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Effectiveness of Transmitter of Knowledge and Conventional Teaching Models on Secondary School Students' Achievement on Circle Geometry and Trigonometry

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Abstract

The study explores the effectiveness of transmitter of knowledge model considering Conventional Teaching Method on students' academic achievement on Circle Geometry and Trigonometry. The main objectives of the study are to expose the experimental group to the transmitter of knowledge model and compare the effectiveness of this mode of teaching in the teaching of circle geometry and trigonometry. The pre-test-post-test control group experimental design is chosen for this work. It is hypothesized that there would be significant difference between mean achievement scores of the experimental group and the control group on the post-test. The population of the study consisted of all the students of senior secondary two (SS2) class studying in Govt. Sec. School, Bwari, Federal Capital Territory (FCT), Abuja, Nigeria from which a sample of 60 students is drawn using random sampling technique. They were divided into two groups formed through matching on the basis of their pre-test scores; each group consisting of 30 students. One of the groups is randomly chosen as the control group and other the experimental group. The independent variable in the study is model of teaching and the dependent variable is academic achievement of students. The dependent variable is measured through a 50-item achievement test *items generated using the West African Examination Council's (WAEC) past questions. These questions are used as both pre-test and post-test items. The experimental group is exposed to the treatment of transmitter of knowledge model while the control group is provided with conventional teaching. Though not statistically significant, It is found that experimental group had better mean score better than the control group taught using the conventional method. This result may be investigated for further confirmation. A blend of models may be used because there is no single model that is exclusively best for teaching all the topics at all levels to all students, considering individual differences among students.*

Keywords: *Transmitter of knowledge, effectiveness, students, academic achievement conventional, teaching.*

1 Introduction

The process of teaching and learning is as old as human beings on the earth. It has been carried out by human beings and even by animals to teach their young ones for successful adjustment in the environment. Teaching, as conventionally understood by a traditional teacher, is just the act of disseminating information to the learner in the classroom. If we observe traditional classroom teaching, we find that either the teacher is delivering information or one of the students is reading from the text book and other students are silently following him in their own text books. Conventional teaching is simply chalk-talk approach in which students remain passive learners. Instruction is ill organized and rote learning is heavily emphasized. Mostly the results of students are not satisfactory due to the presence of this approach. Ever since the beginning of 20th Century, research on teaching has generated useful knowledge about teaching skills, methods and models that can be usefully employed by teachers to promote students learning.

The century old history of research on effective teaching includes three milestones namely, identification of specific teaching skills, integrating these skills into a systematic pattern of instruction and formulation of general models of instruction. Walberg identified seven skills of effective teaching on the basis of his meta-analysis. These include use of academic learning time, reinforcement, cues and feedback, cooperative learning, classroom morale, higher order questions and advance organizers. According to Sprinthall and Sprinthall (1990), one of the weaknesses of such a meta-analysis as Walberg's is that the skills do not depict actual patterns of teaching.

As the present study sought to compare the effectiveness of the Transmitter of knowledge model and Conventional teaching model in the teaching of circle geometry and trigonometry at senior secondary school level, the available research study relevant to this study problem are reviewed.

The analysis of instruction developed by Flanders (1970) shows how these elements fit together in actual classroom interaction. Teaching elements have also been combined into general models of teaching. A model is a cluster of strategies that is logically consistent with a certain set of assumptions about how students learn best. Sprinthall and Sprinthall have simplified research generated teaching modes into three models namely, transmitter of knowledge model, inductive inquiry model and intrapersonal model. Transmitter of knowledge model emphasizes the need to give pupils basic facts and information before they can be expected to think for themselves. They must learn what is already known before they can come up with any new ideas that might fit in with the existing knowledge. The main characteristic of this model is the high degree of structure employed. In this model, the teacher uses advance organizers and the model emphasizes the fifth category (lecturing) of Flanders interaction analysis. Interpersonal model is neither concerned with disseminating information nor does it worry about understanding concepts. It is primarily concerned with human interaction. Sprinthall and Sprinthall (1990) are of the view that teaching and learning can't be exclusively explained by the element of love alone, the quality of pupil - teacher relationship is necessary but insufficient as a teaching model.

According to Sprinthall and Sprinthall (1990), probably the most common teaching model, and certainly the one with the longest tradition, is that which views teaching as the transmission of knowledge. This view assumes that there exists a well known and finite body of knowledge from which the teacher selects certain facts and concepts to pass on to pupils. This model emphasizes the need to give pupils basic facts and information before they can be expected to think for themselves. They must learn what is already known before they can come up with new ideas that might fit into the existing knowledge. It assumes that learning new information is essentially in linear step-by-step sequence. The teachers' expertise is needed to arrange both the content material to be mastered and the method of presentation.

