

THE MULTIPLE INTELLIGENCES TEACHING METHOD AND MATHEMATICS TEACHING

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Abstract

This paper considered the importance of mathematics in a country like Nigeria that is rapidly undergoing social change and scientific/technological progress. It noted with dismay the decline in the success rates of students in the subject despite its importance. This situation does not augur well for a nation in quest of scientific and technological development. It therefore calls for an urgent need to constantly seek ways of meeting the mathematics needs of students until things improve. Results of researches carried out by mathematics educators reveal that the dismal performance of students in the subject is mainly due to defects in the teacher's teaching methods. Consequently students lose interest in the subject and feel disengaged. The Multiple Intelligences teaching approach has evolved and been embraced widely especially in the United States. The approach has been found to be very effective in changing situations for the better, in the teaching and learning of any subject especially mathematics. Multiple Intelligences teaching approach proposes a major transformation in the way schools are run. It suggests that lessons be presented through a variety of ways using pictures/ drawings, music, cooperative learning, field trips, activities, role playing, games, and much more so that each child has the opportunity to learn in ways harmonious with his/her God given talents. This paper therefore set out to introduce Nigerian mathematics teachers to the Multiple Intelligences teaching approach for an enhanced performance of students in mathematics.

Keywords: Mathematics, achievement, interest, multiple intelligences

Introduction

Mathematics permeates the entire society, for which reason it is becoming necessary for everyone to have mathematical skills to function intelligently in today's world. The place of mathematics in the life of any nation is said to be inextricably linked with the place of development in that nation. Mathematics plays an indispensable role in realizing a nation's dream of rapid scientific and technological development. Indeed no nation that wants to develop scientifically and technologically neglects the mathematical component of her school curriculum. According to Ukeje (1997), the increasing attention given to mathematics stem from the fact that without mathematics there is no

science, without science there is no modern technology, and without modern technology, there is no modern society. This therefore suggests that there could be no real development technologically without a corresponding development in mathematics both as conceived and as practiced (Salau, 2002).

Despite the relative importance of mathematics, it is very disappointing to note that students' achievement in the subject has remained consistently poor. Statistics abound to show that mass failure in mathematics especially in the Senior Secondary Certificate Examination (SSCE) is real and that the trend of students' performance has been on the

decline (Agwagah, 2001; Amazigo, 2000; WAEC, 1990, 2000, 2006, 2009). Consequently, there has been a serious hue and cry about what has been described as an alarming rate of poor academic achievement of students in mathematics. Soyemi (2001) stated that to be simply modest is to say that this dwindling trend of poor knowledge of mathematics in schools across the country is fast assuming a frightening state of catastrophe.

The weakness students exhibit in solving mathematical problems has been attributed mainly to poor handling of the topics by the teachers (WAEC, 1991). Educationists that carried out researches on process errors committed by students in some mathematical topics also all gave as their recommendation that workshops should be organized for mathematics teachers to help them improve their teaching (Abonyi, 1992; Unodiaka, 1998; Usman, 1996). This pointing to the fact that the errors students make are largely as a result of defects in the teachers' teaching methods. In fact Wahl (1999) insisted that mathematics boredom, anxiety and hatred are legitimate-even healthy. To him, they are reactions to materials that are meaningless, monotone, black and white and repetitive. He argued that no one would react better with a daily portion of sawdust for his or her meals.

The resultant effect of all the problems of mathematics teaching and learning has been the dire lack of a large pool of students expressing interest in this field at all levels of the educational system. It becomes obvious then that any attempt at improving students' achievement in mathematics must first work on enhancing their interest in the subject. Uyoata (2002) noted that learners' characteristics such as interest play a key role in students' performance in a subject. The learner who is interested in a subject would likely enjoy and feel satisfied in what he is

expected to do. The satisfaction so derived would lead to success which in turn would engender higher positive attitude of perseverance, patience and open-mindedness. Mathematics educators have agreed on the development of interest as a goal for mathematics teaching and learning. Several research studies have shown that there is a positive relationship between interest and achievement (Eccles, Denissen and Zarret, 2007; Kempa and Dube, 1974).

The Multiple Intelligences teaching approach (MITA) has evolved and been embraced widely especially in the United States. This method of teaching and learning has been found very effective in improving achievement and interest of all categories of students in all subjects. There is therefore no doubt that MITA may well be what Nigerian mathematics educators need to revive the interest of students in mathematics and therefore enhance their performance in the subject.

