

PERCEPTION OF SECONDARY SCHOOL'S STUDENTS ON THE INFLUENCE
OF MATHEMATICS LABORATORY ON EFFECTIVE TEACHING AND
LEARNING IN BOSSO, NIGER STATE.

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2017/3/69302BE

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MINNA, NIGER STATE.

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TABLE OF CONTENTS

Content	Page
Title Page	i
Declaration	ii
Certification	iii
Dedication	iv
Acknowledgement	v
Table of content	vii
List of Tables	x
Abstract	xi
CHAPTER ONE: INTRODUCTION	
1.1 Background of the Study	1
1.2 Statement of the Problem	3
1.3 Aims and Objectives of the Study	4
	3

1.4	Research Questions	5
1.5	Research Hypothesis	5
1.6	Scope of the Study	5
1.7	Significance of the Study	5
1.8	Operational Definition of Terms	6

CHAPTER TWO: LITERATURE REVIEW

2.1	Conceptual Framework	7
2.1.1	Senior Secondary School Mathematics Curriculum	7
2.1.2	Teaching and Learning	9
2.1.3	Role of a Teacher	10
2.1.4	Traditional verses Modern Role	10
2.1.5	Meaning of Mathematics Laboratory	11
2.1.6	The need of Mathematics Laboratory	12

2.1.7	Improvisation of Mathematics Laboratory	
		13
2.2.	Theoretical Framework	
		14
2.2.1	Cognitive Learning Theory	
		14
2.3	Empirical Studies	
		20
2.3.1	Setting Mathematics Laboratory	20
2.3.2	Effects of using Mathematics Laboratory in Teaching Mathematics	22
2.3.3	Mathematics Laboratory and Students' Conception of Mensuration	22
2.4	Summary of Literature Reviewed	
		23

CHAPTER THREE: RESEARCH METHODOLOGY

3.1	Research Design	
		24
3.2	Population of the Study	
		24
3.3	Sample and Sampling Technique	
		24
3.4	Instrument used for Data Collection	
		25
3.6	Validity and Reliability of the Instrument	
		26

3.6 Method of Data Collection
26

3.7 Method of Data Analysis
27

CHAPTER FOUR: PRESENTATION AND ANALYSIS OF DATA

4.1 Introduction
28

4.2 Analysis of Research Questions
28

4.3 Analysis of Research Hypothesis
30

4.4 Discussions and Findings
31

4.5 Summary
35

CHAPTER FIVE: SUMMARY, CONCLUSION AND RECOMMENDATION

5.1 Summary of the Study
36

5.2 Conclusion
36

5.3 Recommendation
37

5.4 Contribution of Study to Existing Knowledge 37

5.5 Limitations of the Study 38

5.6 Suggestions for Further Study 38

REFERENCES

39-41

APPENDICES

42-43

LIST OF TABLES

Table		Page
4.1	Research Question 1	28
4.2	Research Question 2	30
4.3	Research Hypothesis	31

ABSTRACT

Over the years, traditional method of teaching has been used to teach mathematics, this method is known to be boring, hectic, and stressful. The performance of students is seen to be decreasing over the years. These challenges are alarming and call for different method of teaching mathematics. This study investigates the perception of secondary school students on the influence of mathematics laboratory on effective teaching and learning in Bosso, Niger State. The research design is a survey research design. With a population of 17391 students, sample size of 391 students selected from four secondary schools that were conveniently sampled based on their willingness to take part in the research work. Questionnaire was used for data collection. Two research questions and one hypothesis were stated and tested at 0.05 level of significance, data collected were analyzed using percentages and t-test formula using SPSS method was used to answer research hypothesis. The hypothesis of no significant difference between male and female student's perception on the influence of mathematics laboratory was accepted as p-value was not significant. The findings from the study revealed that most secondary school students have a positive attitude towards the perception of mathematics laboratory but lack mathematics laboratory and other useful equipment. The availability of mathematics laboratories in secondary schools will improve Effective teaching and learning of mathematics. It also revealed that. Recommendations were suggested among which included the provision of instructional materials in the laboratories so as to enable usability by mathematics teachers and ensure effectiveness of mathematics laboratory.

CHAPTER ONE

INTRODUCTION

1.1 Background of the study

Science can be seen as the bedrock of national development. A nation that is not scientifically advanced is termed a backward nation. Science is used by humans to solve daily problems and control the environment. It is seen as a dynamic human activity concerned with manipulating spherical world. It is seen as “knowledge covering general truths and laws, obtained and tested through scientific methods as concerned laws with the physical world”.

Mathematics is the foundation of science and technology and the functional role of mathematics technology is multifaceted and multifarious that no area in science and technology escapes its application (Okereke 2013). Mathematics is a prime instrument for understanding and exploring scientific, economic and social world. In addition to this usefulness, Mathematics serve as a tool for creating new knowledge in all fields for solving problems, stating theories and predicting outcomes. The world today is witnessing a rapid growth in the development of science and technology with the advent of computer and other information and communication technology. Mathematics is a core subject that is mandatory in all secondary schools in Nigeria as it is a pre-requisite to the study of many courses relevant to humanity which include the following; Medicine, Pharmacy, Biochemistry, Agriculture, Anatomy, Physiology, Botany, Zoology, Mathematics, Ecology, Entomology Immunology, Molecular Mathematics among others.

Mathematics can be conveniently taught in a laboratory which is a place designed and equipped with materials for teaching and learning. It is obvious that most secondary schools lack physical laboratories and where they exist, there are inadequate or lack of

equipment. One of the problems militating against effort to enrich science is inadequate or absence of teaching aids or materials which include; indoor or outdoor laboratory, equipments and unqualified teachers.

There are some Mathematics concepts and phenomena that require indoor laboratory attention such as geometry. It is necessary therefore to introduce the use of materials in teaching and illustration of Mathematics concepts for a meaningful study to take place.

These materials include; concrete objects, charts and other teaching materials.

Mathematics laboratories are instructional media used to illustrate the teaching process and make instruction more compressive to the learner. According to Franzer, Okebukola, and Jegede (2005) professionally qualified science teacher no matter how well trained would not be able to put his ideas into practice if the school setting lacks the equipment and materials necessary to translate potentials into reality. The use of teaching aids is an important tool in the teaching of mathematics. The objective of any educational process determines the content, methods and materials needed for achieving such objectives. Different mathematics laboratories are used for different concepts in mathematics.

Yero (2012) mentioned four types of instructional aids, these are:

- i. Visual Aids:** - these are materials that make visual impression – that is, it interprets the vision of the eyes. They include chalk board, posters, models, motion pictures, projected transparencies.
- ii. Auditory Aids:** -These type appeal to learners the sense of hearing include record players, tape recorders.
- iii. Audio visual Aids:** - these involve both hearing and visual senses e.g. based on sound and vision. Advancement in modern technology has led to the production

of devices known as Information Communication Technology (ICT), which is also used in Teaching.

