

MULTIPLE INTELLIGENCES DEVELOPMENT APPROACH (MIDA) AND STUDENTS' INTEREST AND ACHIEVEMENT IN PHYSICS

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ABSTRACT: *The study sought to determine the effect of Multiple Intelligences Development Approach (MIDA) on students' interest and achievement in physics. Two research hypotheses guided the study. The design adopted was a quasi-experimental, non-randomized control group pre-test-post-test design involving two groups (experimental and control). The sample comprised 100 senior secondary two (SS2) physics students in six intact classes from six secondary schools in Ukanafun Local Government Area of Akwa Ibom State selected through purposive sampling technique. In each of the six schools, a random stream was chosen. Three streams in the chosen schools were then randomly assigned to the experimental group and the control group respectively. Two instruments namely: the Hausler and Hoffman Interest Scale in Physics (HHISP) and the Achievement Test in Physics (ATP) were used in collecting the pertinent data. The experimental group was taught sound concepts in physics using the MIDA while the control group was taught the same concept using the conventional (expository) approach. The students were exposed to treatment for four weeks. Data generated were analyzed using the Analysis of Covariance (ANCOVA) and decision made at 0.05 level of significance. The results indicated that the MIDA was significantly more effective in promoting students' interest and achievement in physics over the conventional approach. Based on these findings, conclusions are drawn and implications for educational practice suggested. Some recommendations were made, among which was that the use of MIDA should be encouraged in the teaching and learning of physics at the senior secondary school level.*

KEYWORDS: Multiple Intelligences Development Approach (MIDA), Students' Interest, Students' Achievement.

INTRODUCTION

Physics which is a core subject in the science study field of senior secondary education in Nigeria deals with the fundamental questions on the structure of matter and the interaction of the elementary constituents of nature which are susceptible to experimental investigation and theoretical inquiry (Safra, 2002). It is seen as a conceptually difficult subject. The importance of physics in engendering scientific and technological development of any nation cannot be over emphasized. Infact, the technological potentials of any nation could be more accurately ganged by the quality of physics education provided (Ogunleye, 2001). The knowledge of physics is also known to help in transforming the world (Ogunneye, 2003). Physics therefore draws awe and respect from people because of its contribution to knowledge, growth and development of individuals in particular and the society in general.

From the foregoing, the recognition of the importance of physics education in Nigeria's educational system and for the nation's technological development gives a picture of the high expectation of students

performance in the subject. However, many problems beset physics teaching at the secondary school level. Some of them reported in studies conducted in Nigeria are lack of quality physics teachers and a consequent poor teaching of physics, poor interest, lack of motivation of students, poor understanding of concepts, perceptual interpretation and ineffectiveness of existing instructional approaches (Achor, 2001; Onwioduokit and Mkpanang, 2001; Abonyi, 2002; Jegede, 2003; and Westen, 2006). The unique nature of physics seems to give the learners multiple problems. This is evident in the discouraging performance of candidates in physics examinations conducted by the West African Examinations Council (WAEC) and National Examinations Council (NECO). Rather than have a corresponding increase in pass rates with a steady increase in the total number of candidates in physics yearly, there had been a steady increase in failure rates for physics over the years (WAEC and NECO Chief Examiners Report 2008, 2009, 2010). Performances of students in the two examinations have been fluctuating over the years. Oyedele, Eule and Langkank (2002) pointed out that empirical research evidences tend to suggest that the causes of the dismal performance of students in science concentrate around wrong methods of teaching and inadequate instructional materials.

Interest in physics or the feeling of a student whose attention, concern or curiosity is absolutely engaged or absorbed in physics activity(ies) is also a criterion variable of great importance. Interest is very important in motivating students to learn. It promotes several other outcomes as well as influences the levels of learning (Hidi, Renninger and Krapp, 2004). Science subject such as physics is more likely to be taken by students who find it interesting (Smyth and Hannan, 2006). Research in the field of students' interest and attitudes towards science indicates that these factors affect students' achievement (Siegel and Ranney, 2003). Indeed, individual and situational interests have been identified by interest theorists as two major kinds of interest. And situational interest is visible when students respond to environmental features. In educational settings, students situational interest are promoted through the affective experiences they gather which enables them to actively attend to their study materials (Schiefele and Rheinberg, 1997). Maintained situational interest is therefore one that is sustained through meaningful and personally involving activities. And this is what the educators seek (Hoffman, 2002).

