AN ASSESSMENT OF THE IMPACT OF GENDER ON MEAN INTEREST SCORE OF CHEMISTRY STUDENTS TAUGHT USING MEND MAPPING TEACHING STRATEGIES (MMTS) IN ENUGU.

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Abstract
This study seeks to assess the impact of gender on mean interest score of chemistry students taught using mind mapping teaching strategies (MMTS) in Enugu.The study sought to specifically study the following objectives; to determine the difference in mean interest score of students taught using MMTS and those without it; to determine the difference in mean interest score of male and female students taught using MMTS; to ascertain the interaction effect of gender and treatment on mean interest score of students taught using MMTS and those taught without it. A quasi experimental, non-equivalent, non-randomized pre-test post-test research design was adopted. The population of the study was 4,698 SS2 chemistry students in Enugu Educational Zone in 2008/2009 academic session. The sample was 194 SS2 chemistry students drawn through multistage sampling technique. The instrument (CII) was developed by the study and validated by two University experts in measurements and evaluation and two university experts of Chemistry Education. The instrument was trail tested at secondary schools in Enugu Education Zone in Enugu State. The internal consistency of the CAT was obtained using Kudder Richardson formula 20(KR-20) and Cronbach alpha procedure. Reliability coefficients of 0.8359 was obtained for the CAT. Mean and standard deviation scores were used to answer the two research questions while the three null hypotheses were tested at 0.05 level of significance using analysis of covariance (ANCOVA). Results showed that MMTS was more effective in facilitating students' interest in chemistry than the control group. Gender was a significant factor on students' academic achievement in chemistry when taught using MMTS. Furthermore, the results revealed a significant interaction effect of gender and treatment on interest. The study recommended that Chemistry teachers in colleges of education, institute of education, department of science education, curriculum planners and textbooks authors should adopt it in order to ensure meaningful teaching and learning in chemistry and also to inspire students to study the course.

Keywords: Gender, Mean Interest Score, Chemistry Students, Mend Mapping Teaching Strategies (MMTS).

Introduction

The primary purpose of teaching at any level of education is to bring a fundamental change in the learner (Tebabal & Kahssay, 2011). To facilitate the process of knowledge transmission, teachers should apply appropriate teaching methods that best suit specific objectives and level exit outcomes. In the traditional epoch, many teaching practitioners widely applied teacher-centered methods to impart knowledge to learners comparative to student-centered methods. Until today, questions about the effectiveness of teaching methods on student learning have consistently raised considerable interest in the thematic field of educational research (Hightower et al., 2011). Moreover, research on teaching and learning constantly endeavour to examine the extent to which different teaching methods enhance growth in student learning.

Quite remarkably, regular poor academic performance by the majority students is fundamentally linked to application of ineffective teaching methods by teachers to impact knowledge to learners (Adunola, 2011). Substantial research on the effectiveness of teaching methods indicates that the quality of teaching is often reflected by the achievements of learners. According to Ayeni (2011), teaching is a process that involves bringing about desirable changes in learners so as to achieve specific outcomes. In order for the method used for teaching to be effective, Adunola (2011) maintains that teachers need to be conversant with numerous teaching strategies that take recognition of the magnitude of complexity of the concepts to be covered.

Recently, there has been a back drop in the academic performance of science inclined students basically in the area of chemistry, and this has been attributed to the teaching methods and practices used in the teaching industry. As a result of this back drop many students seem to have lost interest in the study of chemistry due to the complexity of the course and the undiluted teaching methods used in teaching the course. There has been a demand for a better method of teaching which will inspire student's interest in Chemistry, thus many professionals and experts in the field have opted for mind mapping teaching strategies (MMTS).

Buzan (1991) stated that mend mapping teaching strategy (MMTS) is a constructive and classification graphic organizer of ideas which uses the cortical skills to unlock the brain potentials. Buzan and Buzan (2006) stated that a mend map is a powerful graphic organizer of ideas, which provides a universal key to unlock the potential of the individual brain. It harnesses

the full range of cortical skills, words, image, number, logic, rhythm, colour and spatial awareness in a single uniquely powerful manner. In doing so it gives the learner the freedom to roam the infinite expanses of his or her brain. Although some persons are of the opinion that the efficacy of this strategy is gender based, but it has not yet been proven.

Therefore, this study seeks to study the impact of gender on mean interest score of chemistry students taught using mind mapping teaching strategies (MMTS) in Enugu.

