

Adequacy and utilization of mathematics instructional materials in secondary schools in Nigeria- A review

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ABSTRACT

A review on adequacy and utilization of mathematics instructional materials has been done. It is noted that mathematics is one of the core subjects taught and learnt in secondary schools. However, the effective teaching and learning of this subject cannot be realized without instructional materials. On the provision of these materials, three theoretical models have been proposed. These are the full support model, the partial support model and the equality access model. The full support Model advocates full state provision of mathematics instructional materials and asserts that the state should take full constitutional responsibility for the provision of instructional materials for various levels and school types in the educational sector. This theory also encourages individual contributions towards the provision of mathematics instructional materials through taxes and rates according to their means. The partial support model advocates that the burden of the provision of mathematics instructional materials should be shared between the government and other educational stakeholders in the community while the equality access model proposed that the government should ensure equal educational materials to every student within its borders at a uniform effort through the state in terms of the burden of taxation. It is also noted that for students' achievement and good performance in mathematics, the instructional materials made available for the students and teachers should be adequate. In addition, these materials should be properly utilized. Adequacy and effective utilization of mathematics instructional materials are vital and necessary for students' good performance in the subject. The Nigerian government, stakeholders in education and philanthropists should ensure that secondary schools in the country are adequately furnished with mathematics instructional materials. The federal and state ministries of education should ensure that that the materials provided are effectively utilized.

Keywords: Adequacy, Utilization, Mathematics, Instructional, Models.

INTRODUCTION

[1], defined mathematics as a tool used in science, technology and industries. [2], stated that mathematics is the study of various possible shapes. [3], defined mathematics as the bedrock of science and technology. Mathematics plays an important role in accelerating the social, economic and technological growth of a nation. The world of today which leans more and more heavily on science and technology demands more and more mathematical knowledge on the part of its people. So, it is necessary to prepare the children with a strong base of mathematical knowledge to face the challenges of the modern technological society. Mathematics is a pure science that requires intellectual activity in calculation

designed to discover information about the world. It is one of the core subjects recommended in the national policy on education at both primary and post-primary education. This suggests the importance attached to mathematics whose knowledge is required by every member of the society in view of its usefulness in day-to-day activities. [4], identified the general aims of mathematics as follows:

- (1) To help students develop a belief in the value of mathematics and its usefulness to them.
- (2) To nurture confidence in their own mathematical ability.
- (3) To foster a sense of personal achievement, and to encourage

continuity and creative interest in mathematics.

- (4) To develop in students skills, concepts, understanding and attitude; this will enable them to cope confidently with mathematics of everyday life.
- (5) To develop a variety of approaches to solving problems involving mathematics and to develop the ability to think and reason logically.
- (6) To assist students to achieve the mathematical and statistical literacy needed in the society, which is technologically - oriented and information - rich.
- (7) To provide a foundation for those students who may wish to continue studies in mathematics or other learning areas where mathematical concepts are central.
- (8) To help to foster and develop mathematical talent in students.
- (9) To induce or build into students the ability to think creatively, critically, strategically and logically.

The achievement of these objectives at secondary school would serve as foundation or preparatory knowledge, especially for those wishing to study engineering, medicine, agriculture, science and technology at institutes of higher learning and would be useful when dealing with other science subjects like physics and chemistry in secondary schools. That is why mathematics is made compulsory for every student in secondary school in Nigeria. This makes it an inevitable subject.

According to [5], mathematics is a science of number and shape, which includes as its main divisions, geometry, arithmetic, algebra and trigonometry. Mathematics is a science of structures, order and relations that has evolved from elemental practice of counting, measuring and describing the shapes of objects [6]. Mathematics is the study of measurement, properties and relationship of quantities and sets, using numbers and symbols [7]. According to [8], mathematics is a broad- ranging field of study in which the properties and interactions of idealized objects are examined. Mathematics is the language of