Researchers such as Osborne, Simon and Collins (2003) highlighted the significant decline in students' interest in science and the negative impact this has on a country's economic, political and industrial well-being. Trumper (2006) showed that the interest of students in physics is declining and to explain such scenarios, Hoffman (2002) asserted that the best predictor is the concept a student has about his or her confidence in good performance. This therefore presents a need to make physics relevant to the students and adapting to their interest when delivering lessons (Dawson, 2000; Norman and Salley, 2006). With the growing concern in recent times to have a science classroom that is student centred, activity oriented and focused on understanding in order to facilitate learning for the majority of students (Owolabi, 2002), there emerges the urgent need to explore new approaches/theories with potentially radical teaching applications (Hoerr, 2000; Kelly and Tangney, 2003 and Campbell, 2004). In this regard, the groundbreaking theory of Multiple intelligences (MI) put forward by Howard Gardner which received much spotlight as a new trajectory in science teaching that is beyond the stereotype readily comes to mind. According to this theory, everybody possesses nine intelligences viz: verbal/linguistic, logical/mathematical, visual/spatial, bodily/kinesthetic, musical/rhythmic, interpersonal, intrapersonal, naturalistic and existential. This theory conceives human intellect in a more capacious way, taking into account a wide variety of human cognitive capacities, many kinds of symbol system and skills valued in a variety of cultural and historical settings. It sees intelligence as a set of abilities and skills that can help an individual learner to comprehend and respond to many different types of content in order to learn.

Infact, the theory suggest that everybody has the capacity to activate all the intelligences or different ways of thinking and learning.

In this respect, Gardner (1987) said:

It is of the utmost we recognize and nurture all of the varied human intelligences, and all of the combinations of intelligences. We are all so different, largely because we all have different intelligences. If we recognize this, I think we will have at least a better chance of dealing appropriately with the many problems that we face in the world. P.189.

The MI theory has been embraced by educational theorists and applied by teachers to the problems of schooling (Smith, 2002) because of its appeal for the wholistic development of the child which can broaden success in school (Gardner, 1983; Mckenzie, 2002; and Haggai, 2003). The theory has equally challenged traditional beliefs in the fields of education and cognitive science (EBC, 2004).

Campbell and Campbell (2000) assert that the use of MI theory in the classroom can help students learn better by approaching understanding from different angles. Therefore, classroom activities that teach to the intelligences foster deep understanding that can translate into enhanced achievement (Campbell, 2004 and Eisner, 2004).

The MI theory readily derive a theoretical framework from cognitivism (learning as knowledge acquisition), a major metaphor of learning which is relevant to classroom instruction. Mckeachie (1994) showed that cognitivists argue that individuals do not just react to or perform in the world; they possess minds, and these minds contain mental representations – images, schemes, pictures, frames, languages, ideas and the like. The implication of this is that the numerous internal representations harboured by individuals in their minds/brains opens up enormous educational opportunities. Thus, understanding the specific minds involved in an educational encounter and trying to teach individuals in ways that are consonant with or that stretch their current mental representation is very needful especially in classroom instruction. This underlying framework in the light of multiple intelligences points to the truth that knowing and being aware of the different learning modes and incorporating same into lesson planning in order to address multiple aspects in the presentation of a particular concept can be very rewarding (Beckman, 2002).

Equally of immense relation to this study in the Brunerian theory: specifically, the assumption that human behaviour is purposively and generally directed to the attainment of certain results or objectives. Thus, most human behaviour or activities including perception, concept attainment, discovering and inquiry, skill mastery, solution of a problem can be considered problems whose solutions are actively constructed by the teacher. Through an MI lens, a teacher can offer different pathways for students to learn rather than just filtering all information and learning through the “scholastic intelligences”. This variety of experiences can be converted into greater learning outcomes.

Multiple Intelligences Development Approach (MIDA) is an instructional approach for the development of students learning abilities by utilizing the MI theory/principles backed by the teaching package MIDEPS. This unique and expanded repertoire of strategies and materials based on MI theory but situated in the expository teaching approach is used in this study to stimulate the nine abilities and skills of physics students through curriculum contents elements and related activities.