Statement of the Problem

There is a growing concern about which strategy or method of teaching in our secondary schools should be able to reverse deteriorating trends in students' declining interest in their study of chemistry. Some suggestions have been made regarding the identification of scientific teaching methods and strategies which motivate students better to learn and achieve superior results in their study of chemistry. Researchers have indicated that teachers use ineffective teaching methods and strategies in teaching secondary school chemistry which among other factors have contributed to deteriorating students' achievement in chemistry. The situation, therefore calls for the use of other teaching strategies which have been found effective in some other subject areas and countries. One of such teaching techniques is the use of mind mapping teaching strategy (MMTS). Thus this study seeks to evaluate the inherent problem, and the efficacy of using the mind mapping teaching strategy in solving this problem.

Objectives of the Study

Specifically, the study;

i. Determined the difference in mean interest score of students taught using MMTS and those without it
ii. Determined the difference in mean interest score of male and female students taught using MMTS.
iii. Ascertained the interaction effect of gender and treatment on mean interest score of students taught using MMTS and those taught without it.

Literature Review

Conceptual Framework

Constructive teaching and mend mapping process

Any internally or externally mediated cognitive process that facilitates the transfer of information to be taught from short-term memory to long-term memory can be defined as a teaching strategy (Bruning, 1993). Learning/ teaching strategies are used to construct, rehearse, organize and elaborate information to make it more meaningful. Some commonly used strategies includes all forms of advance graphic organizers, underlining, analysing key points, repetition, outlining, categorization, concept mapping, mental imaging, queuing, forming analogues, inserting questions, paraphrasing, note taking method, providing instructional objectives prior to instruction (Novok 1998) and mend mapping (Buzan and Buzan, 2006).

All of these strategies are not equally effective in facilitating achievement of different learning objectives. In other words, which learning strategy is appropriate depends upon many other factors such as learning objectives to be achieved, individual differences of the learners, level or extent of prior knowledge of the learner, learning resources, process of the learning conditions and environment, teaching/learning methods etc. researchers in education have shown that a number of factors influence students attainment of objectives of instruction. Some of the factors have to do with students, teachers, socio-economic status of the parents, resources available for teaching and learning, instructional methods and instructional strategies adopted by the teaching and even more (Ausubel, 2002; Odubunmi, 1983; Ali, 1994; Ezeh, 1992; Okeke, 1986; Nworgu, 1990 and Mkpa, 1997).

Recent instructional techniques adopted by science educators tend to show more concern for the development of methods and strategies that could facilitate learning more effectively (Mkpa, 1997; Ezeah, 1992 and Buzan, 2001; 2005 and 2006). Most research findings in education tend to indicate that instructional method adopted by the teacher can influence the cognitive and effective outcomes of the students (Mkpa, 1997); Ali & Anaekwe (1997); Ezeh, (1992); and Balogun (1992). Ausubel (1986) hypothesized that instruction can be organized in such a way that all students in a class can achieve at high level which is accomplished only by best students.

Fafunwa (1997) emphasized those feasible and practical instructional methods that could improve cognitive and effective outcomes in sciences classrooms need to be sought for. Similarly some Nigerian educators & researchers such as Ali (1996) and Egbugara (1983) emphasized the need for examination of instructional practices in our educational institutions especially at secondary school level. To this end, researchers have been and are still being carried out by many others and educators with the aim of adopting or developing some of the existing instructional methods for the improvement of learning in our secondary schools.

Furthermore, elaboration of information is specifically useful in enhancing memory when similarities, differences, relationship and associations among items are being emphasized. In other words, elaboration of information helps the synthesizing of information (Maltin, 1998). Various learning methods can affect the learning result by constructing and elaborating on the information being processed. Mend mapping strategy (MMTS) with different degrees of construction and elaboration would instigate different levels of information process and therefore would bring about different enhanced learning results. Therefore, the study tenders that mend mapping teaching strategy is one of the constructivist teaching method. If MMTS is adopted and applied strictly to learning situations in our secondary schools could enhance students mean interest score in secondary school chemistry. This is the focus of this study.