- iv. Stimulation Devices:** - These include devices built to stimulate the actions and functions of real thing or object.

Mathematics laboratory is a place where students can learn and explore various mathematical concepts and verify different mathematical facts and theories using varieties of activities and materials (Igbokwe, 2014). The use of mathematics laboratory helps to integrate theory and practical work in mathematics teaching and learning. Ohuche (2012) advocated the need for moderately equipped mathematics laboratories. Ogunkunle (2010) itemized the advantages of using mathematics laboratory which include;

1. Display mathematical information of Avenue for experimentation through practical work
2. Pool of storage of tends to access mathematical materials for easy access
3. Removing abstractness and increasing effective teaching and learning.

Based on the advantages of mathematics laboratory, it is expected that teaching and learning of mathematics with mathematics laboratory may help to reduce the abstract nature of the subject and draw the students to follow. Hence, this study intends to investigate the perception of secondary school's students on the influence of mathematics laboratory in effective teaching and learning in Bosso, Niger State.

1.2 Statement of the Problem

Effective teaching and learning is key to the attainment of goals for secondary school mathematics curriculum. The effective teaching and learning of mathematics have been on the decline. The poor achievements in Mathematics could be attributed to some factors such as: lack of use of apparatus Tabotndip (2015), lack of fund to purchase

material. There are other factors that contribute to poor achievement in Mathematics which include:

1. Lack of facility for imparting knowledge.
2. Inadequate equipment in laboratories where they exist.
3. Lack of teacher's zeal to make use of mathematics laboratory or improvise in the absence of standard materials.
4. Lack of students' exposure to practical lessons and insufficient time for practical activities.

Available literature shows that much of mathematics teaching is carried out through chalk and board with little or no emphasis on the use of mathematics laboratory. This study therefore investigated perception of secondary schools' teachers and students on the influence of mathematics laboratory in effective teaching and learning in Bosso, Niger state.

1.3 Aims and Objectives of the Study

The study has the following objectives to:

1. Investigate the perception of students on the use of mathematics laboratory on effective teaching and learning of secondary students in Bosso, Niger State.
2. Examine the students perception based on gender on the use of mathematics laboratory on effective teaching and learning of mathematics students.

1.4 Research Questions

The following questions are set for answering: -

1. What is the perception of students on the influence of mathematics laboratory on effective teaching and learning in Niger state?

2. What is the perception of male and female students on the use of mathematics laboratory on effective teaching and learning in Niger state?

1.5 Research Hypothesis

The following hypothesis were formulated for the study:

1. There is no significant difference in the perception of male and female students on the use of mathematics laboratory on effective teaching and learning.

1.6 Scope of the Study

The scope of this study will be limited to four(4) schools in Bosso LGA, to study the perception of secondary school students on the influence of mathematics laboratory on effective teaching and learning.

1.7 Significance of the Study

This study is significant to mathematics teachers and students in Niger State in particular and in Nigeria in general. Teachers will find this study relevant and useful in teaching and learning process

The use of mathematics laboratory will help administrators in the area of practical works. It will be helpful to examination bodies such as WAEC and NECO in setting examination questions with emphasis on area of practical works. Science equipment manufacturers and science book publishers etc. will find this study relevant in areas of mathematics laboratory production to schools. This study will be helpful for further research on retention.

1.8 Operational Definition of Terms

Perception: The act or faculty of perceiving, or apprehending by means of the senses or of the mind; cognition; understanding.

Influence: The power to affect, control or manipulate something or someone, the ability to change the development of fluctuating things such as conduct, thought or decision.

Mathematics Laboratory: This is a unique room or place with relevant and up to date equipment known as Instructional materials, designated for the teaching and learning of mathematics.

Effective: Adequate to accomplish a purpose; producing the intended or expected result.

CHAPTER TWO

LITERATURE REVIEW

2.1 Conceptual Frame Work

2.1.1 Senior Secondary School Mathematics Curriculum

Mathematics occupies a well-established position in the school curriculum. While there is wide acceptance of the importance of mathematics, there is also a lack of consensus regarding the content of the curriculum, how that content should be treated, and overall purposes for the study of mathematics. The public expresses concern about the mathematical competence of students which causes educators to examine the achievement of students more closely. In Nigeria the content of the general Mathematics curriculum (2011), is grouped into six sections (Number and Numeration, Algebraic Processes, Mensuration, Plane Geometry, Trigonometry, and Statistics) but recently reviewed to five content areas similar to that of NCTM with each section occurring every year of the three Senior Secondary School program, as it was emphasized by Nigerian Educational Research Development Council. In recent years the mathematics curriculum from primary to the secondary school in Nigeria has witnessed several changes in terms of contents, performance objectives, activities, methods and materials and so on to make it more relevant or adaptable to changes occurring every now and then in the society (NERDC, 2007). But there has been no corresponding changes in the general objectives of the secondary school mathematics curriculum (Odili 2016)

The importance of Mathematics is so much that it needs to be taught with mathematics laboratory to arouse students' interest. Tabotndip (2014) lamented that abstract teaching goes on today where teachers do not use apparatus and students are not using textbooks. It is reported that most secondary schools do not have Mathematics laboratory, the few

existing ones have been converted into classrooms to create space for the overwhelming population of students arising from the Universal Basic Education (UBE). As a result of WAEC specification on SSCE examination, some schools resorts to multipurpose laboratory. As a result of WAEC specification on SSCE examination, some schools resorts to multipurpose laboratory. There is need for a single laboratory for each of Physics, Chemistry as well as Mathematics Practical. This ought not to be so for they have their disadvantages such as fire or chemical outbreak or accidents. In case of Mathematics, the charts, specimen and models may not be displayed for recognition and observation. Learning occurs when all the facilities for study are harnessed for work during a teaching and learning experience (Tabotndip 2004). Visual imaginary eg. pictures charts etc has become the most powerful means of communication inthe society today. (Ajayi 2014).

Despite the importance placed on mathematics, (Okereke, 2013) had observed that students lack interest in the subject and perform poorly in it. Ukeje (2012) observed that mathematics is one of the most poorly taught, widely hated and tough understood subject in secondary school. West African Examination Council (WAEC) chief examiners [2013, 2014, 2015, and 2016] consistently reported candidates' lack of skill in answering almost all the questions asked in general mathematics. WAEC Chief Examiners [2013, 2015] further observed that candidates were weak in Geometry of circles and 3- dimensional problems. According to their reports, most candidates avoid questions on 3-dimensional problem, when they attempt geometry questions; only few of the candidates showed a clear understanding of the problem in their working. WAEC [2014] also reported candidates' weakness in Algebraic expression and word problems among others.