The MIDA structure that illustrates the role of MI theory is shown in figure 1 below:

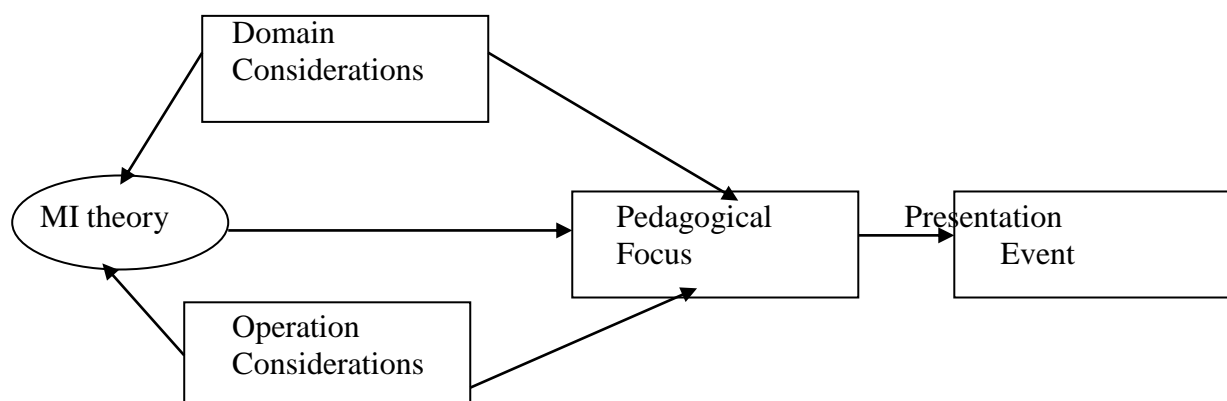


Fig. 1: Structure of MIDA

This MI based approach uses expansive strategies and evocative materials, in addressing the difficulty encountered by students in understanding sound concepts. This is with a view to bringing about desirable school achievement and interest in order to entrench science as epicenter of knowledge for education, economic and cultural development (AKSPST, 2004).

For sometime now, it has been observed that in the science teaching process, the typical interaction pattern is indicated by the lecture or the traditional chalk-and-talk method in which the teacher exerts his dominance in the classroom by giving facts and opinions, overviewing a materials, posing problems and even solving same for the students. This methods which involves a one-way communication pattern in which students' participation is virtually non-existent is a teacher-centred method where learners learn concepts and principles by role memorization (Dagoli, 2000). Modern science education agree that the lecture method is outdated and wondered why it is still prevalent in the educational systems in Nigeria and other African countries inspite of its ineffectiveness in promoting the learning of science (Njoku, 2003 and Uzoечи, 2004). Indeed, research has shown that traditional teaching methods have negative effects on the ability of majority of students to learn physics (Erdemir, 2004).

But Jimoyiannis and Komis (2001) showed that an alternative instructional tool can help students to confront their cognitive constraints and develop functional understanding of physics which can lead to higher cognitive achievement. For instance, the high-quality "transmissive" instructional approaches adopted for physics teaching by Geelan, Wildy, Loudon and Wallace (2004) led to high-quality understanding on the part of the students owing to its sensitivity to issues of context and content and its rich, resourceful and evocative effects respectively. And so to increase the level of success in physics education, there is need to implement new teaching methods (Reid and Skryabina, 2002; Gonen and Basaran, 2005).The rationale for this study is to put to rest the speculative position that MI theory has high potential for educational success. Also there seems to be no empirical study on the use of an MI based approach. Clearly, this study sets out to find the efficacy MIDA and conventional approach on students interest and achievement in physics.

This study is likely to bridge the gap of paucity of research evidence on the use of MI approach in Nigeria and in the subject area of physics.

Statement of the Problem

The growing decline in students' interest and achievement in physics in Nigerian schools have generated extensive worry in the secondary education system; especially when the importance of this fundamental subject in providing analytical, problem-solving and quantitative skills which can aid national development is considered. Literature tend to challenge the prevailing method of teaching physics in schools. This has necessitated this study aimed at establishing the relative effectiveness of Multiple Intelligences Development Approach (MIDA) and the Conventional (expository) approach in enhancing students' interest and achievement in physics.