The multiple intelligences teaching approach (mita)

The Multiple Intelligences teaching approach (MITA) derives from the theory of Multiple Intelligences developed in 1983 by an American Psychologist, Professor Howard Gardner. Gardner in Educational Broadcasting Corporation [EBC] (2004) saw intelligence as an ability to solve problems or to create products that are valued within one or more cultural settings. He proposed that all human beings have nine intelligences: Verbal-Linguistic intelligence, Logical- Mathematical intelligence, Visual- Spatial intelligence, Bodily- Kinesthetic intelligence, Interpersonal intelligence, Intrapersonal intelligence, Musical intelligence, Naturalistic intelligence and Existential intelligence. Gardner conceived of these intelligences as different ways of demonstrating intellectual ability. The bulk of the early work of Gardner in 1983

involved the first seven independent intelligences. It was in 1990 that Gardner posited the existence of the eighth dimension and then the ninth that bothers only on human existence. According to Gardner in Armstrong (2000), each person has a unique profile of these intelligences with strengths in some areas and weaknesses in others.

The theory of Multiple Intelligences urges a rethinking of how teachers should approach subjects and topics. If students have multiple intelligences, which imply multiple ways of knowing, multiple ways of learning, of acquiring knowledge and of processing information, then the teacher truly must teach in these various ways the students learn. Guided therefore by the very diverse intellectual profiles of students in a classroom, the theory suggests that teaching must become less of a single approach aimed at all students and more of a crafted effort to engage the multiple intelligences or potentials present in the classroom. Consequently, MITA is considered as teaching directed through the first eight intelligences channels of learning propounded by Gardner.

The conventional method of teaching is geared primarily to the verbal- linguistic as well as the logical-mathematical intelligences. These are not the strongest assets in some children. So, even when some teachers think they are applying new approaches to teaching, it still leaves some students somewhat cold. According to Wahl (1999), we must tap the other intelligences of all the students in our quest to engender meaningful and worthwhile learning.

The teaching approach which reflects the philosophy of the Multiple Intelligences theory emphasizes the following:

1. Verbal presentation of concepts with thought provoking questions that enables learners express their ideas, for the benefit of students with strength in

verbal-linguistic and/or logical-mathematical intelligences.

2. The use of visual aids, visualization, color, art, metaphor or visual organizers. This sometimes involves inbuilt of a discovery activity in a lesson designed in such a way that students perform certain mental processes such as observing, classifying, measuring, predicting, describing, etc, for students with spatial, bodily-kinesthetic as well as logical- mathematical intelligences.
3. Linking learning concepts to real life situations/experiences through field trips and/or invitation of guest speakers. Here classrooms are sometimes extended to the open field by taking students out of the classroom to learn about concepts in their natural setting, for the benefit of students with naturalistic and/or bodily-kinesthetic intelligences.
4. The use of music or environmental sounds or setting key points in a rhythm or melody, for those students with musical intelligence.
5. Collaborative learning: Providing enabling environment for learners to learn from one another, for those students with interpersonal intelligence.
6. Students working individually sometimes for the benefit of those with intra-personal intelligence.

The MITA stems from the understanding that some students learn better when the learning experiences are presented through one form or the other of the pathways enumerated. For instance, there are the spatial learners who would only need to see the material to be learnt presented in form of pictures, drawings or charts and they would catch the message immediately. There are others who would need key points on the content given in a rhythm or

melody, the musical intelligent learners, and they would immediately rise up to the occasion. There are yet others who once seated at one position do not learn much. These learners need opportunities to get up from their seats and make use of their hands and body to enjoy learning. Yet there are students who learn much by listening to someone talk, the verbal-linguistic learners. These students enjoy the lecture method of teaching and learn greatly through it. There are those who must share ideas with others before they can learn. And there are those who learn better when they are working alone.

This teaching approach, therefore, presents a concept through as many of the different pathways as a lesson can possibly accommodate, and then allows each individual in the class benefit from the pathway that best suits him or her. Teaching strategies involved in MITA are therefore varied. They include drama, role play, songs, games, debate, group discussion, brainstorming questions, stimulations, case study, demonstration, story telling, etc. Following this variability in MITA procedures, the approach holds the attention of the learners, arouses curiosity and provokes thought. The belief of the educators that propose this teaching approach is that all students that enter school are capable of learning what is taught in school. This means that they possess the capacity or the ability to learn, provided they get suitable instruction. Teachers therefore need to understand that all their students would perform better on any measure- particularly those students for whom success in school is elusive- when learning is made enjoyable and when students are taught in the way they learn best. No adult enjoys failure and children are no different. By creating an environment in which more talents are recognized and in which more children can succeed in school, which is what the Multiple Intelligences teaching approach does, students

will naturally approach school with more enthusiasm and interest.