Empirical framework

Students' gender and interest in chemistry

Many studies have been conducted on the students' gender interest in chemistry. Anaekwe (1997) conducted a research on the effect of students interaction pattern (SIP) on students' interest in chemistry including other dependent variable. He reported that there is a significant effect of SIP on students' interest in chemistry. Also, Ifeakor (1999) studied the effects of assessment techniques on students' interest in chemistry and reported a significant effect on students' interest towards chemistry. In a related study Ezeh (1992) noted that teaching strategies have been known to influence students' interest in science. There is no consensus view on the contributive factors that affect Nigeria Students' disposition in chemistry and chemistry related

careers. Truly, interest is very important to understand the individual learner and to guide students' future activities (Ifeakor, 2003).

It should be noted that science in general and chemistry in particular offers prospective career opportunity to students and as such, some students could have vocational interest in chemistry and chemistry related career i.e. positive disposition. This underscores the need for strategies and methods that enhances students' interest in chemistry classroom.

In another related study Chidolue (1983) researched into the apparent lack of interest shown by female students towards physics and chemistry. She reported that female students' aversion of mathematics and general lack of interest in sciences that require calculations by them is due to various laws and formulae to be committed to memory. The researcher therefore tenders that many secondary school chemistry teachers do not relate these laws, formulae and convert them into activity based type for the students. Consequently the students instead of acquiring problem solving skills, they attempt committing the laws to memory.

Furthermore, Ezeh (1992) noted that teaching strategies have been known to influence students' interest in science therefore, there is no consensus of views on the contributive factors that affect Nigerian students' interest in science especially in chemistry. According to Balogun (1985), Okebukola and Jegede (1989), Nigerian students generally have interest in all the basic sciences. However the researcher proposes that Nigerian students find science difficult because of the uninteresting mode of presentation. The study of science especially Chemistry is activity based. Activity based teaching requires that the teacher does while the students by simulation do same over and over by themselves and learning would have taken place. In fact interest is very important to understand the individual learner and to guide his/her further activities. It should be noted that chemistry offers prospective carrier opportunity to students and as such many students could have vocational interest in chemistry and chemistry related careers. This therefore underscores the need for teaching strategy that could enhance interest in chemistry classroom. The use of MMTS may invoke students' interest in chemistry. The students may prefer being taught chemistry using MMTS or without it. This should serve as a litmus test.

Students' Disposition in Chemistry

Research reports revealed that students have negative conceptualization in the nature, structure, language of communication in chemistry (Okebukola, 1990; Okeke, 2005). The basic unit of thinking and comprehension is concept. It is generally accepted that one of the basic processes in the development of human intelligence seems to be concept acquisition.

Roop (2002) stated that concepts are the essential modus operandi of higher mental processes of problem solving and reasoning. Roop (2002) described concepts as the premises, the foundation and structural steel of thinking. From the foregoing there are needs to be understood and communicated. Therefore it is only reasonable to make conceptual construction of learning the focus of chemistry instruction in our schools. Indeed it has been shown that poor performance on chemistry concept construction of learning appears less a function of deficiencies in the acquisition of scientific information than of inabilities to comprehend, interpret correctly and apply scientific concepts in novel situations (Adeniyi, 1997; Okebukola, 1990). In spite of the central role that concepts play in the construction and understanding of chemical knowledge, research has shown that students find chemistry concepts difficult to learn (Ivowi, 1984). The difficulty of students in understanding basic concepts of chemistry, for example the atomic model of chemistry can be assumed to be due to method of presentation and probably other factors Anaekwe (1997).

Another major source of difficulty that students encounter in addition to nature and structure of chemistry is the language of chemistry. Scientists and chemistry educators have been using shorthand notation for many years. There is no doubt that the use of symbol and signs bring efficiency, but provided that the writer (teacher) and the reader (learner) understand the symbols and notation in the same way. For example the notation 2Cl means to chemistry teachers' two individual atoms of chlorine, while Cl_2 means a molecule of chlorine in which two atoms are held firmly together by force known as covalent bond. We often forget that the novice is not very familiar with the ideas of structure and bonding and the difference between atoms and molecules is not obvious to him. The chemistry language as used in the classroom right from the beginning adds to the difficulty that students have with new abstract concepts. Several authors have reported on difficulties that beginning chemistry students have in interpreting correctly chemical language. Okeke (2005) reported that many students do not even differentiate clearly between

symbols such as H, H_2 and H+ and they attach to these symbols incorrect meaning. Therefore the researcher tenders that many students do not differentiate the equality (=) and arrow ( ) meanings in balancing chemical equations. Njoku (1997) reported that many students even after studying chemistry do not understand the role of formulae. Some think that formulae are just mere abbreviations for names rather than a shorthand way to represent composition and structure.