the universe [9]. [10], stated that mathematics is a language which provides an indispensable means of investigating the nature of things, particularly those which are dealt with in the field of science. He pointed out that every field of science and technology has some substantial mathematical content though of different degrees. In support of the above, [11], noted that there can be no real technological development without a corresponding development in mathematics both as conceived and as practiced. The teaching of mathematics in secondary school exposes students to a mathematical world and its wonders, thus laying a solid foundation for them. [12], referred to mathematics as the foundation for science without which a nation can never be prosperous and economically independent. He further noted that competence in mathematics provides many of the opportunity for career choice and production of highly defined personnel required by industry, technology, science and education. For more than two thousand years, mathematics has been a part of human search for understanding. Mathematical discoveries have come both from the attempt to describe the natural world and from the desire to arrive at a form of inescapable truth from careful reasoning. These remain fruitful and important motivation for mathematical thinking but in the last century mathematics has been successfully applied to many other aspects of human policies, the analysis of automobile, traffic pattern and long term strategies for sustainable harvest of deciduous forest [13].

Today, mathematics as a mode of thought and expression is more valuable than ever before. Learning to think mathematically is an essential part of becoming a liberally-educated person. There is more to mathematics than just proof. Indeed the vast majority of people who earn their living doing mathematics are not engaged in finding proof at all, their goal is to solve problem to whatever degree of accuracy or certainty required. While proof remains the ultimate goal standard for mathematical truth, conclusion reached on

the basis of assessing the available evidence have always been a valid part of the mathematics enterprise [14]. Since mathematics was introduced into the syllabus, so many problems have risen like the use of inexperienced teachers in the teaching of mathematics in our different schools, the nonchalant attitude of students towards mathematics, lack of motivational approach by the teachers in teaching the students, poor environment and lack of infrastructural facilities have led to failure in the teaching and learning of mathematics [15]. All these have led to failure in effective teaching and learning of mathematics.

Adequacy means a condition of being enough in quantity and good enough in quality for a particular purpose or need. [16], opined that adequate instructional materials constitute a strategic factor in organizational functioning. This is because they determine to a very large extent, the smooth functioning of any educational programme. He further stated that their adequacy influences efficiency and high productivity in teaching. According to [17], there must be sufficient motivation in form of attractive materials in secondary school. Where these resources are lacking, the effective functioning of the school mathematics will be hindered. Adequacy is a situation in which there are enough resources for a particular purpose. [18], opined that adequacy is a satisfactory condition of resources in an organization. He added that adequacy of materials in schools promotes effective teaching and learning activities in the school while their inadequacy affects the academic performance negatively. [19], asserts that adequacy is a condition in which something is enough or good enough in quantity for a particular purpose or need. Adequacy of materials and their proper utilization have been positively correlated to good performance in examinations while poor performance has been blamed on inadequacies. [20], added that where instructional materials are lacking, teaching may be poorly executed. Adequacy as used in this study therefore means satisfactory or acceptable quantity

of materials as required for success in teaching of mathematics in secondary schools. Adequacy of these instructional materials in the schools should as a matter of importance meet the demand of the minimum standard for establishment of secondary schools. Nigeria secondary schools are now looked upon as one of the fertile grounds for breeding the nation's future men and women. For this objective to be achieved, adequate instructional materials should be provided in the schools to improve standard of education. The National Teachers Institute [21], made a more elaborate recommendation of the use of instructional materials in the schools. They added that in a school, the adequate resources should be utilized in such a way that it enables the students to acquire desirable learning competencies. Utilization is the action of making practical and effective use of something. Utilization of instructional materials brings about fruitful learning since it stimulates students' senses and motivates them. [22], noted that there is a relationship between knowledge of a skill and the actual utilization of such knowledge. She added that the expected outcome in a programme will not come from mere acquisition of knowledge but from its utilization. According to [23], the aim and objective of mathematics are to develop human personality in its totality. This involves the development of the physical, mental, social, emotional and moral aspects so as to make the individual a good citizen. Such a person should be able to make contribution in the process of nation building in his or her own way. According to [24] teaching is usually facilitated and is more effective through the active participation of the learners and utilization of appropriate materials. Active participation of the learner in mathematics is facilitated by the adequacy and effective utilization of instructional materials. [25], noted that teaching and learning are better and easier done through one's interaction with one's environment. It is expected that where teaching materials are available and adequate, teachers should utilize them to ensure effective communication and understanding of curriculum content.

