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## Editorial Comment

The *Journal of Educational Development and Practice* (JED-P) is a journal of the Institute of Education, University of Cape Coast. Ghana. The journal focuses on contemporary issues in educational development in Ghana and other countries, particularly, in the context of a developing world. It also seeks to stimulate extensive dialogue and discussion on educational policy and practice. It equally promotes innovative and creative research-based approaches to solving educational issues. In view of this, articles that feature on the following issues are welcome: (a) Review of curricula practice, (b) Evaluation of educational policies and practices, (c) Evaluation of various educational programmes such as interventions by NGOs and governmental agencies and (d) Studies examining alternative models of educational delivery.

The journal publishes peer-reviewed, original, empirical and theoretical studies and targets local and international audiences. Important criteria in the selection of articles for publication are: quality of presentation, conviction in argument, clarity in presentations and educational significance. It is published once a year in **December**. Articles are received throughout the year. This seventh edition, published in December 2019, has nine articles of significance.

Eric Appiah-Twumasi investigates the impact of Generative Learning Strategy on Academic Achievement and Motivation to study physics among College of Education Students in Ghana. The study provides an empirical basis for using Generative Learning Strategy to promote students' achievement and motivation to learn physics, supported by the results of the findings. Specifically, the results indicated that Generative Learning Strategy increased students' motivation to learn physics. Also, no significant difference in performance by gender and high and low achievers with regard to the using Generative Learning Strategy were discovered. The implications of the results obtained are that physics teachers intending to improve the academic performance

of their students should consider using Generative Learning Strategy in teaching.

Gabriel Kwesi Aboagye and Hassana Ahmed, investigate teacher participatory decision-making as a pre-requisite for democratic governance in Ghanaian second cycle institutions. The thrust of the study was to establish the areas and ways of involving senior high school teachers in decision-making in schools in the Mampong Municipality by collecting data from 252 professional teachers. It was concluded that despite the numerous potential levels and ways of involving teachers in decision-making, the form of teachers' involvement in school decision-making was mostly consultative through meetings, though enough avenues existed. It is, therefore, recommended that the heads of schools should decentralise decision-making in their schools to allow for greater teacher involvement in decision-making.

Tobih, Adebayo and Aina examined the mathematics performance of 253 graduating students in relation to their mode of entry, from a University of Education and a Polytechnic in Ogun State, South Western part of Nigeria during 2014/2015 academic session. The study revealed that only 2.3% of students' achievement in mathematics could be explained by their entry mode and that students do not differ significantly in their academic achievement based on the mode of admission.

Jacob Issaka and Vera Esenam Fordjour Aidoo conducted their study to assess the readability of Ghana Education Service approved Social Studies textbooks used by students in the Junior High schools in Ghana. The study concludes that Social Studies textbooks should be assessed to determine their readability level before they are given to students.

Gabina Susuoroka investigates the effects of using manipulatives in the teaching and learning of algebraic expressions on Senior High School (SHS) one students' achievement in the Wa Municipality. The study

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concludes that there is a significant difference in achievement between students taught algebraic expressions using manipulatives and those taught without the use of manipulatives.

Shanunu Zakaria, Yaw Osei, Tahir Ahmed Andzie and Imoro Nuhu Alhassan, investigate how to use height/weight ratio and body mass index (BMI) to determined Physical Education teacher's health status in Tamale Metropolis. Generally, the study reveals that Tamale Metropolitan Physical Education teachers are healthy based on the Anthropometric classification, though a few of them are overweight. The study also recommended that Physical Education Teachers of Tamale Metropolis should develop positive relationship towards regular exercises to reduce weight and stress in their classroom activities and for the entire society to emulate.

Olufemi Abiodun Ajayi and Jamiu Akinola Ibrahim investigate the perceptions of 300 road users (public transport drivers) on activities and efficiency of TRACE Corps operatives in Ogun East Senatorial District in Nigeria, with the view to ascertaining the effectiveness of TRACE Corps intervention on Nigerian highways. The study concludes that the perceptions of the road users are in support of the sustenance of TRACE Corps' intervention on Nigerian highways.

Fuseini Inusah researched on improving students' performance in Microsoft excel 2007 by using multimedia tutorials with quizzes. This was done in Bagabaga College of Education in the Northern region of Ghana with a population of 555 students and a sample of 60 students. Multimedia tutorials were developed with quizzes to help the students learn at their own pace in the absence of the teacher. The study concluded that mere demonstrations by the tutor during practical lessons without allowing learners to practise does not enhance students' understanding. Multimedia tutorials enhance students' efficiency in learning by making them learn at their own pace faster, accurately and easier.

Bernard Kofi Adinkrah and Charles Fosu-Ayarkwah examine the views of 344 Colleges of Education Religious and Moral Education (RME) tutors and pre-service teachers on approaches of teaching of values in RME in selected Colleges of Education in Ghana, with the aim of establishing whether their opinions bring out effective approaches for teaching of values in RME. The study concludes that the views of the RME tutors and their pre-service teachers suggested values clarification as the most effective approach for the teaching of values in RME.

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# GENERATIVE LEARNING STRATEGY: PHYSICS INTERVENTION FOR IMPROVED ACADEMIC ACHIEVEMENT AND MOTIVATION AMONG COLLEGE STUDENTS IN GHANA

**Appiah-Twumasi, Eric**
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## Abstract

The study examined the effect of Generative Learning Strategy on College of Education students' academic achievement and motivation to learn physics concepts. The research design employed was pretest-intervention-posttest, non-equivalent comparison-group design using a total of 98 College of Education students' of Berekum College of Education. Two research instruments, Multiple Choice Items (MCI) and Motivation Perception Survey on Generative Learning (MPSGL) were used to gather data for the study. MCI was used to gather data on students' academic progression in physics before and after the introduction of the intervention while MPSGL was used to assess students' motivation in physics studies before and after the intervention. Mean, standard deviation, mean gain and effect size were calculated and used to answer the research questions. A t-test was used to test the hypotheses. The results indicated that students instructed using Generative Learning Strategy performed better in the MCI test than those instructed using lecture method fused with demonstration and discussion. Also, the results indicated that Generative Learning Strategy increased students' motivation to learn physics. No significant difference in the performance by gender and high and low achievers with regard to the using Generative Learning Strategy were discovered. The implications of the results obtained are that, Physics teachers intending their students to improve their academic performance should consider using Generative Learning Strategy in teaching.

**Keywords**: generative learning; achievement; motivation; gender; college students.

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## Introduction

Some researchers in recent years have highlighted the decline in the number of students wishing to continue with the study of Physics (Ho & Boo, 2007). A number of factors have been identified by researchers as the contributing factors to this decline. Some students associate this decline to the subjects being boring, irrelevant and too abstract. The literature (Sillito & Mackinnon, 2000; Boyes & Dickson, 2003) also noted that, the study of physics in schools and universities is spiralling into decline as many students believe it is too difficult. Consequently, this has negative effects on the academic achievement of physics students.

The kind of learning environment, interaction, and teaching methods employed by physics teachers at any level of education may also be attributed to the decline in the number of students willing to study physics. Consequently, the utilisation of appropriate instructional methods could be beneficial to halt this decline. The instructional method which is right for a particular lesson depends on factors such as the age and cognitive development of the students, what the students already know, and what they need to know to succeed in the subject, the subject matter, students' interests and the objective of the lesson. Research has shown that the performance, motivation and interest of learners to learn significantly depend on the teaching strategies adopted by teachers (Makgato & Mji, 2006).

Literature suggests that the extent to which learners learn depends on their level of motivation which can be stimulated by the nature of the learning environment and the teaching strategy utilised by the teacher (Mwanmwenda, 2010). Mwanmwenda further added that the teacher's role is to influence the motivation of learners to learn by using teaching strategies that can impact learners' attitudes towards learning, build on their self-concepts and raise their educational aspirations. Mwanmwenda's assertion would be useful if teachers or

instructors use student-centered teaching methods rather than teacher-centered methods.

In the teacher-centered Physics classroom, teachers teach Physics concepts through discussion and lecturing. Physics teachers in teacher-centered Physics classrooms describe and define concepts and write related equation and keywords on the board. Also, students take notes and after the teacher's explanations, the concepts are discussed through teacher-directed questions. Consequently, students in teacher-centered classrooms are likely to be passive learners instead of active learners.

According to Pickering and Pollock (2001), active or participatory learning by students is the effective, efficient, and superior instructional approach for teaching and learning. The assertion of Pickering and Pollock was corroborated by Frankel and Wallen (2007) that the use of student-centered learning can increase the mastery of Physics concepts than the teacher-centered teaching. One of such student-centered learning models is Generative Learning Strategy (George, 2011). On the activity-based Generative Learning, students are required to prepare themselves mentally for understanding of the material to be taught. This implies that in the Generative Learning Strategy, the active students take greater part in the learning process and produce the knowledge with the connections between mental concepts formation.

Generative Learning Strategy is a step-by-step learning strategy, which is based on students' views and experiences in active classroom learning (Ogunleye & Babajide, 2011). They further noted that, the model of Generative Instructional Strategy is a functional model of instruction and not a structural model. Ogunleye and Babajide concluded that as a functional model of instruction, it focuses on the cognitive processes that learners use to comprehend concepts as well

as the teaching and instructional procedures useful for increasing comprehension.

Generative Learning Strategy is a student-centered strategy where pieces of information retrieved from students' memories on a particular concept are explained and modified by the students themselves. Generative Learning Strategy allows for individualised form of learning and empowers learners with the ability to express their personal views. According to Wittrock-(1974), the basis of the Generative Learning Strategy is premised on the theory of schemata. The concept of schemata proposes that the learning process is based on the memory that is formerly stored in individuals' brains, where new information is added to the individual students' long term memory which becomes a component of the individual's knowledge base. The foundation of the Generative Learning Strategy of teaching emphasised that, the learner is not a passive beneficiary of information rather a learner is an active contributor in the learning process, working to create meaningful understanding of information originated in the immediate environment (Wittrock, 1974).

The literature suggests that activities and steps of Generative Learning Strategy vary. For example, George (2011) noted that Generative Learning activities are divided into two. First, the students are encouraged to construct organisational association such as the title, the concentration, the questions, the objectives, a summary, the graphs, the place, and the main ideas. Second, the students are asked to produce the integrated associations between what they see, hear and learn by creating metaphors for example: the analogies, the interpretations, the paraphrases and the conclusions. Maknun (2015) also noted that there are five steps for the Generative Learning model which are the orientation, the disclosure of ideas, the challenges and reconstruction, implementation and evaluation.

Pappas (2014) described the Generative Learning Strategy as having four main key concepts that instructors can use, depending on the needs of the learners and the teaching and learning materials involved. The four concepts proposed by Pappas (2014) are: recall, integration, organisation and elaboration. In the ***recall***, the learner retrieves information stored in the long term memory to aid learning. This may involve regular repetition of a concept. In the ***integration,*** learner continues new information with those already stored in the long term memory to create a new knowledge. This may involve the use of analogies to make concepts clearer. In ***organisation,*** the learner re-organises knowledge through critical analysis of concepts. This may facilitate the creation of a list of related concepts. Finally, in ***elaboration***, the learners are taught to connect new knowledge to the existing ones to create an expanded knowledge. This may be done through critiquing an existing knowledge.

Although the body of literature such as George (2011), Pappas (2014) and Maknun (2015) suggested that the activities of Generative Learning Strategy vary, they have the potential to promote the mastery of concepts. This mastery of concept in Generative Learning Strategy could be attributed to intellectual skills which are related to students' cognitive abilities. A student is said to demonstrate cognitive abilities if such a student is able to define concepts, construct the organisational association such as the title, the concentration, the questions, the objectives, a summary, the graphs, the place, and the main ideas. Also, students who have cognitive abilities can produce the integrated associations between what they see, hear and learn by creating the metaphor. The cognitive abilities are associated with Generative Learning Strategy activities as proposed by George (2011).

## Statement of the Problem

Teaching and learning approaches continue to change over the decades. This is due to the numerous research works being conducted by educationists. Similarly, the Ghanaian academic curriculum continues to advocate the use of modern approaches to teaching. This emanates from the fact that many Ghanaian teachers appear stagnant with teaching methods that do not facilitate students' learning. This study has identified Generative Learning Strategy as one of the modern approaches that the literature has researched and has touted its potency for improving students' learning and motivation in Physics.

It is against this background that this present study was designed to investigate the effect of Generative Learning Strategy which involves active involvement of learners which has the potential of yielding improved academic achievement in physics. Atsuwe and Anyebe (2016) stated that Generative Learning Strategy is credited with the possession of potentials for allowing the self-efforts and abilities of learners through active processes leading to good academic achievement in Physics.

## Purpose of the Study

The purpose of this study was to specifically determine the effects of Generative Learning Strategy on students' academic achievement in Physics and motivation to learn Physics.

## Research Questions

This study was guided by the following research questions:

1. What difference exists in the achievement test scores between students instructed using Generative Learning Strategy and

those instructed using lecture method with discussion and demonstration?

2. What are the perceptions of students about their motivation to study Physics, before and after they were instructed with The Generative Learning Strategy?
3. What difference exists between Physics test scores of males and females instructed with the Generative Learning Strategy?
4. What difference exists between Physics test scores of higher-achievers and low-achievers instructed with the Generative Learning Strategy?

**Research Hypotheses**

From the research questions raised, two hypotheses were stated and tested at 0.05 level of significance.

**$Ho_1$:** There is no significant difference in achievement test scores between male and female students instructed using Generative Learning Strategy.

**$Ho_2$:** There is no significant difference in achievement test scores between high and low-ability students in the Generative Learning Strategy group.

**Methodology**

**Design of the Study**

The design used in this study was the pretest-intervention-posttest, non-equivalent comparison-group design. This design was selected because it aided the establishment of cause and effect between the independent variables and the dependent variables. Table 1 gives step-by-step implementation of the intervention among the two groups.

**Table 1: Research design**

| Groups | Pretest | Treatment | Posttest |
|---|---|---|---|
| Experimental ($n_1$= 48) | 01 Selected topics in physics based on C.o.E* Syllabus | 0X Generative learning Activities (Independent variable) | 03 -Achievement -Motivation, Sex and ability difference (Dependent variable) |
| Control ($n_2$= 50) | 02 Selected topics in physics based on C o E* Syllabus | -- Lecture, discussion demonstration and (Independent variable) | --04 -Achievement (Dependent variable) |

*College of Education

## Population and Sample of the Study

A total of 98 males and females composed of high-achievers and low-achievers in physics were used for the study. The respondents were randomly selected from Berekum College of Education level hundred students of 2017/18 academic year group. The respondents were between the ages of 19 and 35 years and were grouped into two different classes. The first class (A) constituted the experimental ($n_1$=48) whereas the second class (B) constituted the control ($n_2$= 50).

The respondents were divided into the groups according to their scores in the baseline ability assessment test in Physics concepts. Guided by the baseline assessment scores, students were randomly and proportionately assigned to the experimental and control group. As both the experimental group and control group took the same pretest and posttest and the intervention covered the same time period for all subjects, testing, instrumentation, maturation, and mortality are not internal-validity problems. Also, the same researcher taught both the experimental and control groups on different days Wednesday and Thursday respectively, as a result history is not a problem in this

study, since differences among teachers cannot systematically influence post-test results.

**Research Instruments**

Two main research instruments, Multiple Choice Item **(MCI)** and Motivation Perception Survey on Generative Learning **(MPSGL)** were used for the study. These instruments were prepared by the researcher and were field pilot-tested to determine their reliability and validity.

**MCI:** The test consisted of 25 multiple choice items in selected concepts (force, motion, and machines) in Physics based on the Colleges of Education syllabus in Ghana. This was used to test students' knowledge in Physics before and after the introduction of the intervention. The test items were validated by two Science educators at Berekum College of Education Science Department. Test retest reliability analysis revealed Cronbach's alpha reliability coefficients of .76. This value indicated a very satisfactory level of the test items.

In order to differentiate between higher-achievers and lower-achievers after the exposure to Generative Learning activities, the test items were constructed by adopting a discrimination power (ability of the test to discriminate between higher and lower achievers). A discrimination power of above .20 was considered as being acceptable. According to Ebel and Frisbee (1986), as a rule of thumb, test items with discrimination power below .20 were removed and reconstructed. Also, items with discrimination index of .04 and greater are very good items, .03 to .39 are reasonably good but possibly subject to improvement. The authors added that test items with discrimination index between .02 to.29 are marginal items and need some revision. Below .19 are considered poor items and need major revision or should be eliminated. Consequentially, items with

discrimination index levels below and above the specified range stated by Ebel and Frisbee were removed and reconstructed.

**MPSGL: MPSGL** instrument requires respondents to rate their level of agreement with statements on a 5-point Likert scale ranging from strongly disagree to strongly agree on the motivation perception survey before and after exposure to the intervention. A reliability test was carried out to determine the internal consistency of the items in the questionnaire by using Cronbach's alpha reliability test. Cronbach's alpha coefficient was .79. Themes in the **MPSGL** instrument included: enthusiasm to learning, understanding of concepts, recall of concepts, and integration of concepts.

**Intervention Phases**

The two groups (experimental and control) were instructed by the researcher on different days for the seven weeks of the interventional phase. To ensure uniformity and consistency in the teaching and learning process, the researcher used same teaching notes, same exercises and assignments for the two groups. The control group was instructed by using lecture, demonstrations, and discussions with the students. The experimental group was instructed using the Generative Learning activities as highlighted in Table 2 in accordance to the literature searched (Pappas, 2014).

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**Table 2: Intervention Phases for the Experimental Group**

| Phase | Strategy | Teacher Learner Activities |
|---|---|---|
| 1: Introduction | Recall | Teacher assessed students prior information stored related to the current topic that has been already acquired using an advanced organiser. |
| 2: Development | Integration | Through class discussion, demonstration, and lecture, teacher assisted students in making connections to the prior knowledge and the current knowledge structure by using metaphors, paraphrasing, etc. |
| | Organisation | Through outlines, summaries and concepts mapping, teacher assisted students with imposing on content learnt. |
| | Elaboration | Teacher assisted students with elaborating on information by making connection to real examples by identifying examples, predicting results and giving examples. |
| 3: Assessment | | Teacher gave end of lessons' assignments and quizzes, to evaluate the impact of the Generative Learning activities |
| 4: Conclusion | | Teacher concluded the lesson by summing up the main points, reflecting on the lesson using recall, integration, organization and elaboration strategies. |

## Data Analysis

The data relating to the research questions were analysed using descriptive statistics such as means and standard deviation. However, inferential statistics such as t-test was used to test the hypotheses at significant level of .05.

Effect size analysis was also used to investigate how the two different types of teaching strategies affected students' academic achievement. According to the definition of Cohen as cited by Kia-Ti and Tzu-Hua (2012), Cohen's *d* less than .2 means 'small' effect size, between .2 and .5 means 'small to middle' effect size, between .5 and .8 means 'middle to large' effect size, while larger than .8 means 'larger' effect size.

## Results

**Research Question One:** *What difference exists in the achievement test scores between students instructed using Generative Learning Strategy and those instructed using lecture method fused with discussion and demonstration*?

To find out the difference in the achievement of students instructed using Generative Learning Strategy and students instructed using lecture method fused with discussion and demonstration, descriptive statistics were computed on the results of MCI and used to determine the difference in the achievement between the experimental group and the control group. Table 3 shows the mean, standard deviation and mean gains of the experimental group and the control group in the MCI conducted before and after the introduction of the interventions.

**Table 3: Pre-Test and Post-Test Descriptive Analysis for the Experimental and Control Groups**

| Groups | N | Pretest Mean[a] | Posttest Mean[b] | Mean Gain [c = b-a] |
|---|---|---|---|---|
| Experimental | 48 | 11.83(3.92)* | 16.64(2.53) | 4.81 |
| Control | 50 | 11.53(3.68) | 14.67(2.93) | 3.14 |

*Standard deviation in parentheses

Table 3 shows that the experimental group pre-test and post-test mean scores were 11.83 (SD = 3.92) and 16.64 (SD = 2.53) respectively. Also, the control group had pre-test and post-test scores of 11.53 (3.68) and 14.67 (SD = 2.93) respectively. The mean gain for the experimental group was 4.81 whereas the mean gain for the control group was 3.14. These results as presented in Table 3 revealed that students instructed using Generative Learning Strategy performed better in the MCI than those instructed using lecture method fused with discussion and demonstration.

To further estimate the extent of difference between the two groups, an effect size analysis was carried out using Cohen's (*d*) index formula (See Appendix **A**). This involves comparing the mean scores of the two groups and dividing them by their standard deviation. The results of the magnitude of the effect size analysis are presented in Table 4.

**Table 3: Pre-Test and Post-Test Descriptive Analysis for the Experimental and Control Groups**

| Groups | N | Pretest Mean[a] | Posttest Mean[b] | Mean Gain [C= b-a] |
|---|---|---|---|---|
| Experimental | 48 | 11.83(3.92)* | 16.64(2.53) | 4.81 |
| Control | 50 | 11.53(3.68) | 14.67(2.93) | 3.14 |

*Standard deviation in parentheses

It can be inferred from Table 4 that the effect size of the experimental group was 1.5. This represents large effect size in accordance to Cohen's *d* indexes. Also, effect size estimated for the control group was 0.9. This also represents large effect size. However, the effect size of the experimental group is relatively greater than the control group.

**Research Question Two:** *What are the perceptions of students about their motivation to study physics, before and after they were instructed with The Generative Learning Strategy?*

The effects of using Generative Learning Strategy on students' motivation to learning physics were examined through the analysis of the before and after motivation perception survey of Generative Learning Strategy. Table 5 shows the criteria used to interpret the mean score for MPSGL whereas Table 6 shows the means scores for each item.

**Table 5: Level of Interpretation of Mean Score**

| Mean Score | Level |
|---|---|
| 0.01-1.00 | Strongly Disagree |
| 1.10-2.00 | Disagree |
| 2.01-3.00 | Neutral |
| 3.01-4.00 | Agree |
| 4.01-5.00 | Strongly Agree |

**Table 6: Descriptive Analysis of Pre and Post MPSGL**

| S/N | MPSGL | Pre | | Post | |
|---|---|---|---|---|---|
| | | *M* | *SD* | *M* | *SD* |
| 1 | I enjoy Physics lesson | 2.70 | .78 | 3.20 | .64 |
| 2 | Physics is difficult | 2.01 | .86 | 2.96 | .68 |
| 3 | I like to learn Physics topics that are more challenging | 2.65 | .60 | 3.33 | .74 |
| 4 | I contribute constructively during Physics lessons | 2.55 | .59 | 3.01 | .87 |
| 5 | I feel I am achieving the learning outcomes in Physics | 1.99 | .46 | 3.25 | .76 |
| 6 | Generative Learning activities arouse students' interest in Learning Physics | ---* | --- | 3.98 | .59 |
| 7 | Generative Learning activities motivate students to study Physics topics that are more challenging | ---* | --- | 3.89 | .60 |

| | | | | | |
|---|---|---|---|---|---|
| 8 | Generative learning activities help students to retain Physics concepts | ---* | --- | 3.79 | .89 |

**Items 6-7 were not assessed in the pre-perception motivation surveys*

The results in Table 6 with reference to Table 5 suggest that after using Generative Learning Strategy with the experimental group, more students enjoyed physics lessons with mean score of 3.2 (SD=.78) as against mean score of 2.7 (.64) before using Generative Learning Strategy. The analysis also revealed that students' ability to solve more challenging physics questions increased from mean score of 2.65 (SD=.60) to mean score of 3.33(SD=.74) after exposure to Generative Learning Strategy. The results also show that students relatively contributed constructively in the Physics lessons using Generative Learning Strategy with mean score of 3.01 (SD=.59) as against mean score of 2.55 (SD=.87). The results also show that students perceived that they could achieve their learning goals in Physics if they are instructed using Generative Learning Strategies. However, responses on item-2[Post 2.96 (SD=.68); Pre 2.01(SD=.86)] suggest that, students' perception that Physics is difficult still persists after the introduction of the Generative Learning Strategy.

The results as indicated in Table 6 with reference to Table 5 also suggested that students' interest, motivation and ability to retain learnt Physics concepts were enhanced after exposure to Generative Learning Strategy with relatively high mean scores of 3.98 (SD=.59), 3.89 (SD=.60) and 3.79 (SD=.89) respectively. These high means scores suggest an enhanced motivation after students' exposure to Generative Learning Strategies.

**Research Question Three**: *What difference exists between physics test scores of males and females instructed with the Generative Learning Strategy?*

To find out the difference in the physics test scores of male and female students in the experimental group, descriptive statistics were computed on the MCI results. Table 7 shows the mean, standard deviation and mean gains of males and females results on the MCI conducted before and after the introduction of the interventions.

**Table 7: Gender Descriptive Analysis for the Generative Learning Group**

| Sex | N | Pretest Mean[a] | Posttest Mean[b] | Mean Gain C=b-a |
|---|---|---|---|---|
| Males | 27 | 11.98(2.85)* | 16.11(2.85) | 4.81 |
| Females | 21 | 10.63(3.68) | 15.05(1.88) | 4.42 |

* Standard deviation in parentheses

Table 7 shows that the male students pre-test and post-test mean scores were 11.98 (SD = 2.85) and 16.11 (SD = 2.85) respectively. Also, the female students had pre-test and post-test scores of 10.63 (SD=3.68) and 15.05 (SD = 1.88) respectively. The mean gain for the male students was 4.81 whereas the mean gain for the female students was 4.42. These results as presented in Table 7 revealed that male students instructed using Generative Learning Strategy slightly performed better in the MCI than their female counterparts.

**Testing of Hypothesis with Respect to Research Question Three**

To determine whether the difference in the performance between the experimental group and the control group was statistically significant, research question three was formulated into a null hypothesis and tested. It was hypothesised that:

**$H_{01}$:** *There is no significant difference in achievement test scores between male and female students instructed using Generative Learning Strategy*

To find out if a significant difference existed between males and females' achievement in the MCI after using Generative Learning

Strategy, an independent samples t-test was performed. The results are presented in Table 8.

**Table 8: Gender Inferential Mean Score Statistics for the Generative Learning Group**

| Gender | N | Mean | SD | df | t-value | p-value |
|---|---|---|---|---|---|---|
| Males | 27 | 16.11 | 1.30 | 46 | 2.01 | .08 |
| Females | 21 | 15.05 | 1.19 | | | |

It can be inferred from Table 8 that there is no significant difference between the results of the MCI for males (M =16.11, SD = 1.30) and those of females (M=15.05, SD= 1.19). [t = (46) 2.01, p= .08]. Hence the null hypothesis was retained. However, the result as presented in Table 8 shows that the male students slightly performed better than their female counterparts in the MCI.

**Research Question Four**: *What difference exists between physics test scores of higher-achievers and low-achievers instructed with the Generative Learning Strategy?*

To find out the difference in the achievement of high and low-ability students instructed using Generative Learning Strategy in the experimental group, descriptive statistics were computed and used to determine the difference in the achievement between high and low-ability students in the experimental group. Table 9 shows the mean and standard deviation of males and females' results of the MCI conducted before and after the introduction of Generative Learning Strategy.

**Table 9: Comparison of Achievement Test Scores of High and Low-Ability Students after Exposure to Generative Learning Strategy**

| Groups | N | Mean | Std. Dev |
|---|---|---|---|
| Higher- Abilities | 22 | | |
| Pre-test | | 14.83 | 3.92 |
| Post-test | | 16.87 | 2.53 |
| Lower-Abilities | 26 | | |
| Pre-test | | 08.53 | 3.68 |
| Posttest | | 15.67 | 2.93 |

After using Generative Learning Strategy in teaching the experimental group, the higher-ability group in the experimental group scored higher marks (M =16.87, SD =2.53) on the post-achievement test scores compared to the low-ability group test scores in the experimental group (M=15.67, SD =2.93).

**Testing of Hypothesis with Respect to Research Question Four**

To determine whether the difference in the achievement between the high-ability and the low-ability in the experimental group was statistically significant, research question four was formulated into a null hypothesis and tested. It was hypothesised that:

**$Ho_2$:** *There is no significant difference in achievement test scores between high-achievers and low-achievers after instructing students using Generative Learning Strategy.*

To find out if significant difference existed between high and a low-ability group after instructing students using Generative Learning Strategy, independent samples t-test was performed. It can be inferred from Table 10 that there was no significant difference between the performance of high-ability (M= 16.76, SD = 2.53) and low-ability (M = 15.67, SD = 2.93) groups [t (46) = -.24, p = .81]. Therefore, the null hypothesis was retained.