Purpose of the Study

This study aimed at investigating the effect of Multiple Intelligences Development Approach (MIDA) on students' interest and achievement in physics. This study specifically:

1. assessed if there a significant difference in physics students' interest when exposed to Multiple Intelligences Development and Conventional (expository) approaches.
2. verified if there is a significant difference in physics students' achievement when exposed to Multiple Intelligences Development Approach (MIDA) and Conventional (expository) approach.

Research Hypotheses

The following research hypotheses were posited and tested at 0.05 level of significance.

1. There is no significant difference between the mean interest scores of physics students taught sound concepts using MIDA and those taught using the conventional approach.
2. There is no significant difference between the mean achievement scores of physics students taught sound concepts using MIDA and those taught using the conventional approach.

RESEARCH METHOD

The study adopted non-randomized pre-test, post-test experimental and control group design. The multiple intelligences of students were manipulated through a development approach as independent variable and its effect on the interest and achievement of students carefully observed in the quasi experimental study on the concept of sound in physics. The design used intact classes (groups) owing to the inability to fully control and totally randomize the subjects. Assignment of intact classes to groups and to different treatment conditions was random. Treatment was also administered to intact classes or groups.

The study was conducted in Ukanfun Local Government Area of Akwa Ibom State of Nigeria. The area was chosen for the study because of insufficient science skills among the students of the area and the embarrassingly low percentage of candidates with five credit passes and above at Senior Secondary Certificate Examination (SSCE) from statistics released by the National Manpower Board between 2011 and 2014. As at 2014, the percentage share of candidates who set for SSCE in the state and who got five credit passes and above including physics was only 25.0% and a very negligible percentage for Ukanafun Local Government Area. However, the study assumes that the local government area has secondary schools that could be adjudged satisfactory in terms of educational materials/provisions, instructional facilities and staffing.

The population of the study comprises all the senior secondary two (SS2) physics students for the 2015/2016 session in the 14 secondary schools in the study area. The population size was estimated at one thousand students. These students were used because they were not distracted by the requirements of

an external examination such as SSCE by WAEC and NECO. Purposive sampling technique was employed to select schools based on the criteria that the school was well equipped with functional laboratories and have at least one graduate physics teacher with a minimum of three years experience on the job. Six (6) schools met the criteria. And the selection and assignment of an intact class in the different schools to experimental and control groups was to reduce errors due to interaction and exchange of ideas among research subjects.

The instruments used for the study were the adapted Haussler and Hoffman Interest Scale in Physics (HHISP) and a researcher-made Achievement Test in Physics (ATP). The Haussler and Hoffman Interest Scale consist of three dimensions: topic, context and activity with each statement using a 5-point likert scale (1 = do not agree, 5 = absolutely agree). It has a Cronbach Alpha of 0.88. The ATP was a 4-option multiple choice objective test developed on the concept of sound waves in physics. ATP which was administered for pre-test and post-test measurements had forty five items initially but was pruned down to twenty five (25) items in a face-validation exercise performed by three experts in physics education. The validation procedure ensures that the 25 items covered the requisite content area and indeed measured what they were meant to measure.

Two lesson packages namely: Conventional Development Package in Sound (CODEPS) and Multiple Intelligences Development Package in Sound (MIDEPS) both based on the concept of sound and its application as contained in the physics curriculum for senior secondary schools in Nigeria were utilized for teaching in the study. Both lesson packages adopted a format that ensured identical content elements, basic instructional objectives and mode of evaluation. The CODEPS had lessons developed to quickly expose students to information and illustrations and summary of ideas. The MIDEPS was an enriched version of the conventional lesson notes; developed by the researcher, which employed multiple intelligences strategies and activities to exercise and stimulate students pluralistic intelligence during the instructional process. The MIDEPS involved a whole new kind of lesson planning that approaches the teaching of the concept of sound in nine (9) different ways in the learning stations created in the laboratory. Of special note were the Word, Number/Reasoning, Picture, Body, Music, people, self, nature and life learning stations or centres set up on the laboratory benches and designated with signs. Materials of MIDEPS provided multiple entry points into the content areas of the lesson in the package. MIDEPS was therefore the backup package for MIDA and used MI techniques and an array of materials.