According to [26], effective implementation for mathematics curriculum cannot be attained without the use of instructional materials for teaching mathematics because they promote closer and effective communication between the teacher and the learners. Mathematics instructional materials are those tools used in teaching mathematics which enables active learning and assessment. Basically, any resource a teacher uses to help him teach his students is an instructional material. The main types of instructional materials are: Traditional materials, Graphic Organizers and Teacher-Made materials. Traditional materials include any textbooks and workbooks used in the classroom. Graphic

organizer is any type of visual representation of information. Diagrams, charts, tables, flow charts and graph are all examples of graphic organizers. Teacher-made materials include anything the teacher creates, like handout, worksheets, tests, quizzes and projects. Many of these are used for assessments in the classroom to determine the level of learning on any given topic. The importance of mathematics instructional materials for the smooth running of mathematics class cannot be over-emphasized as they allow the students to interact with words, symbols and ideas in ways that develop their abilities in reading, solving, viewing, thinking, speaking and writing using media and technology [27].

BRANCHES OF MATHEMATICS

Mathematics can be divided into the following fields:

1. **Algebra.** Algebra is a branch of mathematics which most people who have gone through high school would have studied at some stage: it introduces symbols (x , y , z) and a series of mathematical operations like factorization, expansions. It can be studied from a very elementary level (like addition and simplifications of algebraic fractions, solving simple simultaneous linear equations involving two unknowns) up to college and university levels and beyond where one studies complex linear systems, determinants, matrices, eigen values, vector spaces and fractals [28, 29].
2. **Trigonometry:** This is the branch of Mathematics that studies angles; in fact, it generally forms part of what used to be called Plane Geometry. In trigonometry the angles are associated with certain defined ratios and thus are born the trigonometric concepts of sine, cosine, tangent, secant, cosecant and cotangent associated with an angle of any magnitude. One studies the various trigonometric ratios and trigonometric identities and various operations involving these [30].
3. **Geometry:** In Geometry, various theorems and lemmas regarding plane figures (straight lines, triangles,

quadrilaterals, trapeziums, circles, and ellipses) are studied in detail. Geometry theorems are often associated with angles (see Trigonometry above). You probably have studied graphing, with horizontal axis (the x -axis) and the vertical axis (y -axis) with straight lines and methods of determining the slope of the straight line. This subdivision of Geometry is Cartesian Geometry or Co-ordinate Geometry, attributed to Rene Descartes. Again, the study of Geometry can progress from the very simple but can become highly complex as in Vector and Spherical Geometry and Topology [31].

4. **Calculus:** This is probably one of the most important branches of mathematics, not least because it has many applications in other fields of knowledge - social sciences, physical sciences, biological sciences and all divisions of engineering. It introduces various important concepts (e.g. the derivative or differential coefficient of one variable with respect to another, the anti-derivative and provides powerful mathematical tools that allow mathematicians to determine accurately and efficiently quantities like rate of flow of water from a tunnel and rate of decay of a radioactive chemical [32].

5. Statistics: This subject is usually studied together with probability theory (which some regarded as a branch of Algebra, or Boolean algebra). It is a Mathematics subject that examines the methods of collecting, representing, comparing, analyzing and interpreting data. In probability theory, the concept of a probability of an event is defined, followed by discussions of various probability theorems and probability

distributions like the Normal Distribution, Binomial Distribution. It introduces terms like mean or average, median, mode, and discusses various ways of representing data - in ogives, histograms, etc. There are also statistical tests (chi-squared tests, the t-tests) that are being used to co-relate sets of data to determine if there is some significant relationship between them [33].

MATHEMATICS INSTRUCTIONAL MATERIALS

Instructional materials is a generic term used to describe the resources teachers use to deliver instruction. Instructional materials refer to materials that are used to facilitate teaching and learning. It enables the teacher communicate ideas or concepts with ease as they appeal to many senses at a time [34]. The learner can see, touch, smell or taste thereby making learning more meaningful. Instructional materials according to Hornby (2005) are what can be used to help achieve an aim such as equipment and facilities which provide information for the teachers and students. [35] referred to teaching materials as the different equipment available in the classroom, adding that the process of teaching-learning depends upon the different types of equipment available in the teaching environment or classroom. Teaching resources are therefore all the facilities, equipment and supplies utilized by the teacher in teaching the subject. [36] defined mathematics instructional materials as facilities, equipment, supplies and personnel utilized in mathematics in schools. The National Teachers Institute defines mathematics instructional materials as human, material and finance available in teaching of mathematics in schools. They are therefore all those facilities, equipment, supplies, fund as well as personnel used in implementing the mathematics education programme in schools. Teaching materials can support student learning and increase student success. Ideally, the teaching

