (2015) reported in their study that those students who were taking laptops to their class rooms were doing activities which were unrelated to class work such as surfing the internet or sending e-mails. Duraisamy et al (2019) attributes this distraction to failure to involve students in the class room rather than blaming them for lack of engagement. McCoy (2016) have found that students indulged in disruptive activities using computers provided in the class room for learning activities. Students have used these computers for instant messaging with friends, sending and receiving emails, paying bills, shopping online, downloading and using copyrighted materials, surfing the web, playing computer games, downloading objectionable materials. The use of cell phones in the class room constituted a nuisance or distraction from the lecture and teaching. Sometimes students leave the class to attend a phone call on their cell distracting whole class and lecturer who may lose their train of thoughts. In some classes students answer the calls on cell phones in a low tone which distract other students around them (McCoy 2016). Cell phones have been used to cheat in examinations. Cell phones equipped with digital cameras have been use by students to record images of other students and lecturers or take pictures of answer sheets of other students, recording material for use in examinations and tests. Not all the effects of use of technology in class room are considered negative as there could be positive unintended effects of technology such as accessing additional lecture material on internet or seeking clarification from friends through email (McCoy 2016).

2.3 Review of Related Literature

The study of Kang and Shin (2015) examined the application of e-learning model to explain the acceptance of e-learning technology in academic setting. The study mainly focused on the relationship of students' use of e-learning and their academic performance. Their results showed that e-learning improves student academic performance. According to these authors positive perception of e-learning is crucial to foster the use of e-learning. Although students' attitude influences the intention to use the e-learning, the actual use of e-learning improves the academic performance of students.

Another paper by Chizhik et al (2017) addressed the impact of e-learning on the academic performance of student- teachers. They conducted an experiment to determine if student- teacher taught using method of e-learning performed better that student-teacher taught using the traditional method of teaching and learning. Their findings suggested that e-learning has a significant influence on the performance of students as student-teachers taught using e-learning consistently perform better than student teacher taught using the traditional method. In their conclusion, e-learning was found to have a significant effect on student-teachers. They supported an initial professional development of student-teachers based on e-learning technologies, change in training approaches, strategies and activities in order to meet the educational challenges. Their study was focused on South Africa and could be useful to developing countries such as Philippines.

CHAPTER THREE

METHODOLOGY

3.1 Introduction

This chapter dealt with the procedures used in conducting the study. These include the research design, sample and sampling technique, research instrument, instrument validation, reliability of the instrument, procedure for data collection and method of data analysis.

3.2 Research Design

The research design refers to the overall strategy that you choose to integrate the different components of the study in a coherent and logical way, thereby, ensuring that you will effectively address the research problem; it constitutes the blue print for the collection, measurement and analysis of data (Alvesson and Sandberg, 2018). The design adopted for this study is quantitative research method. The reason for adopting this method is that it deals with observing and explaining a topic, collecting information, and analyzing the information (Paradis et al, 2016). The method used for this study is a survey method. A survey is used to gather data from relatively large number of cases at a particular time. It is not concerned with characteristics of individuals; rather it is concerned with the generalization that results when data are used from a number of individual cases (Best & Kahn, 2016). This is why survey is suitable for this study. A 4 point – Likert scale questionnaire was used as an instrument for the study.

3.3 Sample and Sampling Technique

The target populations were SS II and SS III students in selected secondary schools in Bosso Local Government Area of Niger State (Zone B). One Hundred and Fifty (150) students from five randomly selected secondary schools participated in the study. Selection of the students in each of the class was by simple random sampling using balloting method where a pick of “Yes” and “No” method was adopted in order to get those to represent that particular class. The selected five Secondary Schools in Bosso Local Government Area of Niger State are Bosso Secondary School, Mariam Babangida Girls Science College, Minna, Ahmadu Bahago Secondary School, Minna, Zarumai Model School, Minna, Government Day Secondary School, Bosso road.