**Table 10: Inferential Statistics for the High and Low-Ability Groups in the Generative Learning Strategy**

| Group | N | *Mean* | *SD* | *Df* | *t-value* | *p-value* |
|---|---|---|---|---|---|---|
| High-achievers | 22 | 16.76 | 2.53 | 46 | -.24 | .81 |
| Low-achievers | 26 | 15.67 | 2.93 | | | |

**Discussion**

The findings of this study have demonstrated the effectiveness of Generative Learning Strategy in the teaching and Learning of physics lessons. This study is significant in that it demonstrates the effects of Generative Learning Strategy on students' achievement and motivation in one single study. Again, the study compared how sex and ability (i.e. high and low-achievers) variations influence students' scores in Generative Learning Strategy lessons.

One major finding of this study is that students instructed using the Generative Learning Strategy scored higher marks in the MCI achievement test used than those instructed using lecture teaching method fused with discussion and demonstration. Specifically, using Magnusson (2014) standardised interpretation, 1.5 Cohen *d* obtained for the experimental group means that the mean performance of about 92% of the students instructed using Generative Learning Strategy would be above those instructed using lecture fused with the discussion and demonstration. Moreover, Magnusson's (2014) interpretation means that there is about 84% chance that a student picked at random from the experimental group will have higher score than a student picked at random from the control group. This shows superiority of using Generative Learning Strategy over the lecture fused with discussion and demonstration.

The students in the Generative Learning group were found to exhibit improved motivation towards the learning of physics, as measured by their motivational perception scores, using the **MPSGL**. This seems to agree with the general notion that individuals can change their

motivation and disposition about subjects through interactive learning strategy. For example, Mwanmewenda (2010) noted that the extent to which learners learn depends on their level of motivation which can be stimulated by the nature of the learning environment and the teaching Strategy utilised by the teacher.

The relative higher levels of motivation by students in the Generative Learning class may also be explained, at least in part, by the fact that student-centered lessons promote better understanding than teacher-centered lessons. For example, Felder and Brent (2007) note that student-centered methods have repeatedly been shown to be superior to the traditional teacher-centered approaches to instruction. They conclude that student-centered lessons promote short-term mastery, long-term retention, or depth of understanding of course material, acquisition of critical thinking or creative problem-solving skills, formation of positive attitudes toward the subject being instructed, or level of confidence in knowledge or skills.

In the current study, neither achievement results were affected by sex or ability. For example, all students, irrespective of their sexes, benefited in about the same margin from the use of the Generative Learning Strategy. This may be the reason why no significant difference was found in achievement by gender in the use of Generative Learning Strategy. However, the results revealed that the males slightly out-performed their females' counterparts. Also, the results revealed that there was no significant difference between the high-achiever and low-achiever students with regard to the use of Generative Learning Strategy.

The result of this current study supports the findings of Atsuwe and Anyebe (2016) that Generative Learning Strategy was effective in enhancing students' academic performance in Physics. However, on the basis of gender in relation to Generative Learning Strategy utilisation in classrooms, the current findings of this study are

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contrary to the conclusion drawn by Atsuwe and Anyebe that, there existe a difference in the academic performance between male and female students. Also, the results of this study support research findings (Joyce & Calhoun, 2000; Maknun, 2015) that Generative Learning Strategy fosters students' academic achievement in science-related subjects.

## Conclusion

Based on the findings of the current study, it is significant to conclude that students perform better in Physics concepts when instructed using the Generative Learning Strategy compared to using lecture with discussion and demonstration. Also, the study shows that there is no significant difference in the academic achievement between males and females and ability groups (higher and lower) achievers after being taught with the Generative Learning Strategy.

## Recommendations

Based on the findings of the study and conclusions drawn, some recommendations are made.

1. Physics teachers should use the Generative Learning Strategy to teach Physics lesson so as to improve students' academic performance.
2. Students should be empowered by their teachers to assume responsibility for their own learning while the teacher becomes a facilitator or a coach in the learning process. This can be done when teachers adopt instructional Strategy which is student-centered in nature such as the Generative Learning Strategy.
3. In-service training in the form of workshops, conferences and seminars should be organized by College managements to prepare teachers to incorporate Generative Learning Strategy in the teaching and learning of physics at the Colleges of Education in Ghana.

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## APPENDIX A

### *Cohen's d formula*

$$d = \frac{M_1 - M_2}{\sqrt{\frac{S_1^2 + S_2^2}{2}}}$$

| | | |
|---|---|---|
| $M_1$ | = | Mean of post- test |
| $M_2$ | = | Mean of pre-test |
| $S_2^2$ | = | Standard deviation of post- test |
| $S_1^2$ | = | Standard deviation of pre-test |
| d | = | Calculated Cohen's d |

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# TEACHER PARTICIPATORY DECISION-MAKING IN SCHOOLS: A PRE-REQUISITE FOR DEMOCRATIC GOVERNANCE IN GHANAIAN SECOND CYCLE EDUCATIONAL INSTITUTIONS

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## Abstract

Participatory decision-making in schools has been identified as a key tool for improving teachers' professional development. However, not much has been done in terms of scientific research to find out the nature, level and areas of teacher participation in making school decisions. Therefore, this study sought to establish the areas and ways of involving Senior High School teachers in decision-making in schools in the Mampong Municipality. The descriptive survey design was adopted for the study. The purposive and stratified sampling techniques were adopted to select the participants for the study. Questionnaires were used to collect data from 252 randomly selected professional teachers. It was observed from the study that teachers were always involved in curriculum and instructional activities and occasionally engaged in school operational activities and decisions that promoted school-community relationship. However, teachers were never involved in decision-making on student admission and placement, staffing and financial matters. Teachers were involved in school decision-making through delegation, school meeting, school Board of Governors, and school committee systems. It is, therefore, recommended that the heads of schools should decentralise decision-making in their schools to allow greater teachers' involvement in decision-making.

**Keywords**: decision-making; teacher participation; shared decision-making; curriculum; brainstorming.

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## Introduction

Currently, all over the world, teachers are presumed to be the managers of their class (Oluwole, 2014). There is also an increasing recognition of the indispensability of effective classroom management in the enhancement of quality teaching and learning in schools (Oliver & Reschly, 2007). It is obvious that we all make decisions which affect our lives in one way or the other. For instance, parents make decisions on the type of school to send their wards, when and how to pay their fees, provision of clothing and feeding. Likewise, school administrators make decisions on the number of students to admit in their respective schools and other related decisions which are pertinent in the running of the school. These decisions at times draw on the past experiences which may be positive or negative and play significant role in determining which choices administrators see as feasible or desirable. According to Fischer and Thomas (2009), educators cannot avoid making decisions irrespective of where they find themselves. The authors further assert that when one decides not to make a decision on a new course of action has nevertheless, made a decision.

According to Seidu (2006), a Senior High School is effectively and efficiently run when there is a co-coordinated effort as the head of the school involves all and sundry to paticipate indecisions through various channels, whether in groups or as individuals. Seidu therefore, identifies establishments such as these bodies to include the Board of Governors, headmaster, assistant headmasters, senior house mistresses, house masters, heads of departments teaching and non-teaching staff, senior prefects, prefects and the entire student body as partners in decision-making. In the absence of the head, the assistant may step in to take up the administrative responsibility of a school. In the same way, the senior housemaster or housemistresses, as well as teachers may also steer the affairs of a school where both the headmaster and assistant are called to duty outside the school.

Despite the growing body of literature which shows that quality decisions accrue in organisations when those closed to the point of implementation are actively involved in decision- processes, the extent to which teachers are involved in this process is not yet clearly established and documented (Kuku & Taylor, 2002). Yet, it is arguable that some benefits are expected to arise from capitalising on the specialised knowledge or abilities of the participants in decision making leading to increased commitment, which might flow in planning and decision taking activities (Mankoc, 2000). It is this limitedness in clarity on the extent of teacher involvement in school decision-making that prompted this study. The justification of this study is that the authors have observed that teachers resent the lack of involvement in decision-making while they are compelled to implement some decisions taken without their input. Richardson (2010) notes that there is a mounting frustration among teachers who feel they lack any real voice in the process of decision-making and this serves as the basis for the misunderstandings and disagreements often experienced in the school system.

There appears to be virtually no documented research works on teacher involvement in decision-making in schools in the Mampong Municipality. Therefore, the questions one has to ask are: "Are teachers involved in school decision-making?" and "To what extent are teachers involved?" It is against these intriguing questions and the identified gap that the researchers want to investigate the extent to which teachers are involved in decision-making in Senior High Schools in the Mampong Municipality by focusing on critical areas such as the key decision areas they are involved, the ways they are involved, the extent of involvement, and the associated demographics.

**Purpose of the Study**

The major focus of the study was to examine the nature of participatory decision- making of teachers in some Senior High

Schools in the Mampong Municipality. Specifically, the study sought to:

1. identify areas of decision making in which senior high school teachers are involved in the Mampong Municipality.
2. identify the ways adopted by school heads to involve teachers in decision making in the Mampong Municipality.

## Theoretical Framework

The theories underpinning the study are the leadership theories which are the trait theory, behavioral theory and the contingency theory. These theories are also supported by the two major models of decision-making which are the rational (classical model) and the Bounded rationality model coupled with the shared decision-making (SDM) model. For the purpose of this study, the *contingency theory* and *the shared decision model (SDM)* best address the issues raised pertaining to participatory decision making from this context. These two theories clearly explain this study. This is attributed to the fact that if the school head believes his or her staff are well-informed and rational enough (rational model) to assist him in taking school decisions, then there is the likelihood to involve them. On the contrary, if he believes there is little information to assist him in making school decisions, the likelihood of involvement will be minimal.

## Contingency/ Situational Theory of Leadership

Personal characteristics of leaders differ according to the situations that give rise to them. Usually, leaders only succeed where the situations they meet are almost similar. Contemporary leadership theory has therefore shifted towards Situational or Contingency approach to leadership. Recent research developments indicate that different organizational structures are more appropriate in certain situations, and different ways of leading are appropriate depending on

the characteristics of the overall situation. Hence, the situation calls for the style to be exhibited (Mankoe, 2002).

**Shared Decision Making (SDM) Model**

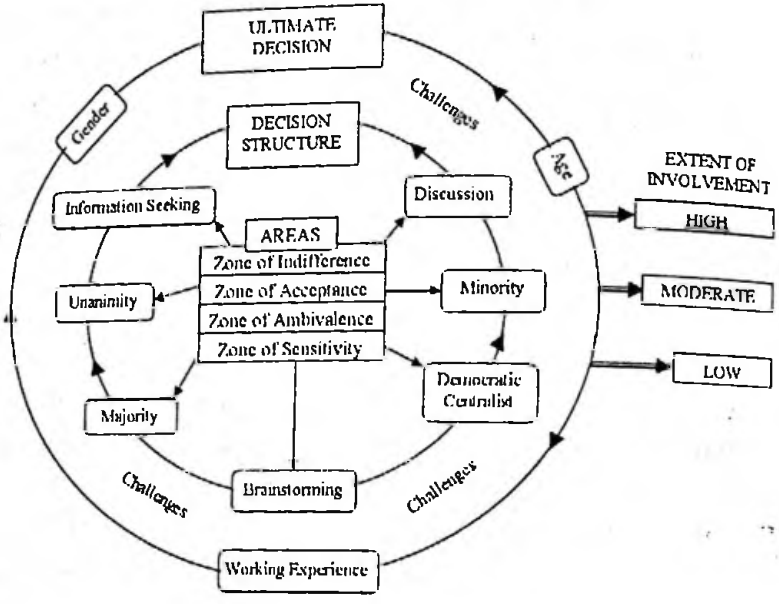
This came into being when various schools of thought initially proposed that schools are to be run by committees of teachers without administrators in sight. It was agreed that teachers deserved to play a greater role in school governance. In the SDM model, teachers are key players in determining school policies and practices. The rationale is that those who are closest to teachers learning are best equipped to make educational decisions. Advocates say shared decision making will improve teacher-learning, create teacher satisfaction and develop new forms of leadership (Liontos, 2012). He also stated that the SDM is to improve teaching and learning. Since teachers mostly teach in the classroom, teachers should be deeply involved in the decision-making process. Again, Liontos predicted shared decision making (SDM) that will create new forms of leadership. Not only will teachers be brought into the process but principals will devie new strategies based on facilitation and trust rather than hierarchical authority. The SDM creates ownership, commitment, a sense of empowerment and increased job satisfaction as teachers' participation in decision making is recognized. Furthermore, according to Blasé (1995) SDM promotes equality and makes the school a more democratic work place. However, research and observations indicate, there is little consistent evidence that SDM increases teachers' achievement (Miller, 1995). According to Liontos (2012), some researchers contend that SDM approach seldom addresses the "core issues" of teaching and learning. Studies of SDM frequently mention a tendency to focus on trivial issues as parking, bus supervision, and smoking in faculty lounges.

**Conceptual Framework for the Study**

This framework espouses the interrelationships existing among the variables in the study. Also, it projects the framework that brings all

the variables of the study to form a comprehensive diagram known as the Conceptual framework.

## Conceptual Framework




***Source: The Decision-making Framework, (Author's Construct, 2015).***

The framework gives a holistic view of what constitute participatory decision-making. This diagram seeks to draw a relationship among the critical decision areas, structures, level and challenges before arriving at an ultimate decision. In the framework, within the inner circle are the areas within which decisions are made which are informed by certain structures. However, before the ultimate decision is arrived at, there are numerous extraneous factors that militate against the effort of making good decisions, coupled with some demographic variables such as age, working experience and gender. All these variables determine the extent to which stakeholders, especially, teachers are involved in decision-making in the context of the school.

## Conceptual Review

### Areas of Teacher-Participation in Decision-Making

Subordinates accept some decisions without question because they are indifferent to them. As Barnard (1938, p. 167) explains, there is a zone of indifference "in each individual within which orders are accepted without conscious questioning of their authority". Simon (2010) prefers the more positive term of zone of acceptance, but the terms are used interchangeably in the literature. The subordinates' zone of acceptance is critical in deciding under what conditions to involve or not to involve subordinates in the decision-making.

The areas of school administration in which teachers are involved in taking decisions in schools are many. Kuku and Taylor (2002) found that both teachers and school leaders, agree that teachers should participate frequently in decisions regarding the formulation of goals/vision and mission of the school, standards of performance and discipline, spiritual matters. In addition are curriculum and instruction, and sometimes in decisions involving operations (management of school building), staff development, budgeting, facilitating structures, and seldom involve in issues regarding staffing. Some authors (Asiedu-Akrofi, 1978; Mankoe, 2002; Ozigi, 1995) have divided into six major decision-making areas, namely, curriculum and instruction, teacher matters, staffing, physical facilities, financial matters, and school- community relations. For the purpose of this study, the six areas were considered.

Curriculum and instruction involve what students learn and the activities that teachers do to ensure that effective teaching and learning takes place. These activities are embodied in the implementation of the school curriculum. In schools, the teacher is at the center of curriculum implementation, which involves the activities that are performed to bring the subject content to the students. Some of the activities undertaken by teachers include decision-making on

the content of the curriculum, teaching and learning support materials, teaching methods (methodologies), and assessment tools (Commonwealth Secretariat [CWS], 1993, Module 4). On the issue of curriculum content in Ghana, the government centrally decides and designs the curriculum with little or no input from the teachers at the school level (CWS, 1993, Module 4). Asiedu-Akrofi (1978) points out that such curricula are usually imposed on students because of the inappropriate teacher professional development, the large per centage of non-professional (unregistered) teachers in the classrooms, the over-emphasis on teachers as technicians, and lack of insistence on ways of knowing in teacher education.

Moreover, selecting and using the right teaching method without the appropriate teaching support materials may derail the success of the curriculum implementation process. It is, therefore incumbent upon the teachers to decide which teaching and learning support materials are best needed for the implementation process. For instance, Reboree (2001) notes that when selecting or developing any teaching and learning materials, they must not show any form of bias such as ethnocentrism, racism and sexism either in explicit or implicit form.

Another decision area of concern to Senior High School heads and teachers is the placement decision. The placement of teachers into programmes of study in Senior High Schools is often done by the school heads with approval from Ghana Education Service. In some situations, this may be assigned to a Placement and Orientation Committee. Pedro (2013) explaines that such placement must be based on the teachers' abilities, interest, and career aspiration. Keller (2009) notes that, in this way, the individuals will be best fitted for the occupation, which would give them most satisfaction.

On financial matters, the heads of Senior High Schools are responsible for determining and mobilising financial resources to meet the expenditure requirements of their schools. A large per centage of

these funds are usually obtained from the central government in Ghana in the form of grants (Duodu, 2001; Mankoe, 2002). Also, the individual school may obtain funds from the local authorities such as the Metropolitan, Municipality, or District Assemblies. Some funds may be obtained from the community or raised from internally generated sources (Commonwealth Secretariat, 1993, Module 5). Adesina (2012) also observes that in Nigeria, teachers must have adequate knowledge of the communities in which their respective schools are situated in order to be in a better position to make a wide variety of satisfactory decisions in adapting the content of the national curriculum to meet the needs and abilities of the students and the communities as a whole. Thus, the teachers must be involved in community activities in order to understand the community better.

## Ways of Involving Teachers in Decision-Making

The following decision structures were also espoused through a study by Mankoe (2000). Group decision whereby the administrator involves participants in the decision-making, then the group members share equally as they generate, evaluate and attempt consensus. *Group advisory:* the administrator solicits the opinions of the entire group, discusses the implications of the group suggestions, then makes a decision that may or may not reflect subordinates' desires. *Individual advisory:* the administrator consults with relevant subordinates individually, who have expertise to assist in the decision, then makes a decision which may or not reflect their opinion. It can be seen that different structures of decision-making exist which headmasters can meaningfully use to involve teachers in decision-making in their schools. The headmaster can do that by analysing the situation at hand in order to find out which decision structures will be efficient to involve teachers in. In a study conducted by Ettling and Jago (2012) it is also found out that when disagreement among members is likely and acceptance is necessary, decision-making structure that allows group interaction generated greater acceptance than when such

method is absent. The subjects used for the study feel that collective thinking results in higher quality decisions and develops them professionally.

School meetings provide teachers the opportunity to take part in school decision-making. These decisions are usually outlined on timetable, staff duties, equipment, and teacher matters among other things and may take the form of briefing meeting, discussion meetings, and problem-solving meetings. Such meetings can be classified as emergency or periodic meetings. Periodic meetings are more formal but emergency meetings are less formal and may be held when the need arises (Mankoe, 2002; Ozigi, 1995). The frequency, quorum and management of these meetings have a greater influence on teacher participation in them. The number of times these meetings are held in a given term or year increases the likelihood of greater involvement of teachers. Kuku and Taylor (2002) observes that teachers hardly participate in decision-making involving students'matters. Perhaps a reason for this situation can be found in Mankoe's (2002) observation that teachers view participation as additional administrative responsibility to their teaching workload as a lack of professional competence to participate. One could further argue that this is as a result of administrative practices and work-culture.

## Methodology

The descriptive survey design was adopted for the study. This design was deemed appropriate because the researchers wanted to report the findings the way they are without manipulating any variables. The purposive and stratified sampling techniques were used to select participants adopted for the study to ensure a fair representation. Questionnaires were used to collect data from 252 teachers who were randomly selected from all the four Senior High Schools in the Ashanti Mampong Municipality.

Teacher-participation in decision making descriptive questionnaire was developed by the author and self-administered to respondents in the schools. This questionnaire was divided into two parts; Section "A" was meant to determine the teachers' involvement in decision-making in the given task areas while Section "B" was meant to determine their opinion on decision making. The questionnaire was validated and subsequently subjected to split-half method to obtain a reliability coefficient of r =.89 which was enough to declare the items suitable for data collection. The data generated from the questionnaire with the aid of the Statistical Package for Social Sciences (SPSS) Computer package version 20 were analysed using descriptive statistics in the form of frequencies and per centages.

**Results and Discussion**

**Demographic Characteristics of Respondents**

A total of 252 teachers made up of 192 (76.2%) males and 60 (23.8%) females were sampled. This made male teachers dominated the sample used for this study.

## Table 1: Areas of Involvement

| Statement | Responses | | | | | |
|---|---|---|---|---|---|---|
| | Always | Frequent | Occasionally | Seldom | Never | Total |
| | N (%) | N(%) | N(%) | N(%) | N(%) | N(%) |
| I decide the teachin g and learning support materials for my lessons. | 138(54.8) | 57(22.6) | 51(20.2) | 3(1.2) | 3(1.2) | 252(100) |
| I plan my lesson alone. | 180(71.4) | 42(16.7) | 24(9.5) | 0(0.0) | 6(2.4) | 252(100) |
| I participate in formulating guidelines for students admissions into my schools | 12(4.8) | 6(2.4) | 48(19.0) | 36(14.3) | 150(59.5) | 252(100) |
| I participate in the placement of students into programmes of study. | 6(2.4) | 9(3.6) | 30(11.9) | 15(6.0) | 192(76.2) | 252(100) |
| I participate in the formulation of guidelines for the recruitmen t of teachers | 3(1.2) | 12(4.8) | 15(6.0) | 222(88.1) | 0(0.0) | 252(100) |
| I recommend my fellow teachersfor recommendation | 3(1.2) | 9(3.6) | 3(1.2) | 18(7.1) | 219(86.9) | 252(100) |
| I participate in the formulation of safety guidelines for the use of school facilities | 12(4.8) | 18(17.1) | 111(44.0) | 66(26.2) | 45(17.9) | 252(100) |
| I take part in deciding the use of school facilities | 9 (3.6) | 9(3.6) | 135(53.6) | 45(17.9) | 54(21.4) | 252(100) |
| I participate in the formulation of guidelines involving my school participation in community programmes | 3(1.2) | 6(2.4) | 84(33.3) | 57(22.6) | 102(40.5) | 252(100) |
| I take part in the activities of PTA | 45(17.9) | 42(16.7) | 93(36.9) | 15(6.0) | 57(22.6) | 252(100) |
| I take part in deciding how much my department spends each year. | 18(17.1) | 27(7.7) | 102(40.5) | 36(14.3) | 69(27.4) | 252(100) |

From Table 1, the majority of the respondents were always involved in curriculum and instructional activities by planning their lessons alone and deciding the teaching and learning support materials to be used for such lessons. This was displayed on Table 1 by 180 (71.4%) of the respondents indicating that they planned their lessons alone. In addition, a majority (62%) of the respondents were occasionally involved in school operations by deciding the use of school facilities and formulating safety guidelines for them. Also, the study into areas of school decision-making in which teachers were deeply involved revealed that teachers were always involved in curriculum and instructional decisions by planning their lessons alone and deciding the teaching and learning support materials to be used for such lessons. This finding agrees with Kuku and Taylor (2002), whose comparative study found that faculty teachers (departmental teachers) participated frequently in decision-making regarding curriculum and instruction. This finding implies that teachers have high preference for taking decisions on curriculum and instructional activities. Therefore, school heads should take advantage to promote the success of the implementation of the school curriculum because according to Attah (2000), the success of a curriculum implementation depends on the understanding and commitment that the teachers have towards the curriculum. This finding may also be as a result of the teachers' roles in curriculum implementation. A nation with cultural diversity (such as Ghana) places its teachers in a position that compels them to interpret and implement the content of the curriculum to meet the needs of students, the community, and the nation as a whole (Commonwealth Secretary [CWS], 1993).

The study also indicated that teachers made decisions on students' matters such as formulating guidelines for students' admission into their schools and the placement of students into programmes of study. The result is in corroboration with Kuku and Taylor (2002) which found out that faculty teachers (departmental teachers) hardly ever participate in decision-making involving students' matters. Perhaps a

reason for this situation may be found in Mankoe's (2002) observation that teachers view participation in schools' decision-making as an additional administrative responsibility to their teaching workload or they lack the professional competence to participate.

The study further revealed that teachers (33.3%) occasionally made decisions on school community relationship by planning school clean-up exercises in the community, taking part in activities of the Parents Teachers Association (PTA) of their schools and formulating guidelines for their schools' participation in community programmes. This result confirms Adesina's (2012) finding that teachers must have adequate knowledge of the communities in which their respective schools are situated in order to be in a better position to make a wide variety of satisfactory decisions in adapting the content of the national curriculum to meet the needs and abilities of the students and the communities as a whole. Thus, the teachers must be involved in community activities in order to understand the community better.

### Ways of Involvement

**Table 2: Teachers Involvement in School Decision-Making through Meetings**

| | Frequency of involvement | | | | | |
|---|---|---|---|---|---|---|
| Statement | Always N (%) | Frequent N (%) | Occasional N (%) | Seldom N (%) | Never N (%) | Total N (%) |
| I put forward issues for discussion during staff meetings | 57(22.6) | 36(14.3) | 84(33.3) | 39(15.5) | 36(14.3) | 252(100) |
| I submit issues as agenda items for discussion at staff meetings. | 12(4.8) | 9(3.6) | 57(22.6) | 45(17.9) | 129(51.1) | 252(100) |
| I take active part in discussions at staff meetings. | 81(32.1) | 84(33.3) | 69(27.4) | 18(7.1) | 0(0.0) | 252(100) |

From Table 2, majority (65.4%) of the respondents agreed that they take active part in discussions at staff meetings. Also, a good number

(36.9%) of the teachers indicates that they put forward issues for discussion during staff meetings. It can therefore be inferred from the above that, some form of delegation exists in their schools. Moreover, 192 (76.2 %) of the total respondents settle that their school heads follow-up to find out how far they have performed assigned jobs. By implication, the teachers are involved in school decision-making through delegation. As a result, activities in their schools did not slow down or come to a halt in the absence of their school heads. Also, the school heads follow up to find out how far teachers have performed tasks assigned to them. Apart from these, the school heads do not take a long time to get a simple job done. This finding agrees with the Ghana Education Service's (2001) assertion that schools which practice delegation are those whose heads do not feel pressed for time to neither perform their daily activities nor take a long time to get a simple job done. In addition, activities in such schools do not slow down or come to a halt in the absence of the school heads. Moreover, the teachers do not always wait for the school heads' instructions before they can perform their duties. The study indicates that teachers (54.2%) frequently participated in school meetings by involving in discussions, occasionally tabling proposals but seldom submitted issues as agenda items for staff meetings. This finding may be as a result of the nature in which the meetings were planned. Teachers' participation in school meetings largely depends on how well the meeting is planned and organized. In further confirmation of the above assertions, Ettling and Jago (2012) found out that teachers who failed to attend the previous meeting may seize the opportunity to participate in a second meeting. However, Asiedu-Akrofi (1978) notes that frequent staff meetings are as bad as infrequent ones even though they may be held for some reasons. Ozigi (1995) is of the opinion that staff meetings could be held at the beginning, the middle, and the end of each term.

## Conclusions

There were enough structures in the schools that allowed teachers in this study to participate in their schools' decision-making process. Examples of such structures are staff meetings held frequently to discuss issues, consultations and consensus building among teachers. However, few of these structures such as brainstorming, social media were actually utilised. Teachers participated freely in curriculum and instructional decisions and sometimes were involved in operational decisions as well. There was minimum or no participation in financial decisions. Thus, teachers were hardly engaged in planning and budgeting (24.8%) for the school. This might have been accounted for by the sensitive nature of monetary issues in administration. Despite the numerous potential levels and ways of involving teachers in decision-making, the form of teachers' involvement in school decision-making was mostly consultative through meetings. Thus, school heads just solicited for their opinion on matters regarding school decisions without necessarily taking the decisions with them. Opportunities existed for teachers to take part in certain critical decisions. However, teachers were seldom (7.2%) involved in decision-making on students' admission and staff placement. The most common ways of involving teachers in decision-making were through delegation, school meetings, school Boards of Governors, and school committees. The relationship between teachers' demographic characteristics and their involvement in areas of school decision-making was statistically significant, but practically insignificant due the fact that the absolute co-efficient between the variables was close to zero.

## Implication for Educational Policy and Practice

First and foremost, school heads should effectively utilise all approved structures in the schools to engage teachers in decision-making to give meaning to collective decision. Also, school heads should be exposed to the current dynamics of participatory decision-making in order to

enable them involve their staff in school decisions, especially, with regard to how and when to involve them to make good use of their expertise. For instance, how to involve teachers in financial planning and budgeting decisions. The Ghana Education Service should formulate guidelines for the composition of all school committees, as done for the school Board of Governors, School Management Committee (SMC) and even the Students Representative Council (SRC). This will ensure that all qualified teachers are given the chance to serve, in at least, a committee instead of the privileged few.

Secondly, the Ghana Education Service (GES) should revise the current composition of schools' Board of Governors to ensure that the number of teacher representation on such Boards depends on the teaching strength of the school in order to give teachers a fair representation and a meaningful participation in school Board's activities.

