SER VOLUME 14 (1): June 2013

TOWARDS EFFECTIVE UTILIZATION OF INSTRUCTIONAL MATERIALS IN MATHEMATICS TEACHING IN NIGERIA

A. K. TSAFE

Abstract

Mathematics teaching has been described by scholars to be a task found at various times to be daunting and with a recorded number of successes and failures. It could be made to be more enticing if certain requirements are maintained. One of these requirements is the utilization of adequate and relevant instructional materials. In this regard therefore, this paper portrays what an instructional material is; types of instructional materials in mathematics and how best those materials could be utilized by both teachers and learners. Instructional materials are materials whose usage in teaching mathematics is believed to be instrumental in addressing learning problems. Depending upon the level of operation of the learner, a particular instructional material is required. Instructional materials commonly used include text books, puzzles, cones, cylinders, spheres, triangular prisms, rulers, diagrams, charts, magazines, newspapers, DVDs, transparencies, projectors etc. The paper further recommends how teachers can best use instructional materials and strategies to apply in improvising instructional materials where they are found to be in short supply or grossly inadequate.

Introduction

Knowledge of mathematics is inherent in virtually every aspect of human existence owing to its wider application in Sciences, Engineering, Medicine, Business, Agricultural Science, Arts and Humanities. In order to facilitate knowledge acquisition of mathematics therefore, its teaching has to be accompanied by relevant instructional materials depending upon the topic to be taught. Instructional materials have over the years been used at different stages of learning and as such have attracted quite a number of definitions by scholars who used them in their various fields of endeavour. For instance, instructional materials are essential teaching materials that enhance the teaching and learning process (Abubakar, 2012). In this regard, if the instructional materials are judiciously used and utilized, the rate at which learning is taking place by the learners would be enhanced and internalization of received instruction from the instructor (teacher) would equally be made attainable by the learners.

Similarly, Olaleye (1998) reiterated that the major use of instructional materials is the fact that they provide a wide range of alternate avenue through which the same unit of instruction can be presented to learners; that effective utilization of instructional materials in our schools make students learn in a meaningful way and as such become actively involved intellectually, perceptually and physically. Therefore the impact of teaching in mathematics could more striking by enriching it with instructional materials. In modern world, instructional materials are a-most-be-used instruments if teachers want to ensure efficiency in the teaching process. As such, instructional materials are viewed to be in form of print and non-print items that are designed to impart information to students in the educational process which include such items as kits.

textbooks, magazines, newspapers, pictures, recordings, slides, transperancies, videos, video discs, workbooks and electronic media including but not limited to musics, movies, radio, software, CD ROMS and online services (Arhad & Fayyaz, 2011). To this end, instructional materials are in our surroundings and in abundance only that to make use of them tends to become a problem to the teachers. If some of these materials could not be found in some areas or communities like software, CD ROMS and online services in the case of rural communities, some could easily be found in virtually all communities whether rural or urban. This is especially of materials like textbooks, newspapers and pictures. However, if the latter materials also prove to be difficult to come by in some communities, Abdullahi (1982) referred to instructional materials as materials or tools locally made or imported that could make tremendous enhancement of lesson impact if intelligently used. Improvisation of locally made materials as such could replace the ones not easily found so that learners would not be thrown off-balance when learning certain concepts. The whole essence is to give or enable the instruction to be resourceful which in turn gives students the opportunity to grasp the content taught at a particular point in time.

Because mathematics has been characterized to be portraying abstraction in most of its areas, the need therefore of using instructional materials to minimize such abstraction becomes imperative. Many experts in the field of education pointed out the importance of instructional materials in teaching and learning of mathematics as an aid to reducing the level of abstraction and the adoption of different teaching strategies to apply while teaching. Afolabi (2008) in this case opined that availability of instructional materials and the ability of mathematics teachers to use them are vital determinant of teaching methods to be used by mathematics teachers.

Instructional Materials

Instructional materials or learning aids as often used sometimes are believed to reinforce the learning since they stimulate, motivate and activate learners within instructional process and they include visual aids, audiovisual aids, real objects and many others (Toptas, Celik & Karaca, 2012) through which teaching and learning are carried out in educational setting. Instructional materials can be considered to be the backbone in teaching and learning process and have a profound impact on both teachers and learners and even the instructional process itself. On teachers' part, instructional materials serves a pedagogical function by imparting facts, developing skills and illustrating how knowledge can be organized for learning to provide links to tutors and students (Gujjar & Malik, 2007). Instructional materials for this reason are quite important in helping teachers in their instructional process.