2.1.2 Teaching and Learning

Learning- The process of learning is continuous which starts right from the time of birth of an individual and continues till death. Learning is a natural phenomenon which is natural to all organisms including both humans and animals. Learning affects a child's development. A child learns new habits only through the process of learning and through imitated traditions and customs. Intellectual skills are also developed through learning. The decision of right and wrong, the concepts of justice and aesthetic sense, etc. develop through learning. It is concerned about cognitive, conative and affective aspects. Knowledge acquisition process is cognitive, any change in the emotions is affective and conative is acquisition of new habits or skills.

Sequiera (2012) Learning is about a change, the change brought about by developing a new skill, understanding a scientific law, changing an attitude. The change is not merely incidental or natural in the way that our appearance changes as we get older. Learning is a relatively permanent change, usually brought about intentionally. When we attend a course, search through a book, or read a discussion paper, we set out to learn! Other learning can take place without planning, for example by experience. Generally with all learning there is an element within us of wishing to remember and understand why something happens and to do it better next time.

Teaching - Mogbo and Gana (2014) Teaching is the relationship between the three Components or major issues in education. Viz:

The teacher, the child and the subject matter.

For teaching to be successful the teacher must have thorough knowledge and grasp of the subject matter and good ability to communicate such knowledge and understanding to his students in an interesting manner.

2.1.3 Role of a Teacher

Sequeira (2012) Generally, the role of teacher can be categorized into:

1. Traditional Role - Teacher Centered
2. Modern Role - Facilitator (Student Centered)

There has been a change from the traditional role to the modern role in the present context. The learning increases when the teacher builds on the previous experience of the student. However, individual's learning differs and each individual learns at his or her own pace. Identifying the slow learners and individual attention of the teacher may be required. Direct experiences are student centered and participation in problem solving. While in indirect experience, the contents are carefully designed and organized by teacher

2.1.4 Traditional verses Modern Role

Traditionally, the role of the teacher has been as a purveyor of information: the teacher was the fount of all knowledge. This suggests a picture of students sitting in rows in front of the teacher who is talking and passing information to students with the aid of a blackboard, while the students either listen passively or, if the teacher is lucky, take their own notes. This, of course, is not true anymore.

The modern teacher is a facilitator: a person who assists students to learn for themselves. Instead of having students sitting in rows, they are likely to be in groups, all doing something different; some doing practical tasks, some writing, some not even in the room but in another part of the building using specialist equipment or looking up something in the library. All of the students might well be at different stages in their learning and in consequence, the learning is individualized to suit individual requirements and abilities. This change from the traditional model is the result of a number of factors. First, it is recognized that adults, unlike small children, have a wealth

of experience and are able to plan their learning quite efficiently. Second, not all individuals learn in the same manner, so that if a teacher talks to students some might benefit, but others might not. Third, everyone learns at their own pace and not, of necessity, at the pace set by the teacher. Sequiera (2012)

2.1.5 Meaning of Mathematics laboratory

Mathematics laboratory is a place where students can learn and explore various mathematical concepts and verify different mathematical facts and theories using varieties of activities and material (Igbokwe, 2014). The use of mathematics laboratory helps to integrate theory and practical work in mathematics teaching and learning. Ohuche (2012) advocated the need for moderately equipped mathematics laboratories. Kolawole and Oluwatayo(2004) defined Mathematics laboratory as a place where we find collection of games, puzzles, teaching aids and other materials for carrying out activities. These are meant to be used by both students and teachers to explore the world of Mathematics, to discover, to learn and to develop interest in Mathematics.

Ogunkunle (2010) itemized the advantages of using mathematics laboratory which include;

1. Display mathematical information of Avenue for experimentation through practical work
2. Pool of storage of tends to access mathematical materials for easy access
3. Removing abstractness and increasing effective teaching and learning. Based on the advantages of mathematics laboratory, it is expected that teaching and learning of mathematics with mathematics laboratory may help to reduce the abstract nature of the subject and draw the students to follow.

The use of mathematics laboratory is an important tool in the teaching of mathematics. The objective of any educational process determines the content, methods and materials

needed for achieving such objectives. Different mathematics laboratories are used for different concepts in mathematics

Mathematics laboratory have great value in education. In this era of science and technology, the government of Nigeria is advocating the use and easy access for computer instruction (Minister of Education 2014). The ITC training i.e. instructional technology communication between teachers and students is for better development in science and technology. The modern and latest instructional aids in this 21st century is the use of instructional technology media such as making use of computer, television etc, which give access to other work and easy development. Onwuakpa and Nweke (2008) were of the view that the teaching of science, technology and mathematics can be enriched when suitable teaching aids are appropriately made use of. Therefore, every STM teacher should consider and prepare materials needed for any lessons to be taught to students.

2.1.6 The need of Mathematics laboratory

Mathematics laboratory is activity centered and a child is placed in problem solving situation through self-exploration and discovery. He provides a solution based on his experience, needs and interest. Some of the ways in which a mathematics laboratory can contribute to the learning of the subject are.

- i. .It provides an opportunity to understand and internalize the basic mathematical concepts through concrete objects and situations.
- ii. . It enables the students to verify or discover several geometrical properties and facts using models or by paper cutting and folding technique.
- iii. . It helps the students to build interest and confidence in learning the subject.
- iv. . The laboratory provides opportunity to exhibit the relatedness of mathematical concepts with everyday life.

- v. . It provides greater scope for individual participation in the process of learning and becoming autonomous learners.
- vi. . It provides scope for greater involvement of both the mind and the hand which facilitate cognition.
- vii. . The laboratory allows and encourages students to think, discuss with each other and the teacher and assimilates the concepts in a more effective manner.
- viii. . It enables the teacher to demonstrate, explain and reinforce abstract mathematical ideas by using concrete objects, models, charts, graphs, pictures, posters etc

2.1.7 Improvisation of Mathematics Laboratory

Improvisation can be seen in different perspective. It can be defined as the process or ability to replace a non-available or insufficient materials.

Akinmoyewa (2012) defines improvisation as designing of the replica of something to make it play the real role with available materials. National Teachers institute (2010) sees improvisation as the act of using alternative materials and resources due to insufficient or lack of some specific teaching aids to facilitate learning. Therefore, improvisation is any object or thing that is used to replace insufficient or unavailable materials for the benefits teaching and learning process.

Iwuzor (2000) reported that the cost of effectively teaching science is so high that the materials may not be affordable for an adequately equipped laboratory and as such, the teaching and learning of science can never be improved if the teaching materials particularly the non available ones that can be improvised are not properly used. One of the objectives of science education, in which Mathematics depicts living concept, is the act of students acquiring adequate laboratory and field skills. To achieve this, students need to acquire physical contact and experience with real materials. With the

introduction of Universal Basic Education (UBE) program the population of students have outgrown the facilities and equipment for instruction and are inadequate or insufficient, the teacher should know when to improvise, what to improvise and how to improvise.

In the case of a school that has no mathematics laboratory, a small corner is set aside, materials are bought and arranged according to related topics. It is used when a topic related to the materials are taught.