Thirdly, the heads of schools should create a congenial environment such as trust and confidence for teachers to participate in decision-making in pursuance of goals of their schools. This would give the teachers the opportunity to satisfy their needs in order to bring about improvement in their own professional performance and that of their students.

Lastly, school heads should encourage young and new teachers to realise the need to take part in school decision-making, irrespective of their level of interest with regard to the decision to be made:

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# PREDICTIVE VALIDITY OF DIFFERENT ENTRY MODES ON THE MATHEMATICS ACHIEVEMENT OF TERTIARY STUDENTS IN OGUN STATE

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## Abstract

The study focused on how students' performance in mathematics could be predicted based on different entry modes. The population was made up of all graduating students from a University of Education and a Polytechnic in Ogun State during 2014/2015 academic session. All graduating students (253) of the Department of Mathematics were used for the study. The grade point average of students obtained at the end of their study from the institutions were collected. In addition, the information about the entry mode and sex were collected from students' file. Three research hypotheses were tested using ANOVA and t-test statistics at 0.05 level of significance. Results revealed that only 2.3% of students' achievement in mathematics could be explained by their entry mode and that students do not differ significantly in their academic achievement based on the mode of admission with $F_{(2,250)}$ of 2.951. However, there is a significant difference in the mean mathematics achievement of male and female students admitted based on their entry mode at 0.05 level of significance with $t_{(31)} = 3.52$ and $t_{(118)} = 5.461$ for Unified Tertiary Matriculation Examination (UTME) and direct entry (DE) respectively. It is recommended that there should be no discrimination in the admission policy against any form of entry mode by the university or polytechnic authority.

**Keywords:** Predictive Validity, Entry mode, Grade point average, Pre-Degree, Academic Achievement

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## Introduction

Education is universally recognized as one of the instruments for social, political, scientific and technological development. Society therefore cannot afford to toy with the education of its citizenry as this will result in a snail pace development. (Azikiwe, 2000). Higher education provides the skilled manpower needed to transform the resources within that country into wealth. This is achieved when higher education provides the right quality of training and skills required at the right quantity (Azikiwe, 2000). University admission in Nigeria is very competitive owing to the high number of applicants vying for limited slots. As a result, admissions were confirmed on the candidate obtaining good grades.

Universities have come under increasing performance scrutiny as they are expected to play a critical role in national development efforts (Cheesman, Simpson & Wint, 2006). Part of the success of the educational process is measured in the quality of students' academic performance while at university. A university is as good as the quality of her graduates. It is common practice that the quality of graduates is measured using academic performance and the quality of a university is the quality of her graduates (Ali, 2003). One indicator of a student quality is the entry qualification, though it is one among many other factors that influence academic performance. A number of studies have been carried out to identify and analyze the numerous factors that affect academic performance. Among such are student factors (attitude, individual differences, physical health and readiness and expectations); home, cultural, and institutional factors (school type, population, discipline, personnel interactions, admission and examination or evaluation policies) (Ali, 2003).

Nwana (1990) had shown that university undergraduates' academic performance cannot be accurately predicted from School Certificate Examination or General Certificate Examination and Joint Matriculation Examination (UTME). Okwilagwe (2001) reported that

SSCE (a secondary school performance) is a potent predictor of undergraduate academic achievement as it exerted a direct and significant positive influence on undergraduate grade point average (GPA) which seems to reveal its stability in establishing predictive validity over time than its counterpart the UTME. Agbonifo and Dimowo (1985) showed in their studies that UTME scores correlated significantly and positively with first year undergraduate performance. This implies that students with high scores in UTME also obtained high scores in university examinations in the first year while Abe (2003), Oluwatayo (2003, 2007) and Adonis (as cited in Alonge, 2005) showed that GCE Advanced level results could predict students' academic performance at Polytechnics and University levels.

Abe (2003) reported that SSCE showed negative prediction to the academic performance among the engineering students. Aminu, Asabe and Suleman (2002) showed that SSCE, Grade II Teachers' Certificate and Advanced level certificate significantly predicted university undergraduate performance. Long (as cited in Farounbi, 2014) observed that the performance of direct entry students in degree examination in Agriculture was better than those admitted through the preliminary programme. Such disparity in performance was not observed among their counterparts in the Faculty of Science in the same year. Majasan and Bakare (as cited in Farounbi, 2014) reported that direct entry students performed better academically than those admitted through preliminary programme.

Sear's study (as cited in Farounbi, 2014) observed that there was a relationship between entry qualification and students' overall performance in final degree result. He observed that most of the candidates that were admitted into the university with GCE Advanced level (A/L), with 12 points or more, had First Class or Second Class Upper Division while only 24% of those admitted with GCE Ordinary level made Upper Division level. Jimoh and Durotolu (as cited in Omede, 2003) studied the relationship between the entry qualifications of National College of Education (NCE) students with

their performance in education courses. They considered WASC/GCE, Grade II and pivotal Grade II as entry certificates: They observed that there was no significant difference in the performance of students admitted into NCE programme through preliminary programme compared to that of direct entry students.

Akabue (as cited in Farounbi, 2014) studied the predictive validity of four entry qualification into the Teacher Training Colleges (TTC). He considered West African School Certificates (WASC), and Primary School Leaving Certificate (PSLC) without teaching experience. He observed that those that were admitted with WASC performed significantly better than others at both Federal and State papers examination. Abdullahi (2003) investigated the linear correlation between JAMB examination result and first year university examination, and observed that JAMB scores in Physics, Chemistry and Economics correlated with university scores in the same subjects. He observed that JAMB scores in Biology and Geography showed no linear correlation with the scores in the first year university examination. Lots of these researches had been carried out over the space of ten years and are based on other subjects apart from Mathematics. Again, gender is a moderating factor that could play a role in the academic performance of students. Haist., Wilson., Elam., Blue., and Fosson (2000) in their study reported that gender is one of the factors that significantly affects students' academic performance. Haist *et al.* showed that men performed better than women in certain settings while women outperformed men in other settings. However, Alton-Lee and Praat (2001); Martin, Gonzalez, & Kennedy (2003) indicated that female students are outperforming their male counterparts at all levels of the education system and attaining higher qualifications. Nonetheless there might have been changes in environmental condition of the institutions which may affect the academic performance of students, hence this study is set to examine how graduating students' performance in Mathematics could be predicted based on different entry modes.

**Statement of Problem**

The academic performance of students admitted into the universities has been an issue of great concern to researchers and all those who are interested in the education industry. There are minimum entry requirements that candidates must possess before they can be admitted into degree programmes in the universities. The requirements are met for both the pre-degree, UTME and Direct entry candidates. Candidates are expected to possess National Examination Council (NECO), West African School Certificate Examination (WASCE), Senior School Certificate Examination (SSCE) or its equivalents with credits in five (5) subjects (including English language and Mathematics) relevant to their course at not more than two sittings.

It is assumed that all those admitted into the university irrespective of the mode of entry will be able to cope with the academic rigors but contrary to this expectation, some drop out on the way without graduating from the university. Some change their courses and others spend extra year(s) before graduating and some end up with pass and Third Class degrees. This scenario shows that performance may be a function of the mode of entry.

**Purpose of the Study**

The purpose of this study was to examine the predictive validity of different entry modes in the performance of students in Mathematics.

**Research Hypotheses**

The following research hypotheses were postulated to guide the study:

**$H_{o1}$** - There is no statistically significant difference in the mean academic achievement of graduating Mathematics students based on their mode of entry.

**$H_{o2}$** – There is no statistically significant difference in the mean academic achievement of male and female students who are

admitted into the university through unified tertiary matriculation examination.

$H_{03}$ – There is no statistically significant difference in the mean academic achievement of male and female students who are admitted into the university through direct entry admission.

## Methodology

An ex-post facto survey design using the existing data that could not be manipulated were used for the study. The population for the study was made up of all graduating students of a University of Education and a Polytechnic in Ogun State during 2014|2015 academic session. All graduating students (253 students) in Department of Mathematics from the two institutions were purposively selected taking note of their entry mode. The grade point average of students obtained at graduation from the institutions were collected and used for the study. Data obtained were analyzed using ANOVA and t-test statistics. All hypotheses were tested at 0.05 levels of significance.

## Results of the Findings

**Research Hypothesis 1:** There is no statistical significant difference in the mean academic achievement of graduating Mathematics students based on their mode of entry.

The grade points average of graduating students were collected and used for the study. It was analyzed by finding difference in the mean mathematics achievement of graduating students in the three groups using ANOVA. The results are presented in Table 1

**Table 1: Descriptive Statistics of Students' Achievement Based on entry mode**

| Mode of Entry | N | Mean Grade Points | Std. Deviation | Std. Error |
|---|---|---|---|---|
| UTME | 120 | 2.99 | 0.90 | 0.0822 |
| Pre-Degree | 100 | 2.86 | 0.86 | 0.0860 |
| Direct Entry | 33 | 2.95 | 0.73 | 0.1271 |

Table 1 shows the mean grade point average for each category of entry mode and standard deviation of the academic achievement of students based on their modes of admission into the university. The mean and standard deviation were M = 2.99, SD = 0.90 for UTME; M = 2.86, SD = 0.86 for Pre-degree; M = 2.95, SD = 0.73 for Direct Entry; Levene test of homogeneity is performed and the result is shown in Table 2

**Table 2: Test of Homogeneity of Variances**

| Levene Statistic | $df_1$ | $df_2$ | Sig. |
|---|---|---|---|
| 2.951 | 2 | 250 | .054 |

The result in Table 2 shows no significant difference, hence equality of variance is assumed. A one-way between groups analysis of variance was conducted to explore the impact of mode of entry on the grade point average obtained by graduating students of Mathematics. There were three modes of entry under consideration: UTME; Pre-Degree and Direct. The result is presented in Table 3.

**Table 3: ANOVA Test of between Subject effect Dependent Variables: Performance**

| Source of Variation | df | Sum of Squares | Mean Square | F-ratio | Sig. |
|---|---|---|---|---|---|
| Between groups | 2 | 212.25 | 106.125 | 2.951 | 0.054 |
| Within Groups | 250 | 8987.86 | 35.951 | | |
| **Total** | **252** | **9200.11** | | | |

Table 3 revealed no statistically significant difference at the $p < .05$ level in the grade point average obtained by graduating students of Mathematics for the three modes of entries $F(2, 250) = 2.951$, $p > .05$. The actual difference in mean grade point between groups was quite small. The effect size .023, calculated using eta squared was small according to Cohen (1988). Therefore, students do not differ significantly in their academic achievement based on the mode of admission into the university. Any physical differences observed amongst the mean academic achievement of students who are admitted into the university through unified tertiary matriculation examination, remedial programme and direct entry admission might have arisen from sampling errors or any other variations in the study.

**Research Hypothesis 2:** There is no statistically significant difference in the mean mathematics achievement of male and female students who are admitted into the university through unified tertiary matriculation examination.

**Table 4: Descriptive Statistics and T-test Statistic of Male and Female Students Admitted through Unified Tertiary Matriculation Examination**

| Sex | Mean | Variance | SD | N | df | t –value | Sig. |
|---|---|---|---|---|---|---|---|
| Male | 3.49 | 0.6889 | 0.83 | 80 | | | |
| Female | 2.4 | 0.94 | 0.97 | 40 | 118 | 5.461* | .00001 |

*Significant, $p < .05$

Table 4 shows the result of an independent-samples t-test conducted to compare the academic achievement of male and female students admitted through UTME. There was a significant difference in the grade point average for male (M= 3.49, SD= 0.83) and female (M= 2.4, SD= 0.97) with $t(80) = 5.461$, $p = 0.05$. Therefore, the null hypothesis is rejected. This implies that there is a significant difference in the mean academic achievement between male and female students who were admitted into the university through unified tertiary matriculation examination at 0.05 level of significance. The result shows that male students who were admitted into the university

through unified tertiary matriculation examination performed better than their female counterparts who were equally admitted into the university through unified tertiary matriculation examination.

The effect size calculated using eta squared was 0.20175 which implies that 20.2 per cent of the variance in the academic achievement of students admitted through UTME could be explained by their gender.

**Research hypothesis 3:** There is no statistically significant difference in the mean academic achievement of male and female students who are admitted into the university through direct entry admission.

**Table 5: Descriptive Statistics and T-Test Statistic of Male and Female Students Admitted through Direct Entry**

| Sex | Mean | Variance | SD | N | df | t –value | Sig. |
|---|---|---|---|---|---|---|---|
| Male | 3.4 | 0.64 | 0.80 | 20 | 31 | 3.52* | 0.00136 |
| Female | 2.5 | 0.44 | 0.66 | 13 | | | |

*Significant, p <.05

Table 5 shows the result of an independent-samples t-test conducted to compare the academic achievement of male and female students admitted through Direct Entry. There was a significant difference in the grade point average for male (M= 3.4, SD= 0.80) and female (M= 2.5, SD= 0.66) with t (31) = 3.52, p = 0.00136. Therefore, the null hypothesis is rejected. This implies that there is a significant difference in the mean academic achievement between male and female students who were admitted into the university through Direct Entry at 0.05 level of significance. The result shows that male students who were admitted into the university through Direct Entry performed better than their female counterparts who were equally admitted into the university through Direct Entry. The effect size calculated using eta squared was 0.286 which implies that 28.6 per cent of the variance in the academic achievement of students admitted through DE could be explained by their gender.

**Discussion of Findings**

There has been much controversy as to which category of students performs better in the university examination and to which mode of admission more emphasis should be placed in the University admission. Table 2 revealed no statistically significant difference at the $p < .05$ level in the grade point average obtained by graduating students of Mathematics for the three modes of entries $F(2, 250) = 2.951$, $p > .05$, therefore we fail to reject the null hypothesis. The findings of this study showed that there was no statistically significant difference in the mean academic achievement of graduating students based on the mode of admission into University of study. This implies that any difference observed amongst the mean academic achievement of students who were admitted into the University of study through unified tertiary matriculation examination, pre-degree programme and direct entry admission were such that might have arisen from sampling errors or any other variations in the study. The finding of this study corroborate the findings of Ezema (2006) and Long (as cited in Faroumbi, 2014) who compared the results of direct entry students, unified tertiary matriculation examination students and pre-degree students and reported that for the five academic sessions studied there was no significant difference between the cumulative grade point average of the three groups of students based on the mode of entry into the university.

Nonetheless, the findings of this study show that 2.3% of the variance in the Mathematics achievement of graduating students could be attributed to the mode of entries (as revealed by the eta square of 0.02307). Several factors may have contributed to non-significant difference in the mean academic achievement of the three groups of students. Among such factors may include the submission of Mgbake (2006) who states that students' academic success is largely a function of the amount of efforts put into study and not necessarily as a result of mode of entry into the university. In addition, Agada (2007) affirms that students' study techniques among other factors influence their

academic achievement in universities. Commenting on this, he stated that achievement of qualitative education and in fact success in all worthwhile endeavours requires effort. He reported that students ought to put more efforts in their academic activities which include concentration in their studies, frequent revision of work already done and diligence in doing assignments. Sequel to this it could be observed that there is a time for everything under the sun and hence the time that students spend while in training in school is the time to work hard so as to achieve a better learning outcome.

The results of the hypotheses 2 and 3 indicated that the two null hypotheses were rejected at $p < 0.05$ level of significance. This therefore implies that there was a statistically significant difference in the mean academic achievement of male and female students who were admitted into the university through direct entry, and unified tertiary matriculation examination admissions at 0.05 level of significance. The academic achievement of male students was higher than that of their female counterparts based on the three modes of admission.

**Conclusion**

Based on the results of the study, it can be concluded that there is no statistically significant difference in the mean mathematics achievement of students who are admitted into the university through unified tertiary matriculation examination and direct entry. Therefore, students do not differ significantly in their performance based on the mode of admission into the university. However, when gender is considered, there is a statistically significant difference in the mean mathematics achievement of male and female students who were admitted into the university through direct entry admission and unified tertiary matriculation examination. Hence the mean academic achievement of male students is higher than that of their female counterparts irrespective of the mode of admission into the university.

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**Recommendations**

Based on the findings of this study, it is recommended that there should be no discrimination in the admission policy into tertiary institution and equal opportunities should be given to all students irrespective of the mode through which admission is being sought. Secondly, attempt should be made to reduce the academic achievement gap between male and female students in universities.

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# ASSESSING THE READABILITY OF SOCIAL STUDIES TEXTBOOKS FOR THE JUNIOR HIGH SCHOOLS IN GHANA

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## Abstract

This study was designed to assess the readability level of Ghana Education Service (GES) approved Social Studies textbooks that are currently in use in Junior High Schools (JHS) in Ghana. The sample of the study consisted of the GES approved Social Studies textbooks for JHS 1-3 currently in use. Thirty different texts (ten from each textbook) were randomly selected for the readability test. The instrument used for data collection was textbook readability test. The data were analysed using free online readability test. The results of the findings showed that the GES approved Social Studies textbooks were difficult, compared to their grade level. The study recommended that Social Studies textbooks should be assessed to see their readability level before they are given to students. This is necessary because readable textbooks motivate students to read and learn better.

**Keywords**: readability, Social studies, text, textbooks, understanding.

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## Introduction

Textbooks are very important for students' learning outcomes because they pull knowledge, ideas and facts needed for a particular field of study. Textbooks are very relevant, because they facilitate students' learning process (Umoke & Nwafor, 2015). A textbook is a book used by students as a standard work for a particular field of study. A textbook is one of the most important teaching and learning materials in instructional process. McGrath (2002) indicates that a textbook is very important because it sets the direction and gives the content on what is to be learnt. For a textbook not to be ambiguous and be clear, it should be easy for the intended readers (Sholeh, 2012). Textbooks only serve their purpose when students are able to read and understand the text.

Understanding the text put up by the writer of a textbook is crucial for the academic success of students (Meyer, 2008). This is why the level of language used in textbooks plays a major role in the understanding of the text; as such, textbooks should be written in simple and clear language. The sentences in the text should be short and simple to make the text readable (Gyasi, 2011). In other words, textbooks should be readable. Text readability is an attempt to match the level of a written text to the understanding level of the reader (Johnson, 2000; Feather, 2004). Text readability is critical for educational achievement, especially for second language learners. According to Feather (2004), readability of a textbook helps students to enjoy reading the text, and this makes them to acquire more knowledge to improve their academic performance. This aim is defeated when students cannot read and comprehend texts intended for them (Burke & Greenberg, 2010). For this reason, a textbook that is suitable for the level of students is needed to serve as a basis in their learning process. Students can learn better with readable textbooks.

Reading is an essential learning skill without which the learner cannot obtain meaningful and desirable knowledge. Comprehension of a text read is therefore a powerful weapon for students to excel in academic life (Alderson, 2001). The main reason for reading is comprehension. Research testifies to the significant contribution that high readable textbooks make to the learning process (Mikki, 2000; Singer & Tuomi, 2003). It is therefore important that textbooks designed for students should be suitable in terms of their difficulty level (Bargate, 2012).

Social Studies is a problem-solving subject therefore, its learning should be based on inquiry approach (Blege, 2001). The purpose of Social Studies is to promote attitudinal and moral literacy needed to solve personal and societal problems. In Social Studies, students are to investigate and research to get solution to societal problems (Blege, 2001; Odumah, 2003; Yidana & Boadu, 2012). Social Studies as a discipline, therefore, requires research and extensive reading. Therefore, the idea of readability and comprehension of text is very important in the learning of Social Studies. Social Studies is an area of study where there is an extensive reliance on the reading of the Social Studies textbooks. The textbooks in Social Studies are major sources of content to be learnt by students in the Junior High Schools (JHS). Many students acquire knowledge by reading Social Studies textbooks, even though some also depend on handouts and notes from their teachers. Therefore, it is important to select textbooks that are readable. Since readability of textbooks is critical in students' work, readability researchers such as Gyasi (2011) and Owu-Ewie (2014) suggest that the readability of textbooks be determined using readability formulae before they are given to students. Extensive research has been done on readability but this is mostly on English Language textbooks (Bargate, 2012). Some readability works in English Language include Gyasi (2011) and Owu-Ewie (2014). There seems to be no research done on the readability level of Social Studies textbooks used in Ghana. There is therefore the need to

conduct readability test to assess the difficulty levels of Social Studies textbooks used in Junior High Schools in Ghana. It is against this background that it has become necessary to conduct this research to examine the readability of Social Studies textbooks used at the JHS level in Ghana. Assessing the readability of textbooks objectively requires the adoption of certain readability formulae. Readability formulae subject a text to mathematical calculations to determine the level of difficulty of the text (Essuman & Osei-Poku, 2015). According to Kasule (2011), these formulae often use word length, sentence length, and polysyllabic frequency. This study adopted the Gunning Fog Index, Flesch-Kincaid Reading Ease and Flesch-Kincaid grade level readability formulas. These formulae are commonly used in determining the readability of textbooks. The researcher used more than one readability formula based on the recommendation of Burke and Greenberg (2010), that using two or more readability formulae is preferable, because it helps to get a better picture of the readability level of the text.

**Statement of Problem**

Social Studies is one of the compulsory subjects at the JHS level. It is among the subjects which are used to determine the placement of students in the Senior High Schools (SHS) by the Computerized Selection and School Placement (CSSP) system in Ghana. A pass in Social Studies is required to gain admission to the SHS in Ghana.

At the JHS level, students acquire much knowledge in Social Studies through further reading of Social Studies textbooks. Therefore, it is necessary for students to be able to understand what they read from their Social Studies textbooks. However, one is not sure whether the readability of the Social Studies textbooks is determined before they are recommended for the students. If the readability is not determined, the textbooks sometimes might not be appropriate for the students and this could result in situations where the students have to struggle in

order to read and understand the text (Ivey, 2010; Gyasi, 2011). When a textbook is too difficult, students are not able to understand the concepts which are the building blocks of the content of the subject. Since much research has been done on readability of English textbooks in Ghana by Gyasi (2011) and Owu-Ewie (2014), and there seems to be no research done on the readability of Social Studies textbooks in Ghana, this study therefore, seeks to assess the readability of Social Studies textbooks used for the JHS level in Ghana schools in order to determine their appropriateness for the students.

**Objectives of the Research**

1. To assess the readability levels of GES approved Social Studies textbooks that are used currently by JHS students in Ghanaian schools.
2. To find out whether the approved JHS Social Studies textbooks are appropriate to the level of the students.
3. To suggest the reasons why it is necessary to determine the readability of Social Studies textbooks.

**Research Questions**

1. What are the readability levels of GES approved Social Studies textbooks used currently by JHS students in Ghana?
2. Are the GES approved JHS Social Studies textbooks at appropriate reading level to the JHS grade levels?
3. What could be done to improve the readability of Social Studies textbooks for JHS students in Ghana

**Theoretical Framework**

The theory that underpins this research is social constructivism developed by Lev Vygotsky. Social constructivism allows people to obtain meaning of the world from social interactions (Kukla, 2000). Social constructivism is based on specific assumptions that reality and knowledge are socially constructed. That is, reality and knowledge are based on human activity (Vygotsky, 1978 cited in Gyasi, 2011).

Therefore, reality is socially constructed. That is, people acquire meaning or knowledge through their interactions with each other in the society (Gyasi, 2011).

This research is related to the theory of social constructivism because writing and reading are socially constructed. This means the writer construct knowledge that will be understood by the reader. Indeed, Kukla (2000) concludes that academic knowledge is perceived as a social construct and there should be agreement between the writer and the academic community. Academic writing as a social construct must meet the requirement of the community for it to be accepted as one of its kind. That is, people should get meaning from what is written.

## The Concept of Textbook and Readability

A text is a collection of words that communicate a meaning (Kasule, 2011). A text is a systematic arrangement of words which are held together by considering the rule of coherence and cohesion. A textbook, according to Hornby (1995), is a book that teaches a particular subject. A textbook is a book used by students as a standard work for a particular branch of study. It is a book used as guidance in teaching and learning. A textbook is a book that provides materials based on current curriculum and students' needs (Gyasi, 2011; Owu-Ewie, 2014). "A textbook is the core learning composed of text and/or images designed to bring about a specific set of educational outcome; traditionally a printed and bound book including illustrations and instructions for facilitating sequences of learning activities" (UNESCO, 2005, p.1).

Reading is the ability to understand words contained in a document and to make use of the knowledge for personal growth and development (Davids, 2002; Fountas & Pinell, 2001). Reading is also a process of receiving and interpreting information encoded in language form through the medium of print (Grabe, 2009). This implies making meaning out of printed materials by an individual.

According to Greene (2001), reading is the identification of the symbols and the association of appropriate meaning with them. It requires identification and comprehension. Comprehension skills help the learner to understand the meaning of words in isolation and in context (Fry, 2006). Fry (2006) believes reading is a process of thinking, evaluating, judging, imagining, reasoning and problem solving.

According to Dubay (2004), readability is what makes some texts easier to read than others. Davids (2002) also defines readability as how easily written materials can be read and understood. Readability here means how easy a text is to the reader it is intended for. It refers to how easy a written text is to read and understand (Ivan, 2010). Another dimension of readability is how interesting and enjoyable a text is to the reader (Pikulski, 2002; Dubay, 2004).

The ability of a test to consistently measure what it is supposed to measure depends on its readability (Bitgood, 1996). This definition is concerned with the interaction between the reader and the text. The readability of a text is a measure on how well and how easily a text conveys the intended meaning to a reader. This implies that when a text cannot be well read and not easily understood by a reader, it is unreadable. Therefore, in readability, there is a relationship between a text and the reader (Fountas & Pinell, 2001).

McGrath (2002) defines readability as the degree to which a given group of readers finds certain reading materials compelling and comprehensible. Dubay (2004) indicates that readability is the sum total of all those elements which a given piece of printed material has that affects the success of a group of readers. The success is the extent to which they understand it. The implication of the definitions above is that, comprehensibility is essential in readability. Thus, a well written material should be highly readable in order to be clearly understood by a wide audience.

Based on the definitions above, it can be concluded that readability is the degree of difficulty or ease of a text to readers. It deals with how easily a text conveys its intended meaning to its reader. There are different readability formulas. Some common readability formulas include Gunning Fog Index, Flesch-Kincaid Grade Level, Fry Readability Graph and Flesch-Kincaid Reading Ease (Gyasi, 2011). This study used Gunning Fog, the Flesch-Kincaid Reading Ease and Flesch-Kincaid Grade Level formulae to ascertain the readability of the GES approved Social Studies textbooks for JHS.

The Gunning Fog Readability test is simply referred to as FOG Index. It was developed by Robert Gunning in 1952. According to him, most of the reading problems are as a result of the written material. He was of the view that written materials were full of "fog" and unnecessary complexities. The FOG test is used commonly to confirm that a text can be read easily by the intended user (Dubay 2004; Owu-Ewie, 2014). A Fog index of 1- 8 is for elementary school students, while 9 -12 is for high school students. A document that scores a fog index of 13 -16 is for post-secondary school students. The ideal score for readability with the Fog index is 7 or 8. Anything above 12 is too hard and difficult for basic and high school students to read (Pikulski, 2002; Dubay, 2004; Ulusoy, 2006; Gyasi, 2011; Kolahi, 2012). The summary of Gunning Fog Index is shown in Table 1.

**Table 1: Gunning Fog Index**

| Score | Estimated reading grade |
|---|---|
| 17 | College graduate |
| 13-16 | College |
| 10-12 | Senior High |
| 9 | 9$^{th}$ grade-JHS 3 |
| 8 | 8$^{th}$ grade-JHS 2 |
| 7 | 7$^{th}$ grade-JHS 1 |
| 6 | 6$^{th}$ grade |

Adopted Zamanian & Heydari (2012)

Another common readability formula is Flesch-Kincaid reading ease. Flesch-Kincaid Reading Ease was co-authored by Rudolph Flesch and John P. Kincaid. It is an improvement of Flesh grade level score (Doak & Doak, 2010; Owu-Ewie, 2014). Flesch-Kincaid reading ease formula became the most widely used formula and one of the most tested and reliable (Dubay, 2004). According to Braught (2003), the Flesch-Kincaid Reading Ease is a number usually between 0-100 indicating how difficult the text is to read. The higher the number, the less difficult it is to read the text. In terms of the level of reading difficulty, documents that score a Flesch Reading Ease of 0-30 are considered very difficult while those that score 30 -50 are considered difficult. A Flesch-Kincaid reading ease of 50- 60 is for documents that are fairly difficult and 60 -70 score is for standard documents. A Flesch-Kincaid reading ease score of 70 -80 and 90 -100 are considered to be easy and very easy documents respectively. Writers are encouraged to aim for a score of approximately 60 to 70 (Braught, 2003; Dubay, 2004; Owu-Ewie, 2014). The formula is based on the average number of syllables per word and word per sentence (Dubay, 2004). The summary of Flesch-Kincaid reading ease formula is shown in Table 2.