materials will be tailored to the content in which they're being used, to the students in whose class they are being used, and the teacher. Teaching materials come in many shapes and sizes but they all have in common the ability to support student learning. Mathematics is designed to enable the learners develop interest in science and technology, acquire basic knowledge and skills in science and technology, and also apply their scientific and technological knowledge and skills to meet societal needs. If these objectives will be achieved, then efforts should be made to provide adequate instructional materials to secondary schools in teaching of mathematics and to encourage its effective use. Despite the emphasis placed on the usefulness of instructional materials in teaching and learning process, most students still find it difficult to cope with the study of mathematics in schools. This may have resulted from lack of or underutilization of instructional materials by teachers. Experiences reveal that in most schools in the state, instructional materials are lacking and where they exist they are not adequately utilized by teachers. [37] says that educational experiences involving the learner actively participating in concrete examples are retained longer than abstract experiences. Many authors have written on the use of instructional materials both in teaching of mathematics and other related subjects in order to enhance teaching

for desired social and behavioral change. These authors include [38, 39, 40]. More specifically, it was emphasized in the works of these authors that the use of instructional materials is a sine qua non in affecting behavior of learning of every field, especially in mathematics. It was equally shown by some of the authors that these materials are important catalysis of social re-engineering and changes. According to the researcher, it is found that mathematics teaching and learning cannot be well accomplished without the use of instructional materials. Instructional materials can be printed and non-printed materials. The printed materials include textbooks, teachers guide, students workbooks, internet, encyclopedia while the non-printed materials include models, abacus, geo-board [41].

Advances in technology have brought instructional materials especially the projected and electronic materials to the forefront as the most radical tools of globalization and social development which have affected the classroom teaching-learning situation positively. The adequacy and utilization of instructional materials in teaching and learning of mathematics have made both teaching and learning become very pleasant to mathematics teachers. According to [42], proper applications of classroom instructional materials in teaching-learning are useful and advantageous on the following grounds. Stimulation of interest: The uses of instructional resources bring life in the process of teaching-learning. They provide cognitive 'bridge' between abstraction and reality to the students. Classroom resources create impressions that are so vivid and powerful that learners hardly forget. Their use make the task of teaching quite easy, interesting, methodical and scientific as the teacher becomes quite capable of attaining the teaching objectives with greater efficiency and effectiveness. [42,43, 44] noted that instructional materials generate and maintain students interest and provide the teacher with interest-compelling spring-

boards which can launch students into a variety of learning activities making learning interesting and the learners self-dependent. Their use can help the individual learner to proceed on his learning path with his own pace according to his own needs, interests and abilities. Gradually, they make him rely on his abilities and pursue his studies independently with or without the presence of the teacher. [45] summarized the following as some of the importance of instructional materials in teaching.

1. Instructional materials help the teacher present concepts in a way that the learners can retain more concepts permanently.
2. They help the teacher to motivate the students by making the environment more interesting to the students.
3. Instructional materials facilitate proper understanding by the students and discourage the act of cramming.
4. It also makes the classroom or learning environment lively and active.
5. It allows the student to take responsibility for his own learning and to progress at his own rate.

The human resources are the teachers involved in teaching of mathematics in the schools. [46] indicated that poor staffing in terms of number of mathematics teachers, their level of preparation and motivation constitute major constraint to effective learning. In other words, for the programme to be successful there is need for adequate number of teachers that are professionally trained and motivated. According to [47] no country can move forward politically, socially and economically without adequate human and material resources. They added that abundant human resources represent potential for educational development, but educational development of people is necessary to translate such potential into per capita income. [48] opined that it is the responsibility of our educational system to provide graduates with the background and skills necessary to be successful in their chosen fields of endeavor. [49] noted