2.2 Theoretical Frame Work

2.2.1 Cognitive Theory of Learning

Ally (2010) defines cognitive theory as students being active in an internal learning process that involves memory, thinking, reflection, abstraction, motivation and meta-cognition. Cognitive learning theory explains how internal and external factors influence an individual's mental processes to supplement learning. Delays and difficulties in learning are seen when cognitive processes are not working regularly. This theory impacts students because their understanding of their thought process can help them learn. Teachers can give students opportunities to ask questions, to fail, and think out loud. These strategies can help students understand how their thought process works, and utilize this knowledge to construct better learning opportunities.

1. David Ausubel learning theory

David Ausubel was a cognitive learning theorist who focused on the learning of school subjects and who placed considerable interest on what the student already knows as being the primary determiner of whether and what he/she learns next. Ausubel viewed learning as an active process, not simply responding to your environment. Learners seek to make sense of their surroundings by integrating new knowledge with that which they have already learned. Ausubel believed that understanding concepts, principles, and

ideas are achieved through deductive reasoning. This led Ausubel to develop an interesting theory of meaningful learning and advance organizers Learning Theory. Ausubel's believes that learning of new knowledge relies on what is already known. Ausubel's view for a correct understanding of the Education reform and evaluation for the value of learning to accept offer of Theoretical guidance. Learning for Ausubel is bringing something new into our cognitive structure and attaching it to our existing knowledge that is located there. This is how we make meaning, and this was the focus of his work.

Meaningful Verbal Learning: According to Ausubel, meaning is created through some forms of representational equivalence between language and mental context. There are two processes involved:

First: Reception, which is employed in meaningful verbal learning.

Second: Discovery, which is involved in concept formation and problem solving.

Ausubel's work is usually compared to Bruner's work because both of them held similar views about the hierarchical nature of knowledge. However, Bruner gave more emphasis on discovery process. On the other hand, Ausubel was strongly oriented toward the verbal learning methods of speaking, reading, and writing.

Motivation Theory: Ausubel's learning theory also attaches great importance to student motivation. According to his view, by the cognitive drive achievement motivation, self-improving internal driving force and the subsidiary internal driving composition. Cognitive drive is a student desire knowledge, understanding and mastery of knowledge and representations and the need to solve the problem. This inner driving force began in the curious tendency of students, and to explore, manipulate, understand and cope with the psychological environment, the tendency is one of the most important and most stable motivations. Self-improvement is the internal driving force by virtue of their

ability of students to win the corresponding position or achievement needs. Subsidiary of individuals in order to maintain internal driving means or the authority of their elders (parents or teachers praise or recognition, and performance out of a well to study or work needs, is an external motivation, age has a more obvious characteristics. learning motivation will not have a direct impact on learning, but through an indirect way of enhancing and promoting learning impact. Research indicates that: motivation, moderate-intensity excitation, or to arouse, to learn with good results.

Subsumption theory: Ausubel's subsumption theory is based on the idea that an individual's existing cognitive structure (organization, stability and clarity of knowledge in a particular subject) is the principal and basic factor influencing the learning and retention of meaningful new material. When information is subsumed into the learner's cognitive structure it is organized hierarchically. New material can be subsumed in two different ways, and for both of these, no meaningful learning takes place unless a stable cognitive structure exists. This existing structure provides a framework into which the new learning is related, hierarchically, to the previous informa

Implications of Ausubel's Learning Theory on Mathematics Teaching

Mathematics teaching is a complex work because of its abstract nature. Ausubel's theory helps to give abstract concept to teaching of mathematics. Mathematics teachers during classroom teaching, may be appropriate to use some sounds, animations, images, realias, objects etc. They can also create a conducive learning environment to encourage students explore and verify what is taught. The implications of Ausubel's theory on Mathematics is summarized below:

1. Abstract concepts can be tough effectively by presenting the appropriate advance organizer and can help pupils to grasp higher order relationships between abstractors.

2. Since meaningful verbal learning depends upon the critical ability and readiness to receive, teacher should make use of adequate pedagogical techniques such as precise and accurate concepts, giving similarities and dissimilarities between related concepts and encouraging learners to define their own words.
3. Since single concept is easier to retain rather than to remember many specific items. Hence clear, relevant, advance organizer should be provided.
4. To develop thinking skills in students requires specific instruction and practice rather than application. Teacher should address analysis, evaluation and synthesis using advance organizers that encourage students to operate at higher level of abstraction. Strengthening cognitive structure helps to retain the information in longer and advance organizer provides with basic structures on which to built new concepts.

2. Zoltan Paul Dienes

ZoltánPálDienes (anglicized as Zoltan Paul Dienes) (born 1916) is a Hungarian mathematician whose ideas on the education (especially of small children) have been popular in some countries. He is a world-famous theorist and tireless practitioner of the "new mathematics" - an approach to mathematics learning that uses games, songs and dance to make it more appealing to children. Dienes translates this approach plainly to the educational context with these words: "Most of the time there is no substitute to doing mathematics. You learn mathematics not out of a textbook, but by engaging in mathematical activity. It is something like learning to swim or to skate or to ski. I doubt if many have learned these skills out of books!"

Gningue (2016) stated Diene's theory outlines four principles that he believes applies to the learning the mathematics.

Dynamic Principle: Learning is an active process that requires opportunities to be provided for students to interact. He states that to be able to understand a concept, there are three essential steps – the play stage, the structure stage and finally the practice stage. Dynamic principle claims that the mental process of building mathematical structures consists of successive cyclic (or rather spiral) development that builds on lower levels of abstraction and repeats the same dynamic process. Informal play develops into structured play that reflects on concrete features and their relations discovering the followed rules, if it is supported by suitable (well prepared or carefully selected) environment with proper affordances. Allied with directed game-based expectations this process leads to the recognition of rules. Experience in rule-following in different situations develops into an understanding of abstract rules applicable in similar games what continues in more sophisticated play. The reapplication of the same moves at higher levels leads to abstraction, extracting general concepts that supervene on the concrete games.

Constructively principle: Learning begins with free interaction with the environment. It is, and it should be, situated. Spontaneous contact with concrete materials leads to new experiences constructed by the learner's own activities. This implies, especially for lower age groups, that informal play precedes rules. Active confrontation with the nature of objects and the environment gives the opportunity to perceive and memorize properties and relationships. These experiences may become consciously reflected. Students need to construct their knowledge before analytical activity.

Mathematical Variability principle- states that when knowledge is imparted, all other irrelevant facts should be systematically varied whilst keeping the relevant variables the same. For example, in teaching the definition of what a triangle is, the teacher should change the size, the angles and orientation of the triangle so that the students understand

that it is three sides that and three angles that define a triangle. Meanwhile perceptual variability enhances the perception of relevant common features and promotes reflection on isomorphic structures; mathematical variability uses systematic elimination of irrelevant properties and differences in order to contrast, as constant, the remaining structure as the essence of the general mathematical concept. The principle should be applied in varied situations methodically. The method consists of holding the relevant variables constant and systematically changing the irrelevant variables. It is a recalcitrant problem of cognitive psychology that perceptual objectification disregards certain features of the objects (position, or intensity of color or shade) but distinguish others.