**Table 2: Flesch-Kincaid Reading Ease**

| Score | Description | Predicted reading grade |
|---|---|---|
| 0-30 | Very difficult | College graduate |
| 30-40 | Difficult | College grade |
| 50-60 | Fairly difficult | $10^{th}$-$12^{th}$ grade |
| 60-70 | Standard | 8-$9^{th}$ grade |
| 70-80 | Fairly easy | $7^{th}$ grade |
| 80-90 | Easy | $6^{th}$ grade |
| 90-100 | Very easy | $5^{th}$ grade |

Adopted Zamanian & Heydari (2012)

Flesch-Kincaid Grade Level Test is another readability test which uses a test score to match with the grade level of the students. It is extensively used to determine the readability level of various books. This formula can be used to determine the number of years of formal education generally required to understand a given text. For instance, a Flesch-Kincaid Grade readability score of 8.4 means that all things being all, an eighth grade or JHS two students should be able to read it (Owu-Ewie, 2014).

**Methods**

This study adopted the quantitative design. Quantitative research is the research that relies primarily on the collection of quantitative data (Christensen & Johnson, 2006). This is considered a quantitative study because the readability formulae, according to Rush (1984), are objective and use quantitative tools for estimating the difficulty of written material without requiring testing of readers. This means that subjectivity does not exist when determining readability and this makes the use of formulae more reliable than other methods. With the quantitative design for this study, data was analysed quantitatively using Gunning Fog, Flesch-Kincaid reading ease test and the Flesch-Kincaid grade test. Texts were selected from GES approved Social Studies textbooks for JHS 1- 3 written by Abane, Agbenorto, Attafuah and Ofori-Attah (2008). All the three Social Studies textbooks were published in 2008 by Unimax Macmillan Ltd.

The population includes the subjects that a researcher intends to study (Kwabia, 2001). All the Social Studies textbooks used at the JHS level in Ghana form the subjects of study. The GES approved Social Studies textbooks for JHS 1- 3 were purposely selected as a sample for the study. These textbooks include Social Studies for JHS Book 1, Social Studies for JHS book 2, and Social Studies for JHS Book 3 all written by Abane, Agbenorto, Attafuah and Ofori-Attah (2008) published by Unimax Macmillan Ltd. They were selected because they are textbooks used currently in all the basic schools in Ghana.

Three readability tests were used as the instruments for data collection. The Gunning Fog Index, Flesch-Kincaid grade level and Flesch-Kincaid reading ease formulae were used to test the readability of the selected textbooks. FOG index was used to determine the readability level of the texts based on the average number of sentences and difficult words. This formula was used because it is simple and it can measure the readability text in general (Dubay, 2004). Flesh-Kincaid Reading Ease was also used to obtain the scores in per centages so as to compare with Gunning Fog scores. Flesch-Kincaid grade level was also used to determine the appropriateness of the texts to the various grades or classes. Texts on ten topics from each approved JHS Social Studies textbook were randomly selected for a readability test using the three readability formulae. In all, 30 different texts were subjected to the FOG, Flesch-Kincaid reading ease and Flesch-Kincaid grade level readability tests.

The first step in the data collection was the selection of the GES approved Social Studies currently used by basic schools in Ghana. Texts written on the randomly selected ten topics from each textbook were retyped to obtain the soft copies of the texts. The retyped texts were uploaded one after the other and subjected to mathematical calculations using readability online software (www.readability formulas.com/free-readability-formula.tests.php).The three readability formulae that were used to determine the readability levels of the textbooks using readability formula software were the Gunning FOG Readability test, the Flesch-Kincaid Reading Ease Formula and Flesch-Kincaid grade level test. The topics in the textbooks were randomly selected and the text written under them subjected to readability test after they were retyped. The figures derived from the three readability formulae were used to determine the readability levels of the textbooks and whether the textbooks were appropriate for that grade level.

## Data Analysis

Data were analysed using tables with the help of online computer readability software. Each readability formula was used to determine the readability of the selected texts of each textbook. Results of each formula for the selected text in each textbook were displayed in tables and the mean was calculated for the various texts under a specific readability formula to obtain the readability for that textbook. In addition, the mean scores of the various readability formulae for the Social Studies textbooks for the JHS level were compared.

## Results

**Table 3: Readability Level of ten Selected Texts from JHS 1 Social Studies Textbook**

| Text | Flesch-Kincaid reading ease | | Gunning Fog | | Flesch-Kincaid grade | |
|---|---|---|---|---|---|---|
| | Score | Interpretation | Score | Interpretation | Score | Interpretation |
| 1 | 65.4 | Standard | 10.4 | Fairly easy to read | 7.8 | 8th grade |
| 2 | 63.2 | Standard | 10.8 | Hard to read | 8.4 | 8th grade |
| 3 | 61.6 | Standard | 10.7 | Hard to read | 8.9 | 9th grade |
| 4 | 51.1 | Fairly difficult | 12.4 | Hard to read | 10.8 | 11th grade |
| 5 | 52.8 | Fairly difficult | 12.9 | Hard to read | 10.5 | 11th grade |
| 6 | 62.1 | Standard | 9.0 | Fairly easy to read | 8.3 | 8th grade |
| 7 | 53.7 | Fairly difficult | 12.7 | Hard to read | 10.6 | 11th grade |
| 8 | 51.1 | Fairly difficult | 13.5 | Hard to read | 10.4 | 10th grade |
| 9 | 55.4 | Fairly difficult | 13.1 | Hard to read | 9.7 | 10th grade |
| 10 | 56.5 | Fairly difficult | 12.5 | Hard to read | 9.2 | 9th grade |
| Mean | 57.3 | Fairly difficult | 11.8 | Hard to read | 9.5 | 10th grade |

Table 3 shows the readability levels of each of the ten different texts selected from Social Studies for JHS 1 based on the Flesch-Kincaid Reading ease, Gunning Fog and Flesch-Kincaid grade level readability formulae. The ten topics which texts were used for the Social Studies Book 1 were: 1. Land degradation, 2. Water pollution,

3. Why the Europeans came to Ghana, 4. Slave trade, 5. The Maroons in Jamaica, 6. British control, 7. Independence, 8. Democracy, 9. Settlement planning and 10. The Yaa Asantewaa war.

Texts of topics 1, 2, 3 and 6 are standard text according to Flesch-Kincaid reading ease formula, while the texts from all the other topics are fairly difficult. The scores for Flesh- Kincaid reading ease range from 51.1 for texts 4 and 8 to 65.4 for text 1 with the mean score of 57.3. Table 1 indicates that the texts for the GES approved JHS Social Studies book 1 for Ghana is fairly difficult according to Flesch-Kincaid reading ease formula.

It is also observed from Table 3 that the mean score for the various texts based on Gunning Fog is 11.8 which shows that the texts for the GES approved JHS Social Studies Book 1 for Ghana are hard to read. The Flesch-Kincaid grade level had a mean score of 9.5 which indicates that the texts for the GES approved JHS Social Studies Book 1 for Ghana is meant for tenth grade students. Table 4 shows the readability levels of each of the ten different texts selected from Social Studies textbook for JHS 2 based on the Flesch-Kincaid Reading ease, Gunning FOG and Flesch-Kincaid grade level readability formulae. The ten topics from which texts were subjected to the readability text for the Social Studies Book 2 were: 1. Changing roles of women, 2. Trokosi system, 3. Drainage, 4. Importance of drainage system, 5. Natural vegetation, 6. Socialization, 7. Conflict, 8. Global fight against world problems, 9. Why people tour, and 10. Partnership.

Table 4 indicates that texts of topics 2 and 3 are standard text, according to Flesch-Kincaid reading ease formula, while most of the texts are fairly difficult, apart from texts 1 and 10 which are difficult to read. The scores for Flesh-Kincaid reading ease range from 45.2 for texts 1 to 64.3 for text 2 with a mean score of 55. From Table 2, it can be deduced that the texts for the GES approved JHS Social Studies Book 2 for Ghana are fairly difficult according to Flesch-Kincaid reading ease formula.

**Table 4: Readability Level of Ten Selected Texts from JHS 2 Social Studies Textbook**

| Text | Flesch-Kincaid reading ease | | Gunning FOG | | Flesch-Kincaid grade | |
|---|---|---|---|---|---|---|
| | Score | Interpretation | Score | Interpretation | Score | Interpretation |
| 1 | 45.2 | Difficult to read | 13 | Hard to read | 11.7 | 12th grade |
| 2 | 64.3 | Standard | 10 | Fairly easy | 8 | 8th grade |
| 3 | 63.8 | Standard | 8.3 | Fairly easy | 8.4 | 8th grade |
| 4 | 56.6 | Fairly difficult | 12.1 | Hard to read | 9.3 | 9th grade |
| 5 | 51.8 | Fairly difficult | 14.4 | Hard to read | 11.2 | 11th grade |
| 6 | 54.7 | Fairly difficult | 13.9 | Hard to read | 10.1 | 10th grade |
| 7 | 53.8 | Fairly difficult | 13.1 | Hard to read | 10.2 | 10th grade |
| 8 | 55.4 | Fairly difficult | 11 | Hard to read | 9.6 | 10th grade |
| 9 | 58.6 | Fairly difficult | 10.9 | Hard to read | 8.8 | 9th grade |
| 10 | 45.4 | Difficult to read | 15.8 | Difficult to read | 11.5 | 12th grade |
| Mean | 55.0 | Fairly difficult | 12.3 | Hard to read | 9.9 | 10th grade |

Table 4 also shows a variation of Gunning Fog readability levels of the various texts ranging from 10 for text 2 to 15.8 for text 10 with the mean score for the various texts being 12.3. Therefore, based on Gunning Fog readability formula, the texts for the GES approved JHS Social Studies textbook 2 for Ghana are hard to read. The Flesch-Kincaid grade level had a mean score of 9.9 which indicates that the texts for the GES approved JHS Social Studies Book 2 for Ghana is meant for tenth grade students (Pikulski, 2002; Dubay, 2004; Ulusoy, 2006; Gyasi, 2011).

The findings of the readability levels of each of the ten different texts selected from Social Studies textbook for JHS 3 based on the Flesch-Kincaid Reading ease, Gunning FOG and Flesch-Kincaid grade level are displayed in Table 5. The 10 selected topics from the GES approved Social Studies Book 3 were: 1. Block mountains, 2. Collaboration, 3. Development projects, 4. Voting in elections, 5. Political instability in Ghana, 6. Sustainable use of resources, 7. Desertification, 8. Malaria, 9. Electricity and 10. Education in Ghana.

**Table 5: Readability Level of Ten Selected Texts from JHS 3 Social Studies Textbook**

| Text | Flesch-Kincaid reading ease | | Gunning FOG | | Flesch-Kincaid grade | |
|---|---|---|---|---|---|---|
| 1 | 56.9 | Fairly difficult | 13.2 | Hard to read | 11.5 | 12th grade |
| 2 | 57.7 | Fairly difficult | 12.6 | Hard to read | 10.3 | 10th grade |
| 3 | 45.4 | Difficult to read | 14.9 | Hard to read | 11.2 | 11th grade |
| 4 | 54.3 | Fairly difficult | 14.7 | Hard to read | 11.1 | 11th grade |
| 5 | 45.3 | Difficult to read | 12.9 | Hard to read | 11.1 | 11th grade |
| 6 | 46.3 | Difficult to read | 15.7 | Difficult to read | 12.5 | College |
| 7 | 50 | Fairly difficult | 13.2 | Hard to read | 11 | 11th grade |
| 8 | 44.7 | Difficult to read | 14.5 | Hard to read | 11.2 | 11th grade |
| 9 | 24.3 | Very difficult | 14.6 | Hard to read | 14.7 | College |
| 10 | 47.8 | Difficult to read | 13.8 | Difficult to read | 11.3 | 11th grade |
| Mean | 47.3 | Difficult to read | 14.0 | Hard to read | 11.6 | 12th grade |

Table 5 indicates that according to Flesch-Kincaid reading ease formula, texts in the GES approved Social Studies textbook 3 are difficult to read with the mean score of 47.3. Text 9, for instance, had a score of 24.3 by Flesch-Kincaid reading ease formula, indicating that it is very difficult. A similar observation is made in Gunning Fog readability formula. The scores for Gunning Fog range from 12.6 to 15.7, with a mean score of 14.0 which is considered to be hard to read.

The scores for Flesch-Kincaid grade level range from 10.3 to 14.7 with a mean score of 11.6 which indicates that the texts for the GES approved JHS Social Studies textbook 3 for Ghana is meant for twelfth grade students.

**Discussion of Findings**

Readable textbooks play very important role in effective learning process (Singer & Tuomi, 2003). It is therefore necessary to ensure that textbooks designed for students are appropriate in terms of their difficulty level (Bargate, 2012). The study sought to find out if the

GES approved Social Studies textbooks are appropriate in terms of their readability levels. Table 6 shows the readability levels of the three GES approved Social Studies textbooks, based on the mean scores from the selected texts of the books using the three readability formulae namely Flesch-Kincaid reading ease, Gunning Fog and Flesch-Kincaid grade level to calculate different texts from the textbooks.

**Table 6: Readability Level of GES Approved Social Studies Textbooks (1-3)**

| Textbook | Flesch-Kincaid reading ease | | Gunning FOG | | Flesch-Kincaid grade | |
|---|---|---|---|---|---|---|
| JHS 1 | 57.3 | Fairly difficult | 11.8 | Hard to read | 9.5 | 10th grade |
| JHS 2 | 55.0 | Fairly difficult | 12.3 | Hard to read | 9.9 | 10th grade |
| JHS 3 | 47.3 | Difficult to read | 14.0 | Hard to read | 11.6 | 12th grade |

Table 6 shows that the mean score for the selected texts from JHS 1 Social Studies textbook, according to Flesch-Kincaid reading ease is 57.3, which is interpreted as fairly difficult. Scores below 61 are appropriate for tenth grade which is equivalent to SHS 1 students and above (Feathers, 2004; Owu-Ewie, 2014). This agrees with Flesch-Kincaid grade level which had a mean score of 9.5 (10th grade) as shown in Table 6. The mean score for the JHS 1 Social Studies textbook based on Gunning Fog test is 11.8, which indicates that the textbook is hard to read (Abdulla & Hashim, 2007; Gyasi, 2011). It could be concluded from the analysis that the GES approved JHS 1 Social Studies textbook is above the students' level, based on the readability formulas adopted. In other words, the textbook is not appropriate for students at JHS 1 grade or level, based on its readability grade. The three readability scores point to the fact that the JHS Social Studies Book 1 is appropriate for tenth grade students, that is SHS 1 students and not JHS 1 students.

On the GES approved JHS 2 Social Studies textbook, it was observed from Table 6 that the mean score by Flesch-Kincaid reading ease formula is 55.0 which is interpreted as being fairly difficult. Gunning Fog scored it 12.3, which is interpreted as hard to read. Anything above 12.0 is considered difficult for Basic and Senior High students by Gunning Fog (Pikulski, 2002; Dubay, 2004; Ulusoy, 2006; Gyasi, 2011; Owu-Ewie, 2014). Flesch-Kincaid grade level had a mean of 9.9 indicating that the book is equivalent to tenth grade or SHS 1 level. On the basis of the analysis from Table 6, it can be concluded that the GES approved JHS Social Studies textbook 2 is above that grade level and is not appropriate for the students at that level in terms of readability.

Table 6 also shows the readability level of the GES approved Social Studies Book 3. It had a mean score of 47.3 by Flesch-Kincaid reading ease, which can be described as difficult to read. It also had a mean score of 14.0 by Gunning Fog formula which could be described as difficult to read because according Gyasi (2011) and Owu-Ewie (2014) anything above 12 by Gunning Fog is considered difficult JHS students. The mean score of JHS 3 GES approved Social Studies textbook as calculated using Flesch-Kincaid grade was 11.6 indicating that the book is appropriate for 12$^{th}$ grade students that is, SHS 3 students. On this basis the JHS 3 GES approved Social Studies textbooks for Ghana is not appropriate for the level of students in terms of its readability level.

It could be realized from Table 6 that the GES approved Social Studies texts for the JHS are not appropriate for the level of students in terms of their readability levels and this could result in extraneous cognitive load. The cognitive load theory provides a general framework that deals with extraneous cognitive load, as it deals with how materials are to be presented. If text being read is too difficult, the reader spends more time reading the words, and less time on analysis, critical thinking and reflection. Therefore, instructional

materials should be designed to lessen the extraneous cognitive load (Vygotsky 1986, cited in Ginns, 2006).

## Conclusions

This study was to assess the readability level of GES approved Social Studies textbooks for the JHS to ascertain their suitability to the students at that level. Three readability formulaes were used to determine the readability of the textbooks. The results of the study show that the GES approved Social Studies textbooks for the JHS in Ghana are difficult and higher than the grade level of the students. It could be concluded that the Social Studies textbooks for the JHS are not suitable for the level of the students in terms of their readability.

## Recommendations

The study recommends that in selecting Social Studies textbooks, authorities and teachers should assess the readability of the textbooks to determine their readability level. This is very essential to make sure that the textbooks are suitable for the level of students they are intended for. This will help the students to read and understand the text. It is important for classroom teachers to be aware of the readability or comprehensibility of Social Studies textbooks. Teachers who are uncertain about the readability of a text can easily use readability formulas such as Gunning Fog, Flesch-Kincaid reading ease or Flesch-Kincaid grade level readability formulae to find the suitability level of the text quickly.

This research was limited to only GES approved Social Studies textbooks for JHS in Ghana. It is recommended that future research should also assess the readability of SHS Social Studies textbooks.

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# THE EFFECTS OF USING MANIPULATIVES IN TEACHING AND LEARNING OF ALGEBRAIC EXPRESSION ON SENIOR HIGH SCHOOL (SHS) ONE STUDENTS' ACHIEVEMENTS IN WA MUNICIPALITY

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## Abstract

The study set out to investigate the effects of using manipulatives in teaching and learning of algebraic expressions on Senior High School one students' achievement in the Wa Municipality. The purpose was to find out what type of manipulative is being used to teach algebraic expressions and its effects on the achievements of students in Senior High Schools. In all, 10 mathematics teachers were randomly sampled from all the senior high schools in the Wa Municipality while eighty students were also selected from the same schools for the study. The research design used for the study was a survey and the instruments used for collecting the data on the study were achievement test and questionnaire. An ANOVA test conducted revealed that there was a significant difference in achievement between students taught algebraic expressions using manipulatives and those taught without using manipulatives. The study also found that students were very active and in high spirit to learn mathematics when manipulatives were used. The study further found that students taught algebraic expressions with the use of manipulatives achieved higher than those taught without the use of manipulative. The study concludes that teachers should always use manipulatives to teach concepts in mathematics since it is pupils friendly, activity oriented, arouses students' interest and facilitates higher understanding that results in higher achievement.

**Keywords**: algebraic expression; effects; investigation; manipulatives; students' achievement.

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## Introduction

Until fairly recently, algebra was considered an exclusively letter symbolic domain. Much of the research that was conducted during the period preceding the 1990s focused specifically on the transition required by students as they moved from arithmetic to algebra at about age thirteen or fourteen (Kieran, 2001). Kieran notes that this large body of research which continues to grow has investigated the learning of concepts that under-pin students' successes in algebra. These concepts include unknowns and variables, expressions and equations and the expansion of the meaning given to the equal and minus signs. Some of the earliest research focused on students' ability to discriminate among the different ways that letters are used in algebra (Nathan & Koedinger, 2000). However, changing curricular emphases and using technological tools have expanded students' views of algebraic letters.

Spread sheet activity has been found to encourage simultaneous multi-valued and single-valued interpretations of the letter (Ainley, 2002). The shift in the content of algebra from equation centered to function-centered content has broadened students' views of algebraic letters, but has also introduced additional difficulties (Chazana &Yerushalmy, 2003). Healy and Hoyles (2005) observe that the use of patterning activities to develop meaning for algebraic expressions suggests that hard work is needed by students in order for them to express the observed numerical and geometric patterns in a letter-symbolic form. Many of the difficulties that students face in learning algebra may have their source in the poor understanding of two important concepts: the variable and the algebraic expressions.

Over the years, the role of the teacher has changed from being the transmitter of knowledge to being the facilitator of learners' discovery of knowledge. This means that learners' roles have equally changed from being spectators in the game of learning to being active participants. It appears that conceptual understanding of algebra is

essential, and methods that enhance this understanding should be included in the mathematics curriculum. The poor understanding of algebra has multiple effects on students' performance in mathematics.

To overcome the challenges in learning mathematics, a variety of teaching and learning strategies have been advocated for use in mathematics classrooms, moving away from the teacher-centered approach to more student-centered ones, and the use of manipulative materials is one of such potential strategies. Also, there is a substantial evidence of research work done by other researchers on the various effects on the use of manipulatives on students. For example, Cramer (2002) indicates that girls favour and achieve higher in cooperative learning than in competitive learning.

The majority of recent research supports the importance of using concrete materials in developing mathematical concepts (Dienes & Golding, 1971; Reys, 1971; Suydam & Dessart, 1976). Suydam and Higgins (1976) in their study of the activity-based mathematics learning in grade k-8 determine that mathematics achievement increased when manipulatives were used. Suydam (1984a) suggests that manipulatives enhance mathematics achievement across a variety of topics, grade levels, achievement and ability levels.

**Statement of the Problem**

Evidence of poor performance in mathematics by Secondary School students' points to the fact that the most desired technological, scientific and business application of mathematics cannot be sustained. This makes it paramount to seek for a strategy for teaching algebra that aims at improving students' understanding and performance in it. Evidence abound (Srinivasa, 1978; Ogunkunle, 2000) that lack of mathematics teaching aids and Mathematics teachers' non-use of manipulatives in teaching mathematics is one of the major factors that contribute to poor achievement in mathematics by secondary school students.

At the basic level of education as pointed by Mereku (2001), the Ghanaian mathematics teacher is regarded as a demonstrator of process and transmitter of information and teaches largely through lecturing and teacher-centered approaches. This prevents the students from experiencing the learning of mathematics using manipulative materials. No wonder therefore, that students' performance in mathematics in Ghana remains among the lowest in Africa and the world (Kraft, 1994; TIMSS, 2007). In Ghana, most students learn without adequate teaching and learning materials (Nabie, 2009). The use of teaching and learning materials in teaching enables the child to form a concept. Nabie (2009), cited in Bolton (2010), describes concept formation as a process in which a person recognizes similarities and abstracts the resemblances away from the other properties that are not relevant to the concept.

Many students have struggled with understanding mathematical concepts and become frustrated in the classroom (Rust, 2008). Most students have low-test scores and have difficulty in completing homework (Rust, 2008). It becomes apparent for the need to research into the use of manipulatives in the Mathematics classroom. Therefore, a study to find out the effects of using mathematics teaching aids in teaching on the achievement of Senior High School (SHS) (1) mathematics students is of great relevance. This may go a long way to improve the teaching and learning of algebraic expressions. It will be more relevant to investigate the effect of using manipulative materials in the teaching and learning of algebraic expressions in Wa Municipality in Upper West of Ghana.

**Research Questions**

The following research questions were formulated:

1. To what extent are manipulative materials used during algebraic expression lessons in the Wa Municipality?
2. What is the level of participation of students during algebraic expressions lessons using manipulative materials in Wa Municipality?

**Hypothesis**

$H_0$: There is no significant difference in achievement between students taught algebraic expressions using manipulative materials and those taught without using manipulatives.

**History of Manipulatives**

Since ancient times, people of different civilizations have used physical objects to help them solve everyday mathematics problems. The ancient civilizations of Southwest Asia used counting boards, which were wooden or clay trays covered in a thin layer of sand. The counting board users would draw symbols in the sand to tally inventory or whatever else they may need to count. The ancient Romans created the first abacus based on counting board. The abacus was made of beans or stones which moved in grooves in sand or on tables of wood, stone, or met. al. The Chinese abacus, which came into use centuries later, may have been an adaptation of the Roman abacus. The Mayans and the Aztecs both had counting devices that were made of corn kernels strung on string or wires that were stretched across a wooden frame.

The late 1800s saw the invention of the first true manipulative-maneuverable objects that appeal to several different senses and are specifically designed for teaching mathematical concepts. In 1837, German educator Friedrich Froebel introduced the world's first kindergarten. He designed the educational play materials known as

Froebel Gifts, or Frobelgaben, which included geometric building blocks and pattern activity blocks (Friedrich Froebel, 2009). Then in the early 1900s, Italian educator Maria Montessori continued with the idea that manipulatives are important to education. She designed several materials to help elementary students learn the basic ideas of maths. Since the 1900s, manipulatives have come to be considered essential in teaching mathematics at the elementary school level. In fact, the National Council of Teachers of Mathematics (NCTM, 2000) has recommended the use of manipulatives in teaching mathematical concepts at all grade levels (Matthew *et al.*, 2010). The use of manipulatives to teach algebraic expressions can greatly increase students' understanding and learning progression of concept (Rapp, 2009). According to Hartson (2006), manipulatives are objects that can be touched and moved by students to introduce or reinforce a mathematical concept.

During the 1960s and 1970s researchers compared, in a number of educational settings, outcomes of Mathematics instructions with concrete materials or pictorial materials to outcomes of instructions without such materials. The results were often mixed. Findings in some comparisons favored the group using the materials, whereas in other comparisons the control group achieved comparable or better results. Some early reviewers of research on manipulatives simply summarized findings and let readers draw their own conclusions about the effectiveness of the materials. Others concluded that manipulative materials were beneficial for young children but were unnecessary for older children (Fennema, 1972; Friedman, 1978; Johnson, 1971; Kieren, 1969; Scott & Neufeld, 1974). Kieren, (1971) claimed that students learn Mathematics well in laboratory settings where manipulative materials are common, but that other methods of instruction work equally well.

**The Level of Participation by Students During Lessons on Algebraic Expressions Using Manipulative.**

Children are naturally curious, playful and full of energy. Sousa (1995) reports that children do not often enjoy sitting for extended periods of time, listening to their Mathematics teacher lecture. Beyond the lack of enjoyment, most students in a sit-and listen mathematics lesson walk away with low degree of understanding and retention. Sousa further indicates that utilizing manipulative materials allows children to break away from the traditional classroom setting and instructional style. Using manipulatives can be exciting and motivating to students, naturally leading toward a greater interest in the intended use of manipulatives and the learning activity.

Moyer (2001) studied 10 teachers, focusing on how and why they used manipulative materials in their classrooms. While the teachers who participated in the study claimed that the manipulative materials were fun but not necessary to teaching and learning mathematical concepts, there was an overwhelming positive behavior exhibited by students when using the manipulative materials. Moyer finds that in lessons where manipulatives were used, students appeared to be interested, active and involved.

In addition to the ability of manipulatives to aid directly in the cognitive process, manipulatives have the additional advantage of engaging students and increasing both interest in and enjoyment of mathematics. Students who are presented with the opportunity to use manipulatives report that they are more interested in Mathematics. Long-term interest in mathematics translates to increased mathematical ability (Sutton & Krueger, 2002). Young (2004) supports the NCTM contention that physical materials have a positive effect on students understanding and involvement during Mathematics lessons.

**Achievement Rates of Students Taught Algebraic Expressions Through the Use of Manipulatives.**

Bloom, Hill and Lipsey (2008) declare that our goal in teaching Mathematics is to have students understand and apply Mathematics to the everyday world. Students understanding can only come when they have been actively involved in their own learning. Students must do mathematics. They need to take charge of their own learning and teachers must show them how, and provide them with the opportunities to do so. Ozel (2009) supports the idea that manipulatives can help students and teachers to bridge the gap that divides how Mathematics is taught and how Mathematics is learned. According to Konold (2004), manipulatives used in the classroom can help students at all grade levels to understand processes, communicate their mathematical thinking and extend their mathematical ideas to higher cognitive levels during algebraic expression lessons.