A reliability coefficient of 0.84 was obtained for the ATP instrument using parallel form reliability and the Pearson Product Moment Correlation analysis while the Alpha value of 0.89 was obtained in the analysis performed to check the reliability of the Haussler and Hoffman interest scale. The corrected item total correlation was also high.

For the research procedure, the domain (curriculum and associated requirements in sound) and operations (nine different intelligences, representing different ways of learning) was viewed through an MI perspective (for the experimental group) thereby defining the pedagogical focus. The pedagogical focus moves the MI from a set of principles to actual implementation by structuring the sound concepts into meaningful and related learning units with each unit having multiple representations of the content based on the principle of multiple intelligences. It introduces the MIDEPS which utilized a delineated instructional objectives for each intelligence for the creation of lesson design, approaches and implementation techniques in developing MI concepts in sound through the provision of rich classroom experiences and opportunities for authentic learning based on students' interest. The pedagogical focus leads to the presentation or instructional event which recognizes the key elements of the teaching process,

viz: awakening, explaining, reinforcing and transferring. The instructional sequence was accomplished with movement to the learning stations or centres where the learners' attention were awakened by capitalizing on their entry behaviour. Thereafter, explanation of curricular content elements of sound in different ways using MI was carried out, following by reinforcement through the review of the key points of the lesson and then finally allowing the students to exhibit interactive actions to fully grasp the concept taught. Student brought out their strengths and shared their expertise in the learning process under the guidance of the teacher. Transferring as an element of the teaching process concludes the presentation event at the centres (stations). The conventional (lecture) teaching approach was used for the control group by utilizing the Conventional Development Package (CODEP). Before the experiment commenced, both groups were given the pretests. This was followed by the experiment with strict adherence to the two instructional packages developed. The experiment lasted for four weeks after which post-tests were administered to the subjects in the experimental and control groups. Data collected were analysed using Analysis of Covariance (ANCOVA).

RESULTS

The results of the study are presented in the tables below, firstly with the descriptive statistics and secondly in accordance with the stated hypotheses.

Table 1: Summary of descriptive statistics associated with treatment

| S/N | Variables | Group | | Pre-test | Post-test | Mean |
|-----|-------------|----------------------|------|----------|-----------|-------|
| 1. | Interest | Experiment (MIDA) | Mean | 45.49 | 59.82 | 14.33 |
| | | | N | 51 | 51 | |
| | | | SD | 2.65 | 4.49 | |
| | | Control (Conv.) | Mean | 35.47 | 49.74 | 14.27 |
| | | | N | 49 | 49 | |
| | | | SD | 2.67 | 1.50 | |
| 2. | Achievement | Experiment (MIDA) | Mean | 47.47 | 62.29 | 14.82 |
| | | | N | 51 | 51 | |
| | | | SD | 2.38 | 2.04 | |
| | | Control (Conv.) | Mean | 37.49 | 52.27 | 14.78 |
| | | | N | 49 | 49 | |
| | | | SD | 2.42 | 2.05 | |

NB: MIDA = Multiple Intelligence Development Approach
Conv. = Conventional Teaching Approach (Expository)

Hypothesis One

Ho₁: There is no significant difference between the mean interest scores of physics students taught sound concepts using MIDA and those taught using the conventional approach.

Table 2: Analysis of Covariance (ANCOVA) for students overall interest scores by treatment

| Source of Variation | Sum of Squares | df | Mean Square | F | Sig. | Decision at P<.05 |
|---------------------|----------------|-----|-------------|----------|------|-------------------|
| Corrected Model | 2629.886 | 2 | 1314.943 | 1755.103 | .000 | S |
| Intercept | 550.924 | 1 | 550.924 | 735.339 | .000 | S |
| Pre-test | 146.462 | 1 | 146.462 | 199.488 | .000 | S |
| Treatment | 155.461 | 1 | 155.461 | 207.500 | .000 | S |
| Error | 72.674 | 97 | 749 | | | |
| Total | 303884.000 | 100 | | | | |
| Corrected Total | 2702.560 | 99 | | | | |

Adjusted R Squared = .973

NB: S = Significant at P <.05

Table 3: Multiple Classification Analysis (MCA) of Post-test interest scores by treatment