Perceptual principle - states that different kinds of teaching materials should be used to teach the same concept or idea. It is often mentioned as the “Multiple Embodiment Principle”. It is usually quoted as the variable use of diverse physical objects referring to the multiple physical “embodiment” of the “same” abstract properties in various objects, or to their relations in different objective or inter-subjective situations. It appears that the essence of the principle is the use of different objects, forms and physical installations (associated to the same the mental process). With respect to the mental development, the principle underlines the importance of the repetition of similar activities in varied physical circumstances with different objects in diverse architectures that are capable to exhibit the “same” properties. Consequently, it does not mean just the “embodiment” of the same structures in different materials. Small children learn to tell one color from another, one shape from another shape. This is perceptual discrimination. At a later stage, when they are able to abstract complex concepts, they learn conceptual discrimination. They can learn to tell one abstract structure from another, or tell when they are meeting the same structure dressed up a little different.

2.3 Empirical Studies

2.3.1 Setting a Mathematics Laboratory

As defined by Adenegan (2014), the mathematics laboratory is a unique room or place, with relevant and up-to-date equipment known as instructional materials, designated for the teaching and learning of mathematics and other scientific or research work, whereby a trained and professionally qualified person (mathematics teacher) readily interact with learners (students) on specified set of instructions. Mathematics laboratory is relatively a new concept, in a situation where there is no mathematics laboratory, the teacher and students can improvise and create a corner in the classroom as a mathematics laboratory. This Mathematics corner created can contain some of the things in the mathematics laboratory but maybe not be as equipped and updated as the mathematics laboratory.

The activities in the mathematics laboratory should be appealing to a wide range of people, of different ages and varying mathematical proficiency. While the initial appeal is broad-based, the level of engagement of different individuals may vary. The mathematics laboratory activities listed here have been done with students and teachers of different grade levels. The activities are intended to give children an experience of doing mathematics and not merely for the purpose of demonstration.

The benefits of mathematics laboratory is that it helps students discover mathematics by doing. Nischals (2016) stated that many school students even today express displeasure to learn math viewing it as dull and boring and lacking in application. To them math means either to get something right or wrong. When they get it wrong they view it as a failure and lose interest.

Since mathematics is a core subject in Nigeria curriculum, it is necessary for the schools to make mathematics teaching more captivating, interesting and exploring for

the students. These provide opportunities to teach mathematics in different ways through games and other activities, the goal of these activities is to make mathematics more interesting. The role of the mathematics laboratory teacher is not to teach but facilitate learning inquiry in mathematics. This could either be done by posing probing questions, offering an extra resource or asking to discuss with peers.

In setting mathematics laboratory, Adegan (2014) itemized the following:

1. Identify the necessary materials and basic materials required in the laboratory by labeling them with nametags.
2. Put or assemble all related equipment or materials on the same side/place. eg. realia should not be placed where audio-visual materials are positioned.
3. Put the bulletin board close to the entrance or in case of any information display.
4. Arrange the benches and tables to allow for free movement in the laboratory.
5. Hang relevant pictures and charts on picture rails and boards.
6. The whiteboard must be positioned where every student can readily see it.
7. Shelves can be constructed for keeping and demarcating materials.
8. Electronic materials such as projector, television, etc. Should be properly displayed.
9. Electrification of the laboratory should be professionally done to allow for safety use.
10. Display materials on tables in an organized manner.
11. The laboratory should be set in such a way that it must be well ventilated.
12. Arrange the materials in places (on tables, shelves, board, etc) in a way that they can be easily accessed when needed and returned appropriately after use.

2.3.2 Effects of Using Mathematics Laboratory in Teaching Mathematics

Ebele, et al. (2014), Evidence of poor performance in mathematics by secondary school students point to the fact that the most desired technological, scientific and business application of mathematics cannot be sustained. This makes it paramount to seek for a strategy for teaching mathematics that aims at improving its understanding and performance by students. Evidence abound that lack of mathematics laboratory and mathematics teachers' non-use of laboratory technique in teaching mathematics is one of the major factors that contribute to poor achievement in mathematics by secondary school students.

The study used 100 students as samples. The researchers used the Mathematics Achievement Test (MAT) as an instrument. Also, Designed Mathematics Laboratory (DML) and the lesson plan were used as instructional tools for the study. Based on the research done, these are the results: students taught with mathematics laboratory achieved better than those taught without it. There exists no significant difference in achievement of male and female mathematics students taught with mathematics laboratory.

2.3.3 Mathematics Laboratory and Students' conception of mensuration

Fidelis, (2014) Poor performance of students in mathematics has been of great concern to many people. This because a credit pass in mathematics is needed for registration in science, engineering, medical and related courses. However, according to Chief examiners' report (2012), most students avoid answering questions in mensuration. This probably, maybe as a result of improper understanding of the concept, which in turns could be attributed to poor approach of teaching in secondary schools. Ogunkunle, (2009) established that school teachers in Port Harcourt were ineffective in teaching mathematics as they apply conventional approach in almost all topics taught. Could the

poor performance of students be as a result of insufficient involvement and exposure to instructional materials?

The study was designed as a quasi-experimental and a 4x2 factorial design. In this design two experimental groups and one control group were used. The first experimental group used demonstrative approach with mathematics laboratory and the second experimental group used collaborative approach with mathematics laboratory. The use of mathematics laboratory was found to improve student understanding and of concept of mensuration. Students who were taught using demonstration with mathematics laboratory approach outperformed their counterparts in terms of understanding of concepts of mensuration, mathematics laboratory using demonstration and collaborative approaches impacted significantly on student understanding of concept of mensuration. Gender factor did not significantly affect student understanding and application of the concept of mensuration respectively.

2.4 Summary of Literature Reviewed

In this chapter, different studies related to students effective learning with mathematics laboratory were considered. How different usage of mathematical laboratory will cause a great difference in students performance and achievement. It vividly explains mathematics laboratory, the need of mathematics laboratory and how to improvise in a case where there is none.

The study attempted to find out the perception of secondary school's students on the influence of mathematics laboratory.

CHAPTER THREE

RESEARCH METHODOLOGY

Introduction

This chapter deals with the methods, techniques used in data collection. The methods, techniques used in data collection assisted the researcher to determine the perception of secondary school's students on the influence of mathematics laboratory on effective teaching and learning. A case study in Bosso, Niger State.

3.1 Research Design

The research design that was adopted for the study is a survey research design, it was adopted to obtain facts about a given population through the study of the population to determine the relationship between student's perception on the influence of mathematics laboratory.