The use of manipulatives helps students hone their mathematical thinking skills during algebraic expression lessons. According to Steen, Brooks and Lyon (2006), "Manipulatives can be important tools in helping students to think and reason in more meaningful ways in algebraic expression lessons. By giving students concrete ways to compare and operate on quantities such as manipulative materials, pattern blocks, tiles and cubes, can contribute to the development of well-grounded, interconnected understandings of mathematical ideas"

Manipulatives are especially useful for teaching low achievers, students with learning disabilities and learners of English language (Ruzic & O'Connell, 2001). To gain a deep understanding of mathematical ideas such as algebraic expressions, students need to be able to integrate and connect a variety of concepts in many different ways. Clements (1999) calls this type of deep understanding "integrated-concrete" knowledge. The effective use of manipulatives can help students connect ideas and integrate knowledge so that they gain a deep understanding of mathematical concepts. With long-term

use of manipulatives in Mathematics, educators have found that students make gains in several areas such as relating real-world situations to mathematical symbolism (Sebesta & Martin, 2004). Studies have shown that students using manipulatives in specific mathematical areas such as algebraic expressions are more likely to achieve success than students who do not have the opportunity to work with manipulatives. (Sebesta & Martin (2004); Chappell & Strutchens, 2001).

According to Chappell and Strutchens (2001), students who used manipulatives in their mathematics classes had higher algebraic abilities than those who did not use manipulatives. Heuser (2000) indicates that using manipulatives helps improve the environment in mathematics classroom during algebraic expression lessons. Keeping students engaged and motivated to learn mathematical concepts is another challenge for teachers. At the basic level of education as pointed by Mereku (2001), the Ghanaian mathematics teacher is regarded as a demonstrator of process and transmitter of information and taught largely through lecturing and teacher-centered approaches.

In a comprehensive review of activity based-learning in Mathematics, Agashi (2003) concludes that using manipulative materials always produces greater achievement gains than not using them. In a similar study that compares the effects of using manipulative materials in teaching with that of abstract teaching in a mathematics class, Kurumeh and Achor (2008) observe that the long-term use of manipulative materials by teachers improves students' achievement and attitude. In fact, research shows that using manipulatives can contribute to the development of well-grounded and interconnected understandings of mathematical ideas. Students can more easily remember what they did and explain what they were thinking when they used manipulatives to solve a problem (Moch, 2001).

## Methodology

The study is a quasi-experimental research design. Quasi-experiments are in many respects like experiments. They seek to evaluate the impact of some factors such as a particular intervention of set of factors on participants, and they aim to test hypotheses based on prior research. Quasi-experiments are founded on a positivistic paradigm which espouses the belief that it is possible to assess cause and effect, to predict outcomes and to control the effect of random, confounding or intervening variables. (Campbell and Stanley, 1963).

The population for the study was students and Mathematics teachers in all Senior High Schools in the Wa Municipality. It consisted of 15 Senior High Schools. Each SHS in the municipality had an average of ten mathematics teachers and 1500 students. The 15 SHSs in the Municipality had a total of one hundred and fifty (150) Mathematics teachers, with 22500 students' altogether. A total sample of ten (10) teachers was randomly selected from the ten (10) SHS in the Municipality which included both private and government schools. The ten schools were purposively selected based on the fact that at least each has a working population of ten (10) Mathematics teachers. For each institution, one Mathematics teacher was randomly selected or picked to answer the questionnaire.

Eighty (80) students were randomly selected from the ten selected schools. Out of the eighty (80) students, forty (40) were put into two groups of twenty (20), and treated as experimental groups while the remaining 40 students were put into two groups of twenty (20). These were also treated as control groups. The experimental groups were taught by two of the ten selected teachers using manipulatives (algebraic tiles) for a period of two weeks while the two control groups were also taught by two different teachers from the selected teachers without using manipulatives (algebraic tiles) for the same period.

In selecting the sample for the purposes of data collection, two techniques; purposive and simple random sampling techniques were used. The purposive sampling technique was used to select schools in Wa Municipality. Purposive sampling is a non-probability sampling technique where samples are chosen by intentionally seeking individuals or situations likely to provide greater understanding of a chosen concept of research (Sarantakos, 2005). Simple random sampling, however, was used to select 10 mathematics teachers and 80 students from the ten SHSs in the Municipality. Simple random sampling is a probability sampling technique where all individual participants are given equal chance of being included in the sample. As part of the methods of data collection, the instruments that were employed in the field to gather the data were mainly two. These instruments were the survey questionnaire and achievement test. These instruments were used as complements to each other with the aim of compensating for scantiness and gaps. This depicts the idea of triangulation of data collection instruments as means of enhancing the validity and reliability of data that were gathered for the study. In effect, the survey questionnaire was the instrument administered to the 10 selected mathematics teachers and the achievement test was also written by the selected students in the municipality. An achievement test was conducted during the pre-test and post-test stages of the research to determine any significant difference in achievement of students taught algebraic expressions with the use of manipulatives, and those taught without the use of manipulatives. The pre-test was conducted to find out the entry behavior of the students during lessons on algebraic expressions. The second test which was the post-test was also conducted after some lessons using manipulatives on algebraic expressions were taught.

In both the pre-test and post-test, the researcher pegged the average score at 60%. Therefore, those who scored below 60% were considered as below average and those who scored above 60% were considered to have scored above average. To establish reliability and

validity, selected questions were administered to a group of thirty (30) students on two different occasions. Ten questions were given to the selected groups of students to answer. Data was collected through interviewing, test and questionnaire administration.

## Validity and Reliability

In order to achieve validity and reliability, various types of triangulations were employed in the study. According to Sarantakos (2005), triangulation refers to the practice of employing several tools within the same research design. Triangulation serves several purposes in a qualitative research. It is useful for validating procedures, results and findings of the study. The triangulation strategy enables researchers to address all possible dimensions of a phenomenon, collect sufficient data for advancing knowledge and address the limitations associated with using single technique for data collection. Contextually, the validity of this study was ensured through the use of methodological, data and respondent triangulations. The adoption of these validity and reliability strategies allowed for data to be reviewed and efficiently authenticated for presentation.

## Data Presentation, Analysis and Discussion

*To what extent are manipulatives used during algebraic expression lessons in SHSs in the Wa Municipality?*

For the researcher to find out the extent to which manipulatives are used in teaching algebraic expressions in SHSs in the Wa Municipal, a questionnaire on how often manipulatives are used by teachers was administered to the selected teachers and the responses are displayed on Table 2.

**Table 2: The Extent to which Teachers in SHSs in Wa Municipality use Manipulatives in Teaching Algebraic Expressions.**

| Response | Number of teachers | Per centage (%) |
|---|---|---|
| Through-out the lesson | 6 | 60 |
| In the middle of the lesson | 1 | 10 |
| At the beginning of the lesson. | 2 | 20 |
| At the end of the lesson | 1 | 10 |

From Table 2, it is seen that 6 teachers representing 60% of the selected teachers used manipulatives throughout algebraic expression lessons, while 40% of the selected teachers used manipulatives at the various stages of the lessons. This shows that more teachers in SHSs in the Wa Municipality use manipulatives always, which is consistent with findings of Kurumeh and Achor (2008) who observed that the long-term use of manipulative materials by teachers improved students' achievement and attitude.

*What is the level of participation by SHS students in the Wa Municipality during algebraic expression lessons using manipulatives?*

To assess the level of participation by SHS students in algebraic expression lessons in the Wa Municipality, the researcher gathered the responses to the questionnaire and the results are displayed on Table 3.

**Table 3: Level of Participation of Students in Class During Algebraic Expressions Lesson.**

| Response | Number of respondents | Per centage (%) |
|---|---|---|
| Active | 5 | 50 |
| Inactive | 1 | 10 |
| Passive | 1 | 10 |
| Curious | 3 | 30 |

From Table 3, 80% of the respondents indicated that the students were active and curious to learn new concepts in class when manipulatives were used in the teaching process while 20% said the students were inactive and passive. As evident in the pictorial representation of students' level of participation during algebraic lessons taught with manipulatives, more students were active and anxious to learn new ideas. This is consistent with Martins and Schwartz, (2005) who support NCTM contention that physical materials have a positive effect on students' involvement during Mathematics lessons.

**Hypothesis Testing**

*$H_o$: There is no significant difference in achievement between students taught algebraic expressions using manipulatives and those taught without using manipulatives.*

To test the null hypothesis, the means and standard deviations of achievement test scores were found as indicated in Table 4.

**Table 4: Descriptive Statistics of Pre-test and Post-Test Scores for Control and Experimental Groups.**

| Test | Group | Mean | Std. deviation |
|---|---|---|---|
| Pre-test | Control | 16.551 | 3.120 |
| | Experimental | 17.870 | 5.673 |
| Post-test | Control | 16.560 | 3.012 |
| | Experimental | 22.610 | 4.3356 |

From Table 4, it is clear that there are differences in the mean and the standard deviation (SD) of students' scores in both the pre-test and the post-test with mean (16.551) and standard deviation (3.120) as against 16.560 (mean) with (SD) 3.012 respectively for the control group, while that of the experimental group are 17.870 with a standard deviation of 5.673 as against 22.610 with SD of 4.3356 respectively.

To determine if these differences are significant, an Analysis of Variance (ANOVA) was conducted. The analysis sought to verify

whether significant gains were made both within and between groups. Table 5 illustrates within groups ANOVA.

**Table 5: ANOVA within Group Summary of Marks on Pre-Test and Post-Test Scores of Control and Experimental Groups.**

| Group | Test | Sum of squares | df | Mean square | F | P-value |
|---|---|---|---|---|---|---|
| Control | Pre-test-Post test | 1654.9 | 1 | 50.150 | 1.199 | 0.723 |
| Experimental | Pre-test-Post test | 4681.9 | 1 | 74.316 | 6.863 | 0.002 |

From Table 5, it can be observed that the within group p-value for the control group was 0.723>0.05 which showed that the difference within this group was not significant, while that of the experimental group was 0.002<0.05 indicating a significant difference. This implies that students in the experimental group gained more than those in the control group. To determine any differences between group achievements, ANOVA was conducted and the results are presented in Table 6.

**Table 6: ANOVA Between Groups Summary of Marks on Pre-Test and Post-Test Scores of Control and Experimental Groups.**

| Test | Groups | Sum of squares | Df | Mean square | F | P-value |
|---|---|---|---|---|---|---|
| Pre-test | Control-Experimental | 89.08 | 1 | 89.08 | 1.100 | 0.789 |
| Post-test | Control-Experimental | 344.202 | 1 | 344.202 | 6.873 | 0.000 |

From Table 6, it can be seen that by groups, the p-value for the pre-test was 0.789 > 0.05, indicating no significant difference at the entry level; an indication that all students in both groups entered at almost

the same level of knowledge. However, the p-value of the post-test of $0.000 < 0.05$ indicates a significant difference in mean value. Thus, we reject the null hypothesis that: *There is no significant difference in achievement between students taught algebraic expressions using manipulatives and those taught without using manipulatives* and accept the alternative hypothesis. Hence, we conclude that there is a significant difference in achievement between students taught algebraic expressions using manipulatives and those taught without using manipulatives. This is consistent with Agashi (2003) who concludes that using manipulative materials always produces greater achievement gains than not using them

**Summary of Findings**

The analysis of the results of the study through the research questions indicated among other things the following:

1. The students' participatory level was very high during algebraic expression lessons taught with manipulatives.
2. Manipulative use increases students' level of understanding of operations on algebraic expressions.
3. The use of tiles in teaching algebraic expressions changed the performance of the students for better.
4. Most teachers felt because they had strong background knowledge in algebraic expressions, they could pass on knowledge to students without the use of manipulatives. This is in contrast with the studies of Ball and Bass (2000a) and Cohen (2004).

**Conclusion**

The findings of the research gave empirical evidence to the effects of manipulatives used in the teaching and learning of algebraic expressions. The analysis of the data did indicate a significant difference in achievement levels of student taught with the use of manipulatives and those taught without the use of manipulatives. It also suggested appropriate methods that may be employed to help develop positive interest in the teaching and learning of algebraic expressions.

The study exhibited clearly and in simple terms the approach to the teaching and learning of algebraic expressions and Mathematics in general. Pupils are always in high spirit to learn effectively when they interact with teaching and learning materials (TLMs). When teaching and learning materials (TLMs) are used, it helps to encourage and sustain pupil's interest.

Based on the findings of the study, the following conclusions were drawn. Teachers' inability to prepare and use adequate and appropriate teaching and learning materials (manipulatives) to teach algebraic expression, was a hindrance to students' performance.

- Preparation of technical terminologies in operations of algebraic expressions confuses the students. Care must therefore be taken by teachers of algebra to give enough time to students to discuss terminologies of subject-matter (especially algebraic expressions)
- Teachers' inability to encourage and entice students to develop affection for Mathematics and for that matter, algebraic expressions, was a major factor.
- The difficulty in measuring performance of students especially when they are made aware of being tested is the tendency for respondents to pretend or distort the information they provide. Hence, it is not likely for students who lack confidence in

Mathematics to respond favourable to questions by the teacher in class.

- The use of algebraic tiles could only work effectively where there was a coordinated effort from the students and their classroom teacher. Therefore, the attention of theorists, researchers and teachers is drawn to the fact that the use of algebraic tiles alone cannot improve mastery of subject-matter. Attention is also drawn to the fact that students cannot master subject-matter unless they make the effort to do so.

**Recommendations**

The study was done in the Wa Municipality and the following recommendations were made to help improve the teaching and learning of mathematics in schools using manipulative materials.

Curriculum developers for Senior High Schools are encouraged to stress the need for the use of manipulative materials in presenting lessons to students. They should also present in the curriculum; a suggested list of concrete materials that may be used to teach Mathematics lessons. It is recommended that further research be conducted using more students across the country to investigate whether the use of concrete materials will improve the teaching and learning of Mathematics in our schools.

The Government through the Ministry of Education should provide a motivation package in the form of allowances to be given to teachers so that they can improvise some of the manipulative materials, which are needed but unavailable in the schools. The researcher also recommends that the use of concrete materials in the teaching and learning of Mathematics should be vigorously continued to realize the maximum benefit because they enhance students' understanding, involvement, participation and interest in the learning of Mathematics.

Research on how algebraic expressions generally enables students to use algebra is mainly in small-scale teaching interventions, and the problems of large-scale implementation are not so well reported. We do not know the longer-term effects of different teaching approaches on early algebra on students' later use of algebraic notation and thinking.

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# USE OF BODY MASS INDEX (BMI) TO DETERMINE CARDIOVASCULAR RISK FACTORS OF PHYSICAL EDUCATION TEACHERS IN TAMALE METROPOLIS

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## Abstract

Body Mass Index (BMI) is sometimes used for defining Anthropometric in adults. The common interpretation is that it represents an index of an individual's fatness characterized by height/weight in adults and for classifying them into groups. It is widely used as a risk factor for the prevalence of several health issues among adults. Body fatness has been an important psychosocial issue among humans for decades. Evidence indicates that there is a wide range of BMI over which mortality risk is modest among Physical Education Teachers in the Tamale metropolis and this is age-related. The data collected were analyzed using simple frequency counts, percentage spread, mean, mode, and the findings included the fact that most of the Physical Education Teachers in the Tamale Metropolis have low risk health factors. The results also show a mean score of 1.75554 for the entire height with 73.3482 score for weight and 23.5500 for BMI respectively. Seventeen (17) out of the 28 respondents have Normal Weight, and are therefore healthy, representing 60.71% of the total number of respondents. Eleven (11) out 28 of the respondents representing 39.28% are overweight therefore not Healthy as agreed by the American College of sports medicine classification (2010). Development of positive relationship towards regular exercises to reduce weight and stress in their classroom activities is recommended.

**Keywords**: anthropometric, body mass index (bmi), fatness, health, height.

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## Introduction

The body mass index (BMI) is the metric currently in use for defining anthropometric height/weight characteristics in adults (Stefan, et al 2008). It is also used to categorize body types into groups. (American College of Sports Medicine Classification 2010) Research has shown that body fatness has become an important psychosocial issue among humans in recent years. More recently, the degree of rotundity considered ideal also has varied considerably in the general population, but particularly for male and females (Nestle, 2000). Traditionally, a person's fatness has been defined at personal level as well as at a societal level (Nestle. 2000) However, this is difficult to quantify as indicated by Malis, et. al (2005). The social consequences of being "too fat" are sometimes severe. This can lead to discrimination and result in social and emotional issues (Must, et. al 2001). Not only the societal but also the functional, and indirectly, the medical consequences of an excessive accumulation of fat also have been observed among Physical Education teachers in Tamale Metropolis. Nevertheless, the concept that fatness is a major population-based medical issue has gained popularity among Physical Education teachers

## Background

Traditionally, a person's fatness has been defined at a personal level and societal level (Must, et. al 2001). However, this is difficult to quantify. That is, each individual has his/her own perception of how fat he/she should be. As indicated above, this often depends on a general concept of societal norms. Earlier on, it was recognized that tall people had a lower death rate than short people with the same height and weight (Wt/Ht) ratio (Singh 2001). It was recognized that a person's height in general and leg length in particular could affect the calculated body mass adjusted for height. (Singh 2001) Some people view the secular trend within the Physical Education Teachers in Tamale Metropolis over the past years as being one in which the

Teachers in general are "more obese''. The net effect of the above is that chronic diseases of aging have become more of a public health concern. Therefore, the function of the Physical Education teacher is to persuade and use his skills and knowledge to coordinate all activities of the school which will lead to a healthy life for his / her students in accordance with Ghana Education Service Rules.

Education Service rules. From observation, there are some physical changes regarding body weights and the prevalence of obesity amongst the physical education teachers in Tamale Metropolis. In observing Teachers of Physical Education extraction, they are averagely heavier and are more likely to be "overweight" or "obese", as defined by current BMI standards, than those in other teaching disciplines in Tamale metropolis. However, their lookout may be pointing to a healthier figure that can live longer than any person.

**Problem Statement**

A critical observation of students and residents of Tamale Metropolis expect their Physical Education teachers to behave, look and live in a particular way because of the roles they play in their schools. Physical Education teachers see themselves as inculcating skills, knowledge and shaping the future of the young ones in their respective schools. However, students and the entire residents of Tamale Metropolis expect that Physical Education teachers to live by what they preach in the schools, so that they can properly shape the future of others whose future, in one way or the other, depends on them. Therefore, the problem that this study seeks to investigate is how to use height/weight ratio and body mass index (BMI) to determine Physical Education teachers' health status in Tamale Metropolis.

**Purpose of the Study**

Physical Education teachers occupy a key position in the Basic and Senior High Schools in Tamale Metropolis. However, they rely on both situational and environmental variables of which the supply of

some inputs such as good health, sound mind and good healthy environment are crucial for their work. The purpose of the study is how Physical Education teachers will use Body Mass Index, Weight and Height to determine their health status. To determine the relationship between body mass index and weight/height as an effective health tool to determine health status of Physical Education teachers in Tamale Metropolis.

**Research Objectives**

1. To identify the height and weight of Physical Education teachers in Tamale Metropolis.
2. To find out the body mass indexes (BMI) of these teachers.
3. To use weight and height to determine the health status of these teachers.

**Research Questions**

1. What are the Heights and Weights ratios of Physical Education teachers in Tamale Metropolis?
2. What are the body mass indexes (BMI) of these teachers?
3. How can these be used to determine their health status?

**Significance of the Study**

The study examined the influence of body mass index, waist to hip ratio and the relationship on how it can affect the health status of the Physical Education teachers in Tamale Metropolis. It will enable us to critically examine factors leading to obesity. Parents usually hold Physical Education teachers responsible for success and failure of school games and sports activities. In the light of this, the study sets out to find the extent to which Physical Education teachers' life style or behaviour contributes to obesity. This study will be significant and relevant to:

- practising educational administrators and headteachers/ Head-masters/Headmistresses
- Physical Education administrators/practitioners

- Local, Metropolitan/ Municipal/District school board and Ministry of Education officials
- Teachers and students/pupils
- Ministry of Education and Ghana Education Service

**Instrument**

Instrument used in collecting data for this study was the questionnaire which was entitled 'Determination of cardiovascular risk factors of Physical Education Teachers in Tamale metropolis. It was developed by the researchers based on the literature review. The questionnaire was in parts; part 'A' sought for bio-data of respondents and part 'B' was to measure height and weight of the respondents. The questionnaire was piloted to determine its usability. According to Bamidele et'al (2002) validity involves an essential and systematic examination of test content to determine whether it covers a sample of the behaviour domains to be measured. Validity of the instrument was determined by a panel of tutors from the Science Department of Bagabaga College of Education-Tamale. Abiri (2006) agrees that reliability is the extent to which an instrument is free from random error, thus measuring over time the variables of interest. The instrument was administered to 28 physical education teachers in the metropolis to elicit responses from respondents from the schools. A clear instruction on how to complete the questionnaire was provided to the respondents by the researcher.

**Review of Related Literature**

**Cardiovascular-Diseases and Risk Factors**

Urban populations in the developing world are growing rapidly and at an accelerating rate (Kruger et. al 2008). Rural-to-urban transitions are often associated with marked changes in behaviour and lifestyle, such as diminished physical activity, sedentary employment, poorer dietary habits, and increased psychosocial stress (Ogeng, et. al 2011). In fact,

because of these emerging risk factors, over 80% of the global burden of cardiovascular disease has now shifted to low- and middle-income countries. (Koorts, et. al 2011). According to Kruger et. al (2008), the fastest rate of urbanization worldwide is occurring in sub-Saharan Africa, driven by high fertility rates and rapid industrialization. The transition from pre-industrial to industrialized economies has initiated an epidemiological transition from illnesses related to malnutrition, childbirth, and infection, towards chronic, non-communicable diseases, such as cardiovascular diseases. However, the epidemiological transition in sub-Saharan Africa is still in its early stages. As a consequence, diseases such as HIV and malaria continue to strain limited resources and dominate the public consciousness, while CVD and its often-subclinical symptoms are overlooked. Thus, populations are becoming older and more vulnerable to CVD at a time when surveillance capacities remain poor and skilled health workers scarce.

However, given these heterogeneities of cardiovascular disease risk profiles, a multi-factorial approach to cardiovascular disease risk assessment and intervention is essential. Here, are some major risk factors: dyslipidemia, hypertension, obesity, over weight and diabetes, are common among urban and rural Ghanaian men and women. Stedman (2006) contends that cardiovascular relates to the circulatory system, which comprises the heart and blood vessels and carries nutrients and oxygen to the tissues of the body and removes carbon dioxide and other wastes from them. Risk factors are conditions or habits that make a person more likely to develop a disease. (Stefan, et. al 2008). These factors can increase the chances that an existing disease will get worse. Stefan et al (2008) also points out some important risk factors for the heart that one can do something about. They include high blood pressure, high blood cholesterol, diabetes, overweight or obesity and being physically inactive. According to WHO report (1997), the heart is a muscular organ in most animals, which pumps blood through the blood vessels of the circulatory

system. Blood provides the body with oxygen and nutrients, as well as assists in the removal of metabolic wastes. In humans, the heart is located between the lungs, in the middle compartment of the chest.

Hillsdon et. al. (2005) agree that the ability of the heart, blood cells and lungs to supply oxygen-rich blood to the working muscles and the ability of the muscles to use oxygen to produce energy for movement is as vital and important. This type of fitness is a health-related component of physical fitness that is brought about by sustained physical activity, A person's ability to deliver oxygen to the working muscles is affected by many physiological issues, including heart rate, cardiac output, and maximal oxygen consumption. Understanding the relationship between cardio-respiratory endurance training and other categories of conditioning requires a review of changes that occur with increased aerobic or anaerobic capacity. (Frank 2010). As aerobic/anaerobic capacity increases, general metabolism rises, muscle metabolism is enhanced, hemoglobin rises, buffers in the bloodstream increase, venous return is improved and the blood bed becomes more able to adapt readily to varying demands as agreed by Frank (2010. Inferring from each of these results of cardiovascular fitness conditioning will have a direct positive effect on muscular endurance, and an indirect effect on strength and flexibility. To facilitate optimal delivery of oxygen to the working muscles, the person needs to train or participate in activities that will build up the energy stores needed for sport. A 2005 Cochrane review demonstrated that physical activity interventions are effective for increasing cardiovascular fitness.

**Fatness as a Personal or Societal Issue**

A person's fatness has been defined at a personal level as well as at a Societal level (Nestle, 2000). However, this is difficult to quantify. That is, each individual has his/her own perception of how fat he/she should be. As indicated above, this often depends on a general concept of societal norms or is due to peer pressure. For example, currently in

Western societies, young women are often concerned about their body image, and most consider themselves to be too fat, even though they are well within population-based references. This is not only due to societal concepts of an ideal degree of fatness, but also due to thinness being a goal promulgated by the fashion industry and reinforced by commercial advertising. At the societal level, although poorly described or quantified, there also is a degree of fatness beyond which a person generally is considered to be unacceptably fat; that is, there is an ill-defined threshold at which a person is labelled as being "fat" or "obese children." (Stefan, et al 2008).

Oduro et. al (2012) contends that, the social consequences of being "too fat" are severe. Discrimination begins in childhood and results in serious emotional scars. Societal discrimination limits career choices, and indeed many career paths are closed to those considered to be too fat. Also, societal stigmatization often impairs a person's ability to express his/her intellectual and other talents; that is, they become underachievers. In addition, the potential pool of mates is limited because of their perceived unattractiveness. Thus, obese people tend to marry other obese people and genetically may produce "obese"

**Fatness as a Medical Issue**

Consequences of an excessive accumulation of fat also have been recognized over the years. Nevertheless, the concept that "body build" (fatness) is a major population-based medical issue gained popularity in the medical field only shortly before 1900 (Agyemang et. al, 2012) Life insurance data accumulated at that time and subsequently indicated that body weight, adjusted for height (Wt/Ht), was an independent determinant of life expectancy, and in 1910, the effects of being overweight were noted to be greater for younger people than for the elderly. Subsequently, the Metropolitan Life Insurance Company in 1959 published tables of average body weights for heights (Wt/Ht) by gender and at different ages. This was based on data from 1935 to 1953 from more than 4 million adults, mostly men,

insured by 26 different insurance companies. The risk for development of certain diseases as well as mortality data related to Wt/Ht differences also were analyzed and reported in the 1960 Statistical Bulletin of the Metropolitan Life Insurance Co. (Flegal, et. al, 2001)

The Wt/Ht tables were used for many years as a reference for population-based studies. If a person's Wt/Ht was 20% above or below the mean for that height category, he/she was considered to be overweight or underweight, respectively. (Must, et. al 2001). The insurance data also indicated the ratios of weights for heights (the term used was "body building") at which mortality was lowest in adults. (Must, et. al 2001). The latter was referred to as the "ideal" or later the "desirable" weight. All of these data were periodically updated. Interestingly, from 1909 to 2003, the desirable weight, that is, the weight/height representing the lowest mortality had increased. However, a "desirable body" weight for height was invariably lower than the average weight for height in the insured population. (Must, et. al 2001).

**Adoption of the BMI as an Index of Obesity**

Keys et. al (2002) severely criticized the validity of Metropolitan Life Insurance data in 1998 but published tables of desirable weight for height, as well as the tables used to define people who were underweight or overweight. That era "obesity" as a word was not common. Instead, Keys et. al (2002) used better documented weight for height data, referred to as the body mass index (BMI). Thus, = body weight (kilograms) divided by height squared (meters) = BMI. Keys et. al (2002) agreed that by squaring the height, it reduces the contribution of leg length in the equation and tends to normalize the body mass distribution at each level of height; that is, it reduces the effect of a variance in height in the relationship of weight to height. This was considered to be important because most of body fat is in the

trunk. Nevertheless, as also pointed out by Keys et. al (2002) even the BMI rather poorly represents a person's per centage of body fat.

Keys et. al (2002) and American college of sports medicine (2010) used a better documented weight for height data, referred to as the body mass index (BMI). Thus, = body weight (kilograms) divided by height squared (meters) = BMI to measure the Health status of an individual. Table 1 and Table 2 shows how the various health status are classified based on gender.

**Table 1: Body Mass Index Classification (Men) Based on Gender**

| Measurement | | Health Status |
|---|---|---|
| Height ..... cm | 18 to 24.9kg/m$^2$ Normal weight | Healthy |
| Weight .....kg | 25 to 29.5kg/m$^2$ Over weight | Not Healthy |
| BMI .....kg/m$^2$ | 30 to 35kg/m$^2$ Obese | Cardiovascular Risk |
| | Above 35kg/m$^2$ Extremely obese | Serious Cardiovascular Risk/Disease |

Source: American College of Sports Medicine (2010

**Table 2: Body Mass Index Classification (Women) Based on Gender**

| Measurement | | Health Status |
|---|---|---|
| Height ..... cm | < 27kg/m$^2$ Normal weight | Healthy |
| Weight .....kg | 27 to 29.5kg/m$^2$ Over weight | Not Healthy |
| BMI .....kg/m$^2$ | 30 to 35kg/m$^2$ Obese | Cardiovascular Risk |
| | Above 35kg/m$^2$ Extremely obese | Serious Cardiovascular Risk/Disease |

Source: American College of Sports Medicine (2010)

Despite all the criticisms, the Metropolitan Life Tables criteria for defining obesity were widely used in the United States until the early 1990s. The World Health Organization (WHO) classification of body weight for height, based on the BMI, was published, and later it was widely adopted and used.