According to Njoku (1997) ill-equipped or sometimes no equipped laboratory is one of the factors that could lead to students poor result in science subject especially chemistry. Also the opinion of the missionaries and colonial masters had for us over science as a discipline had adverse effect over the teaching and academic achievement as a whole. To support this Abdullahi (1982) stated that students poor achievement in science subject during the colonial era was the alien content of the science curricula, the emphasis is on rote learning of irrelevant definitions, laws and theories, non-exposure of students to practical due to the lack of science teaching facilities and qualified teachers, foreign examination boards and the worst was poor teaching methods and strategies. Today the story is not different as the poor achievement in science subjects especially in chemistry persisted. Efforts made to encourage the teaching and learning of science by the independent Nigeria administrators was near futile. Okebukola and Jegede (1989) tested the hypothesis that students engaged in concept mapping activities on a co-operative basis will achieved meaningful learning better than students working individually on concept mapping task. The sample consisted of 145 students (84 boys, and 61 girls). Mean, standard deviation and ANCOVA were used for data analysis. The result revealed that co-operative teaching was superior to individual mode. They therefore concluded that concept mapping strategy appears to be a promising strategy for arresting the declining performance in science. Will similar mend mapping teaching strategy do the same in chemistry? The study seeks to find out. Also Jegede et al (1990) found in a study of biology learning that "there was a tendency for the concept mapping strategy to significantly reduce anxiety towards biology achievement in males". They suggested that anxiety which has been found to effect learning (Novak and Godwin, 1996; Okebukola and Jegede, 1989), certainly shoed that pressures, which exert considerable influence on learner's intellectual competence and performance in anxiety. They therefore concluded that concept maps confer on the learners the advantage of shaking off from the pressure, which would otherwise impede meaningful learning. Would mend map confer

the same effect in as much as they are similar? The study may supply the answer when completed. Many factors like methods of teaching, abstract nature of the subject, students' interest, and career job opportunities of the subject etc. can influence the academic performance of students towards any subject. Negative conceptualization has been indicated as a result of deteriorating achievements in chemistry over these years were generally very poor i.e. negatively disposed. Students were taught by their teachers using their own conventional teaching methods and reports revealed deteriorating achievement (WAEC, annual report 2001 to 2010). The researcher therefore proposes the use of constructivists' teaching strategy, MMTS to verify how it would affect academic achievement, interest and retention in senior secondary school chemistry. Chidolue (1983) researched into the apparent lack of interest shown by female students toward physics and chemistry. He observed that student's aversion for mathematics in them and general lack of interest in sciences is due to various laws and principles to be committed to memory. The use of MMTS may lead to positive disposition and increment in students' interest in chemistry. Students may prefer being taught chemistry with MMTS or without it.

Research Methodology

Research Design

This study adopted quasi experimental non-equivalent pretest-posttest non randomized control group design. Intact classes were then used for the study. Subjects were not randomly assigned to groups rather intact classes were assigned to experimental and control groups. The design way symbolically represented below

Table 1: Design.

Design	Interest
Experimental group (MMTS)	O_1 x O_2
Control group (CTM)	O_1 C O_2

X = Treatment using MMTS (experimental)

C = CTM (control)

O_1 = Pre-test of CII

O_2 = Post-test of CII

Population of the Study

All the senior secondary two chemistry students in Enugu Education Zone made up the population. The figure was 4,698 as indicated in the Post Primary School Management Board (PPSMB) statistical unit of Enugu Education Zone, 1st term 2008/2009 academic session. They were 23 state secondary schools in all made up of 11 single sex (4 male and 7 female) schools and 12 co-educational schools.

Sample and sampling technique

The sample of this study is 194 SS2 chemistry students (95 boys and 99 girls) in the four sampled schools. The students offered chemistry as one of their SS2 subjects. The sampling

technique was multi-stage sampling. 1st, 2 LGA out of 3 in the Education zone were sampled out by random sampling (balloting). 2nd, 11 single sex schools were purposively sampled of chemistry classes and gender is an independent variable of this study. 3rd, the single sex schools were stratified. Out of 4 male schools 2 were sampled and out of 7 female schools 2 were sampled by random sampling (balloting). 4th, out of the two streams from each school one class were assigned treatment (MMTS) and the other control (CTM) by random sampling (toss of coin). The distribution of the research subjects in their intact classes of this study is shown in Table 2 below.