3.2 Population of the Study

The population for this study consists of 17391 senior secondary school students in Bosso Local Government Niger State, 8701 male students and 8690 female students. (Min. of Ed. Niger State)

3.3 Sample and Sampling Techniques

The sample of this research work is composed of four senior secondary school mathematics students in Bosso Local Government that were selected at random.

1. Police Secondary School Minna
2. Bosso Secondary School Minna
3. AhmaduBahago Secondary School Minna
4. Maryam Babangida Science Girls College Minna

Different sampling techniques was employed in selecting respondents for the research work. At first, random sampling technique was used to select four secondary schools among other schools. Sample selected cut across both male and female students in selected school. Thereafter, the researcher used convenience sampling to select male and female students based on their availability, representing 391 sampled students, using Taro Yamani formula

$$n = \frac{N}{1 + N(e)^2}$$

Where; n = the sample size

N= the finite number

e = Margin of Error (MoE)

l = unity (constant)

Therefore;

$$n = \frac{17391}{1 + 17391(0.05)^2}$$

$$n = \frac{17391}{1 + 17391(0.0025)} = \frac{17391}{1 + 43.48} = \frac{17391}{44.48}$$

$$n = 391$$

3.4 Instrument for Data Collection

The research instrument needed for the study for data collection is titled Perception of Secondary School's Students on the Influence of Mathematics Laboratory on Effective Teaching and Learning Questionnaire, constructed by the researcher. It consists of two sections, section A which includes the respondent's bio-data: gender, class, age, teaching experience, name of school. Section B consists of has 20 items constructed questionnaire on the student's perception on the influence of mathematics laboratory.

The instrument was designed on 4points Likerttypes scales, where the respondent chooses an opinion against a particular statement. The response category are as follows:

4. Strongly agree (SD)

3. Agree (A)

2. Disagree (D)

1. Strongly Disagree (SD)

3.5 Validity and Reliability of Instrument

The instrument was validated (checked) before being tested (used) by the supervisor and two (2) lecturers from Federal University of Technology Minna, Niger State. Observations and corrections were made which were effected in the questionnaire by the researcher before administering it to the students of the selected schools.

Reliability of the instrument was conducted at Zarumai secondary school which is not among the sampled schools used for the study. The result was established through application of coefficient of Cronbach Alpha and was found to be 0.61, which was reliable.

3.6 Method of Data Collection

Permission was taken from the management of the sampled schools to get approval in order to sample mathematics teachers and students. Once the permission is granted, the respondents were briefed on the objectives of the study. Thereafter, the researcher administered 391questionnaires to the sampled students and 391 were collected on spot.

3.7 Method of Data Analysis

The data collected from the research were from the questionnaire responded to by the students of selected schools in Bosso, Niger State. This data collected was analyzed using percentages and mean to answer research questions and t-test to answer research hypothesis. The level of difficulty is determined by the value of percentages and mean

responses, the mean value below 2.5 was rejected and the mean value above 2.5 was accepted, the percentage between 0-49% represents disagreed while 50-100% represents agreed.

CHAPTER FOUR
PRESENTATION AND DATA ANALYSIS

4.1 Introduction

This chapter presents the data collected on identifying "the perception of secondary schools' students on the influence of mathematics laboratory on effective teaching and learning in Bosso, Niger state."

The analysis was based on 391 students as respondents from the four senior secondary schools.

4.2 Analysis of Research Questions.

Question one: What is the perception of students on the influence of mathematics laboratory on effective teaching and learning of mathematics in Bosso, Niger state.

Table 4.1: Distribution of respondents based on student's perception

S/N	ITEMS	S	A	A	D	S	D	Mean	Decision
1	Mathematics is one of the tough understood subject in secondary school but can be made easier using mathematics laboratory.	1 6 7	4 3 %	1 7 8	4 5 %	3 9 7	1 0 %	3 . 3 5	Agreed
2	Effective learning of mathematics does not depend the use of mathematics laboratory.	4 3 7	1 1 %	1 7 1	1 9 %	1 7 3	4 4 %	1 . 7 3	Disagreed
3	Mathematics teachers play a better role in shaping students attitude towards mathematics using mathematics laboratory.	1 1 4	2 9 %	1 7 9	4 6 %	7 1 2	1 8 %	3 . 3 5	Agreed
4	There is no mathematics laboratory in my school.	2 1 7	5 5 %	1 2 4	3 2 %	4 3 7	1 1 %	3 . 2 6	Agreed
5	Mathematics laboratory makes mathematics teaching easy and interesting.	1 8 4	4 7 %	1 0 9	2 8 %	4 0 5	1 0 %	3 . 2 6	Agreed
6	Using mathematics laboratory allows students to learn at their own pace.	2 0 8	5 3 %	1 5 8	4 0 %	1 9 6	5 %	3 . 2 2	Agreed
7	One of the benefits of mathematics laboratory is that, it enables students discover mathematics by practicing.	1 5 7	4 0 %	1 1 6	3 0 %	7 9 3	2 0 %	3 . 2 4	Agreed

8 .	In a case where there is no mathematics laboratory, small corner should be set aside for laboratory.	1 6 7 4 2 %	1 0 9 28 %	7 0 19 %	4 5 11 %	3 . 2 5	Agreed
9 .	Mathematics laboratory enables the students to explain abstract mathematical ideas easily.	9 7 2 5 %	1 7 3 44 %	8 7 22 %	3 4 9 %	3 . 1 0	Agreed
10 .	For teaching to be effective using mathematics laboratory, the teacher must have thorough knowledge on the use of mathematics laboratory.	1 2 8 3 3 %	1 5 4 39 %	4 9 13 %	6 0 15 %	3 . 3 0	Agreed
11 .	Mathematics laboratory in secondary school can help in retention of what was taught.	2 0 3 5 2 %	1 3 2 33 %	4 9 13 %	7 2 %	3 . 2 2	Agreed
12 .	Mathematics laboratory can be used by students to explore the world of mathematics better.	2 0 0 5 1 %	1 0 2 26 %	4 7 12 %	4 2 11 %	3 . 2 8	Agreed
13 .	Mathematics laboratory is activity centered, the student do more of the activities.	1 2 8 3 3 %	1 3 9 35 %	7 3 19 %	5 1 13 %	3 . 2 4	Agreed
14 .	Lack of students interests to make use of mathematics laboratory can contribute to students poor performance.	6 1 1 6 %	6 6 17 %	1 7 4 45 %	9 0 22 %	2 . 0 2	Disagreed
15 .	Activities in mathematics laboratory should be appealing to a wide range of students.	1 0 3 2 6 %	1 9 1 49 %	5 9 15 %	3 8 10 %	3 . 3 0	Agreed
16 .	Mathematics laboratory contributes to effective teaching of mathematics.	1 6 1 4 1 %	1 2 9 33 %	5 7 15 %	4 4 11 %	3 . 2 4	Agreed
17 .	The mathematics laboratory encourages students to think, discuss with each other and the teacher in a more effective manner.	1 2 3 3 2 %	1 4 9 38 %	7 2 18 %	4 7 12 %	3 . 0 2	Agreed
18 .	The role of mathematics laboratory teacher is to facilitate learning enquiry in mathematics.	1 0 4 2 7 %	1 5 7 40 %	7 8 20 %	5 2 13 %	2 . 8 7	Agreed
19 .	None use of the laboratory technique in teaching is one of the factors that contribute to poor effective learning in mathematics.	1 1 4 2 9 %	1 7 1 44 %	7 9 20 %	2 7 7 %	3 . 2 9	Agreed
20 .	Mathematics laboratory help students to build interest and confidence in learning mathematics.	1 6 5 4 2 %	1 2 0 31 %	5 9 15 %	4 7 12 %	3 . 3 4	Agreed