3.4 Research Instrument

The instrument used for this research is questionnaire. A questionnaire, with five different Sections, with a total of 20 questions was structured. The questions were labeled from A-E, with section A checking the demography of the students, and B checking their computer ownership. Section C and D checked what they use the computer predominantly on, at home and in school and how often they use it. Section E, checked their perception on the use of computers in learning of mathematics. The questionnaire was an adaption of 4 points Likert Scale types. Respondents were asked to responses, Strongly Agree (SA), Agree (A), Disagreed (D) and Strongly Disagree (SD) in the questionnaire.

3.5 Instrument Validation

The research instrument was validated by Dr. Bashir Ahmed Usman and Dr. A. A. Hassan of the department of Science Education, Federal University of Technology, Minna, Niger State.

3.6 Instrument Reliability

The reliability scales (Cronbach's Alpha values) for the instrument was .67 which indicates a high degree of reliability of the items in the instrument.

3.7 Method of Data Collection

The researcher visited the selected schools, used the computer in teaching the students and then personally administered the questionnaires of the one hundred and fifty students in the five selected schools used for the study. These were filled and returned, from the students.

3.8 Method of Data Analysis

Based on the hypothesis, the data collected was analyzed using Analysis of Variance (ANOVA) on the Statistical Package of Social Sciences (SPSS), and was tested at 0.05 alpha level.

CHAPTER FOUR

PRESENTATION OF RESULT, DATA ANALYSIS AND DISCUSSION OF RESULT

4.0 Introduction

This chapter presents the results of the data collected, the result of the analyzed data and the discussion of result.

4.1 Presentation of Results

4.1.1 Results from Section A of Questionnaire

Table 4.1 Distribution Table of Class of Respondent

Class	Frequency	Percentage (%)
SSII	78	52.0
SSIII	72	48.0
Total	150	100

Source: Field Survey, 2019

Table 4.1 shows the distribution table of the classes of the respondent. 78 of the respondent are from SSII which represent 52.0% of the sample while 48 of the respondent are from SSIII with a percentage of 48.0 percent.

Table 4.2 Distribution Table of Age of Respondent

Age	Frequency	Percentage (%)
13-14	45	30.0
15-16	42	28.0
17-18	45	30.0
19&above	18	12.0
Total	150	100

Source: Field Survey, 2019

The result in table 4.2 shows the year distribution of the respondent. 30.0% of the respondents are from the age range of 13-14 years, 28.0% of the respondents are from the range age of 15-16 years, 30.0% of the respondents are from the age range of 17-18 years and 20.0% of the respondents are 19 year and above.

Table 4.3 Distribution Table of Gender of Respondent

Gender	Frequency	Percentage (%)
Males	74	49.3
Females	76	50.7
Total	150	100

Source: Field Survey, 2019

Table 4.3 shows the result of the gender distribution of the respondents. From the table, 49.0% are males while 50.7 of the respondents are females.

4.1.2 Results from Section B of Questionnaire

Table 4.4 Distributive Table on the Availability of Computer to Students

S/N	ITEMS	YES (%)	NO (%)
1	Do you have computer at home?	38.0	62.0
2	If yes, is the computer connected to internet?	40.0	60.0
3	Do you use your computer at home for your school work?	54.0	46.0

Source: Field Survey, 2019

The result from table 4.4 shows that is only 38.0% of the students have computer while 62.0% don't and even those that have the computer, only 40.0% of the students' computer is connected to the internet while 60.0% of them are not connected to internet. 54.0% of the students use their computers at home to do school work while 46.0% don't.

4.1.3 Results from Section C of Questionnaire

Table 4.5 Distribution Table on the Use of Computer in School

S/N	ITEMS	DAILY (%)	WEEKLY (%)	MONTHLY (%)
1	I use computers in school for browsing and charting	42.7	38.0	19.3
2	I use computer in school for mathematics learning	50.0	42.7	7.3
3	I use computers in school for playing games	36.0	52.0	12.0

4	I use computer in school for other things	52.7	37.3	10.0

Source: Field Survey, 2019

Table 4.5 shows that 42.7% of the respondents uses computer in school for browsing and charting daily while 38.0% and 19.3% of the respondents uses computers in school weekly and monthly respectively. As of the issue of using of computer to learning mathematics, 50.0%, 42.0% and 7.3% uses it daily, weekly and monthly respectively. 36.0%, 52.0% and 12.0% of the respondents uses computer in school for playing of games daily, weekly and monthly respectively.