Table 2: Distribution of Subjects in their Various Intact Classes in the School of Study by Gender

S/N	SCHOOLS	GENDER	MMTS (EXPERIMENTAL GROUP)	CTM (CONTROL GROUP)	TOTAL
1.	Girls Sec. Sch. Abakpa Nike Enugu	Girls	24	25	49
2.	Girls Sec. Sch. Emene Enugu	Girls	26	24	50
3.	Nike Grammar Sch. Enugu	Boys	25	23	48
4.	St. Patrick's Sec. Sch. Emene Enugu	Boys	23	24	47
	TOTAL		98	96	194

Instrument for Data Collection

The instrument developed for the study for data collection is the chemistry interest inventory (CII). The chemistry interest inventory (CII) was for collection of pre-test interest score and post-test interest score.

Development of Instrument

The CII is a 30-item interest inventory developed in the study. It has a 4 point scale response. The responses are strongly Agree, Agree, Disagree and Strongly Disagree. The respondents were expected to indicate their degree of agreement or disagreement on a number of statements (positive and negative) equal cues about the units of study in senior secondary chemistry. The instrument is non-dichotomously scored and there are 15 of positively and 15 negatively directed items. The scale and scoring pattern are shown below. The reliability coefficient of the test instrument was 0.7214

For Positive Items			for Negative Items		
Strongly Agree	=	4	Strongly Agree	=	1
Agree	=	3	Agree	=	2
Disagree	=	2	Disagree	=	3
Strongly Disagree	=	1	Strongly Disagree	=	4

Trial testing of Instruments

The CII instrument was trial-tested using twenty six (26) SS2 chemistry students of the college of Immaculate Conception (CIC) and twenty six (26) SS2 chemistry students of the Holy Rosary College (HRC) Enugu.

An hour was allowed for the test. The papers were marked, scores collated and collected. The choice of the above schools for the pilot testing was because these schools were considered equivalent to the schools of the study proper.

Reliability of the Instruments

The students' responses in the CII were used to calculate the reliability coefficient of the CII using Cronbach alpha procedure. The reliability coefficients for the CII obtained was 0.7214.

Method of data collection

The pre-test score, post-test scores were recorded after each marking exercise. The CII items scored 2 marks each. The maximum mark is 80 marks for pre-test, and post-test scores respectively. A total of 194 copies of the CII were issued and retrieved.

Methods of data analysis

The two research questions were answered using mean and standard deviation scores while the three null hypotheses were tested at 0.05 alpha level of significance using analysis of covariance (ANCOVA). The pre-test scores were used as covariates to the post-test scores. ANCOVA was appropriate here because it served as a procedure for controlling the initial groups' differences as well as increasing the precision due to the extraneous variables thus reducing error variance (Ferguson, 1981).

Decision rule

Reject the null hypothesis if the calculated value of test statistics F-Cal is equal to or greater than the critical or table value (F – Cal ≥ F critical) at 0.05 level of significance, and appropriate difference, otherwise accept.

Data Presentation, Analysis and Results

Research Question 1

What is the difference in mean interest score of students taught using MMTS and those taught without it?

Table 3: Mean (X) and Standard Deviation (S) of interest scores of subjects by gender (MMTS and CTM)

Method	Gender					
	Male		Female		Overall	
MMTS (experimental)	X	SD	X	SD	X	SD
	67.85	9.70	65.66	9.71	66.76	9.44
N	48		50		98	
CTM (control) N	56.13	17.24	63.90	11.05	60.01	14.14
	47		49		1. 96	
Overall						
N	61.20	3.20	64.78	10.38	63.39	11.79
	95		99		194	

As shown in table 3 above, mean interest score of students taught using MMTS is X = 66.76, and those taught using CTM is X = 60.01. The difference in mean interest score of students taught using MMTS and those taught using CTM is 6.75 in favour of MMTS groups. This is an indication that students taught using MMTS became more interested in chemistry than those taught using CTM. The standard deviation score obtained by the students taught using MMTS is 9.44 and those taught using CTM is 14.14. This is an indication that the MMTS group obtain lower spread out of score about their mean than the CTM group that obtained higher spread out of scores about their mean. In order to make a valid decision on whether the difference in mean interest score based on the use of MMTS and CTM in teaching senior secondary school chemistry is due to variance or error null hypothesis 1 was tested.