Grand Total	36%	35%	18%	11%	3.12	Agreed
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Source: Field work (2021)

From table 4.1 above majority of the students agreed with most of the items in the table above with the grand mean of 3.12 and percentage 71% while students that disagreed are with the percentage 29%. This implies that the students agreed that with the help of mathematics laboratory, there tends to be effective teaching and learning process for the students. It will help their teaching process easy and interesting, it will enable them learn at their place among other benefits.

Question Two; what is the perception of male and female students on the use of mathematics laboratory on effective teaching and learning in Bosso, Niger state.

Table 4.2 Distribution of respondents by gender

S/No	Gender	Respondents	Percentage
1	Male	207	53%
2	Female	184	47%

From table 4.2 above, it shows that the male students responds to the questionnaire more than the female students, which means the percentage of the male students 53% is higher than the female students 43%. The male students agreed that mathematics laboratory influence effective teaching and learning of mathematics than the female students.

4.3 Analysis of Research Hypothesis

H1: There is no significant difference in the perception of male and female students on the use of mathematics laboratory on effective teaching and learning.

Table 4.3

Group	N	Mean	S.D	DF	T-value	P -value	Remark
Male	207	62.16	4.50	388	0.61	0.54	Not significant
Female	184	62.41	3.42				

The result of the analysis of student's perception with respect to gender indicated that the null hypothesis was accepted given the fact that the probability level (p-value = 0.54) was greater than 0.05 level of significance at 388 degree of freedom. This implies that there is no significant difference in the perception of male and female students on the use of mathematics laboratory on effective teaching and learning.

4.4 Discussions and Findings

Out of 391 students in senior secondary school, Bosso, Niger state, 38% are SS1 students, 35% are SS2 students and 27% are SS3 students.

Table 4.1 shows students responses to item 1, 88% agreed that mathematics is one of the tough subject in secondary school but can be made easier using mathematics laboratory while 12% disagreed, with the mean of 3.35. Based on these, using mathematics laboratory can make mathematics teaching easier.

The student's responses to item 2 from table 4.1, 30% agreed that effective learning of Mathematics does not depend on the use of mathematics laboratory, while 70% disagreed, with the mean of 1.73. This implies that the secondary school students see that effective learning of mathematics does not depend on mathematics laboratory.

Students responses to item 3 from table 4.1, 75% agreed that mathematics teacher played a better role in shaping students attitude towards mathematics using mathematics laboratory, while 25% disagreed, with the mean of 3.35. This means that the students in

Bosso, Niger state see that the teachers play a major role in teaching mathematics using the mathematics laboratory.

Respondents' responses to item 4, from table 4.1, 87% agreed that there is no mathematics laboratory in their schools, while 13% disagreed with that, with the mean of 3.26. Based on these, majority schools do not have mathematics laboratory which is a barrier to teaching and learning mathematics especially practical aspect.

The student's responses to item 5 from table 4.1, 75% agreed that mathematics laboratory makes teaching easy and interesting, while 25 disagreed, with the mean of 3.26. Which implies that using mathematics laboratory during teaching makes the teaching easy and interesting.

From Table 4.1, showing students responses to item 6, 93% agreed that using mathematics laboratory allows students to learn at their own pace, while 7% disagreed. This means that, the students agreed that with the use of mathematics laboratory, the students can learn at their own speed.

Student's responses to item 7, 70% agreed that one of the benefits of mathematics laboratory is that, it enables students discover mathematics by practicing, while 30% disagreed, with the mean of 3.22. This shows that, the percentage of those agreed is higher than disagreed, so most students are allowed to discover mathematics by practicing using mathematics laboratory.

Table 4.1, showing the student's responses to item 8, with the mean of 3.24, 70% agreed that in a case where there is no mathematics laboratory, a small corner should be set aside for laboratory, while 30% disagreed. This means that in a situation where there is no mathematics laboratory, a small corner in the classroom should be set aside for mathematics laboratory, which is a good way of making practical work easy.

As shown in Table 4.1, students' responses to item 9, with the mean of 3.25, 69% agreed that mathematics laboratory enables the students to explain abstract mathematical ideas easily, while 31% disagreed, with the mean of 3.10. It shows that majority of students in Bosso, Niger state think that mathematics laboratory enables students to explain abstract mathematical ideas.

Responses to item 10 in table 4.1, 72% agreed that for teaching to be effective using mathematics laboratory, the teacher must have a thorough knowledge on the use of mathematics laboratory while 28% disagreed, with the mean of 3.30. This shows that, the teacher must have a thorough knowledge on what it is about to teach and how to use the mathematical laboratory equipment.

The students responses to item 11, in table 4.1, 85% agreed that mathematics laboratory in secondary school can help in retention of what has been taught, while 15% disagreed, with the mean of 3.22. This implies that with the help of mathematics laboratory, students tend to have a longer retention of what was taught compared to when no mathematics laboratory was used.

Table 4.1, students responses to item 12 shows that, with the mean of 3.28, 77% agreed that mathematics laboratory can be used by students to explore the world of mathematics, while 23% disagreed. This shows that, the students see Mathematics laboratory as a means to find out the better mathematics, to explore the world of mathematics.

The respondents' responses to item 13 on table 4.1, with the mean of 3.24, 68% agreed that mathematics laboratory is activity centered, the students do more of the activities, while 32% disagreed. This means that, the students agreed that, the activities done in the mathematics laboratory is students centered, the students do more of the activities and the teacher just directs them on what to do.

Responses to item 14 on table 4.1, 31% agreed that lack of students interests to make use of mathematics laboratory can contribute to students performance, while 67% disagreed, with the mean of 2.02. From this responses, most of the students disagreed that lack of students interests to make use of mathematics laboratory can contribute to poor performances.

Item 15, on table 4.1, 75% agreed that activities in the mathematics laboratory should be appealing to a wide range of students, while 25% disagreed, with the mean of 3.30. This shows that, the students sees activities in the laboratory should be appealing to a much number of students.

Table 4.1, the response to item 16 shows that 74% agreed that mathematics laboratory contributes to effective teaching of mathematics, while 26% disagreed, with the mean of 3.24. It shows majority of students agreed that with mathematics laboratory, the teacher teaches more effectively than without mathematics laboratory.