that the decline of staff quality is a consequence of obsolete and inadequate teaching and learning facilities in schools. [50] pointed out that it appears as if the mathematics teachers are not being adequately prepared for the well-prepared mathematics education curriculum in our schools. This could be better and easier achieved if there is availability of adequate instructional materials for teaching the subject right from the secondary school level, more so in mathematics education where some of the skills are practical-oriented. [51] asserted that the mathematics teacher needs to be professionally trained to enable him possess the necessary skills required in performing the job effectively. They added that instructional materials include all materials designed for use by students and their teachers as learning resources to help students to acquire facts, skills, and or to develop cognitive processes. Lack of adequate and standard instructional materials hampers mathematics education programme in many ways. [52] pointed out that there must be sufficient motivation in the form of attractiveness of materials to captivate student's interest to participate in mathematics class. He further stated that lack of instructional materials in secondary schools in this country is simply hindrances to mathematics development in our secondary schools. Commenting on the state of instructional materials in secondary schools in Nigeria, [53] noted that in Nigeria today it is well understood that the major cog in secondary schools success in mathematics education are sub-standard facilities and lack of sophisticated equipment. They added that Nigerians also lack maintenance culture. Effective mathematics education in schools requires organizational and administrative variables such as personnel, facilities, equipment, supplies and finance. The effective performance of mathematics education programme in secondary schools involves the determination, allocation and development of funds for the achievement of the objectives of the programme. The programme requires a large amount of money every year. This is

because facilities such as models, slides, film trips, motion pictures and related projected equipment, maps and globes, learning kits etc are constructed and maintained for the use of the students. Some of these materials require either purchasing, replacement or repairs. [54] opined that facilities should be planned and constructed with an eye to the future. They added that too often, instructional materials are constructed and out-grow their use within a very short time. Most materials constructed in our secondary schools are very difficult to exchange. The relevance of instructional materials to the smooth running of the field of mathematics has been severally emphasized in literature [55]. According to [56] instructional materials are very vital in teaching and learning in schools. Similarly [57] asserts that facilities and equipment related in any teaching programme, should be provided in sufficient quantity to meet the needs of the school in the field of mathematics. National Association for Mathematical Education [58] advocates that sufficient instructional materials are needed to meet the standard for secondary school mathematics education programme. [59], also observed that school mathematics education resources (facilities, equipment supplies and the personnel) are very important to the successful implementation of the school mathematics education programme. Instructional materials play an important role in teaching of mathematics. The teaching and even the learning process would never be complete without full utilization of instructional materials in whatever form [60]. Instructional materials can be printed and non-printed materials. The printed materials are textbooks, teachers guide, students' workbook, internet, charts, graphs, encyclopedia etc while the non-printed materials are models, geo-board, abacus, etc. The teacher uses instructional materials suitable for the level of understanding of the students. Instructional materials are based on the topics to be discussed by the teacher. Teachers should plan for the instructional materials to be used in the class and

prepare all important or necessary things to use and make sure that the instructional materials are neatly done and an eye catching for the students [61]. The instructional materials serve as a simple motivation not only for the students but also for the teachers in their learning process. It can help the students in reinforcing in their new learning. The teacher uses instructional materials to help the students to improve their knowledge, abilities and skill from the information in using the instructional materials. It can help the students in their development in learning mathematics [62]. A teacher uses instructional materials to transfer new ideas to students. Some of the instructional materials that can be used are power point presentation, books, visual aids and other materials to facilitate learning. Some of the teachers use books as their way of imparting knowledge to their students. Some of the teachers use games as the medium of instruction in their classroom setting [63]. With the use of certain instructional materials the students uplift their confidence in learning the topics in Mathematics [64]. Most of the students learn mathematics topics with the use of instructional material like the power point presentation. Since we are now in the internet world, the students are engaged with the computer in their everyday life situation. When the lessons in mathematics are introduced with the help of our technology, the students have an extra interest with the subject matter. Students are active in participating in the lesson since the lesson is presented in computer [65]. One of the commonly used instructional materials is the modules. Modules are made for the students to understand mathematics with the use of examples given in the modules [66]. The students will have a guide in the modules on how to execute the given task. It can help the students to familiarize with terminologies and process involved in mathematics. Modules can be done anywhere, anytime as long as it engaged the interest of the students. With the help of the instructional materials, students can be exposed to the different methods of learning mathematics. It is rest-assured

that the students will acquire new ideas or knowledge about the topics in mathematics with the use of instructional materials [67].