4.1.4 Results from Section D of Questionnaire

Table 4.6 Distribution table of the Use of Computer at Home

S/N	ITEMS	DAILY (%)	WEEKLY (%)	MONTHLY (%)
1	I use computer at home for charting and browsing	46.7	32.0	21.3
2	I use computer at home for mathematics learning	36.0	45.3	18.7
3	I use computer at home for playing games	45.3	31.3	23.3
4	I use computer at home for other things	60.0	32.0	8.0

Source: Field Survey, 2019

Result in table 4.6 is a distribution table of the uses of computer at home. From the table 46.7%, 32.0 and 21.3% of the respondents uses computer at home for charting daily, weekly and monthly respectively. 36.0%, 45.3 and 21.3% of the respondent uses computers at home for mathematics daily, weekly and monthly respectively. 45.3%, 31.3% and 23.3% of the respondents uses computer at home for playing games daily, weekly and monthly respectively. 60.0%, 32.0% and 8.0% of the respondent uses computer in school for other things daily, weekly and monthly.

4.1.5 Results from Section E of Questionnaire

Table 4.7 Distribution Table on the Importance of Computer to Learning Mathematics

S/N	ITEM	SD (%)	D (%)	A (%)	SA (%)
1	It is important to use computer to learn mathematics because it makes the school work easy	7.3	13.3	26.7	52.7
2	Using computer at school improves learning of students	4.0	12.7	40.0	43.3
3	When a student use computer in school, it makes learning more interesting	6.7	6.0	30.7	56.7
4	Students make good use of internet in school	38.0	18.7	20.0	23.3
5	Students have access to computer whenever they need	19.3	40.0	24.7	16.0

6	The use of computer distract students from in completing the required exercise	56.0	22.0	8.0	14.0
7	Students value the use of computer in learning.	14.7	10.7	18.7	56.0

Source: Field Survey, 2019

Table 4.7 shows the result on how important computer is to learning of mathematics. 7.3%, 13.3%, 26.7% and 52% of the respondents strongly disagree, disagree, agree and strongly agree respectively responded that it is important to use computer to learn mathematics because it makes the school work easy. Using computer in school improves learning of students in mathematics, 4.0%, 12.7%, 40.0% and 43.3% of the responded strongly disagree, disagree, agree and strongly agree respectively. When a student use a computer in school, it makes learning more interesting, 6.7%, 6.0%, 30.7% and 56.% of the respondents strongly disagree, disagree, agree and strongly agree to that respectively. Students make good use of internet in school, 38.0%, 18.7%, 20.0% and 23.3% of the respondents strongly disagree, disagree, agree and strongly agree to it respectively. Students have access to computer whenever they need, 19.3%, 40.0%, 24.7% and 16.0% of the respondents strongly disagreed, disagreed, agreed and strongly agrees to that respectively. The use of computer distract students from completing the required exercise, 56.0%, 22.0%, 8.0% and 14.0% of the respondents strongly disagreed, disagreed, agreed and strongly agreed to that respectively. Students' value the use of computers in learning mathematics, 14.7%, 10.7%, 18.7% and 56% of the respondents strongly disagrees, disagreed, agreed and strongly agreed respectively.

4.2 Research Questions

4.2.1 Research Question One

What is the perception of male and female students on the use of computers in learning mathematics?