Effectiveness of the multiple intelligences teaching approach

A. Effectiveness of MITA in enhancing students' interest in learning.

According to Weber (2007), UCLA Higher Education Research Institute carried out a survey of more than 260,000 full-time freshmen in year 2000 and reported boredom, drudgery and disengagement in class. It was the MITA model, she said, that was used to resolve these problems of student passivity in higher education classes. According to her, at the time of her report, the MITA model has been used successfully in several courses at so many universities in the United States and in several other countries.

Further, noting that poor student motivation and lack of interest may interfere with the academic growth of students, Janes, Koutsopanagos, Mason and Villarenda (2000) investigated the extent to which MITA improves motivation and interest of children. Participating in the study were second and third grades from three schools. The twelve week intervention had Multiple Intelligences activities incorporated into classroom practices. The findings of the post-intervention data showed that applying the Multiple Intelligences approach had a positive effect on the targeted classroom. Students revealed positive attitudes towards themselves and their school.

Anaduaka (2008) also carried out a study which sought to find out the effect of MITA on students interest in geometry. The study involved Senior Secondary One students in Ajaokuta Local Government Area of Kogi State, Nigeria. The result of the study showed that MITA enhanced greatly students' interest in the geometrical contents studied.

B. Effectiveness of MITA in enhancing students' achievement in mathematics

Pajkos and Klein-Collins (2001) conducted a study on an intervention program for increasing mathematical achievement of African American students. Within the targeted population, it was evident that the disparity in mathematics achievement between African American and White students was increasing each year. Analysis of probable cause data revealed that teachers heavily favor the Westernized approaches of verbal-linguistic and logical-mathematical instructional styles. A review of strategies suggested by experts in the field posed the following solution: implement MITA in all aspects of teaching and learning. Post intervention data indicated an increased diversity in the teaching strategies, an expansion and understanding of learning styles, elevated teacher and student enthusiasm, and a desire on the part of the students to continue with MITA in mathematics as well as integrate them into other curricular areas.

The effectiveness of MITA has been further supported by the findings of a study conducted by Harvard's Project Zero (Hoerr, 2002). In interviewing the Principals of forty-one schools using MITA, 78% of them said that their schools had realized gains on standardized achievement scores and 63% attributed the growth to practices inspired by Multiple Intelligences theory. Not surprising, the use of MITA paid other benefits in these schools as well: 78% of the schools reported improved performance by students having learning difficulties, 80% reported improvement in parent participation and 81% reported improved student discipline. Hoerr readily extolled the virtues of MITA anecdotally. According to him, students are more likely not to find school boring.

Discipline problems, he also said, tend to disappear when students are excited about learning and finding success.

A similar study was also carried out in Nigeria by Anaduaka (2008) using Senior Secondary One students of Ajaokuta Local Government Area. The goal of the study was to ascertain the effect of Multiple Intelligences teaching approach on students' achievement in geometry, a branch of mathematics. The finding revealed that MITA was very effective in enhancing students' achievement in the geometrical contents studied.

Teaching mathematics with the MITA

One of the remarkable features of MITA is how it provides eight different potential pathways to learning. If a teacher is having difficulty reaching a student in the more traditional linguistic or logical ways of instruction as most mathematics teachers do, the approach suggests other ways in which the material can be presented to facilitate effective learning. One does not have to teach or learn something in all the eight ways at a time. The particular pathways that interest students the most or seem to be the most effective teaching tool at a time should be employed. When mathematics is taught through as many intelligence channels as a lesson can possibly accommodate, one has a vastly increased chance of reaching every student in the classroom.

Obstacles to mathematics teaching and learning are many and among them is mathematics anxiety arising from the obnoxious notion that mathematics is an abstract, complex and difficult subject. The MITA makes up for a multitude of such assumed impossibilities. It helps teachers to stimulate students' natural learning abilities, bringing them out of mathematics fear into mathematics power. When a child has to learn in ways harmonious with his or her God given

talents, then learning becomes more meaningful and enjoyable.