Some educators have suggested that deductive teaching can be critically important for students with learning disabilities, Brigham and Matins (1999). This method that has a clear and readily apparent structure is easily paced to accommodate student needs and is very familiar to students. But deductive teaching has a trade off. It can be too rigid, a form that does not allow for divergent student thinking nor emphasize student reasoning and problem solving.

The transmitter of knowledge model can be more efficient by means of improving the organization of course content and introducing simulation such as mystery simulation. In fact that in a book of chemical reaction engineering presenting a murder mystery to be solved using the principles of reaction engineering, presenting a murder mystery to be solved using the principles of reaction engineering, Fogler (1999).

Transmitter of knowledge model is also called deductive model, advance organizer model, mastery learning model and direct instructional model. Thus the transmission of knowledge model, through the use of advance organizers, can provide a clear and systematic approach to teaching. One of the disadvantages of the model is that so much of the work of learning is controlled and directed by the teacher. One study found that low achievers did not understand the directions, spent most of their time watching their peers, speed through the assignments, turned incomplete work and were frequently criticized. It is clear that some students will do better under learning conditions that are fewer teachers directed and controlled (Sprinthall and Sprinthall, 1990).

In this model, the teacher uses advance organizers. At the outset of a lesson, the teacher presents the pupils with the general rule, the generalization or the main ‘point’ of the activity. The concrete examples help them understand the connections between the facts and the general point. The teacher would proceed to a presentation of a long series of facts (Sprinthall and Sprinthall, 1990).

It includes providing the general rules, correlations and then asking students to apply these to solve problems. This is the most common teaching method, where a lecturer represents the principles of the subject; followed by a tutorial where the students practice the application of the knowledge they are taught. For a crash course or to transmit large chunks of information, this technique would be more suitable. The technique provides a sequence of instruction that can be applied to solve a problem.

This model in extreme becomes a set of boring monotonous lectures followed by tutorials. Also the students are asked to derive corollaries from the given facts and principles, Rao and Reddy, (1992). The presentation of examples, finally, is followed by the restatement of the generalized principle. In this sense, the transmission of knowledge model is often called guided discovery. But the researcher is of the view that guided discovery and unguided discovery both come under Bruner’s inquiry model to be described later because, according to Prince and Felder(2007) in enquiry based learning also known as guided enquiry, students are presented with a challenge and accomplish the desired learning in the process of responding to that challenge. Through various examples, all pupils are led to the same generalization. Probably the strongest example of his model of transmitting information is the lecture format. Although it can be used with other teaching strategies, this model is most effectively used as a format for lectures or for mini lectures. This model is based on deductive teaching.

Deductive teaching (also called direct instruction) is much less constructivist and is based on the idea that a highly structured presentation of content creates optimal learning for students. The instructor, using a deductive approach, typically presents a general concept by first defining it and then providing examples or illustrations that demonstrate the idea. Examples that do not fit the idea are helpful in confirming the idea. Students are given opportunities to practice, with instructor guidance and feedback, applying and finding examples of the concept at hand, until they achieve concept mastery, Landmark College, (2005).

Conventional teaching refers to the long established customs found in schools that societies have traditionally deemed appropriate. Traditional teacher centered method focus on rote learning and memorization. Conventional education focuses more on teaching than learning. It assumes that for every activity teaching, there is some level of learning by those who are taught. As a result of conventional teaching, what so ever that is taught in classroom setting is forgotten soon, and what is remembered is irrelevant. It often leads to passive learning and rigid classroom with few opportunities for real world and collaborative learning, Santrock (2006).

Conventional teaching is concerned with the teacher being the controller of the learning environment. Power and responsibility are held by the teacher and he plays the role of instructor (in the form of lectures) and decision maker (regarding curriculum content and specific outcomes). He regards the students as having ‘knowledge holes’ that need to be filled with information. In short, the conventional teacher views that it is the teacher that causes learning to occur, and classroom discipline is based upon fear, Koacher (1986).

Folker as cited by Khan and Siddique (1991) investigated the effects of adjunct post-questions and expository advance organizers on problem-solving from prose text. The sample consisted of 88 introductory psychology students. A post-test only control group was utilized. The findings showed that there were no significant performance differences between having and not having advance organizers, and there were no significant interaction effects.