Table 4.8 Distribution Table of use of Computer as Perceived by Male and Female Respondents

S/N	ITEM	GENDER	SD (%)	D (%)	A (%)	SA (%)
1	It is important to use computer to learn mathematics because it makes the school work easy	Males	12.2	10.8	25.7	51.4
		Females	2.6	15.8	27.6	53.9
2	Using computer at school improves learning of students	Males	4.1	14.9	29.7	51.4
		Females	3.9	10.5	50.0	35.5
3	When a student use computer in school, it makes learning more interesting	Males	2.7	8.1	20.3	68.9
		Females	10.5	3.9	40.8	44.7
4	Students make good use of internet in school	Males	47.3	17.6	17.6	17.6
		Females	28.8	19.7	22.4	29.1
5	Students have access to computer whenever they need	Males	24.3	39.2	20.3	16.2
		Females	14.5	40.8	28.9	15.8
6	The use of computer distract students from completing the	Males	60.8	16.2	9.5	13.5
		Females	51.3	27.6	6.6	14.5

	required exercise					
7	Students value the use of computer in learning mathematics	Males	10.8	9.5	16.2	63.5
		Females	18.4	11.8	21.1	48.7

Source: Field Survey, 2019

Table 4.8 shows that 12.2%, 10.8%, 25.7% and 51.4% of the males strongly disagree, disagree, agree and strongly agree respectively that it is important to use computer to learn mathematics because it makes the school work easy while 2.6%, 15.8%, 27.6% and 63.9% of the females strongly disagree, disagree, agree and strongly agree respectively to that also. 4.1%, 14.9%, 29.7% and 51.4% of the male respondents strongly disagree, disagree, agree and strongly agree respectively that using computer in school improves learning of students while 3.9%, 10.5%, 50.0% and 35.5% of the females' respondents strongly disagree, disagree, agree and strongly agree respectively. 2.7%, 8.1%, 20.3% and 68.9% of the males strongly disagree, disagree, agree and strongly agree respectively that using computer in school makes learning more interesting while 10.5%, 3.9%, 40.8% and 44.7% of the females strongly disagree, disagree, agree and strongly agree respectively to that also. 47.3%, 17.6%, 17.6% and 17.6% of the males strongly disagree, disagree, agree and strongly agree respectively that students make good use of computer in school while 28.8%, 19.7%, 22.4% and 29.1% of the females strongly disagree, disagree, agree and strongly agree respectively to that. 24.3%, 39.2%, 20.3% and 16.2% of the males strongly disagree, disagree, agree and strongly agree respectively that students have access to computer whenever they need while 14.5%, 40.8%, 28.9% and 15.8% of the females strongly disagree, disagree, agree and strongly agree respectively to that. 60.8%, 16.2%, 9.5% and 13.5% of the males strongly disagree, disagree, agree and strongly agree respectively that the use of computer distract students from completing the requires exercise while 51.3%, 27.6%, 6.6% and 14.5% of the females strongly disagree, disagree, agree and strongly agree respectively to the statement also. 10.8%, 9.5%, 16.2% and 63.35% of the males strongly disagree, disagree, agree and strongly agree respectively that students value the use of computer in learning mathematics while 18.4%, 11.8, 21.1% and 48.7% of the females also strongly disagree, disagree, agree and strongly agree respectively.

4.2.2 Research Question Two

What is the computer usage of students and their perception on the importance of computers in learning mathematics?

Table 4.9 Distribution Table of the Uses of Computer in School Based on Gender

S/N	ITEMS	GENDER	DAILY (%)	WEEKLY (%)	MONTHLY (%)
1	I use computers in school for browsing and charting	Males	50.0	39.2	10.8
		Females	50.0	46.1	3.9
2	I use computer in school for mathematics	Males	45.9	43.2	10.8
		Females	53.9	41.2	3.9

	learning				
3	I use computers in school for playing games	Males	51.4	39.2	9.5
		Females	52.6	32.9	14.5
4	I use computer in school for other things	Males	54.1	35.1	10.8
		Females	51.3	39.5	9.2