## World Health Organization (WHO) and the Categorization of BMIs

World Health Organization (WHO) brought Experts to Consult and develop a uniformed categorization of the BMI in 1993 (World Health Organization Report 2010). The results were published as a technical report in 1995. Four categories were established: underweight, normal, overweight, and obese. An individual would be considered to be underweight if his/her BMI was in the range of 15 to 19.9, normal weight if the BMI was 20 to 24.9, overweight if the BMI was 25 to 29.9, and obese if it was 30 to 35 or greater. Using linear regression, a BMI of 16.9 in men and 13.7 in women represents a complete absence of body fat stores.

The above categories are similar to those suggested by Garrow in 1981, but the terminology used were different "desirable" for a BMI up to 25, "grade I obesity" between 25 and 29.9, "grade II obesity," between 30 and 40, and "grade III obesity" for BMI greater than 40. The latter classification was based on Rosenbaum and colleagues' own data obtained in a survey of an adult population, aged 16 to 64 years, in Great Britain and published in 1985. The population based data indicated that the majority of people were in the "desirable" range of the BMI. Unfortunately, this distribution is not and has not been similar to those found in other surveys. The BMIs have been higher.

## BMI as a Determinant of Body Fat Mass

Burton et. al (2005) critique a particular problem with the use of BMI as an index of obesity. He said that it does not differentiate between body lean mass and body fat mass; that is, a person can have a high

BMI but still have a very low fat mass and vice versa. Anatomical and metabolic perspective, obesity should be referred to an excessive accumulation of body fat (triacylglycerols), and upon these grounds, the accuracy of the BMI as a determinant of body fat mass has been repeatedly questioned by some scholars. This is because it clearly has limitations in this regard. In addition, in a recent study in individuals with or without diabetes in which the loss of lean body mass with aging was reported, the mean BMI in those without diabetes was 26.8. In those with diabetes, the BMI was 29.1; that is, it was higher as generally expected. However, the per centage of lean body mass was the same; that is, the increased BMI in those with diabetes was not due only to an excessive accumulation of fat.

**Trends in Body Weight and Height**

Over the years, there has been an increase in BMI in the general population (Blackburn, 1999). This has resulted in prediction of a public health disaster or a problem in the society as well. It should be recognized that in the United States during the period from 1960 to 2002 not only has the mean weight increased by 24 lb among men aged 20 to 74 years, but also the height has increased by about 1inch. We can then calculate that the weight increase per year has only been 0.57 lb, and as indicated above. The results can be due to an increase in lean mass rather than fat mass, or it may be a combination of the two.

According to Wildman et. al (2008) there was an earlier report on life-insured men up to age 40 years, reported to be 0.5 to 1.5 inches taller and 2 to 9 lb heavier for the same height in 1959 than those studied 50 to 60 years prior to 1959. Also, in the earlier study, the mortality rate was lowest in those with higher weight-to-height ratios. This was attributed to the presence in the population of diseases such as tuberculosis that resulted in an increase in death rate (Stefan, 2008). Previously, a secular upward trend in height in adults in the United Kingdom also was reported. In addition, in a twin study in the United

Kingdom, children in 2005 were not only heavier but also taller than 1990 children, whereas their BMIs were essentially the same. Toth et. al (2000) agrees that the overall history of changes in height and weight in Western European men and probably women has been that of an increase in both weight and height. In the 17th century, the average height of men in Northern Europe was 5 ft 3 inch. It now approaches 6 ft. These data suggest that the BMI categories should be adjusted upward periodically to accommodate population-based changes.

**The "Obesity Epidemic"**

Recently, there has been concern that an epidemic of obesity is occurring in most countries. This is based on a worldwide data on BMI. (McPherson, 2010). There has been a change in the mean but to a greater extent in the distribution of BMI for adults aged 20 to 74 years in the United States (Flegal et. al, 1998). That is, the mean BMI has increased, but there has been a greater increase in skewing toward the right and very large BMI. This results in more individuals being categorized as "obese." The reason for the recent increase in mean BMI, but particularly in those in the obese category, is unknown, although there are many speculations. The dramatic decrease in smoking is likely to have been a contributor (Pisinger et'al 2007) Smoking contributes to population-based BMI by at least 2% (Pisinger et'al 2007). Smoking impairs appetite per se. It is pathogenetically important in the development of chronic obstructive pulmonary disease which results in a lower body mass.

**Methodology**

**The Research Approach**

The study used a survey research design, aimed at determining cardiovascular risk factors of Physical Education teachers in Tamale Metropolis. Survey deals with ''what is"? Its scope is very vast. It describes and interprets what exists at present. In surveys, we are

concerned with conditions or relationships that exist, practices that prevail, beliefs, points of view or attitudes that are held, processes that are going on, influences that are being felt, and trends that are developing. Although the major purpose of survey method in research is to tell "what is"? i.e., to describe the problem or phenomenon, many surveys go beyond a mere description of the existing situation. For example, the survey dealing with curriculum courses help us in obtaining information not only on the strength and weaknesses of the current curriculum but also can elicit recommendations for change. Surveys or studies also serve as direct sources of valuable knowledge concerning human behaviour (Babbie, 1990).

The survey method or approach was used to collect the following three types of information (*i*) what exists, (*ii*) what we want, (*iii*) how to get there. The information of what exists will be gathered by studying and analyzing important aspects of present situation. The information on what we want was obtained by clarifying goods, goals, and objectives possibly through a study of the conditions existing elsewhere or what experts consider to be desirable. The Information of how to get these is collected through discovering the possible means of achieving the goals on the basis of the experiences of others or of opinions of experts. Kothari (2004) views this approach as conditions or relationship that exists, opinions that are held, processes that are going on, effects that are evident or trends that are developing.

**Population, Sample Selection and Sample Size**

All items in any field of inquiry constitute a 'Universe' or 'Population' (Kothari 2004). Kothari also agrees that a complete enumeration of all items in the 'population' is known as a census inquiry. Millar (1991) agrees that there is the need to select few items from a large population for study purposes. This is to enable one to make inferences and to be able to generalize. The Representation sampling approach will be used for the sampling and sample size as agreed by Millar. He also agrees that representation sampling is better

than large sample size or a whole population. The size of a sample should not be too large or too small (Karma, 1999).

**Sample Size**

The Northern Region has about hundred (100) Physical Education personnel scattered all over the region (Regional Education Office 2016/ PE unit). The study area is the Tamale Metropolis which is one of the Assemblies in Ghana and the capital of Northern Region. The Metropolis has 244 schools consisting of both Basic Schools and Senior High Schools (Public and Private) (Metro Education Office 2016/ PE unit). Not all the 244 were selected for the study, but all the Senior High Schools Physical Education teachers, Metro Education Physical Education personnel and Regional Education Physical personnel were purposively sampled and used for the study. This sampling technique was used for the simple reason that these Physical Education teachers and personnel possess at least a first degree in Physical Education and have either taught Physical Education in both theory and practical and therefore possessed the requisite knowledge that were elicited from them (*'Preach what you teach'*). In all a sample of twenty-eight (28) Physical Education teachers were selected and used as the sample size for the study. However, there are a few things that inform the sample size:

- Time
- Population size
- The interest of the population
- Consanguinity of the population

**Data Collection Approach**

Data collection is an important aspect of any type of research study. Inaccurate data collection can impact the results. Data were collected by taking each of the respondent's weight and height by using a scale and a tape measure to determine each of the height and weight. Information were recorded in a field record note book and codes assigned to each of them. This is for the purpose of reference in an event that there is an error.

## Data Analysis

Data collected were analyzed using descriptive statistics (mean, mode and median). The mean weight of the respondents was determined by using the SPSS to analyze. The BMI was calculated manually by taking the weight and dividing it by height$^2$.

## Findings and Discussions

From table 3, the results indicate that a total of 28 Physical Education teachers were contacted. This was made up of seventeen (17) males, eleven (11) females who took active part in responding to the questionnaire administered by the researchers. All the 28 questionnaires sent out were retrieved. The results show a mean score of 1.75554 for the entire height with 73.3482 score for weight and 23.5500 for BMI respectively. The results also indicate that the standard deviation for the distribution for height, weight and BMI are .09747, 15.11634 and 2.74337 respectively. An indication of its closeness to the mean score of the various variables. The results support the accession by WHO (1997) report that was published as a technical report in 1995 that establishes four categories: underweight, normal, overweight, and obese. An individual would be considered to be underweight if his/her BMI was in the range of 15 to 19.9, normal weight if the BMI was 20 to 24.9, overweight if the BMI was 25 to 29.9, and obese if it was 30 to 35 or greater. Using linear regression, a BMI of 16.9 in men and 13.7 in women represents a complete absence of body fat stores. Multiple modes also exist within the various variables but the smallest value is shown. This is also an indication that some of the respondents have the same height and weight in the distribution.

**Table 3: Statistics of Height and Weight of Physical education Teachers in Tamale Metropolis.**

| | What is Height | What is Weight | What is Height$^2$ | What is BMI |
|---|---|---|---|---|
| | 28 | 28 | 28 | 28 |
| | 0 | 0 | 0 | 0 |
| Mean | 1.7554 | 73.3482 | 3.0854 | 23.5500 |
| Median | 1.8000 | 71.7000 | 3.2400 | 22.4050 |
| Mode | 1.83[a] | 48.50[a] | 3.34[a] | 21.71 |
| Std. Deviation | .09747 | 15.11634 | .33260 | 2.74337 |
| Variance | .009 | 228.504 | .111 | 7.526 |
| Range | .35 | 49.60 | 1.17 | 8.59 |
| Sum | 49.15 | 2053.75 | 86.39 | 659.40 |

a. Multiple modes exist. The smallest value is shown

Table 4 also indicates that seventeen (17) out of the twenty-eight (28) respondents have Normal Weight, and are therefore healthy, representing 60.71% of the total number of respondents. 11 out 28 of the respondents representing 39.28% are overweight therefore not Healthy per the American College of Sports Medicine Classification (2010) as indicated in the literature. The results also confirm Flegal et al. (2001) assertion that the Weight/Height tables were used for many years as a reference for population-based studies. If a person's Weight/Height was 20% above or below the mean for that height category, he/she was considered overweight or underweight, respectively. Among the 28 respondents 7 of them are females and out of the 7, 5 of them have Normal Weight representing 71.42% and 2 are overweight representing 28.58% of the female respondents.

**Table 4: Heights and Weights of Physical Education Teachers in Tamale Metropolis**

| Height m | Height$^2$ $m^2$ | Weight kg | BMI=W÷HT$^2$ $Kg/m^2$ | Gender |
|---|---|---|---|---|
| 1.50 | 2.25 | 48.50 | 21.55 | M |
| 1.58 | 2.49 | 51.10 | 20.10 | M |
| 1.59 | 2.52 | 56.80 | 22.53 | M |
| 1.62 | 2.62 | 56.90 | 21.71 | M |
| 1.64 | 2.68 | 58.20 | 21.71 | F |
| 1.67 | 2.78 | 59.70 | 21.47 | M |
| 1.69 | 2.85 | 59.80 | 20.98 | M |
| 1.70 | 2.89 | 59.85 | 20.70 | M |
| 1.71 | 2.92 | 60.20 | 20.61 | F |
| 1.73 | 2.99 | 61.20 | 20.46 | F |
| 1.75 | 3.06 | 63.60 | 20.78 | M |
| 1.76 | 3.09 | 66.00 | 21.35 | M |
| 1.79 | 3.20 | 67.90 | 21.21 | M |
| 1.80 | 3.24 | 71.20 | 21.97 | M |
| 1.80 | 3.24 | 72.20 | 22.28 | M |
| 1.81 | 3.27 | 76.20 | 23.30 | M |
| 1.81 | 3.27 | 77.70 | 23.76 | M |
| 1.82 | 3.31 | 83.10 | 25.10 | F |
| 1.83 | 3.34 | 84.10 | 25.17 | M |
| 1.83 | 3.34 | 84.30 | 25.23 | M |
| 1.83 | 3.34 | 84.50 | 25.29 | F |
| 1.83 | 3.34 | 90.30 | 27.03 | M |
| 1.84 | 3.38 | 91.10 | 26.95 | M |
| 1.84 | 3.38 | 91.20 | 26.98 | M |
| 1.84 | 3.38 | 91.40 | 27.04 | F |
| 1.84 | 3.38 | 92.50 | 27.36 | M |
| 1.85 | 3.42 | 96.10 | 28.09 | F |
| 1.85 | 3.42 | 98.10 | 28.69 | M |

## Conclusion

The results obtained in this study support the three research questions, although other studies are certainly needed in other contexts and from other perspectives. Generally, the study reveals that Tamale Metropolitan Physical Education teachers are healthy based on the Anthropometric classification, though a few of them are overweight. This means that they have what it takes to demonstrate their commitment in the teaching learning process in their respective schools. Interestingly, the study also brought out the various weights to heights and BMI of the Physical Education teachers. BMI, it is tended to be used in associating with risk factors with regards to health, and obesity. Physical Education teachers of Tamale Metropolis should check their weight and also frequently exercise their bodies.

## Recommendations

It is recommended that Physical Education Teachers of Tamale Metropolis should develop positive relationship towards regular exercises to reduce weight and stress in their classroom activities. This will go a long way to promote active teaching and learning process, and students' participation in the class.

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# IMPACT EVALUATION OF OGUN STATE TRAFFIC COMPLIANCE AND ENFORCEMENT CORPS INTERVENTION ON NIGERIAN HIGHWAYS

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## Abstract

This study sought to evaluate the impact of TRACE Corps intervention on Nigerian highways in Ogun state. The study adopted a descriptive survey design with CIPP evaluation model. A sample of three hundred (n=300) road users participated in the study. Road Users Perception Questionnaire (RUPQ) (r =.77) and TRACE Corps Efficiency Questionnaire (TCES) (r = .72) were used in data collection. The findings reveal that the number of road crashes within a period of five years under review was on the increase (191 in 2010 - 409 in 2014). However, the crash-fatal ratio was on decline while the crash-injured ratio was on the increase. Road users' perception of activities of TRACE Corps operatives on Nigerian highways was positive ($\bar{x}$ = 2.62). TRACE Corps operatives were efficient ($\bar{x}$ = 2.67). Therefore, TRACE Corps agency is a worthwhile intervention. Thus, the management of the agency should enhance and sustain productivity of corps operatives with periodic trainings, seminars, and workshops.

**Keywords**: evaluation, intervention, road users' perception, trace corps operatives, efficiency.

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## Introduction

The Nigerian populace deserve a better deal in terms of ensuring safety of lives, vehicles and goods being moved on the roads. The fact that Nigeria's rating in the world as regards the number of fatalities and serious injuries resulting from road crashes is high and its calls for collective and concerted efforts of all and sundry. Road accidents have become a recurring decimal on Nigerian roads. Road crashes from reckless driving constitutes the leading cause of death in Nigeria. According to Federal Road Safety Corps (FRSC) (2012), 473 persons died from a total of 1,115 road crashes nationwide. The research also revealed that in the same year 2012, an average of 11 persons died daily from road accidents across Nigeria (FRSC, 2013).

Road accidents occur worldwide but the incidence is more in developing countries. According to World Health Organization (WHO, 2004), about 1.24 million people die annually as a result of road accident. Road traffic injuries are seen as the leading causes of death among young people, aged 15-29 years. Ninety-one per cent of the world fatalities on the roads occurs in low income and middle income countries, even though these countries have approximately half of the world's vehicles. Half of those dying on the world's roads are vulnerable road users, pedestrians, cyclists and motorcyclists. Without action, road crashes is predicted to account for death of about 1.9 million people annually by 2020 (WHO, 2013). Only 28 countries, representing 416 million people (7% of the worlds' population) have adequate laws that address all five risks factors such as over speeding, driving under the influence of alcohol, riding motorcycle without using helmet, driving without using seats belts and child restraints (WHO,2013). Fadare (2005) noted that road transport which is the major source of road traffic remains the most unregulated and driving or riding on Nigerian road has become free entry and free exit venture without consideration for safety. He added that the standard of driving education has fallen below acceptable limit as drivers and riders' licenses can be obtained without proper education thereby causing

disregard for traffic regulations by a large majority of motorists and other road users. The significance of education to safety on roads world-over cannot be overemphasized bearing in mind that education is a universal tool for human growth and development. Experience from use of Nigerian roads questions the road safety education status of the motorists and other road users in general. Observation suggests that these people are grossly deficient in road safety consciousness and awareness.

Between January 1949 and 2004, several efforts were made towards ensuring the safety of all road users (TRACE Corps, 2009). Efforts made include the establishment of road safety commission in 1974, which was renamed in 1984 as Federal Road Safety Commission, as well as installation of traffic signals which greatly enhance safety and reduce capacity at the intersection. However, the fluctuating nature of electricity supply, and at times, total black-out affects the effectiveness of traffic signals. Thus, the use of traffic wardens becomes pertinent. The socio-economic development of Ogun State in the recent years, which can be progressively measured in every sphere of life for which transportation is an important integral call for concern (Osibanjo, 2013). One of the greatest challenges of this new status is a free safe road transport system where efficient and effective movement of goods and human are expected to be at its optimum. Across the nation, the transport sub-sections are plagued with problems such as lack of adequate regulatory machinery that could monitor, manage and enforce road traffic rules and regulations.

Road traffic accidents' statistics in Nigeria revealed a serious and growing problem with absolute fatality rate and casualty figures increasing rapidly (TRACE Corps, 2015). In majority of the developing countries, accidents occurrence and related deaths are related to either population or number of vehicles. Ironically, in Nigeria, studies have indicated that better facilities in terms of good quality and standardized roads have been accompanied by increasing number of accidents (Gbadamosi, 2002). Studies showed mixed

results regarding traffic law effectiveness. According to Yagil (2002), two assumptions are made about traffic laws: citizen must obey regulations and laws are passed to ensure safety. Yagil argued that not everyone accepts this as true.

The appearances of the motorcycle operators in the public transport system have added a new dimension to the traffic accident phenomenon in the state. The aggressiveness of motorcyclists and vehicular traffic often run in contrast to traffic regulation and sometimes leads to fatal accidents (TRACE corps, 2014). Nigerian highways and its usage are of great importance to many stakeholders when we talk of safety issues. Ogun state as a gateway to industrialization of the country has many economic and social benefits because of the road network in the state. Nevertheless, the rate of accidents on the major highways in the state is becoming worrisome because valuable lives and properties are always involved (Osibanjo, 2013). The emergence of Ogun state traffic compliance and enforcement corps (TRACE) is traceable to resurgence of civilian regime in Nigeria.

Traffic Compliances and Enforcement Corps (TRACE) was established by the enabling law of Ogun state House of Assembly in March, 2005 and an amendment to that law was made in 2007 by the Governor of the state then (TRACE Corps, 2009). The corps began public enlightenment campaign for all road users in the state in the year 2005 but whether or not this lofty arrangement was sustained is a question begging for an answer and by June 2006, subtle enforcement was introduced. The state traffic management agency was established using Lagos State Traffic Management Authority (LASTMA) as a model with Major Dapo Sunmola (Rtd) as the pioneer corps commander (TRACE Mayor Handbook, 2009). TRACE commenced operations with five directorates and two zonal operational commands immediately after the training of the first batch of its operators. The directorates in TRACE then include:

a. Directorate of Operation;
b. Directorate of Planning, Research and Statistics;

c. Directorate of Training and Provost;
d. Directorate of Finance and Accounts; and
e. Directorate of Administration and Supply.

The major goal of TRACE corps is to maintain road traffic regulations while the vision of the corps is to ensure discipline among road users, protect and enhance safety of all road users. Meanwhile, the mission of the agency is to ensure a drastic reduction in road traffic accident that may result into economic losses, conflicts, congestions and delays on public highways by employing modern traffic management techniques to inject orders and control the road system in the state. Ogun State has three international transit corridors, namely; Ota-Idiroko, Sagamu interchange-Ilaro Ohunbe and Abeokuta –Imeko – Ilara. In addition, the state has seven national transit corridors namely, Lagos-Ibadan, Lagos-Abeokuta, Agbara-Sokoto, Ikorodu-Ijebu-Ode, Epe - Ijebu-Ode and Sagamu-Benin (Osibanjo, 2013).The Ogun State Traffic Compliance and Enforcement Corps according to Sangofadeji is set in order to accomplish the following objectives based on the TRACE law 2005 and 2007:

1. Provide traffic management services in solving the envisaged transport problems attendants with investment drive.
2. Checkmate and control road traffic spillover effect of neighboring states.
3. Manage the heavy traffic flow on the extensive Ogun State corridor on Lagos, North and East bound expressway linkage.
4. Ensure safety of lives and properties of citizenry in the state through adequate traffic monitoring and rescue of accident victims.

Premised on the above' this study sought to evaluate the impact of Ogun State Traffic Compliance and Enforcement Corps (TRACE) intervention on Nigerian highways. The issue of raising the consciousness of people's safety on the road through a proactive traffic regulations and management is important and the increase in road traffic accidents resulting in loss of lives and properties in the

state is worrisome. Road crashes have emerged the major source of human and material loss worldwide and the casualty and fatality vary significantly across different regions in population, traffic intensity, compliance with traffic regulations, and extent of preventive and remedial measures put in place. Ogun State, being the gateway state to industrialization in Nigeria, records a high incidence of road accident and this calls for concern of all and sundry. Few researches on the impact of traffic management on how to prevent road crashes have been documented, but the findings are not consistent. Beyond, none on comparison between the obtained and the obtainable in respect of impact of TRACE has been found documented. Therefore, this study sought to evaluate the impact of Traffic Compliance and Enforcement Corps' intervention on highways in Ogun State.

The main purpose of this study is to evaluate the impact of TRACE corps' intervention on Nigerian highways in the state. In order to achieve this, the following specific objectives were highlighted:

1. Determine the profile of road crashes in Ogun State in the last five years
2. Investigate the perception of road users on the activities of TRACE corps operatives on Nigerian highways
3. Determine the adequacy of TRACE corps operatives' efficiency in the state.

The following questions were raised to guide the study:

1. What is the profile of road crashes in the last five years in Ogun State?
2. What is the perception of road users of the activities of TRACE corps operatives on Nigerian highways in Ogun State?
3. How adequate is TRACE corps operatives' efficiency in Ogun state?

## Methodology

This research work adopted descriptive survey research design. This design is considered appropriate because it relies on the use of questionnaire for the collection of data from the target population. In addition, the study adopted a Context, Input, Process and Product (CIPP) evaluation model. The application of the model to the study is shown in Table 1 that follows.

**Table 1: Evaluation Framework**

| Component | Variable indicator | Data source | Instrument for data collection | Research Questions | Statistical Tools |
|---|---|---|---|---|---|
| Context | - | - | - | - | - |
| Input | - | - | - | - | - |
| Process | - | - | - | - | - |
| Product | 1.TRACE Corps Efficiency | Road users | TCES | 3 | Frequency counts, simple per centages, mean scores and standard deviation |
| | 2.Road users perception | Road users | RUPQ | 2 | |
| | 3.Profile of road crashes | Directorate of Planning, Research and Statistics of TRACE | Road crashes record | 1 | Ratio |

The population comprises all the public intercity/inter-states road users (strictly public drivers) in Ogun East Senatorial District of Ogun State. The researchers used multi stage sampling technique in the selection of sample of study. Ogun East Senatorial District has nine (9) Local Government Areas out of which five (5) were drawn using simple random sampling technique. From each Local Government Area two major towns were selected using simple random sampling technique to make a total of ten (10). A notable terminal for intercity or inter-state routes was purposively selected in each town. Thirty (30)

road users per terminal were selected from the group of road users that was met on ground as at the time data were collected using simple random sampling technique to give a sample size of three hundred (300) participants. The sample size was considered adequate for a population of road users in the selected District estimated to be less than 2000.

Three instruments were employed in data collection. They are: Road Users Perception Questionnaire (RUPQ), TRACE Corps Efficiency Scale (TCES) and Road Crashes Statistical Record. RUPQ is designed by the researcher for road users which has two sections. Section A captures demographic details such as name of LGA, gender, age, and highest qualification. Section B measures road users' perception about TRACE Corps activities in the state using the scale of SD = Strongly Disagree A = Agree and SA = Strongly Agree. TCES is an adapted version of Teacher efficiency scale developed by Ajayi (2015). The scale is meant for TRACE operatives using the scale of SD = Strongly Disagree A = Agree and SA = Strongly Agree. The third instrument was the road crashes profile adapted from the Directorate of Planning, Research and Statistics (DPRAS) of the TRACE Corps. The RUPQ and TCES were given to experts in Educational Evaluation for review in terms of content, language and structure after which the instruments were administered to a sample of participants that were not part of the main study and alpha coefficients 0.77 for RUPQ and 0.72 TCES were obtained using Cronbach alpha.

The instruments for data collection were administered personally by the researchers. Prior to the administration of the instruments, informed consent of the respondents was obtained to participate in the study. The administration and retrieval of the instruments were closely monitored to ensure that they were properly filled. This exercise lasted for six weeks. The data collected were analyzed using frequency counts, simple per centages, mean scores, standard deviation and ratio scores.

**Results**

**Table 2: Profile of Road Crashes in Ogun State from 2010 -2014**

| Year | Number of crashes | Number of persons killed | Crash-killed ratio | Number of persons injured | Crash-injured ratio |
|---|---|---|---|---|---|
| 2010 | 191 | 84 | 2:1 | 50 | 3:1 |
| 2011 | 270 | 175 | 1:1.5 | 331 | 1:1 |
| 2012 | 339 | 136 | 2:1 | 442 | 1:1 |
| 2013 | 478 | 134 | 4:1 | 826 | 2:1 |
| 2014 | 409 | 132 | 3:1 | 743 | 2:1 |

*Source:* Directorate of Planning, Research and Statistics (TRACE Corps)

The results presented in Table 2 indicate a steady rise in number of road crashes within the state from 191(2010) to 270 (2011), 339 (2012), 478 (2013) and 409 (2014). The breakdown of the results shows that 84 persons were killed with a crash-fatality ratio of 2:1 in 2010 while 50 others were injured with a crash-injured ratio of 3:1. In 2011, 175 persons were reportedly killed giving a ratio of 1.5:1 while the number of individuals injured was 331 with ratio 1:1 compared to the number of crashes. For 2012, 136 persons with a ratio of 2:1 were killed with 442 others with a ratio of 1:1 injured. In 2013,134 persons representing a ratio of 4:1 were killed while additional 826 persons with a ratio of 2:1 were injured. The data for 2014 were as presented in Table 2.

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killed with 442 others with a ratio of 1:1 injured. In 2013,134 persons representing a ratio of 4:1 were killed while additional 826 persons with a ratio of 2:1 were injured. The data for 2014 were as presented inTable2

**Table 3: Frequency Counts, Simple Per Centages, Mean and Standard Deviation indicating Road Users' Perception of TRACE Corps Operatives**

| S/N | Items | SA | D | A | SA | $\bar{X}$ | S.D |
|---|---|---|---|---|---|---|---|
| 1 | The motive of TRACE Corps appears to be an attem pt to generate revenue for the state government | 6(2.0) | 31(10.3) | 39(13.0) | 224(74.7) | 3.60 | .75 |
| 2 | TRACE Corps operatives do not care to educate traffic offenders they apprehend on the highways | 42(14.0) | 55(18.3) | 186(62.0) | 17(5.7) | 2.59 | .80 |
| 3 | TRACE Corps operatives are more violent in approach to erring road users | 58(19.3) | 127(42.3) | 78(26.0) | 37(12.3) | 2.31 | .92 |
| 4 | The allegation that TRACE Corps operatives pursue traffic offenders with their vehicles not minding the consequence is true | 120(40.0) | 105(35.0) | 46(15.3) | 29(9.7) | 1.95 | .97 |
| 5 | The TRACE Corps operatives have oppressive manner of approach while on duty | 97(32.3) | 62(20.7) | 62(20.7) | 79(26.3) | 2.41 | 1.19 |
| 6 | TRACE Corps operatives are courteous with motorists while performing their duty | 19(6.3) | 104(34.7) | 119(39.7) | 58(19.3) | 2.72 | .85 |
| 7 | The intervention of TRACE Corps have led to a decrease in road crashes on Nigerian highways in the state | 27(9.0) | 82 (27.3) | 105(35.0) | 86(28.7) | 2.83 | .95 |
| 8 | TRACE Corps is not relevant except that it provides employment opportunities to citizens of the state | 41(13.7) | 131(43.7) | 96(32.0) | 32(10.7) | 2.40 | .85 |
| 9 | TRACE Corps operatives promptly respond to the scene of accidents on our highways | 62(20.7) | 44(14.7) | 94(31.3) | 100(33.3) | 2.77 | 1.12 |

*Figures in parentheses indicate per centages. Grand Mean = 2.62

The perception of road users of activities of TRACE Corps operatives on Nigerian highways as indicated on Table 3 was positive ($\bar{x}$ =2.62). In other words, the perception of the road users on account of greater number of items being measured was positive. A high per centage (87.7%) of the road users perceived ($\bar{x}$ = 3.60) that the motive behind the operation of TRACE Corps appears to be more of revenue generation. The road users (67%) were of the opinion ($\bar{x}$ = 2.59) that TRACE Corps operatives did not care to educate erring motorists but rather what is paramount to them is booking for a financial penalty. However, TRACE Corps operatives were perceived ($\bar{x}$ = 2.31) by the road users (61.6%) as being more civilised in approach rather than being violent. Further, the road users (75%) perceived ($\bar{x}$ = 1.95) the allegation that TRACE Corps operatives pursue traffic offenders with their vehicles not minding the consequence was not true. A slightly above average (53%) proportion of the respondents disagreed ($\bar{x}$ = 2.41) that TRACE Corps operatives were oppressive in approach.