Nixt as cited by Khan and Siddique (1991) investigated the relative effects of frequent use of advance organizers and structural reviews in a college mathematics course for students who were not physical science, engineering, or mathematics majors. The sample consisted of students enrolled in a freshman mathematics course. He found that there was no significant difference for treatment effect, recitation effects, or interaction.

Neol (1983) investigated the influence of advance organizers in a systematically designed lesson to teach rule-using behavior on transfer of rule learning to problem solving situations. The sample consisted of 72 5th and 6th grade elementary students. The findings show that while students benefit from systematically designed instructions to teach rules, advance organizers incorporated in that instruction do not necessarily enhance learning transfer.

Dennis (1984) investigated the effectiveness of advance organizers and repetition on achievement in a high school biology class. The sample consisted of four groups of 10th grade students. California Achievement test, a Lindquist type I Research Design and A Multivariate analysis of Variance were utilized. The findings showed that there was no significant interaction between treatments on the two dependant variables. However, there was a significant gain in achievement by students in all groups from pre-test to post-test.

Martorella (1979) found that no conclusion from research has emerged to establish clearly the superiority of inquiry over the traditional approaches. Learning through inquiry is often more enjoyable to the students. Generally speaking, the students are more interested, or more enthusiastic, or just more active in the inquiry process as they are generating more knowledge like a social scientist. Inquiry teaching seems to have a positive effect on discipline, retention and attitude towards social studies.

Research evidence on the use of transmitter of knowledge model as a method of teaching circle geometry and trigonometry with respect to student achievement is not so common, more research is needed.

Objectives of the Study

The main objectives of the study are:

1. To expose the experimental group to the transmitter of knowledge model.
2. To compare the academic achievement of experimental group taught through the transmitter of knowledge and the control group taught through conventional teaching on their post test scores.

Scope of the Study

The study was delimited to:

1. Only Students of Government Secondary School, Bwari, Federal Capital Territory (FCT), Abuja, Nigeria.
2. Students in senior secondary two (SS2) class.
3. The subject is mathematics- circle geometry and trigonometry.
4. The first three levels of Bloom taxonomy of cognitive domain (that is knowledge, comprehension and application levels of objective).

Significance of the Study

The significance and utility of models are universally acknowledged. The latest approach of using teaching models is generally considered not only to increase student's performance in the examinations but also help in improving their attitude towards the subject. The results of the study are of theoretical and practical significance which may be helpful in creating fresh knowledge of teaching effectiveness.
The results of this study might provide indigenous knowledge about the overall relative effectiveness of this model -transmitter of knowledge models. The result of the study may contribute to the theory and practice of teaching not only at the class and school levels but maybe helpful to curriculum developers designing appropriate methodologies for teaching the curriculum contents.

Limitations of the Study

Some limitations of this study should be taken into account before generalizing the results of the study. Firstly, the study is conducted in an urban setting therefore; the generalization of the results on rural settings may be limited.
Secondly, the achievement test on Circle Geometry and Trigonometry used in the study for pre-testing and post-testing is the same. The use of parallel test may have given better results.

Research Hypotheses

The null and alternative hypotheses of the study are as follows:

H_{01}. There is no significant difference between the mean posttest achievement scores of students taught through the transmitter of knowledge model and those students taught through conventional teaching using Scheffe test.

H_{11} There is significant difference between the mean posttest achievement scores of students taught through the transmitter of knowledge model and those students taught through conventional teaching Scheffe test..

H_{02}. There is no significant difference between the mean posttest achievement scores of students taught through the transmitter of knowledge model and those students taught through conventional teaching method using ANOVA.

H_{12} There is significant difference between the mean posttest achievement scores of students taught through the transmitter of knowledge model and those students taught through conventional teaching method using ANOVA.

2 Methodology

Population and Sample

The target population of the study is the 520 senior secondary two (SS2) students studying in the Government Secondary School, Bwari of Federal Capital Territory (FCT) Abuja, Nigeria.

The study sample consists of 60 students drawn using random sampling technique because this required number of students is available in the school. Government Secondary School, Bwari is a model school in Abuja and the students studying in this school belonged to different socio economic strata.

They were divided into two groups formed through matching on the basis of their pretest scores; each group consisting of 30 students. One of the groups is randomly chosen as the control group and other as experimental group. The independent variable in the study is the mode of teaching and the dependent variable is the academic achievement of students. The dependent variable is measured through a 50-item achievement test items generated using the West African Examination Council's (WAEC) past questions. These questions are used as both pretest and posttest items.