Source: Field Survey, 2019

Result from table 4.9 shows the distribution how computer is used in school by students based on gender. I use computer in school for browsing and chatting, 40.0%, 39.2% and 10.8% of the males use it daily, weekly and monthly respectively while 50.0%, 46.1% and 3.9% of the females use it daily, weekly and monthly respectively. I use computer in school for mathematics learning, 45.9%, 43.2%, and 10.8% of the male respondents use it daily, weekly and monthly respectively while 53.9%, 41.2% and 3.9% of the female respondents use it daily, weekly and monthly respectively. I use computer in school for playing games, 51.4%, 39.2% and 9.5% of the males use it daily, weekly and monthly respectively while 52.6%, 32.9% and 14.5% of the females use it daily, weekly and monthly respectively. I use computer in school for other things, 54.1%, 35.1% and 10.5% of the respondent use it daily, weekly and monthly respectively while 51.3%, 39.5% and 9.2% of the females use it daily, weekly and monthly respectively.

Table 4.10 Distribution Table of Use of Computer at Home Based on Gender

S/N	ITEMS	GENDER	DAILY (%)	WEAKLY (%)	MONTHLY (%)
1	I use computer at home for charting and browsing	Males	50.0	28.4	21.6
		Females	43.4	35.5	21.1
2	I use computer at home for mathematics learning	Males	28.4	44.6	27.0
		Females	43.4	46.1	10.5
3	I use computer at home for playing games	Males	44.6	32.4	23.0
		Females	46.1	30.3	23.7
4	I use computer at home for other things	Males	64.9	31.1	4.1
		Females	55.3	32.9	11.8

Source: Field Survey, 2019

From table 4.10, it can be depicted that 50.0%, 28.4% and 21.65 of the male students use computer at home for chatting and browsing daily, weekly and monthly respectively while 43.4%, 35.5% and 21.1% of the females use it for same purpose daily, weekly and monthly respectively. 28.4%, 44.6% and 27.0% of the male students use computer at home for mathematics learning daily, weekly and monthly respectively while 43.3%, 46.1% and 10.0% of the females use it daily, weekly and monthly respectively. 44.6%, 32.4% and 23.0% of the male students use computer at home for playing games daily, weekly and monthly respectively while 46.1%, 30.3% and 23.0% of the females uses it daily, weekly and monthly respectively. 64.9%, 31.1% and 4.2% of the male students use computer at home for other things daily, weekly and monthly respectively while 55.3%, 32.9% and 11.8% of the females uses it daily, weekly and monthly respectively.

4.3 Research Hypothesis

4.3.1 Hypothesis One

$H_0$1- There is no significant difference between the male and female students perception on the use of computers in learning mathematics.

Table 4.11 Correlation between Male and Female Perception on the Use of Computer in Learning Mathematics

	Sum of Squares	Df	Mean Square	F	Sig.
Between Groups	.763	3	.254	1.012	.389
Within Groups	36.730	146	.252		
Total	37.493	149			

$p>0.05$

Table 4.11 shows the correlation of the significance between the male and the female respondents on their perception on the use of computer. From the table, the p-value of .389 is greater than 0.05 significant levels. The result indicated that the null hypothesis is accepted. Therefore, there is no significant difference between the male and females' perception on the use of computer in learning mathematics.

4.3.2 Hypothesis Two

H_o2– There is no significant difference between the use of computers and its importance in learning mathematics.

Table 4.12 Correlation between the Use of Computer and its Importance in Learning Mathematics

	Sum of Squares	**Df**	**Mean Square**	**F**	**Sig.**
Between Groups	.908	3	.303	.765	.515
Within Groups	57.785	146	.396		
Total	58.693	149			

$p>0.05$

Table 4.12 shows that the p-vale of .515 is greater than 0.05 significant levels. Based on the result, the null hypothesis is accepted. Therefore, there is no significant difference between the importance of computer and it use in learning mathematics.

CHAPTER FIVE

SUMMARY, CONCLUSION AND RECOMMENDATIONS

5.0 Introduction

This chapter, which is the last for this research report summarizes the major findings as to the Perception of Secondary School Students on the Use of Computers in the Learning of Mathematics in Bosso Local Government Area, Minna, Niger State. Conclusions are drawn from the findings and recommendations are given.