There is a general belief among scholars that teachers, not the materials are the key to successful instruction but notwithstanding instructional materials could always serve to provide support for the teachers to see to the success of the process. Teachers alone without the instructional materials, there is high possibility that the process may not

appear to the students enticing and may not make them develop high level interest in whatever they are taught in the class. This is in addition to enabling the students to retain the information they may have been taught if a provision is made of these materials. The presence of instructional materials in the teaching enables the process to be concretized and child-centered. This is because a greater percentage of students' attention could be secured if instructional materials are used. Even though differences exist between learners in terms of comprehension and understanding but yet instructional materials to some extent can take care of such differences by according the slow learners the ability to be carried alone in the lesson. In this respect, Adaramola (2012) maintained that the usage of instructional resources by teachers helps in developing problem solving skills, scientific attitude and functional knowledge which leads to achieving mathematics educational goals. He further reiterated that teaching mathematics in resource rich classroom will stimulate the senses of students to explore familiar landscapes in new horizons and become actively involved and properly motivated.

Instructional Materials in Mathematics

Instruction in mathematics requires concretization because of the perceived nature of abstraction in the subject by its learners. The use of these concrete materials would enable the learners to be reflective in their thinking and be able to make connections between one segments of instruction to another. An experience according to (Dewey, n.d) is not a true experience until it is reflective. Ability of the learner to be subjected to reflective thinking is what offers the educators in mathematics the need to emphasize much on the usage of these instructional materials so that the whole aim of education would eventually be achieved.

Instructional materials in mathematics could take the form of images, charts, models, visuals, audiovisuals, papers, books and the like. There were quite a number of contributions from scholars as to which instructional material is to be used and in which particular topic in mathematics. For instance, Hiebert and Wearne (1991) reported a success consistently in the use of concrete instructional materials to aid students' understanding of decimal fraction and decimal numeration. Depending upon which topic is to be taught, a particular instructional material is required. When the instructional materials are eventually made available to be used by the learners, it is the ability of the teacher then to make them learner-friendly as advocated by Piaget (1974) who maintained that children (learners) themselves are to be encouraged to be active in their own learning through the exploration of manipulative materials. This is because Childs' thinking is oriented to objects and events in the immediate present which assumed that the experience of concrete materials would enable the child to construct a mental representation of the concept which is being portrayed by the material.

In this regard, the usage of instructional materials in mathematics teaching becomes very imperative and would go a long way in enriching the process of teaching. This is because they facilitate learning of abstract concepts to concretize ideas and stimulate the

learners' imagination which are known to increase the learners' active participation in learning and save the teachers' energy by reducing the tasking time (Esu, Enukoha & Umoren, 2004).

The following could as such serve as instructional materials needed in teaching and effective learning of mathematics especially at the early stage of the learning process:

Stones	Bottle Tops
Square Blocks	Abacus
Textbooks	Newspapers
Journal	Encyclopedia
Thesis/Project	Teacher's Guide
Models	Mathematical Games
Rulers	Compass
Photographic Slides	Posters
Globes	Diagrams and Charts
DVD Players	VCD Players
Television	Video Tape Recorder etc

These are some of the instructional materials which would invariably help in transforming abstract concepts into real and concrete ones and helps in fastracking the rate of understanding among learners especially those who are at a disadvantage.

Utilization of Instructional Materials in Mathematics

Another important aspect of mathematics teaching is how best both a teacher and a learner can make judicious use of the instructional materials. The availability of instructional materials does not matter if and only if their usage could be a problem to the beneficiaries. Popoola and Olarewaju (as cited National Board for Technical Education, 2008) opined that, teaching mathematics is about educating learners and for the learners to be educated mathematically, they must acquire mathematical knowledge, skills and understanding whereby the process of teaching and involves a two-way communication between a teacher and a learner; that how well a teacher is able to communicate with learners determine the extent they are able to understand, learn and perform well in mathematics. Since it is a two-way therefore, it has to involve a medium through which it would be channeled for successful transmission. The process has to be well understood by both parties; the learner and the teacher. Such understanding is what would eventually accord both parties the ability to utilize the entire medium with efficacy. According to Bila (2008) the process involves the use of spoken words, signals, gestures, pictures, visual displays, print, film etc

However, to effectively utilize instructional materials in mathematics, the foregoing instructional materials mentioned above are categorized as teacher-used, learner-used and teacher/learner-used ones respectively as could be depicted in the following table.

Table showing the instructional materials utilization by teachers and learners

Teacher-used ones	Learner-used ones	Teacher/Learner used ones
Textbooks	Cone	Puzzles
Newspapers	Cylinder	Ludo Game
Journals	cube	Draft Game
Encyclopedia	Cuboid	Ruler
Thesis/Projects	Triangular Prism	Compass
Teachers' Guide	Sphere	DVD & VCD Player
Diagrams & Charts		Television
Globes		Video Tape Recorder
Posters		
Projectors		
Photographic Slides		

Source: Self-designed

Though both parties can use virtually all the instructional materials interchangeably but the table portrays who often use what when it comes to utilization.

Problems Affecting Effective Utilization of Instructional Materials

It is common knowledge that institutions of learning in Nigeria whether primary, secondary or tertiary are bedeviled with instructional materials shortage and inadequacy- hence they are ill-equipped; and for effective learning to take place, such institutions have to be well equipped with instructional materials that will stand the test of time. This is in line with the belief of Jimoh (2010) who maintained that teaching cannot be attained without effective use of instructional materials effectively. Teachers have to be groomed in the technicalities surrounding the handling of the materials in an appropriate way so that when they come to use them, they would not be found wanting. This could be done through engaging teachers in technical sessions like workshops, seminars and refresher courses among others. This could serve as a complementary effort of making the teachers to become conversant with the technical know-how regarding the usage of the materials. This is especially important because of the sophisticated nature of the instructional materials nowadays.