Grand Mean = 54.83

| Variable + Category | N | Unadjusted Deviation | Eta | Adjusted for Independents + Covariates | Beta |
|-------------------------|----|----------------------|-----|--|------|
| Treatment | | | | | |
| 1. Experimental | 51 | 4.99 | .82 | 2.68 | .84 |
| 2. Control | 49 | -5.09 | | -2.68 | |
| Multiple R ² | | | | | .973 |
| Multiple R | | | | | .986 |

As shown in Table 2, the main effect of treatment with an F-ratio of 207.500 was significant at P < .05 alpha level. Hence, the null hypothesis which stated that there was no significant effect of MIDA on students' interest in physics was rejected and the alternate hypothesis upheld. This implies that the two types of treatment (MIDA) and expository approach differs significantly in their enhancement of the interest of physics students. Indeed, Table 1 gives a mean gain of 14.33 in favour of the experimental (MIDA) group while the control group had 14.27.

As a result of the main effect of treatment on students' interest in physics, MCA aspect of ANCOVA was employed to detect the direction of differences between the respective groups (see Table 3). The MCA gives an indication of the interest of each group. At the treatment level, the experimental group has a higher adjusted post-test mean score (57.51) than the control group (52.15), the group mean being 54.83. In this case therefore, physics students in the experimental (MIDA) group had more interest than those in the control (expository) group.

To determine the index of relationship and also ascertain the variance of the dependent variable (interest in physics) that is attributable to the influence of the independent variable (teaching approaches – MIDA and expository), a multiple regression squared index (R²) of 0.97 was recorded. This implies that 97% of the total variance in the interest of student in physics was attributable to the influence of teaching approaches used.

Hypothesis Two

Ho₂: There is no significant difference between the mean achievement scores of physics students taught sound concept using MIDA and those taught using the conventional approach

Table 4: Analysis of Covariance (ANCOVA) for students overall achievement scores by treatment

| Source of Variation | Sum of Squares | df | Mean Square | F | Sig. | Decision at P<.05 |
|---------------------|----------------|-----|-------------|----------|------|-------------------|
| Corrected Model | 2764.164 | 2 | 1382.082 | 1122.834 | .000 | S |
| Interrupt | 222.608 | 1 | 222.604 | 180.848 | .000 | S |
| Pre-test | 290.698 | 1 | 290.698 | 236.170 | .000 | S |
| Treatment | 35.533 | 1 | 35.533 | 28.868 | .000 | S |
| Error | 119.396 | 97 | 1.234 | | | |
| Total | 332130.000 | 100 | | | | |
| Corrected Total | 2883.560 | 99 | | | | |

Adjusted R Squared = .958

NB: S = Significant at P <.05

Table 5: Multiple Classification Analysis (MCA) of Post-test achievement scores by treatment

Grand Mean = 57.35

| Variable + Category | N | Unadjusted Deviation | Eta | Adjusted for Independents + Covariates | Beta |
|-------------------------|----|----------------------|-----|--|------|
| Treatment | | | | | |
| 1. Experimental | 51 | 4.94 | .84 | 1.39 | .86 |
| 2. Control | 49 | -5.08 | | -1.39 | |
| Multiple R ² | | | | | .959 |
| Multiple R | | | | | .979 |

Table 4 reveals the result of the main effect of treatment on students achievement in physics. The observed F-value for treatment was found to be significant at the 0.05 alpha level ($F(1,99) = 28.868$; $P < .05$). This implies that hypothesis two was rejected. That is, there was a significant effect of treatment on students achievement in physics. Table 1 equally present mean gain scores of 14.82 and 14.78 for the experimental (MIDA) group and the control (expository approach) group respectively. As a result of the main effect of treatment on students' achievement in physics, the data was subjected to MCA (see Table 5 above), in order to determine the magnitude and direction of effect. Thus, the MCA in Table 5 shows the adjusted mean achievement scores of the students according to treatment. At the treatment level, the experimental group has a higher adjusted post-test mean (58.74) than the control group (55.96), the grand mean being 57.35. It is evident here that the MIDA group performed better than the conventional or expository group.