In contemporary Nigeria, greater emphasis is placed on science and technological development. As a result students are being encouraged to take up science-related subjects and one subject that most students opt for is Mathematics. Mathematics pervades literally every field of human endeavor and it plays a fundamental role in educational advancement. Nigeria's need for an effective scientific and technological development appears to be overwhelming as she is going through hard times in her history especially with regard to her economy. This hard condition has partly resulted to a poor living standard of the people. [68], acknowledged that science and technology have always been recognized as critical factors in the process of development. Science and technology can provide the basis for Nigeria's social, economic and political well-being. Therefore, many people in Nigeria have come to realize that Mathematics can be applied to solve many problems facing the nation, especially as a result of the technological breakthrough in the advanced countries. [69] predicted that in a short time to come, only people with appropriate and appreciable knowledge and skills in science and technology disciplines would be required in the job market.

The implication of this is that economic survival, relevance and social mobility will depend considerably on the level and appropriateness of the knowledge and skills an individual has acquired through science education. Mathematics as a science subject is practical-based [70]. Therefore, to effectively implement the new curriculum, it requires that both the teachers and students should extensively carry out many activities using modern, current, and suitable instructional materials. The importance of instructional materials to the successful implementation of the new mathematics curriculum cannot be overemphasized. This is because the use of mathematics is

essential for effective behaviour change in learners [71]. [72], noted that when the students are given the chance to learn

through more senses than one, they can learn faster and easier.

ADEQUACY OF SECONDARY SCHOOL MATHEMATICS INSTRUCTIONAL MATERIALS

[73] explained adequacy as a situation in which there is enough resources for a particular purpose. [74] asserts that adequacy is a satisfactory condition of resources in an organization. [75], opined that the wealth of a nation or society could determine the quality of education since it determines the possibility of the provision of adequate instructional materials in secondary schools. The author further noted that a society that is wealthy will establish good schools with quality teachers and adequate learning infrastructures. He added that when these conditions are on ground students may learn with ease thus bringing about good academic performance. Commenting on importance of adequate instructional materials in teaching, [76], reiterated that when instructional materials are provided in adequate quantity to meet relative needs of a school system, students will not only have access to the reference materials mentioned by the teacher but individual students will also learn at their own pace. The net effect of this is increased overall academic performance of the entire students. On the contrary, inadequate instructional materials and lack of qualified mathematics teachers in the teaching field is the origin of failure [77]. According to him a close look at the public schools in Nigeria and what goes on there shows that nothing good can come out of most schools as they do not have adequate facilities, and appropriate human resources to prepare candidates for the West African School Certificate Examination (WASCE). Similarly [78] blames the failure of Curriculum Reforms in Nigeria (CRN) on the inability of the initiators of the programme to mobilize adequate resources (human, material and financial) to execute it and transform the plan into reality.

National Teachers Institute in 2002 asserts that the issue of facilities and materials as well as equipments for use in teaching of mathematics in schools and colleges has for long constituted a problem in Nigerian

schools that the number of facilities, equipment and materials for teaching mathematics respectively has been generally inadequate in our schools and colleges. The learners themselves are resources to a resourceful teacher. The teacher can utilize their innate skills and ingenuity in producing certain local materials to be used as teaching aids. However, [79] asserts that resources should be provided in quality and quantity for effective teaching in schools. [80] emphasized that the adequacy and utilization of learning materials promote effective teaching and learning activities in schools while their inadequacy affects the academic performance negatively. Also [81] stressed that besides having sound instructional programme on ground, the number and qualification of the teacher is yet another important factor to be considered in teaching of mathematics in secondary schools. According to the author, equally important apart from availability of adequate instructional materials is the teacher's experience on the job. [82, 83] noted that availability of adequate materials and its utilization is of vital importance in mathematics education. The author added that funding or financing is equally an important factor affecting the implementation of the school mathematics education programme. Writing on adequacy of mathematics instructional materials and academic performance, [84] opined that adequacy of instructional materials is a potent factor to quantitative education. According to them the importance of adequacy of instructional materials for teaching and learning in the education sector cannot be over-emphasized. The authors added; "teaching is inseparable from learning but learning is not separable from teaching". According to them this means that teachers do the teaching to make the students learn, but students can learn without the teachers. They added that learning can occur through one's interaction with one's environment.