A good proportion (59%) of the respondents believed ($\bar{x}$ = 2.72) that TRACE Corps operatives have good interpersonal relationships with the public. Similarly, 63.7% of the respondents agreed ($\bar{x}$ = 2.83) that the intervention of TRACE Corps have actually reduced the number of road crashes within the state. The road users (57.4%) believed ($\bar{x}$ = 2.40) that TRACE Corps is much more relevant beyond provision of employment opportunities to the citizens of the state. Finally, TRACE Corps operatives were seen ($\bar{x}$ = 2.77) by the road users (64.6%) as being prompt to distress call whenever an accident occurs on the highways.

**Table 4: Frequency Counts, Simple Per Centage Mean and Standard Deviation indicating adequacy of Efficiency of TRACE Corps Operatives**

| S/N | Items | NE | IE | AE | VAE | $\bar{X}$ | SD |
|---|---|---|---|---|---|---|---|
| 1 | TRACE Corps operatives are always punctual on their beat | 177(59.0) | 14(4.7) | 64(21.3) | 45(15.0) | 1.92 | 1.18 |
| 2 | TRACE Corps are always found performing their duties on the road | 10(3.3) | 154(51.3) | 85(28.3) | 51(17.0) | 2.59 | .81 |
| 3 | Operatives of TRACE Corps always respond promptly to distress calls at the scenes of accident | 20(6.7) | 43(14.3) | 140(46.7) | 97(32.3) | 3.05 | .86 |
| 4 | TRACE Corps always penalize erring motorists by issuing fine tickets | 31(10.3) | 80(26.7) | 73(24.3) | 110(38.7) | 2.91 | 1.03 |
| 5 | Operatives of TRACE Corps considers taking bribe as a serious offence | 127(42.3) | 50(16.7) | 53(17.7) | 70(23.3) | 2.22 | 1.22 |
| 6 | TRACE Corps operatives are courteous when relating with the public | 23(7.7) | 68(22.7) | 151(50.3) | 58(19.3) | 2.81 | .83 |
| 7 | Operatives of TRACE Corps are always in possession of writing materials while on duty | 29(9.7) | 130(43.3) | 72(24.0) | 69(23.0) | 2.60 | .95 |
| 8 | Operatives of TRACE Corps are always found fully kitted while performing their duties | 37(12.3) | 36(12.0) | 49(16.3) | 178(59.3) | 3.23 | 1.08 |

*Figures in parentheses indicate per centages, Grand Mean =2.67

Note: NE (Not Efficient), IE (Inadequately Efficient), AE (Adequately Efficient), VAE ( Very Adequately Efficient)

**Ground Rule:** Mean score of less 2.5 indicates inefficiency while a mean score of 2.5 and above indicates efficiency of TRACE Corps operatives.

Given the Grand Mean score of 2.67, it can be deduced from Table 4 TRACE Corps that the operatives were observed to be efficient. Disaggregating the results, a large proportion (75.6%) of the respondents rated TRACE corps operatives as efficient ($\bar{x}$=3.23) in terms of being fully kitted when on duty. Similarly, 79% of the respondents with high rating ($\bar{x}$=3.05) affirm that TRACE corps operatives were efficient in terms of prompt response to distress calls. The operatives of TRACE corps were also rated efficient ($\bar{x}$=2.91) by 63% of the respondents. The efficiency index ($\bar{x}$=2.81) of TRACE corps operative in use of courtesy when relating with the public was high supported by a positive rating of 69.6% of the respondents. The results on Table 4 further reveal that the operatives were efficient ($\bar{x}$=2.60) for being in possession of writing materials each time they were on duty among other things. This was reported by a slightly high proportion (57%) of respondents. It was also reported by 54.6% of the respondents that the operatives of TRACE Corps were efficient ($\bar{x}$=2.59) on regularity at their duty posts on the road. However, their efficiency was reportedly low in two items. A slightly high proportion (59%) of respondents with a Mean score of 2.22 observed that TRACE Corps operatives were inefficient for non-consideration of bribe as a criminal offence. Finally, the operatives were reportedly (63.7%) inefficient ($\bar{x}$=1.92) in terms of being punctual at their duty posts on the road.

## Discussion of Findings

The number of road crashes within a period of five years under review was on the increase. The fatality of the crashes was represented by a huge increase in per centages of people injured and a corresponding decrease in the per centage of people killed. This result is similar to

the one by TRACE Corps (2009) that, 'Prior to year 2004, road traffic situation in Ogun state was so pathetic that the state was known as the "mortuary" of Nigeria. While Tutu (2007) submits that road traffic accidents kill and maim millions of people annually in African countries, he also stated that they hamper economic development of many nations and cause enormous suffering. Tutu (2007) further argued that the rate of fatality in road traffic accidents is very high among children and young adults who are in their prime and constitute the work force in many countries. In 2004, the rate of road traffic accident was very high and deaths recorded on Ogun state highways were ranked among the first ten in the country, an indication that there was an increase in the rate of road crashes across the years in review as recorded by TRACE Corps (2009). The reason for this result may likely be due to changes that have taken place in population parameters in terms of steady increase in population size with a corresponding increase in the number of vehicles on the road. In addition, deteriorated state of the road overtime is another likely factor. However, steady reduction in per centages of people killed may be traced to prompt response of TRACE Corps operatives and operatives of the Federal Government sister agency to victims of road accidents who needed support and aid, road accident emergency clinic intervention of the state hospital at designated locations on the roads also deserves mention and credit.

The perception of road users of the activities of the TRACE Corps operatives was a positive one. Reported evidences show that users were of the impression that the operatives were civilised, rather than being violent, oppressive and ruthless when apprehending erring motorists. Road users were also of the impression that TRACE Corps agency is relevant both for its core mandate and employment opportunities. The agency was also positively reported for a decrease in the number of road crashes, being courteous in approach with motorists and prompt response at the scene of accident. These results were consistent with the findings of Olorunponmi (2010) in which it

was stated that the intervention and dedication of traffic managers like the FRSC, TRACE Corps and LASTMA to work have indeed helped in drastic reduction of road crashes, though some officials of these agencies are corrupt and unfriendly with motorists.

However, road users were of the impression that the operatives of the TRACE Corps were not favourably disposed to giving education to erring motorists and that revenue generations appear to be their hidden motive behind the operation of the agency. The explanation for this report may likely be a product of direct experience of the road users with the operatives of TRACE Corps on the road or at terminals. Opinions shared by the road users with other members of the public cannot be ruled out as well. Public education in terms of road safety consciousness enlightenment was not being properly addressed and harnessed which of course is a big minus to the intended outcome of the activities of TRACE Corps operatives. The finding is in contrast to the submission of Hill (2008) in the United States who argued that the enactment and enforcement of traffic safety reinforced by public education brought about an improvement in the traffic situation of the country evidenced in the decrease in the rate of accidents.

Meanwhile, the efficiency of the TRACE Corps operatives was high. The operatives were efficient in being fully kitted when on duty, prompt response to distress calls from the scene of accident and use of a fine to book erring motorists. Other areas by which they were efficient include use of courtesy when dealing with motorists, being in possession of writing materials among others when on duty and display of regularity in attendance at their duty posts when on the road. The result contradicts the findings of Ajayi and Longe (2015) where it was submitted that majority of the members of the public described the relationship between them and law enforcement agents as very antagonistic. However, the findings align properly with the submission of Sangofadeji (2013) who argued that high level of dedication and commitment to duty of TRACE Corps operatives is a reflection of their efficiency, and that capacity building and training

with proper remunerations of traffic managers will motivate them to discharge their duty without fear or favour. The explanation for this may likely be that effective monitoring and supervision is in place. Beyond this, it must be noted that they were conscious of being a public official whose duty post is in the full glare of the public who can make a report of any inadequacies noticed to the relevant constituted authority using social media platforms or any other means considered convenient at any time of the day.

**Conclusion and Recommendations**

On the basis of the results of the study, the TRACE Corps agency is a worthwhile intervention strategy addressing the need for which it was established. Quite interesting, the agency enjoys good public image impression. Based on the major findings of this work, it is recommended that the management of the agency should organise periodic trainings, seminars and workshops for road traffic managers to enhance and sustain their productivity. At the same time, they should pursue vigorously road safety education on periodic basis among motorists with the aim of promoting road safety consciousness and awareness among. The government of other states in the federation should also make efforts to replicate the intervention as the issue of road safety is everybody's business.

In addition, it is vital to make a strategic traffic management plan with relevant programmes developed across the country. TRACE Corps should collaborate with other sister agencies like FRSC to ensure an integrated and enhanced traffic management in the state. Finally, there is the need to start thinking of how to reduce dependence on roads as the commonest mode of transportation available to over 180 million Nigerians. With concerted efforts, government should revive other means of transport and this will obviously reduce dependence on the road, and by implication reduce the rate of crashes on Nigerian roads.

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# APPROACHES TO TEACHING OF VALUES IN RELIGIOUS AND MORAL EDUCATION IN SELECTED COLLEGES OF EDUCATION IN GHANA

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## Abstract

The teaching of Religious and Moral Education as a course appears to be problematic in the Colleges of Education. This research work was undertaken in some selected Colleges of Education in the Eastern Region of Ghana to overview tutors' approaches of teaching of values in Religious and Moral Education as a course. The study used sequential mixed method survey and the sample size was 344 respondents – 336 pre-service teachers and 8 tutors from the chosen Colleges of Education. Questionnaire and semi-structured interview guide were used to collect data. Deductive and inductive data analyses and interpretation were used in discussing the responses from the respondents. Major finding of the study was that the most effective approach to teaching of values in Religious and Moral Education is values clarification It was recommended that stakeholders of education take note of this finding and promote the use of values clarification for the teaching of values in Religious and Moral Education.

**Keywords**: values education, religious and moral education, values clarification, approaches, colleges of education.

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## Introduction

The curriculum for Religious and Moral Education was designed to supplement religious and moral training people acquire from their various homes and religious affiliations. The course was introduced into Ghana Education Curriculum in 1999 and it was made compulsory for all students by the Ghana Education Service. This initiative was challenged when the subject was taken out from the basic school curriculum in 2007 educational reform. This decision did not go down well with opinion leaders of the nation, especially, religious leaders. They spoke against the decision and asked for its re-introduction into the basic school curriculum. The situation opened the subject up for deeper reflections on its impact in the lives of pupils and students. Teachers, parents and other stakeholders of education expressed their opinions on the issue. The decision was reversed by the then government and the subject was re-introduced (Owusu, 2014). If the government of the day had succeeded, it suggests that the subject would have been removed from the Colleges of Education curriculum since the products of the Colleges teach at the basic schools of the nation. The removal of the subject from the basic school curriculum may be that the subject was not achieving its aim. This study attempts to overview the Religious and Moral Education methods of teaching as a course in some selected Colleges of Education in the Eastern Region of Ghana using RME tutors and students for their perceptions on the impact of the subject.

## The Importance of College-Based Values Education

What is important to say, in many ways against the conventional wisdom, is that a school is clearly the best place where values education can happen. While this is not to pitch the school against other social agencies of home, peers, religion, media, etc., it is to boldly assert that, for most people, these agencies tend towards narrowing of lifeworlds and towards pressure to conform to those lifeworlds, to compound the sense that "we've got it right!". The

school's bolder role should be to stretch the comfort implied by this and to open minds to the breadth of lifeworlds. Ideally, this will be done carefully and with the support of other agencies, especially the home, but one should not be surprised if there are occasional tensions between the role of the school and the other agencies. Like the other agencies, the school's role is a distinctive one and much of the substance of this role is to be found in a comprehensive Values Education pursuit.

Perspectives like those of Dewey (1929) and Habermas (1935) help to illuminate why it is that issues of trust, care, respect and acceptance are so vital if Quality Teaching is to have its full effects (Bryk & Schneider, 2002; Louden et al., 2004; Rowe, 2004). Furthermore, these perspectives underline just why the Values Education pursuit must be grasped by teachers, schools and systems as being central and pivotal to their endeavours, rather than being on their margins. Again, it is worth re-stating the central proposition of this paper; namely that Values Education has the potential to go to the very heart of what it is that teachers, schools and educational systems are about. It certainly has potential to provide the missing link for Quality Teaching.

**Statement of the Problem**

In Ghana, Religious and Moral Education was introduced into the schools' curriculum by the Ghana Education Service (GES) and made compulsory for all students since 1999 (Ministry of Education, 1999). Decades on, it is expected that the nation would have realized some of the benefits of the purpose for which it was introduced. It is expected that through the teaching of Rreligious and Moral Education, the nation would produce responsible citizens having the necessary values needed to drive its development. This implies that most of the students that have passed through the school system and Colleges of Education would have had their moral and ethical make-up developed sufficiently enough to enable them participate actively in the nation's development activities.

Asare Danso (2010) noted that despite the goals and purposes of Religious and Moral Education (RME), the expected outcomes of learners after their contact with the subject appear unachieved. The majority of the Ghanaians appear to be putting up behaviours contrary to the goals and objectives of the course, resulting in the stagnation of the progress of the nation's fight against corruption. All these misbehaviours have both educational and social implications which need to be addressed. Some of the people have attributed the problem to the approaches teachers use in teaching values in Religious and Moral Education. There is therefore the need to investigate the approaches teachers use in teaching Religious and Moral Education as a course as a way of addressing the problem.

**The Objectives of the Study are:**

1. to investigate how teachers approach the teaching of values in Religious and Moral Education as a course in Colleges of Education in the Eastern Region of Ghana.
2. to assess the approaches teachers consider as appropriate /effective in the teaching of values in RME in Colleges of Education.

**Research Questions**

1. What are the approaches teachers use in teaching values in Religious and Moral Education as a course in Colleges of Education in the Eastern Region of Ghana?
2. What approaches do teachers consider as effective in the teaching of values in Religious and Moral Education in Colleges of Education?

## Literature Review

### Empirical Studies on Values Education

Values education is known internationally by a number of names, including Moral Education and Character Education, among others. Each variant has a slightly different meaning, pointing to one or other

distinctive emphasis. Each variant is nonetheless united in the common belief that entering into the world of personal and society. All values is a legitimate and increasingly important role for teachers and schools to play. This is not an attempt to supplant the influences of the home but rather to supplement them and, where necessary, to compensate for them. International research into teaching and schooling effects is overturning earlier beliefs that values were exclusively the preserve of families and/or religious bodies and that, as a result, schools function best in values neutral mode. This research is not only pointing out the void of such a belief but the potential for it to lead to diminished effects in all realms of student-achievement, including academic attainment. In fact, it could be asserted that, in a sense, teaching and schooling that function in values-neutral mode might actually serve to undermine the potential effects of other socializing agencies, including families.

**The Positive Impact of Values Education**

Carr (2006, 2007, 2008, and 2010) has argued persistently that values and effective teaching are inextricably interwoven and that, in that sense, values education goes to the heart of the role of the teacher and effective learning for the student. He focuses especially on the issue of relationships and the moral mentoring of the teacher as being central to teaching as an inherently relational profession. There is more than a hint of Dewey (1916, 1929) and Peters (1981) in such postulations and, furthermore, recent empirical studies have provided confirming evidence of them.

Among these studies are those of Benninga et al. (2006, 2010) that, using the California Academic Index as a guide, were able to show a correlation between high quality values (character) development and strengthened academic achievement. Rowe (2004) provides explanation and evidence for a similar correlation in his linking 'performance character' and 'moral character' as integrally related in the development of personhood. Peters (1981) offers further evidence

of these joint effects in showing that it is the teacher who both provides quality content in the context of effective pedagogy and establishes good relationships with students who enjoy the greater academic impact. In other words, establishing positive relationships with students is itself part of effective pedagogy and, in a circular effect, high quality teaching has its own positive impact on strengthening student-teacher relationships. In confirming this twin effect, Peters (1981) cites results of a study that shows positive relationships among students are an inherent feature of teachers achieving optimal results. Studies that provide both fortified conceptual proffering and empirical verification of the inherent interconnections between values education and holistic student wellbeing, including academic enhancement, are growing in number and scope (Nucci & Narvaez, 2008; Lovat, 2011; Lovat et al., 2010a, 2011a, 2011b).

## The Australian Study

Much of the evidence referred to above has also been captured in the research and practice of the projects emanating from the Australian Values Education Program. The program was federally funded, beginning with a pilot study in 2003, followed by the development of a National Framework for Values Education in Australian Schools ['National Framework'] (DEST, 2005) that identified the developing research links between values education and good practice pedagogy and proposed a set of guidelines based on these links.

The programme then issued in a range of research and practice projects from 2005 to 2010, the most crucial of which were the two stages of the Values Education Good Practice Schools Project ['Good Practice Schools'] (DEST, 2006; DEEWR, 2008), the Project to Test and Measure the Impact of Values Education on Student Effects and School Ambience ['Testing and Measuring'] (Lovat et al., 2009) and the Values in Action Schools Project (DEEWR, 2010).

Within the two stages of 'Good Practice Schools', 316 schools organized into 51 clusters across the country, involving approximately 100,000 students, 10,000 teachers and 50 University academics, engaged in a variety of approaches to values education, all guided by the central principles enunciated in the 'National Framework'. Findings were disseminated at annual national forums that included keynote addresses from the two authors (Lovat at the 2005, 2006 and 2009 events and Hawkes at the 2006 and 2007 gatherings).

Findings from stage 1 (DEST, 2006) illustrated that a sound values education can be a powerful ally in the development of good practice pedagogy, with positive effects being demonstrated across a range of measures, including persistent reference to the improved environment of learning and greater student attention to the regular academic work of the classroom: We ... found that by creating an environment where (the) values were constantly shaping classroom activity, student learning was improving, teachers and students were happier, and school was calmer. (p. 120)

The Executive Summary of the report concluded that, based on the evidence, values education has potential to impact positively on the total educational environment of a school, resulting in a number of features, including strengthened teacher-student relationships, classroom climate and ethos, student attitudes and behaviour, student knowledge and understanding and student achievement. The Stage 2 Report (DEEWR, 2008) identified clearer and more sophisticated links between the rollout of values education and the effects on both student behaviour and performance.

**Methodology**

The research design adopted for the study was sequential explanatory mixed method approach. The population of 1409 consisted of all tutors and pre-teachers of four Presbyterian Colleges of Education in the Eastern Region of Ghana. The sampled size made up of 344

respondents (8 tutors and 336 pre-service teachers) purposely chosen through lottery random sampling technique. A questionnaire and semi-structured interview guide were used to collect data from the students and tutors respectively for the study. The researcher collected a letter of introduction from the Head of Department of Psychology. Copies of the letter were given to Principals of the selected Colleges. They in turn informed the RME tutors and the students of the intent of the study and an occasion was arranged for the administration of the questionnaires. The questionnaires were administered to the respondents on the agreed date and collected on the same day. The respondents' rate was 100%. The Cronbach Co-efficient calculation was 0.92. Data collected were analysed using Statistical Package for the Social Sciences (SPSS).

**Table 1: Distribution of Pre-Teachers' Responses on Approaches of Teachers in Teaching of Values in the Colleges of Education**

| Statement | SA | A | SD | D | NA |
|---|---|---|---|---|---|
| Values clarification as an approach | 33.0% | 61.8% | 1.6% | 3.1% | 0.5% |
| Values analysis as an approach | 38.7% | 55.1% | 1.3% | 3.0% | 1.9% |
| Moral development as an approach | 38.7% | 54.8% | 3.3% | 1.0% | 2.2% |
| Modelling as an approach | 40.9% | 50.6% | 0.3% | 7.6% | 0.6% |
| Discussion as an approach | 42.3% | 50.2% | 0.6% | 6.0% | 0.9% |
| Group activities as an approach | 36.3% | 54.8% | 0.9% | 7.4% | 0.6% |
| Story Telling as an approach | 47.7% | 45.2% | 1.9% | 4.6% | 0.6% |
| Role play as an approach | 48.0% | 44.6% | 3.4% | 3.4% | 0.6% |
| Values inculcation as an approach | 40.8% | 46.7% | 1.8% | 6.2% | 1.5% |
| Field trips as an approach | 5.6% | 15.2% | 30.1% | 47.2% | 1.2% |

Source: Field Data, July 2016

Table 1 indicates that 61.8% representing the majority agreed that values clarification was the most important approach for teaching values in RME. It was followed by 33.0 strongly agreed, 3.1% disagreed, 1.6% strongly disagreed respectively. Not applicable marked 0.5%. The results suggest that values clarification is the most important among the approaches of teaching values in RME. This result could be due to the flexibility and learner-centered approach to the use of the method. This finding is consistent with what Asare-Danso (2010) posits that values clarification is the most modern and dynamic method of teaching values.

Similarly, responses from the interviewees indicated that there are many approaches in teaching values in RME in the colleges of education. When an interview question on the same theme was posed, interviewees responded as follows:

> ...values clarification is a very good approach for teaching values, except that it does not encourage a search for consensus, thereby providing a common solution to a problem. [KPCE, pre-service teacher2]

> For me, I am for values clarification, but my challenge is that it relativizes moral issues. It does not make a distinction between what is moral and non moral. It claims to be value neutral. [PCE, pre-service teacher1]

The findings from the tutors suggest that despite values clarification advantages, it has its criticisms. However, it is the approach that should be promoted in the colleges since it is easy to learn and easily accessible to pre-service teachers. Scholars whose work are associated with this approach are: Raths, Harmin & Simon (1966), and Simon, Howe and Kirschenbaum (1977). One can conclude that values clarification approach should be promoted and used for the teaching of values because of its numerous advantages for learners and teachers.

The second most important approach was values analysis. This approach was represented by 55.1% agreed, 38.7% strongly agreed. The rest were, 3.0% disagreed and 1.9% strongly disagreed. Not applicable was 1.3%. This result means that values analysis is one of the approaches for teaching values in RME. This finding might be as a result of the use of scientific application in this approach. In much the same way, majority of the interviewees held up for values analysis as a good approach for teaching values. This approach was running through the themes generated when a similar question was posed to interviewees. Two of the statements are below:

> "It has to do with using logical reasoning and scientific investigations to deal with issues that require value judgment. This is by the use of methodical and precise form to explain issues of values to the learner." [APWCE, pre-service teacher 1]

> For other "I see values analysis to be more of social than individual and it involves analysis of situations or issues, which require people to make informed choices and value judgement" [KPCE, pre-service teacher2].

This approach is associated and developed by Social Sciences educators like Scriven (1966) and Bond (1970). Scriven and Bond's arguments show that values analysis has to do with social values than other values. Also, it uses common sense in its examination. Conclusively, the finding from the results suggests that values analysis is a good approach for the teaching of values in RME because of its promotion of social values in pre-service teachers. This approach could imbue in teachers the sense of relating well with one another, as well as developing love for the teaching of values in RME.

The third approach selected by respondents was moral development. The approach was represented by 54.8% of the respondents agreed. It was followed by 38.7% strongly agreed, 3.3% disagreed, not applicable was 2.2% and the least score was 1.0% who strongly

disagreed. The result indicates that moral development is one of the approaches of teaching values in RME. This result could be due to the assumptions that moral development touches on students' feelings and behaviours. The majority (5) out of (8) of the interviewees confirmed that moral development as an approach for teaching values was appropriate. One of the statements of the interviewees is captured below:

> "...for moral development, a person acts based on his feelings, thoughts, behaviour and experiences". [PCE, pre-service teacher2]

A pre-service teachers from APCE supported the finding but stated one of the weaknesses of moral development. He posits that:

> "...moral development is the application of ethical principles to moral situations in life, but it is purely based on moral values at the expense of other values." [APCE, pre-service teacher3]

In other words, moral development as an approach uses ideals that are classified as right to solve or deal with issues of morality. However, moral development has a weakness of only advancing the cause of moral issues as against other values. Advocates of this approach include Kohlberg (1969, 1984), Piaget (1932, 1962), Erikson (1950) and Loevinger & Wessler (1970). It can be gathered from the responses from the tutors that moral development employs ethical principles to solve moral issues. This approach has positive impact on teachers' moral behaviour. This in effect could help to complement the strengths and weaknesses of other approaches used in teaching values in RME in Colleges of Education.

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**Table 2. Distribution of Pre-Service Teachers' Responses on Effective Approaches in Teaching Values**

| Statement | SA | A | SD | D | NA |
|---|---|---|---|---|---|
| Values clarification as an approach | 55.7% | 40.3% | 0.6% | 3.4% | 0.0% |
| Values analysis as an approach | 40.2% | 54.8% | 4.4% | 14.9% | 0.6% |
| Moral development as an approach | 40.7% | 53.6% | 1.3% | 4.5% | 0.0% |
| Inculcation as an effective approach | 40.3% | 50.3% | 1.3% | 8.2% | 0.0% |
| Action learning as an effective approach | 44.4% | 49.4% | 0.6% | 5.0% | 0.0% |

**Source: Field Data, July 2016**

The data in Table 2 shows that 55.7% strongly agreed that values clarification is the most effective approach for teaching values in RME. Those who agreed were 40.3% and 3.4 disagreed. The rest were, 0.6% strongly disagreed and not applicable was nil. The scores imply that values clarification is the most effective approach of teaching values in RME. The reason could be that the approach promotes active student-participation in moral education. During the interviews, a question posed to interviewees was: Among the approaches of teaching values, which one do you consider effective? In response, all the eight (8) interviewees responded that it is values clarification. Two of the statements are captured below.

> ... It is a modern way of teaching values, notwithstanding, the same value can support contradictory positions, this would happen when people who are in favour of or against an issue insist that they have all acted upon their choices or claim

> and for that matter, the entrenched position they may have taken is of value to them. On the part of teachers, values clarification has the satisfaction of considering openly very important issues concerning individual life goals. An example of values clarification is Ranked Order. Ranked Order Strategy could be used to compare personalities in the various religions. Students may be asked to rank the personalities according to their choices and justify their answers with values students perceive as individuals. [PCE, pre-service teacher2]

> In support of the earlier submission, Abetifi pre-service teacher asserted that for values clarification, teachers' views are not final or imposed on the students. The teacher rather acts as a facilitator, trying to help the students to clarify their values by thinking through some of the moral confusion that may go through in their minds. Suitcase Strategy among others is an example of values clarification. By suitcase strategy I mean a suitcase is given to students and they are to fill it with good moral values. Each student may be asked to write one moral value on a piece of paper and drop it into the suitcase, which may be represented by a small box. The teacher then collects what the students have written and reads them to the hearing of the class. The values are then listed on the Board for discussion. [APCE, pre-service teacher3].

The responses from the interviewees indicate that values clarification has merits as well as demerits. The merits among others are that, in values clarification approach, a teacher rather acts as a facilitator, trying to help pre-service teachers to clarify their values; it is easy to learn and easily accessible to teachers and students; it is learner

centred and participatory. On the other hand, there are some demerits. These include, the same value can support contradictory positions and it does not give room for consensus building, which provides a common solution to a problem.

In spite of the limitations of the values clarification approach for teaching of values, its strengths outweigh the weaknesses because of its paradigm shift from a "content approach" to a "process approach" to the teaching of values (Raths et al, 1966). Content approach stresses on what one holds as a value and process approach looks at how or the process: choosing, prizing and acting. Values clarification approach needs to be encouraged in RME lessons, particularly in the teaching of values to make values education lessons lively and participatory.