DISCUSSION OF FINDINGS

The MIDA in physics, as an interest enhancing treatment approach proved to be a significantly efficacious treatment. The approach was found to have contributed significantly to the gain in the interest scores of students exposed to it. This result can be explained in terms of the fact that the MIDA took into

cognizance the students creative behaviour as well as their show of imagery and active imagination in providing a variety of special teaching and enrichment activities to the experimental group. Students situational interest was sustained through their involvement in these meaningful activities. The findings of this study lend credence to the fact that an MI approach to teaching when developed will lead to educational measures gains (Gardner, 1995). This is in agreement with the work of Guignon (1998), Roth and McGuin (1998) and Gardner (2001). The need arises therefore to restructure the conventional curriculum to reflect multiple intelligences techniques and strategies related to sound concepts to stimulate students interest during the teaching-learning process.

Also, Table 4 indicates a significant difference in the mean achievement scores of students exposed to MIDA and those exposed to the conventional lecture method. Thus, the null hypothesis was rejected. And the MCA in Table 5 showed a higher adjusted post-test mean for the MIDA group. It is reasonable to infer that the academic environment provided by the MIDA was richer than that obtainable through the conventional (expository) approach, hence the significantly better achievement of the experimental group. This may imply that exposure of students to child-centred, practical-oriented teaching approach such as obtained from the use of MIDA, have potentials for improving students understanding of sound concepts and hence improved achievement. The achievement gain recorded indicates that the teacher was able to stimulate the ability of the students to use a variety of manipulatives and solve problems through physical activities in sound. MIDA provided a different kind of science classroom with its range of activities and experiences energizing the classroom. This facilitated learning and helped the students to achieve remarkably in sound concepts in physics.

Clearly, the achievement recorded was due to practical involvement and qualitative teaching which enhanced student learning (Packard and Hudgings, 2002; Gunstone and White, 2005).

The results support the speculations of Gardner (1983) and Mckenzie (2002) as well as the findings of Watt and Zaman (1998), Weber (2001) and Trindade, Fiolhais and Almeida (2002) who reported that child-centred, practical-oriented teaching/learning approaches have potentials for superior students achievement in science (physics inclusive).

CONCLUSION

The use of the MIDA in teaching sound concepts has proved to be an effective approach in teaching physics. Not only do the student taught with the use of MIDA develop higher interest than those taught with expository approach but MIDA has proved that it is capable of improving achievement in physics.

From the findings, it would be confirmed that MIDA is student-centered and learning is encouraged through its student-friendly and stimulating settings. The result of the study seems to have helped in paving the way forward in the search for effective teaching/learning approaches that are potentially viable especially in teaching and learning of physics, for improved achievement.

IMPLICATIONS OF THE FINDINGS

The findings of this study suggest the following in terms of theory and practice.

1. Since MIDA was more efficacious in facilitating physics students' interest and achievement, it implies that its choice as a teaching approach for physics would no longer be speculative but based on empirical evidence as in this study. Physics teachers are therefore encouraged to use MIDA.

2. The MIDA as a teaching approach stimulated active involvement by the students. Thus the use of an MI approach should be considered by teachers as a means of ensuring that the learning needs of the students are catered for through active participation. The active involvement of the students in MIDA group gave rise to efficient learning. Physics teaching and learning therefore should be made more stimulating for students. The MIDA sees the learner as an active information processing organism.
3. The enhanced interest and improved achievement in the difficult concept of sound in physics brought about by MIDA is enough evidence to convince experts of curriculum planning to integrate MIDA into the school teaching programmes. The aim is not only to disseminate information but also to motivate the students as well as to generate participation for an MI approach. MIDA should also form part of teaching approaches used in our schools for teaching.
4. The situation in Nigerian schools where students are always studied with facts without an array of materials and techniques does not seem to encourage autonomy of learners. Physics should be learnt with activity-oriented approaches and provision should be made for more classroom interactions with a view to improving students' diverse educational measures.

RECOMMENDATIONS

Based on the findings of this study, the researcher recommends that:

1. MIDA should be adopted as an approach of instruction for teaching physics and its use should be encouraged in the teaching and learning of physics at the senior secondary school level.
2. Education Ministry, departments and agencies as well as professional science Associations should organize workshops, conferences, seminars, refresher courses, inservice training, etc in order to publicize and popularize the use of MIDA in teaching difficult concepts in physics.
3. Physics curriculum should be reviewed in terms of available instructional approaches to incorporate an MI approach with its differentiated strategies and materials; concepts and paradigms in a systematic and complementary fashion so that the initial conceptual status of the students are challenged for improved achievement.

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