Environment here refers to instructional materials that are adequate to facilitate students learning outcome. Commenting on factors affecting adequacy and utilization of mathematics instructional materials, [85] lamented the political influence in mathematics education environment in relation to adequacy of instructional materials. He maintained that corruption among other factors is militating against effective use of instructional materials in secondary schools. According to him money which is meant for development of infrastructural facilities in our schools may be channeled to private pockets. Similarly, [86] regretted the attitude of some school heads that show great apathy to instructional materials. He added that such situations found in schools are not healthy development since many future leaders could be left behind. National Teachers Institute [87] outlined the following as the major factors affecting the adequacy of instructional materials in schools as follows:

1. Careless planning of programme by the mathematics teacher
2. Employment of unqualified teachers to handle mathematics
3. Lack of funds
4. Poor maintenance of existing instructional materials

According to [88], inadequacy of fund to the schools as provided by the government is the main problem of secondary schools in Nigeria. Correspondingly, this situation affects the extent of adequacy of instructional materials in our secondary schools.

UTILIZATION OF SECONDARY SCHOOL MATHEMATICS INSTRUCTIONAL MATERIALS

Utilization of resources according to [88], Islam, [89] is a complex behavioral phenomenon; however it is always related to the availability and quality of such resources or services as the case may be. [90] explained utilization as to make use of available services at the individual's disposal. [91] asserts that from the National Policy on Education of 2004, it

could be observed that one of the objectives of education is to make learning permanent. According to him the utilization of instructional materials in teaching is a sure way of achieving this objective. When real objects or their representatives are used in teaching, students see, touch and interact with these materials. Interaction with learning materials will help the students not to forget what they learnt easily. [92] explained that the process of managing and organizing resources is resource utilization. According to [93], one of the reasons why available materials are not used by many teachers in schools and colleges is that teachers lack the necessary skills to operate them. [94], emphasized that the usefulness of resource materials depends on what the teacher makes out of them. Literature reveals that there are mathematics teachers who are not interested in the use of those instructional materials [95]. According to them, such situation has worsened the teaching and production of physically educated Nigerians. The authors added that the modern technological age with its accompanying explosion of knowledge calls for teachers who are ready to keep abreast with the constant changing needs of individuals being taught, as well as that of the society. One of the factors contributing to non-utilization of instructional materials in senior secondary schools includes lack of maintenance culture of instructional materials. According to [96] maintenance of most public properties which belong to nobody is less concern of some citizens of Nigeria. They suggested that for such instructional materials to be readily available for utilization in teaching, maintenance culture should be established by the school mathematics education teacher. Writing on maintenance culture of mathematics instructional materials, [97] opined that instructional materials should always be maintained in a serviceable condition. Procedures for caring for instructional materials should be routine so that repairs are provided as needed.

PROVISION OF INSTRUCTIONAL MATERIALS AND THE THEORETICAL MODELS

There are three models that have been proposed. These are the Full Support

Model, the Partial Support Model and the Equality Access Model.

The Full Support Model

The full support model as propounded by [98] sees the funding of education as a social responsibility of the state government. The full support model advocates full state provision of instructional facilities and that the state should take full constitutional responsibility for providing a particular level and type of school in the educational sector with adequate instructional materials. This arrangement is healthy for educational development in some respects. Firstly, it tends to equalize educational opportunities even among local and state government with inequalities in local wealth and education tax capacity. Secondly, the arrangement guarantees rational distribution of educational resources since individuals contribute (through taxes and rates) according to their means and benefit from educational services in accordance with their needs. Notwithstanding how good

this model sounds, the model has the following defects:

1. It is very expensive in terms of resources requirement. Such a model is impracticable within the context of dwindling resources which the nation is facing today.
2. The arrangement is not an encouraging framework for ensuring that those who contribute more (in terms of tax effort) are allowed to enjoy more of the benefit of educational provision (principle of fairness) [99].

The full support model has implication in all public secondary schools. Public secondary schools in this regard are schools owned and managed by the government. Based on this theory, funding of public secondary schools including provision of mathematics instructional materials is the responsibility of the government although individuals (philanthropists) may assist

The Partial Support Model

[80] while propounding this model advocated that the burden of educational provision be shared between the government and other stakeholders in the communities. His model which was aimed at equalizing educational opportunities as well as ensuring fairness stipulates that:

- Theoretically, all the students in the zone are equally important and are entitled to have the same advantage.
- The duty of the government is to secure for all as high minimum of good instruction as it is possible but not to reduce all to this minimum, to equalize the advantages to all as nearly as it can be done with the resources at hand to place a premium on those local effort which will enable communities to rise

above the legal minimum as far as possible, and to encourage communities to extend educational energies to new and desirable undertakings.