The marks obtained by them were arranged in descending order. The students of equivalent pretest scores were identified. Each of them is assigned to one of the two groups. The same procedure was adopted for each group containing 30 students. These groups were randomly named as experimental and control group. The experimental group is exposed to the treatment of transmitter of knowledge model while the control group is provided with conventional teaching.

Research Instrument

In order to measure academic achievement of the sample in Circle Geometry and Trigonometry an achievement test was designed and conducted before and after the experiment. It contained 50 fifty multiple choice test items generated using the West African Examination Council's (WAEC) past questions covering the content of circle geometry and trigonometry which was taught during experiment. Hundred percent weight-ages are assigned to the topics to learn. Thus all the 50 items were related to the content material. The time duration of the test is sixty minutes, which is considered appropriate for all the students to complete the test.

3 Presentation and Analysis of Data

This section deals with the analysis and interpretation of the data pertaining to the study:

Table 1: Mean and standard deviation of pretest scores of the experimental group and the control group

Group	N	Mean	S.D	Coefficient of Variation
Experimental	30	22.53	2.99	13.2
Control	30	22.30	3.14	14.0

The table 1 indicates that the mean pretest scores of comparison group are 22.53 and 22.30 respectively. Spread (standard deviation) of individual scores around their respective means is from 2.99 to 3.14.
The variability the control group (14.0) is more than that of the experimental group (13.2) as shown by the coefficient of variation. The control group is found to be a bit more variable than two experimental groups implying that the experimental group is more homogenous than the control group.
The equality on pretest scores, among comparison group is also statistically determined through simple Analysis of Variance (ANOVA) as given in the table 2.

Table2: Significance of difference between mean pre-test scores of the groups

	Sum of squares	Df	Mean square	F	Sig.
Between Groups	279.050	12	23.254	121.637	0.000
Within Groups	3.250	17	0.191		
Total	282.300	29			

Table 2 shows an F value of 121.637 and a significance of 0.000 at 0.05 level of significance. This implies that there is no significant difference in the pre-test mean scores of the groups being compared.

Table 3: Mean and standard deviation of post-test scores of experimental group and the control group

Group	N	Mean	S.D	Coefficient of Variation
Experimental	30	36.40	3.4	9.34
Control Group	30	34.13	3.3	9.40

The table 3 above indicates that the mean post-test scores of the experimental group taught through transmitter of knowledge model is 36.40 and the mean post-test score of the control group is 34.13. The above comparison has a spread of scores around their mean scores; 3.4 for the experimental group and 3.3 for the control group. It means that the experimental group taught through the transmitter of knowledge model has higher average mean score achievement than control group with an average mean score of 34.13 on the post-test. The coefficient of variation of the experimental group taught through transmitter of knowledge model is 9.34.This is slightly lower than 9.40 of the control group taught through the conventional method.
Scheffe test is applied to compare the mean scores of the groups if there is no significant difference between the mean post-test achievement scores of students exposed to the transmitter of knowledge model and those taught through conventional teaching .The result is shown in table 4 below.

Table 4: Comparison of the experimental group and the control group on the mean post-test scores through Scheffe test.

Group	Mean	*F*	*p*
Experimental	36.4	1.10	>0.05
Control	35.1		

$(df = 1{,}58)$

$F_{.05} = 4.00$

Entries in table 4 show that mean post-test scores of the experimental group (Transmitter of knowledge model) and control group are not statistically significantly at .05 level of significant. Therefore, the groups are not found to be significantly different in their post-test performance. Therefore, the null hypothesis H_{10}that there is no significance difference between the mean post-test achievement scores of students exposed to the transmitter of knowledge model and those taught through conventional teaching using Scheffe test is retained.
Further, the difference in post-test achievement among the groups being compared is statistically tested by simple ANOVA, as shown in table 6 below.

Table 5: Significance of difference between mean post-test scores of the groups

	Sum of squares	df	Mean square	F	Sig.
Between Groups	346.783	12	28.899	58.369	0.000
Within Groups	8.417	17	0.495		
Total	355.200	29			

Table 5 shows that the calculated F value of 58.369 and a significance of 0.00 at 0.05 level of significance. Therefore, the null hypothesis H_{02} that there is no statistical significant difference between the mean post-test scores of students taught through the Transmitter of knowledge model and those students taught through conventional teaching model is accepted. This implies that there is no significant difference in the post-test mean scores of the groups being compared.