Another area that poses a problem to the utilization of instructional materials is mathematics curriculum which did not make a provision for all the needed instructional materials to be used in teaching mathematics; as a result of which teachers sometimes find it difficult to handle some topics via the usage of instructional materials. In this regard, a question once raised by Eshiwani (1986) as to the type of materials with what type of cost and which determines what learning outcome, has not been answered. This further suggests that instructional materials have to be less costly so that they would be made available for easy procurement; so that their availability would enable teachers to utilize them in teaching the students appropriately. In addition to availability, the materials should be relevant to what is to be taught

and at what level so that that they would not be abused and used inappropriately.

Lastly, when instructional materials are in short supply or not supplied at all, teachers should be taught to devise a means of creating alternative for such materials. The whole idea behind this is to make students active participants in the instructional process, not mere passive learners.

Conclusion

For teaching and learning of mathematics to be effective and to be made enticing to the learners, it has to be followed by instructional materials relevant to the level it is meant to be used. A provision has to be made in which ideas incorporated in curriculum could be translated into real application through the usage of contemporary instructional materials since their usage has been found to be of tremendous to the learners.

Recommendations

The following are the recommendations the paper offers which are of great importance towards effective utilization of instructional materials in mathematics

1. Training of mathematics teachers at various institutions of higher learning should be structured to allow for exposing prospective teachers to proper usage of different instructional materials
2. In addition to provisions made in curriculum regarding the instructional materials to be used in teaching a particular topic, teachers should endeavour to be using some materials not necessarily provided in the curriculum.
3. Teachers should always devise a means of creating alternative instructional materials if they are in short supply or not available at all.

References

Abdullahi, A. (1982). Science Teacher in Nigeria: Atoto Press Ilorin.

Abubakar, R. B. (2012). The effect of using probability instructional materials for the achievement attitude and anxiety of mathematics students. *Abacus, the journal of Mathematical Association of Nigeria*, NR-ISSN 3099. **37** (1): 151-164.

Adaramola, M. O. (2012). Evaluating mathematical instructional resources in Public and Private schools in Portharcourt metropolis for transmuting Nigeria to achieve vision 20:2020. *Mathematical Association of Nigeria Proceedings of September 2012.*

Afolabi, S. S. (2008). Teaching methods and textual materials as correlates of students' learning outcomes in Senior Secondary School. *Seminar Series Department of Teacher Education,* University of Ibadan.

Arhad, M. D. & Fayyaz, A. F. (2011). Effect of the Availability and the use of instructional materials on Academic performance of students in Punjab (Pakistan). *Middle Eastern Finance and Economics*

Euro Journal, Publishing Inc Issue **1** (1): ISSN: 1450-2889.

Eshiwani, G. S. (1986). Utilization of instructional materials: A review of published and unpublished research for Eastern, Central and Southern Africa. *Bureau of Educational Research.* Kenyatta University, Kenya.

Esu, A. E. O.; Enukoha, O. I. & Umoren, G. U. (2004). *Curriculum Development in Nigeria for Colleges and Universities.* Whyte and whyte Publishers: Owerri Pp. 103-109.

Gujjar, A. A. & Malik, M. A. (2007). Preparation of instructional material for distance teacher education. *Turkish Online Journal of Distance Education-TOJDE*, **8** (1): ISSN 1302-6488.

Hiebert, J.; Wearne, D. *et al* (1991). "Fourth graders gradual construction of decimal fractions during instruction using different physical representation." *The Elementary School Journal*, **91** (4): 321- 341.

Jimoh, M. F. (2010). Teaching Aids: A panacea for effective instructional delivery. Retrieved on 18th July, 2013 from *www.google.com*

National Board for Technical Education (2008). Training manual. *Pedagogical Skills for Technical Teachers in Nigerian Polytechnics and Monotechnics 1-55.*

Olaleye, O. O. (1998). Effective use of instructional materials for teaching and learning in Secondary School. *Sped Journal of Science in Education*, **1** (1): 50-53.

Piaget, J. (1974). Forward in Schwebel, M and Raph, J. (Eds). *Piaget in the Classroom.* Routledge and Kegan Paul: London.

Popoola, F. R. & Olarewaju, R. R. (2012). Availability of Instructional materials for teaching and learning of mathematics in achieving the Millennium Development Goals in Nigeria. *Advances in Arts, Social Sciences and Education Research*, **2** (6): 198-205 ISSN 2276-6715 Retrieved on 11th April 2013 from http://www.ejournal.sedinst.com

Toptas, V.; Celik, S. & Karaca, E.T. (2012). Pedagogical materials use of Primary Grade Teachers in Mathematics Education. *Elementary Education Online*, **11** (4): 1121-1130.