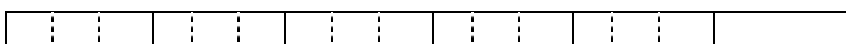
Consider this mathematical question: Bola was given a portion of land to clear. She cleared $\frac{1}{3}$ of it by afternoon and $\frac{3}{4}$ of the remainder by evening time. What fraction of the work will be left for her to do the next day?

Wahl (1999) noted that a problem of this sort throws students off balance just by its wording. They get confused seeing all the

fractions in the question and consider it difficult to tackle. However, using other intelligences could make a little more sense. For instance, with the visual-spatial and naturalistic intelligences, the student can visualize the portion of land in question and imagine it divided into the parts stated. Precisely he can make a rectangle to represent the land and then divide it into 3 parts marking one part as portion cleared before noon [See figure below].



Then the remaining two thirds are divided into 4 parts and three marked done before evening time as shown in the figure below.



A close examination of the figure above shows clearly that one out of six equal parts of the job would be left for Bola to do by the next day.

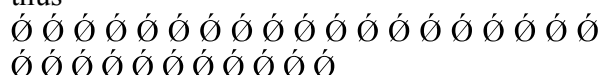
With such illustrations, a visual- spatial learner would feel excited about his/her discovery of the solution and with that enthusiasm, he or she will be in the right mood to be led to solve the problem the logical-mathematical way: $\frac{3}{4}$ of $\frac{2}{3} = \frac{1}{2}$ which is the portion done by evening time. That added to the portion done by afternoon gives $\frac{5}{6}$ as finished portion, implying that $\frac{1}{6}$ is still left undone.

There could also be confusion about this simple problem also: $30 \div \frac{1}{2} + 5$. If anyone was given this to give an answer quickly, many would give 20 as the answer. This comes from a misapplication of the rule of division. The teacher can explain the question this way-

If $30 \div 2$ means how many twos can be cut out of 30, then $30 \div \frac{1}{2}$ means how many halves can be cut out of 30. With the cutting thing, the bodily-kinesthetic learner is stimulated and can give the answer to $30 \div \frac{1}{2}$ as 60,

correctly. Then the answer to the main question becomes 65, when 5 is added to 60.

Again the visual-spatial learner may feel better if he is directed to use pictures to find the answer to that question. He can just draw 30 circles and cut each one into two with a line thus-



He can now find out by counting that in 30 circles there are 60 halves. So, $30 \div \frac{1}{2} = 60$ [Wahl, 1999].

Further in teaching Perimeter of regular and irregular shape for instance, the teacher applying MITA may start off by explaining what Perimeter is using the school field, the blackboard, etc. This reference to things they can see would get the students with strength in linguistic and naturalistic intelligences overtly attentive.

If the teacher goes ahead to demonstrate how to find perimeter of any shape using real objects such as textbooks, fan blades, chalkboard, etc, instead of going straight to quote formulas on the board and applying the formulas, he would have done well for students with naturalistic as well as spatial intelligences.

If he now directs students to carry out some of these activities on their own either individually or in groups, e.g. determining the perimeter of their desktop, picking a leave outside the classroom and determining its perimeter, etc, he would have also done well to help the intrapersonal/interpersonal, naturalistic and bodily-kinesthetic intelligent students. Further, when he arranges key points in the lesson in rhythms and teaches the students, then he does not want to leave out the musically intelligent students in his class.

When the concept has in these various ways been understood by the students, he can now go on to lead them, still in the same manner, to derive the formula for perimeter and to apply the formula in the solution of problems. This is what Multiple Intelligences teaching approach [MITA] is all about.

Conclusion

The alarming poor state of mathematics education in schools as revealed by the dismal performance of students in public examinations such as the SSCE raises the problem of devising another strategy for meeting the mathematics needs of the students. It is clear that without this significant transformation of the existing strategies and methods used in most classrooms, mathematics learning would not improve.

The Multiple Intelligences teaching approach is so intriguing because it expands our horizon of available teaching/learning strategies beyond the conventional teacher-centered in most schools and beyond the recent

pedagogies being advocated. Many schools especially in the United States were reported to have started implementing the MITA. Teachers from such schools testify to seeing their students more deeply and thoughtfully involved with the material they are learning and learning them more thoroughly through activities that articulate their minds and their bodies. An improved performance in test scores and other benefits has been the result of this. Incidentally, MITA is not yet a popular teaching strategy in Nigeria. This paper is an attempt to introduce mathematics teachers to the Multiple Intelligences teaching approach.

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