Responses to item 17, from table 4.1, 70% agreed that mathematics laboratory encourages students to think, discuss with each other and the teacher in a more effective manner, while 30% disagreed, with the mean of 3.02. This implies that, since mathematics laboratory is activity centered, the students will discuss with each other and their teacher.

The students responses to item 18, from table 4.1 shows that 67% agreed that the role of mathematics laboratory teacher is to facilitate learning enquiry in mathematics, while 33% disagreed, with the mean of 2.96. Which shows that the role of mathematics laboratory teacher is to help the students to facilitate learning enquiry in mathematics

Students responses to item 19, from table 4.1, shows that with the mean of 3.29, 73% agreed that none use of the laboratory technique in teaching is one of the factors that contribute to poor effective learning in mathematics, while 27% disagreed with that.

From table 4.1, the students responses to item 20, with the mean of 3.34, 73% agreed that mathematics laboratory helps students to build interest and confidence in learning mathematics, while 27% disagreed with that.

4.5 Summary

From the data presented and analyzed in this chapter, it is clear that students who use mathematics laboratory in the course of teaching and learning will retain and perform better than students who use only the traditional method. Mathematics teaching be mixed with mathematics laboratory to enable the students to learn mathematics effectively.

CHAPTER FIVE

SUMMARY, CONCLUSION AND RECOMMENDATION

5.1 Summary of the Study

The study investigates the perception of secondary school's students on the influence of mathematics laboratory on effective teaching and learning in Bosso, Niger State. From the analysis of data collected, it has been observed that most of the secondary school students love to be taught with mathematics laboratory but lack of mathematics laboratory and useful equipment makes their teachers not to use the laboratory method to teach the students. Carrying out practical work in mathematics to teach some complex concepts is very necessary and is supposed to commence from secondary schools, if possible junior secondary schools. The use of mathematics laboratory for teaching mathematics can stimulate interest of the students, it provides an opportunity to understand and internalize the basic mathematical concepts through concrete objects and situations.

5.2 Conclusion

From the results of the study, the following conclusions are drawn: Mathematics laboratory with relevant equipment's' when utilize can; Help the students build interest and confidence in learning the subject; Enables the students to discover several geometrical properties and facts using models or by paper cutting and folding technique; Provide opportunity to exhibit the relatedness of mathematical concepts with everyday life. Based on the findings, availability of these mathematics laboratories in secondary schools will improve and arouse interest to students who sees mathematics as one of the tough understood subject in secondary schools.

5.3 Recommendations

Based on the findings of the study, the following recommendations have been made to improve teaching and learning of mathematics.

1. The Federal, State, Local government and non- governmental organization should assist in providing mathematics laboratory in secondary schools for effective teaching and learning of mathematics.
2. The school authorities should ensure provision of mathematics laboratory building and equipment to ease practical work in mathematics as it is in other science subjects.
3. The curriculum and time table for secondary school should include time for practical work in mathematics teaching.
4. The school authorities should encourage practical work in mathematics and also encourage mathematics teachers to emphasize on practical work during teaching.
5. Mathematics practical work should be taught from secondary schools so as to make mathematics easy and interesting to students in advance level.
6. Where there is no mathematics laboratory, a small corner should be set aside in the classroom and used as mathematics laboratory.
7. Where there is no or limited mathematics laboratory equipment, the mathematics teachers should improvise.

5.4 Contribution of study to Existing knowledge

The significance of this study could be used by teachers, students, school management, and mathematics book publishers. Since the study shows a positive perception on the influence of mathematics laboratory, teachers might try to make use of mathematics laboratory to teach the students mathematical concepts, the school management might

include time for mathematical practicals to enhance use of practicals in mathematics.

5.5 Limitation of the Study

This study would have covered more schools and areas of Bosso Local Government Area of Niger State but due to time constraints and material resources, it was confined to few secondary schools in Bosso Local Government Area of Niger State.

5.6 Suggestion for Further Study

Based on the findings of this study, the following suggestions are for further studies

1. Further Study should be carried out using larger population.
2. A study can be carried out using junior secondary students.
3. A study can be carried in another region.
4. A study can be carried out to find out teachers and students attitude toward the use of mathematics laboratory.

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APPENDIX

FEDERAL UNIVERSITY OF TECHNOLOGY MINNA NIGER STATE DEPARTMENT OF SCIENCE EDUCATION

QUESTIONNAIRE ON: Perception of Secondary School's Students on the Influence of Mathematics Laboratory on Effective Teaching and Learning in Bosso, Niger State.

Dear Respondent,

I am a final year student conducting a study titled above. The purpose of this questionnaire is to find out student's perception on the influence of mathematics laboratory on effective learning. The questionnaire is purely for research purpose and any information will be treated as strictly confidential and utilize for the purpose of the research.

Thank You.

SECTION A: Student's Demographic information

Class: SS1 [] SS2 [] SS3 []

Gender: Male [] Female []

SECTION B:

Please tick [√] the appropriate option **SA** - Strongly Agree, **A** - Agree, **D** - Disagree, **SD** - Strongly Disagree

S/N	ITEMS	S	A	A	D	S	D
1.	Mathematics is one of the tough understood subject in secondary school but can be made easier using mathematics laboratory.						
2.	Effective learning of mathematics does not depend the use of mathematics laboratory.						
3.	Mathematics teachers play a better role in shaping students attitude towards mathematics using mathematics laboratory.						
4.	There is no mathematics laboratory in my school.						
5.	Mathematics laboratory makes mathematics teaching easy and interesting.						
6.	Using mathematics laboratory allows students to learn at their own pace.						
7.	One of the benefits of mathematics laboratory is that, it enables students discover						

	mathematics by practicing.				
8.	In a case where there is no mathematics laboratory, small corner should be set aside for laboratory.				
9.	Mathematics laboratory enables the students to explain abstract mathematical ideas easily.				
10.	For teaching to be effective using mathematics laboratory, the teacher must have thorough knowledge on the use of mathematics laboratory.				
11.	Mathematics laboratory in secondary school can help in retention of what was taught.				
12.	Mathematics laboratory can be used by students to explore the world of mathematics better.				
13.	Mathematics laboratory is activity centered, the student do more of the activities.				
14.	Lack of students interests to make use of mathematics laboratory can contribute to students poor performance.				
15.	Activities in mathematics laboratory should be appealing to a wide range of students.				
16.	Mathematics laboratory contributes to effective teaching of mathematics.				
17.	The mathematics laboratory encourages students to think, discuss with each other and the teacher in a more effective manner.				
18.	The role of mathematics laboratory teacher is to facilitate learning enquiry in mathematics.				
19.	None use of the laboratory technique in teaching is one of the factors that contribute to poor effective learning in mathematics.				
20.	Mathematics laboratory help students to build interest and confidence in learning mathematics.				