Hypothesis 1

There is no significant difference in the mean interest score of students taught using MMTS and those taught without it.

Table 4: Summary of Analysis of covariance on subjects' pre-CII and Post-CII mean interest scores by gender (MMTS and CTM)

Sources of variation	Sum of squares	Degree of freedom (DF)	Mean square	F-Cal	F –Critical	Decision at P≤ 0.05 level
Covariates	1858.45	1	1858.45	13.39		
Pretest	1858.45	1	1858.45	13.39	3.00	S
Main effect	2294.39	2	1147.19	8.26		
Treatment	2254.98	1	2256.98	16.26		
Gender	35.48	1	35.48	0.26	3.00	NS
2 way interactions	741.05	1	741.05	5.34		
Treatment X Gender	741.05	1	741.05	5.34	3.00	S
Explained	5563.51	4	1390.88	10.02	3.00	S
Residual	26242.42	189	138.85			
Total	**31805.99**	193	**164.80**			

S = Significant at 0.05 probability level; NS = Not Significant at 0.05 probability level.

As shown in Table 4 above, the calculated F-ratio for interest is 13.39 against the F-critical value of 3.00 at 0.05 level of significance, 1df numerator and 193df denominator. Since the F-calculated value of 13.39 is greater than the F-critical of 3.00. Null hypothesis 1 of no significant difference in the mean interest score was rejected. This implies that the observed difference in mean interest score of students taught using MMTS and those taught using CTM was significant. It was due to variance and not attributed to error.

Research Question 2

What is the difference in mean interest score of male and female students taught using MMTS?

As shown in Table 3 above, mean interest score of the female students taught using MMTS is X = 65.66 and those of the male students taught using same MMTS is X = 67.85. The difference in mean interest score of male and female students taught using MMTS is 2.19 in favour of the females. This indicates that the female students taught using MMTS became more interested than the male students taught using same MMTS. Similarly the standard deviation score of the female

students taught using MMTS is 9.71 and that of the male students taught using same MMTS is 9.70. This indicates that the female student taught using MMTS obtained higher spread out of scores about their mean than the male students that obtained lower spread out scores about their mean. Therefore, in order to make a valid decision on whether the gender difference in mean interest score based on the use of MMTS in teaching senior secondary chemistry was due to variance or error Null hypothesis 2 was tested.

Hypothesis 2

Gender does not significantly influence the mean interest score of students taught using MMTS.

As shown in table 4 above, the calculate F-ratio for gender influence on mean interest score was 0.2256 against the F-critical value of 3.00 at 0.005 level of significance, 1df numerator and 193df dominator. Since F-calculated of 0.26 level of less than F-critical of 3.00. Null hypothesis 2 of no significant gender influence on mean interest score was not rejected. This implies that the observed influence on mean interest score of students taught using MMTS was not significant. It was attributed to error and not variance.

Hypothesis 3

The interaction effect of gender and treatment on mean interest score of students taught using MMTS and those though without it is not significant.

As shown in table 4 above, the calculated F-ratio for interaction effect of gender and treatment on mean interest score of students taught was 5.34 against the F-critical value of 3.00 at 0.05 level of significance, 1df numerator and 193 df denominator. Since F-calculated of 5.34 is greater than the F-critical of 3.00. Null Hypothesis 3 of no significant interaction effect of gender and treatment on mean interest score of students taught using MMTS and CTM was rejected. This implies that the observed interaction effect of gender and treatment on mean interest score of students taught using MMTS and CTM was significant. It is due to variance and not attributed to error.

Summary of Result

The major findings in this report are shown below.

1. Mean interest score of students taught using MMTS was significantly higher than those taught without it.

2. Gender had no significant influence on mean interest score of students taught using MMTS
3. Significant interaction effect of gender and treatment on mean interest score of students taught using MMTS and those taught without it was observed.

Conclusion

This study has shown that the MMTS has significant effect on students' cognitive interest in Chemistry. The MMTS is more efficient than the CTM. Also the influence of gender on mean interest score was significant.

Recommendations

The use of MMTS has been proved to be effective in facilitating greater interest of students in chemistry content. Therefore, Chemistry teachers in colleges of education, institute of education, department of science education, curriculum planners and textbooks authors should adopt it in order to ensure meaningful teaching and learning in chemistry and also to inspire students to study the course.

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