**Conclusions**

The study identified five approaches used in teaching values in Religious and Moral Education. Values clarification, values analysis, moral development, modelling and action learning are key approaches for the teaching of values in RME. While field trips and values inculcation are the less approaches for teaching, values. Values clarification is identified as the most effective and key approach for teaching values in RME.

**Recommendations**

From the findings and conclusions drawn from the study, the following recommendations are made to help improve upon the teaching of values education in the Colleges of Education in the Eastern Region of Ghana. The recommendations are made to create formal and professional awareness of values education in the Colleges of Education.

The Governing Councils of Colleges of Education through their Academic Boards should make it a policy for teachers to use approaches such as: Values clarification, values analysis, moral development, modelling and action learning for the teaching of values in Religious and Moral Education.

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# IMPROVING STUDENTS' PERFORMANCE IN MICROSOFT EXCEL 2007 BY USING MULTIMEDIA TUTORIALS WITH QUIZZES

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## Abstract

The use of demonstration during practical lessons for learners to observe without practice is very common in most Ghanaian schools. This does not enhance understanding. Demonstration without hands-on practical does not enhance learners' understanding of Microsoft Excel. The main purpose of this study is to help students in level 200 in Bagabaga College of Education use Microsoft Excel 2007 to do calculations as prescribed in the syllabus. The Microsoft Excel 2007 is an improved version of the 2003 version with the ribbon feature. This makes it suitable for adoption to teach what the syllabus requires. Sixty (60) students out of the total population of 555 students were taken as sample to carry out the investigation in the form of experiment against the rest of the population. Instruments used are: test and observation. These were used at the pre-intervention and post-intervention stages of the research. Multimedia tutorials were developed as an intervention to help improve the students' performance. A post-intervention information revealed that students' performance improved significantly. Camtasia Studio 7 was used in developing the tutorial with natural Ghanaian narrations by the tutor. The findings of the research revealed practical lessons that are taught by mere demonstrations without students' practice do not enhance students' understanding of the subject-matter. Demonstration coupled with students practical are vital to student understanding of classroom lessons.

**Keywords:** camtasia studio 7, demonstration, microsoft office excel, multimedia, tutorial, quizzes.

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## Introduction

The Ghana Education Service in collaboration with the Curriculum Research and Development Division has structured the syllabus of the colleges of education to effectively train teachers to impart knowledge on pupils at the basic school level. Apart from imparting knowledge on the students, the curriculum will also help the teacher trainee to be more efficient in carrying out other duties as a teacher. Microsoft Excel 2003 or 2007 has been included in the syllabus to enable teachers learn how to calculate by using formulae and functions in dealing with tasks such as continuous assessment, ranking of students after assessing them and sorting of data. These specific tasks were seen as difficult tasks for the students in Bagabaga College of education since they could not identify commands under a tab.

The importance of Microsoft Excel is well noticed in the Ghana Education Service. Almost all templates for data collection are designed using Microsoft Excel and the importance has been noticed by various stakeholders of education. This therefore makes stakeholders place so much emphasis on Excel training to help improve the efficiency of teachers in the service.

In 2015, the government of Ghana through the ministry of education in collaboration with the Ghana Education Service contracted the Rlg Institute of Technology to assist Government in boosting ICT education. Government at the time made a major boost to Information Communication Technology (ICT) as an integral part of the Ghanaian education system.

The Ministry of Education entered into an agreement with Rlg Institute of Technology to train, develop and improve the ICT knowledge and skills of basic school teachers across the country. The program was under the Government's Basic School Computerization Project. The goal of the ICT training program was to introduce ICT in the basic schools throughout the country to enable basic school pupils

acquire the requisite skills in ICT usage and also enhance effective teaching and learning. Over thirty-one thousand (31,000) teachers were trained in this batch after a major training was done in the year 2013 (Mensou,2015)

Students in Bagabaga College of Education who are teacher-trainees have difficulties in identifying the various commands that are under a particular tab in Microsoft Excel 2007. This is due to lack of practice after class and inadequate time allocated for practical lessons in schools. This problem makes students unable to understand what they learn and incapable of revisiting those topics on their own for better understanding. This research is therefore undertaken to help identify and solve the problems students face in identifying the commands under tabs in Microsoft Excel for creating and editing workbooks. It will also help students to learn on their own without the guidance of the teacher.

Multimedia tutorials were chosen to help solve the problem of students' forgetfulness, their inability to use the commands to create and edit workbooks and the lack of practice after class.

The purpose of this study was to find out the causes, effects and the approaches to solve the problem of students in Bagabaga College of Education inability to identify various commands in Microsoft Excel 2007.

The research seeks to find answers to the following questions:

1. To what extent will the combination of demonstration and students practice in every practical lesson help student to identify commands in Microsoft Excel 2007?
2. What is the effect of quizzes after every lesson on students' recollection on Microsoft Excel 2007 commands?
3. What is the effect of developed multimedia tutorials on students' own learning pace in the absence of a teacher?

This research work is very relevant in addressing problems students face in remembering commands in Microsoft Excel 2007. The study

will also add up to relevant literature to assist stakeholders in Ghana during the implementation of ICT in education policies. Again, it will help stakeholders in knowing the importance attached to the provision of computers to the teacher-trainees in school to aid in the teaching and learning of ICT. The study will also help the learner to know the importance attached to "learning by doing" and the need to always go through practical sessions during classroom lessons. The multimedia tutorial product will be a source of reference for the teacher in the classroom to prepare adequately before going to teach.

The study examines the problems associated with abstract learning, inadequate practical lessons and the effect of inadequate computers in the laboratory for learning.

## Literature Review

### Multimedia

The use of computers and multimedia systems has become very popular recently. Multimedia system is considered a computer-based communication system as defined by Burleson et al (2001) that includes the use of text, audio, video, graphics and computer animations. The use of multimedia software is becoming very important in the learning process. Instructional software can be found for different levels of knowledge and a wide range of subjects. Therefore, the integration of classroom lectures and multimedia tutorials provides not only the theoretical foundations but also the visual component for the ICT problems that help students to grasp the concepts and enhance their practical skills.

### Tutorial

A tutorial is a technique of imparting knowledge and may be used as a part of a learning process. It is a more interactive and specific than a book or a lecture Malik (2012). Tutorial seeks to teach by example and supply the information to complete a certain task.

A tutorial can be in many forms, this ranges from instructions to complete a task to an interactive problem-solving session, sometimes with quizzes (usually in academia).

**Multimedia Tutorials**

Lawrence (2008) is of the view that Multimedia is the use of text, graphics, animation, pictures, video, and sound to present information. Since these media can now be integrated using a computer, there has been a virtual explosion of computer-based multimedia instructional applications. These applications run the gamut from serious computer-based tutorials for adults to the new category of "edutainment" products for children.

According to Malik (2012), Multimedia is being used increasingly to provide computer-based instruction. One reason for this trend may be the assumption that multimedia information helps people learn. Redundant multimedia does not always enhance effective learning compared to "monomedia." Specific situations in which multimedia information may help people to learn include; when the media encourage dual coding of information, when the media support one another and when the media are presented to learners at their level of understanding. There is empirical support for concluding that specific multimedia can be used to help people learn specific kinds of information.

**Advantages of Multimedia Based Tutorials**

The advantages of multimedia tutorials over static non-interactive tutorials cannot be over emphasized. The traditional system of tutorials that has to do with the use of written guidelines or procedures to help learners go through a task without going through interactions and demonstrations lacks the practical task that learners go through to acquire knowledge. Andresen (2013). Advantages of multimedia tutorials over the traditional tutorial system are:

1. the answering of questions after a test to find out one's level of understanding (quizzes);

2. the use of demonstrations and practical view also enhance learning in multimedia tutorials as compared to the traditional system of tutorials;
3. the combinations of text, voice, video and other forms of media arouses the interest of learners and keep them learning as it motivates them.
4. the grouping of task to various stages which can be selected for learning gives the learner the chance to start learning at a suitable stage;
5. learners can learn at their own pace and also control the rate of leaning. (Andresen, 2013).

**Microsoft Excel 2007**

Samuel (2010) refers to Microsoft Excel as an electronic spreadsheet program that runs on windows computers and can be used to organize, manipulate and analyse data. Excel is often used in the workplace to track statistics, create statistical reports, financial modelling, scientific engineering, and making charts and graphics. However, it can also be useful at home to create budgets or even make a list of family members' birthdays. Excel is a versatile and powerful program with a lot to offer.

Microsoft Excel 2007 version is an improved version of the Microsoft Excel 2003. The 2003 version which is made up of file, menu bar, tool bars, etc. has been replaced by ribbon and tabs with commands grouped for easy identification. This makes the 2007 version easy to use as compared to the 2003 version.

Harvey (2009) examined the Microsoft Excel application. He said it has the basic features of all spreadsheets, using a grid of cells arranged in numbered rows and letter-named columns to organize data manipulations like arithmetic operations. It has a set of supplied functions to answer statistical, engineering and financial needs. Also, it can display data as line graphs, histograms and charts, and with limited three-dimensional graphical display. It allows sectioning of

data to view its dependencies on various factors for different perspectives (using pivot tables and the scenario manager). It also has a variety of interactive features allowing user interfaces that can completely hide the spreadsheet from the user, so the spreadsheet presents itself as an application, or decision support system (DSS), via a custom-designed user interface.

**Features of Microsoft Excel 2007**

Havey (2009) perceives the Microsoft office 2007 program as an improved version of the 2003 version. The components of the 2003 version as well as the interface are not completely different. However, some components have been replaced by an improved form of those components. The ribbon system has replaced the menu system in earlier Microsoft versions such as the 2003. The ribbon contains tabs which also contains groups or chunks of commands. The grouping of commands to groups or chunks helps in identifying commands that are related in solving a problem. The organized groups of commands under a tab also help in easy location of commands.

Another feature of the program is the office button. This feature contains options to adjust and make changes to the interface. Some commands and tabs may be shown on the interface or hidden by using the office button. The Excel option button which is located at the bottom part of the menu when one clicks on the office button activates a dialogue box that gives one the chance to control almost all the other features of the program. This is an improvement of the Microsoft Excel 2003 commands under the file menu.

Also, a quick access tool bar is added as a component of the interface. It keeps track of frequently used commands and also helps in saving the time spent in moving far in searching for those commands to use them. This feature is very important in the interface as it has the option of adding more commands to it and also choosing the position of it in relation to the ribbon either below or above it.

These are major components of the Microsoft Excel 2007 that make it different from that of the Microsoft Excel 2003 interface. Other components however remain the same as in Excel 2003. The detailed nature of some of the components however cannot be over emphasized. Torben (2009) figure 1 is a screen shot of the ribbon as a major feature.

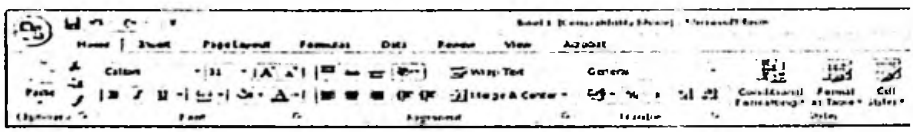

Figure 1: Ribbon of Microsoft Excel 2007

**Importance of Microsoft Excel 2007**

Torben (2009) observed that just like other software or programs of Microsoft, the importance of the Excel 2007 is highly recognized. As an improvement of the Excel 2003 version, Microsoft Excel 2007 has so many importance just like the 2003 version and even beyond. Some of the importance of Excel 2007 version are:

1. as a spread sheet application, it helps in doing complex and simple calculations;
2. it also helps in data analysis and logically organizing the data to more accurate and reliable results;
3. the program also helps in setting up constraints and measures to control data inputs and also prevents others who are not permitted to edit the document from doing so;
4. the program also contains programmable features that can help software developers to improve on the program to get a more desirable application;
5. also, the program accepts import of documents from other applications and also supports the export of information to other applications.

**Camtasia Studio 7**

Scott (2011) explained Camtasia Studio 7 as a software for creating and editing video, sound, graphics, text and other multimedia

elements. It was developed by Techsmith Company Limited. This multimedia company is the global leaders for screen recording and screen capturing software. Camtasia Studio 7 really has two main functions: video editing, and screen casting (recording your computer screen). It is this combination of tools that makes the software an ideal solution for video creating and editing for the novice and expert. **Scott** (2011).

Unlike Final Cut Pro or Adobe Premiere Pro which are specifically used by professionals, camtasia is easy to use and can be used by an average person. Camtasia Studio 7 offers a powerful yet simple option for video creation and editing. Figure 2 shows the interface of Camtasia Studio 7

Figure 2: Interface of Camtasia Studio 7.

Source: www.camtasia.com online help version 7

**Classroom Lecture versus Multimedia Instruction**

Multimedia tutorials have shown to be a very effective learning tool Poli et al. (2003). It can have all the necessary tools for an effective learning experience. Text, audio, visual effects, videos, pictures and graphics animation can be easily integrated in a single program making the tutorial not only user friendly but also a pleasant experience. Computer-related tutorials can be used as a supplemental learning tool for the traditional classroom teaching or they can be used as a single teaching tool for on-line courses or even for in-house courses. In both cases its effectiveness has been proved as concluded Merino and Abel (2003).

The use of visual aids in the learning process has been recognized by many educators and researchers as can be seen in Juarez-Espinosa et al. (2000), Lowrie (2002), Les and Les (2003) among others. The use of labs for many ICT courses is a form to expose the students to practical tuition and also help students to solve problems in real word situations. The well-known expression "graphics speak louder than words" is applicable in learning ICT. However, the use of computer laboratory for ICT is not only expensive but sometimes almost impossible to accomplish in some schools.

The use of computers and multimedia systems has become very popular recently. Multimedia system is considered a computer-based communication system as defined by Burleson, et al (2001) that includes the use of text, audio, video, graphics and computer animations. The use of multimedia software is becoming very important in the learning process. Instructional software can be found for different levels of knowledge and a wide range of subjects. Therefore, the integration of classroom lectures and multimedia tutorials provides not only the theoretical foundations but also the visual component for the ICT problems that help the students to grasp the concepts and enhance their retentive memory.

Interactivity matters in student learning and evaluation of lessons are also very important to assess the level of progress of the learners. It is therefore prudent for the problem to be tackled by using a more detailed and careful approach to help in getting a lasting solution to the problem.

It can be clearly seen from the above that, all the various aspects talk about tutorials as an alternative to classroom learning. However, they all fail to include quizzes and clear voice narrations with demonstrations to help the learner understand the concept. This study is therefore in to the details of multimedia tutorial development to develop interactive multimedia tutorials with clear and natural voice narration to help the learners understand the concept. It also includes

quizzes at the end of each lesson to test the level of understanding of the learner.

**Methodology**

The research design, populations, sample, sampling techniques, research instruments and data collection and data analysis for the research are discussed in this section. The main purpose of this study was to train and quiz students to help them understand and do practical data manipulation in Microsoft Excel 2007.

**Research Design**

This research was carried out in Bagabaga College of Education. The problem was identified and solved in the school for a period of four months.

**Population**

The targeted group in this research was the level 200 students of Bagabaga College of Education made up of five hundred and fifty-five (555) teacher-trainees. The population is made up of sixty-nine (69) students in the Science option, three hundred and fifty-five (355) in general diploma option, sixty-nine (69) in technical option and sixty-five (65) students in the French option. The sample was derived from the entire population.

**Sample**

The sample of the research was made up of sixty (60) students from the population. This was a group given the tutorial to practice and their pre-intervention performance was compared to that of the post-intervention performance. Sampling was based on the entire population and measures were taken to give equal chance to members of the population to be captured.

**Sampling Techniques**

The sampling techniques that were used in the sampling was stratified sampling and random sampling.

**Strata**

The various courses (Technical class, Science class, French class and General Diploma) were the groupings for the various students. Measures were taken to give equal chance to members of each of these groups.

**Random Sampling**

From the stratum, 10 members each were randomly selected in the Technical, Science and French classes. 30 members were selected from the general diploma class since they had a larger number.

**Research Instruments**

Observation and test are the instruments used in this research. Details of how each of these instruments were used is as follows.

**Observation Guide**

This was another instrument that was used to gather data in other to find out the nature of the problem and the strategies to solve the problem. Under this, the respondents were observed in the research to find out the behavioral pattern they may possess that is likely to be affecting them in the problem. The result of the observation was use for interpretation to find out if the problem actually exists. It was also used at the post-intervention stage to find out if the problem has been solved.

**Test**

A test was conducted to gather information about the performance of the students on the topic. This was used at both the pre-intervention

and the post-intervention stage to gather data for interpretation to the problem. It was made up of twenty (20) questions and each question was assigned five (5) marks. This instrument was very reliable as the true reflection of students' performance was recorded at each level.

**Intervention, Design and Implementation**

This aspect talks about how preparations were made to tackle the problem and the various measures that were taken at each stage to ensure that the problem was addressed with ease. The Pre-Intervention, Intervention Design, Implementation of Intervention, Post-intervention and Discussion of the Study, Presentation of Findings and Results were the aspects the researcher looked at.

**Pre- Intervention**

Before solving the actual problem identified, the researcher used some measures to find out if the approach to the problem was the best strategy to adopt. The students' inability to identify various commands under the tabs in Microsoft Office Excel 2007 was a problem that should carefully be looked at to get a better approach to help the students do away with those challenges. The students were carefully observed during this stage. Some of the factors that were identified are:

1. Students do not go through lessons practically, hence they are passive listeners during lessons;
2. Students do not get the chance to practice what they learn after class because they do not have computers in their various halls of residence in the school;
3. There are no questions for students to answer to test their ability to perform certain task;
4. The number of students using the computer laboratory as well as the number of computers in the laboratory also affect the learning of the topic;
5. Students cannot get the guidance of the teacher to go through learning after classes; this affects their understanding.

Based on these responses, the researcher settled on using Camtasia Studio 7 to develop multimedia tutorials to help the students understand and identify the various commands under the tabs in Microsoft office 2007. This approach reduced the challenges that the students were facing in the topic.

**Intervention**

After the main problems were identified and the approach to solving them had been chosen, the researcher moved in to gather information on the approach chosen. Camtasia Studio 7 was the software used to develop the multimedia tutorials and quizzes. The software was selected among many because of the convenience and the interactivity features that make it possible for students to go through all steps practically. The availability of quizzing in the software was another factor that stimulated the researcher to use the software for the development of the product.

The multimedia tutorial was developed by using the Camtasia Studio 7 software. Each component on the interface of Microsoft Excel 2007 was looked at and linked to the features of Excel 2003 to review student's relevant previous knowledge in Excel versions. After discussing the various features on the interface, the main problem of the work (the various commands in each group under the tabs) was looked at in detail. Voice narration accompanied by the movement of the mouse pointer to go through practical work with vivid explanation of the procedure and the terminologies involved in each stage was the strategy adopted. The recording of the screen was captivating enough to help students go through the tutorials with ease. After going through the various tabs with the groups or chunks under them, the researcher set questions from the topic to test students' level of understanding of the tutorials. Both multiple choice and short answers objective quizzing were used in the tutorials to help students do self-test to find out their level of understanding of the topic. After answering each question in the test, a feedback is given to the

students. This is to help students know as to whether their responses are correct or wrong. At each of the stages of the tutorials, students are also motivated to keep learning. Chance is also given to students to select the stage they want to learn without going through unwanted stages.

**Implementation of Intervention**

The product was launched with the students to take them through how to use it. Each student was asked to give out any portable storage medium to copy the tutorials as a personal copy. The tutorials were also loaded on the school computers, giving the students the chance to learn on their own anytime they have access to the computer laboratory without a teacher. The students were encouraged to keep watching the video as it will make them understand the concept well. The product can be played on any device that supports MP4 or MPEG, so those with smart phones can use it. Also, those with computers in their various homes will have more advantage as they can answer the questions through the quizzes for feedback to measure their level of understanding.

In all, the five hundred and fifty-five (555) students had access to the multimedia tutorials and used them at their convenient time to enhance more understanding. The researcher took steps in finding out the level of progress of the students by testing them periodically to find out how far they are going with the tutorials. Students who were having problems in understanding some of the aspects in the video were given attention by the researcher to enable them pace well in the tasks.

**Post-Intervention**

After the product was delivered to the students and they used it, the researcher took measures to find out if the students actually understand the teachings and can now face the challenges that they were facing with ease. Class test was conducted in all the six classes

to find out students' level of understanding. From the results gathered, it was clear that the students showed knowledge of the topic and were able to perform various tasks in the topic. The interest of the students in the learning of ICT was also aroused as they keep attending ICT classes voluntarily. The data and the results of the above stages are illustrated in the data analysis.

## Data Analysis

The data was organized in tables. The main techniques used in analyzing the data were frequency tables and per centages, since it appears to be more understandable. Also, paired sampled T-test was used to compare the pre-intervention results to the post-intervention results to find out the variation between them. Each of the results was also interpreted in the form of explanation to help in clarifications. This analysis was based on the research questions.

## Presentation of Findings and Results

The findings and results of this research are grouped under the various research questions of the research. For the research question one, data was gathered by using the various instruments that are selected as the research instruments in this research.

## Test Based on Research Question 1, 2 and 3

After the students wrote the test on Microsoft Excel 2007, it was wise going through the scripts of the students to find out the scores and know why they are facing such problems. After going through the scripts of the students, the information below was revealed.

**Table 1: Representation of Pre-Intervention Student's Performance.**

| Marks | Mid-Point (X) | Frequency(F) | FX | $Fx^2$ |
|---|---|---|---|---|
| 0-39 | 19.5 | 7 | 136.5 | 2661.75 |
| 40-49 | 44.5 | 24 | 1068 | 47526 |
| 50-59 | 54.5 | 18 | 981 | 53464.5 |
| 60-69 | 64.5 | 5 | 322.5 | 20801.25 |
| 70-79 | 74.5 | 4 | 298 | 22201 |
| 80-100 | 90 | 2 | 180 | 16200 |
| | | $\sum F=60$ | $\sum FX=2986$ | $\sum FX^2=162854.5$ |

Mean Score $=\sum FX/\sum F=49.76$

Standard deviation S $=\sqrt{(\sum FX^2/\sum F) -(x)^2}$

$=\sqrt{(162854.5/60) -(49.76)^2}$

$=\sqrt{2714.24-2476.06}$

$=\sqrt{238.18}=15.43$

From Table 1, it can be seen that only two (2) representing three per cent (3%) of the students had Excellent. Four (4), representing seven per cent (7%) of the students were very Good, five (5) representing ten per cent (8%) were Good, eighteen (18), representing thirty per cent (30%) of the students were Average, twenty-four (24), representing forty-per cent (40%) of them, were Poor and the remaining seven (7), representing twelve per cent (12%) were those who could not just do the work at all. The findings above were seen at the pre-intervention stage of the research. The information gathered above gave the researcher an insight to the problem and the way forward in handling the problem to get a lasting solution to it. Below are the findings at the post-interventions stage after all measures in addressing the problems were used and the researcher tried to find out as to whether the problem was solved or not. The information is grouped under the various tools just as in the pre-intervention stage.

**Post-Intervention Test.**

When the students' scores in the various test were checked at the post-intervention stage, the following information emerged.

**Table 2: Representation of Post-intervention Students Performance.**

| Marks | Mid-Point (X) | Frequency(F) | FX | $FX^2$ |
|---|---|---|---|---|
| 0-39 | 19.5 | 0 | 0 | 0 |
| 40-49 | 44.5 | 3 | 133.5 | 5940.75 |
| 50-59 | 54.5 | 3 | 163.5 | 8910.75 |
| 60-69 | 64.5 | 12 | 774 | 51483 |
| 70-79 | 74.5 | 24 | 1788 | 133206 |
| 80-100 | 90 | 18 | 1620 | 145800 |
| | | $\sum F=60$ | $\sum FX=4479$ | $\sum FX^2=345340.5$ |

Mean Score=$\sum FX/\sum F=74.65$

Standard deviation S $=\sqrt{(\sum FX^2/\sum F) -(x)^2}$

$=\sqrt{(345340.5/60) -(74.65)^2}$

$= \sqrt{5755.67-5572.62}$

$=\sqrt{183.05}$

$=13.53$

From Table 2, eighteen (18) representing thirty per cent (30%) of the students had Excellent, twenty four (24) representing forty per cent (40%) had Very Good marks, twelve (12) representing twenty per cent (20%) had Good marks, three (3) representing five per cent (5%) had Average and the remaining three (3) representing five per cent (5%) had Poor marks. All students were able to do the work. This indicates that the intervention measures which were taken has helped in improving the performance of the students.

The pre-intervention and the post-intervention data gathered was compared to find out how best the situation has improved in the school. Below is the T-test between the pre-intervention performance of the students and the post-intervention performance of the students.

**Table 3: Paired Sample Statistics for Pre and Post-intervention Test**

| | | Mean | N | Standard Deviation |
|---|---|---|---|---|
| Pair 1 | Pre-intervention | 49.76 | 60 | 15.43 |
| | Post-intervention | 74.65 | 60 | 13.53 |

CI = (.9500)

As it can be seen from the Table, a paired sample T-test of the pre-intervention and post-intervention performance of the students in the various test reveals the mean for the pre-intervention performance was 49.76 while that of the post-intervention performance was 74.65 bringing a variance of 24.89. This shows the massive improvement of the performance. Also there was a standard deviation of 15.43 for the pre-intervention against 13.53 for post-intervention which shows a wider variation in the marks at the pre-intervention stage than the pre-intervention stage revealing an improvement in the performance.

**Observation Based on Research Questions 2 and 3**

**Pre-Intervention Observation**

An observation was made before the intervention to find out the competencies executed by the students. At the pre-intervention stage, students were observed during the pre-test. The emphasis was on the efficiency of the students. Speed, accuracy and easy to use were the parameters used in measuring their efficiencies. The speed was on how fast they can quickly carry out a task, the accuracy was on how they are able to avoid the mistakes and the easy to use was on how convenient they found it accomplishing the task that was given to them. For the aspect of efficiency, Table 3 represents the information that was gathered.

**Table 4: Results from Pre-Intervention Observation**

| | Observations | Findings in percentages |
|---|---|---|
| Students who accurately and easily completed the task within the time given. | 6 | 10 |
| Students who requested for additional time to complete the task | 48 | 80 |
| Students who could not do the task given | 6 | 10 |

From Table 3, it is realized that only six (6) students, representing ten per cent (10%) of the students, were able to accurately and easily finish doing the work within the time allowed. Forty-eight (48) students representing eighty per cent (80%) of them, requested for more time to complete the work; and six (6) students, representing ten per cent (10%) of them, could not just do the work at all.

**Post-Intervention Observation**

When a post-intervention observation was made to find out the improvement in students' performance in solving the problem, it was realized that the students' performance in the topic increased positively. They were able to go through the work with less stress and trauma and all students were able to finish the work as compared to that of the pre-intervention stage. This is because they were able to easily identify the various commands on the ribbon and locate them to execute a task.

**Table 5: Results from Pre-Intervention Observation**

| Observations | Number of students | Findings in percentages |
|---|---|---|
| Students who accurately and easily completed the task within the time given | 48 | 80 |
| Students who requested for additional time to complete the task | 12 | 20 |
| Students who could not do the task given | 0 | 0 |

From table 4, forty eight (48) representing eighty per cent (80%) of the students were able to finish the work within the time that was allocated to it, only twelve (12) representing twenty per cent (20%) requested for additional time and all students were able to do the work at the end.

**Research Findings**

Comparing the pre- intervention and post-intervention results was necessary. This was done in relation to the various research questions that were used in conducting the research. The following information emerged.

From the research, it is realized that over seventy per cent (70%) of students cannot carryout practical task when lesson delivery is mere demonstration without students practice in practical lessons in ICT. This is as a result of forgetfulness due to lack of practice.

It was realized that eighty per cent (80%) of students who go through self-test (quizzing) to find out their level of understanding helped in improving their learning.

From the research, it was realized that eighty per cent (80%) of students can learn at their own pace in using multimedia tutorials in the absence of the teacher.

Interactive multimedia with options for quizzing to test learner understanding enables different groups of learners to learn and understand at their own pace.

Effective teaching and learning can be enhanced if the teacher trainee is given a personal computer (laptop) to go through the learning process in the college. This will help in easy integration of technology into the curriculum.

## Conclusion

The problem of students finding it difficult to identify the various commands to create edit and save work in Microsoft Office Excel 2007 has been minimized. Students can now confidently carry out tasks and explain to teach Microsoft Excel 2007 without trauma. Practice during and after a lesson is necessary for retentive memory and it will be prudent if stakeholders consider putting technological devices into the hands of the teacher-trainee. The use of multimedia tutorials with quizzes has helped in improving the learners' performance. Leaners can continue revisiting this and learn at their own pace.

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