This implies that the government should not only provide support to maintain a desirable minimum standard of mathematical education but must also ensure that schools located in areas with low income receive more of their support. Individuals, philanthropists and non-government organizations should be encouraged to participate in providing instructional materials for effective teaching and learning of mathematics in senior secondary schools.

The Equality Access Model

[93] proposed that the government should ensure equal educational facilities to every student within its borders at a uniform effort throughout the state in terms of the burden of taxation.

- The tax burden should throughout the state be uniform in relation to the

educable population desiring education. This model further maintained that districts or communities that are wealthy enough are not precluded from offering at their expense any particular rich education programmes or services. In their regard, they are permitted to

augment the uniform fund provided to achieve desired equality of education through local tax effort and not to enjoy state financial reward for additional tax efforts. In view of the above, it is obvious that the provision of mathematics instructional materials and other relevant educational resources should be the responsibility of the government. Individuals and other agencies concerned may however join hand to make

mathematics instructional materials and other relevant educational resources available in our secondary schools. Also, the government should pay more attention to schools located in areas with low income to equalize educational opportunities. This will enhance the performance of the teachers and learners and lead to the achievement of the stated mathematics objectives in secondary schools in Nigeria.

SUMMARY

Mathematics is indispensable as far as development is concerned and as such every society needs to embrace it not only as a discipline but also for nation building. Instructional materials are essential and significant tools needed for teaching and learning of school subjects to promote teachers' efficiency and improve students' performance. They make learning more interesting, practical, realistic and appealing. They also enable both the teachers and students to participate actively and effectively in lesson sessions. They give room for acquisition of skills and knowledge and development of self-confidence and self-actualization. They are materials used to aid the transfer of information from one person to another [8]. Effective use of instructional materials enable students to build a bridge between what they can see, handle and scientific ideas that account for their observations. Unfortunately, lack of instructional materials is a problem challenging mathematics education. The insufficiency of teaching materials in schools has made learning difficult. With the use of instructional materials, the teacher has less talk when it comes to discussion of the lesson. The students learn the subject matter in mathematics on their own

understanding with the help of the instructional materials together with the supervision of the teacher in charge.. Instructional materials play an important role in teaching of mathematics. The teaching and even the learning process would never be complete without full utilization of instructional materials in whatever form [77]. Instructional materials can be printed and non-printed materials. The printed materials are textbooks, teachers guide, students' workbook, internet, charts, graphs, encyclopedia etc while the non-printed materials are models, geo-board, abacus, etc. Instructional materials are based on the topics to be discussed by the teacher. Teachers should plan for the instructional materials to be used in the class and prepare all important or necessary things to use and make sure that the instructional materials are neatly done and an eye catching for the students (Eno, 2015). The instructional materials serve as a simple motivation not only for the students but also for the teachers in their learning process. Mathematics instructional materials, when adequately made available to schools and effectively utilized will enhance students' achievement and performance in the subject.

CONCLUSION

Instructional materials are all the facilities, materials and supplies utilized by the teacher in teaching the subject. Instructional materials help the teacher present concepts in a way that the learners can retain more concepts permanently; they help the teacher to motivate the students by making the environment more interesting to the students; they facilitate proper understanding by the students and

discourage the act of cramming; they make the classroom or learning environment lively and active. These instructional materials should be adequate and at the same time utilized in order to realize their objectives and when these instructional materials are not adequate, it will hinder the performance of students because the level of success of most mathematics students is greatly dependent on the

degree of adequacy and utilization of up-to date facilities, equipment and supplies.

RECOMMENDATIONS

From the foregoing, the following recommendations are made: The government of Nigeria should ensure that mathematics instructional materials are provided adequately in secondary schools. Educational stakeholders and philanthropists should support the

government in the provision of mathematics instructional materials. The ministries of education (federal and state) should thoroughly monitor the utilization of mathematics instructional materials in secondary schools.

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