5.1 Summary of Findings

First, the aim of this study was to unravel the perception of secondary school students on the use of computer application in the learning of mathematics. As the result for the first research question has shown, the students agree that the use of computers is an integral aspect of their learning of mathematics, although there seems to be cut backs in terms of them seeing computers as a kind of distraction sometimes, and that they don’t always have access to computers when they need to.

Also, from research question two, it can be seen that the students usage of computers by the students at home is relatively higher in school than when at home, as this proves that majority of the students do not have access to computer at home, safe when they are in school.

And from the two hypotheses, it is established that both male female students see computers as necessary in the learning of mathematics, and that the importance of computers in the learning of mathematics prompts its usage.

5.2 Conclusion

This study was an attempt to examine perception of secondary school students on the use of computers in the learning of mathematics in Bosso Local Government Area, Minna, Niger state. The following conclusions were drawn: The role played by computers in the students learning of mathematics cannot be overemphasized, as it seen that using computers tend to make understanding of mathematics topics a lot easier and it helps the students solve the different mathematical problems even faster. The use of computers in education, particularly in learning of mathematics is in line and a step closer to achieving the vision 20:20.

However, there are some challenges confronting the use of computers in learning mathematics in Bosso Local Government Area, Minna, Niger State, which include the unavailability of these computers in the homes of the students. Also, schools lack sufficient computers, to be used by the students, probably due to cost of purchasing these computers in large quantity that would be sufficient for the creation of an ICT laboratory, where science subjects can be taught. Finally, the students do not get access to these computers when they need to make use of them.

5.3 Recommendations

Based on the findings of the study, it is recommended that:

1. Adequate technological facilities should be made available to public secondary schools, as this will help aid nation building.
2. There should be constant light or stand-by generators in schools where there are computers available.

3. The government should match policies with action regarding ICT compliant mathematics classrooms.
4. There should be adequate manpower and ICT supply in the secondary schools through the government.
5. Technological supports should be provided to all secondary schools; this will help the users (students) to solve specific problems in mathematics education.

5.4 Area for Further Research

The present study examined the perception of secondary school students on the use of computers in the learning of mathematics in Bosso Local Government Area, Minna, Niger State. Further research could be carried out in this area, while extending to a much wider population. The study examined particularly public schools, further research can be carried out to check the perception of private secondary school students on the use of computers in the learning of mathematics.

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QUESTIONNAIRE ON PERCEPTION OF SECONDARY SCHOOL STUDENTS ON THE USE OF COMPUTER IN THE LEARNING OF MATHEMATICS

SECTION A

1. Class SSII ☐ SSIII ☐
2. Age 13-14 ☐ 15-16 ☐ 17-18 ☐ 19 & above ☐
3. Gender Male ☐ Female ☐

SECTON B

4. Do you have a computer at home? Yes ☐ No ☐

   If yes, Is the computer connected to the Internet? Yes ☐ No ☐
5. Do you use your computer at home for you schoolwork? Yes ☐ No ☐

Please complete the following placing a tick in one of the boxes next to each Statement.

	SECTION C			
		Daily	**Weekly**	**Monthly**
6.	I use computer at school for chatting and browsing.			
7.	I use computer at school for mathematics learning.			
8.	I use computer at school for playing games.			
9.	I use computer at school for other things.			
	SECTION D			
		Daily	**Weekly**	**Monthly**
10.	I use computer at school for chatting and browsing.			
11.	I use computer at school for mathematics learning.			
12.	I use computer at school for playing games.			

13.	I use computer at school for other things.			

SECTION E

SD Strongly Disagree

D Disagreed

A Agree

SA Strongly Agree

	ITEMS	**SD**	**D**	**A**	**SA**
14. .	It is important that I use computers in learning mathematics because it makes the school work easy.				
15.	Using computers at school improves learning of students.				
16.	When a student uses computer at school, it makes learning more interesting				
17.	Students make good use of internet at school.				
18.	Students can get access to computers at school whenever they need to.				
19.	The use of computers distracts students from completing the required exercise.				
20.	Students value the use of computers in learning mathematics.				