5.2 Findings

The findings of the study are:

1. The mean post-test scores of the comparison groups are 36.40 and 34.13 with a spread of individual scores around their respective means as 3.4 and 3.3 for the experimental and control groups respectively. The coefficient of variation of the experimental group $(V = 9.34)$, taught through transmitter of knowledge model and the control group $(V = 9.40)$ taught through Conventional Teaching Method shows that the experimental group is a little more homogeneous ,(table 3).
2. There is no significant statistical difference between the mean post-test scores of the experimental (taught through Transmitter of knowledge model) and the control group (taught through conventional teaching) as tested through Scheffe test. Therefore, the null hypothesis is retained (table 4).
3. There is no significant statistical difference between the post-test scores of the experimental group (taught through Transmitter of knowledge model and the control group taught through conventional teaching as tested through Analysis of variance (ANOVA), (table 5).

4 Discussion

This study is conducted to find out the effectiveness of the transmitter of knowledge model as compared to the Conventional Teaching Method on students' academic achievement on circle geometry and trigonometry at secondary level in Govt. Sec. School, Bwari, Federal Capital Territory (FCT) Abuja, Nigeria using an experimental group and a control group. The experimental group was taught through transmitter of knowledge model and the control group was taught through conventional teaching method.

In this study, the group taught using transmitter of knowledge model is found to have better mean score in the post-test than the control group taught using the conventional teaching method. However, there is no statistical significant difference in their post-test mean scores. The result of this study agrees with those of Kalia (2005),Rose and Fong (1997).

However, the result is not in line with the works of Shaffer's (1989), Farrell and Hesketh's (2000), and Prince and Felder (2006).

As no experimental study can be perfect and flawless, this study may contain some flaws. In fact, transmitter of knowledge model and conventional teaching method are very similar to each other except that the former is more systematic and logical in its approach. The purpose of the study was to explore the effectiveness of the use of transmitter of knowledge model on students' academic achievement. The main objective of the study is, therefore, to compare the effect of transmitter of knowledge model on students' academic achievement. It was hypothesized that the students taught through transmitter of knowledge model may show better performance than the control group taught through conventional teaching. The sample of the study consisted of 60 students of Govt. Sec. School, Bwari of Federal Capital Territory (FCT) Abuja, Nigeria. The sample was selected on the basis of their pretest scores through matching and a group randomly assigned for the treatment. The experimental group was taught using Transmitter of knowledge teaching models while the control group was taught through conventional teaching, a method. The analysis was done using Sheffee test and Analysis of Variance (ANOVA) statistical techniques at 0.05 level of significance.

5 Conclusions

Based on findings, following conclusions are drawn:

1. The null hypothesis H_{01} that there is no significant difference between the mean post-test achievement scores of students taught through the transmitter of knowledge model and those students taught through conventional teaching using Scheffe test is supported.
2. There is no significant difference between the mean post-test achievement scores of students taught through the transmitter of knowledge model and those students taught through conventional teaching using ANOVA.

The Scheffe and ANOVA tests lead to the acceptance of no statistical difference as hypothesized, though no two things are the same and can produce exactly the same results. The overall conclusion that can be drawn from this study is that the transmitter of knowledge model is found to be as effective as the conventional teaching method for teaching circle geometry and trigonometry.

6 Recommendations

On the basis of findings, conclusions and the discussion, the following recommendations are made for action and further research:

1. Since the transmitter of knowledge model is effective in the teaching of circle geometry and trigonometry, the teachers should be trained to use this model because it is found to be an effective for teaching circle geometry and trigonometry. Students' curiosity and interest should be stimulated through stimulating questions that promote deep thinking.
2. Transmitter of knowledge model is a new model of effective teaching that requires thorough understanding and sufficient practice before usage for instruction. In future studies sufficient rigorous training on the model should be provided to the teachers of the experimental group before conducting experiments.

3. The results of this study may have been confounded as the experimental group was taught by the researchers. To avoid experimental bias, regular teachers of the same institution should be selected to provide the treatment to the experimental groups after ensuring adequate training and practice in the methodology. This step may control the critical teacher variable, polluting the effect of the independent variable.
4. Similar studies should be also replicated on students at both secondary as well as elementary levels for teaching mathematics and other subjects other than mathematics in order to confirm and generalize the present result.
5. As the present study centers on transmitter of knowledge model, experimental studies may be conducted for the evaluation of the effectiveness of other teaching models like cooperative learning, direct instruction, indirect instruction and concept attainment models of teaching etc.

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