Effective Ways to Teach Mathematics

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INTRODUCTION

Auto-mechanics is one of the vocational trades that are being offered in Nigerian technical colleges which is geared towards the production of artisans and craftsmen. These craftsmen are expected to have greater skills, attitude and knowledge to meet the demand and the development in the automobile industries. For this to be achieved, auto-mechanics trade in the technical colleges in Nigeria should be given the attention it deserves, so that the output would be able to cope with the trend in the automobile industry.

Automobile supposes to occupy a strategic position in the nation economy. But unfortunately in most of the developing countries like Nigeria, giant strides have not been made in automobile industries. Based on United Nations ratios of 1:4:30 (Engineer, Master Craftsmen and Craftsmen respectively); crafts level manpower constitutes an essential base upon which lies the strong foundation needed for the desired technological growth of this nation (Aina, 1998). The success of auto-mechanics trade programme in the technical colleges in making substantial contribution to the economy of a nation like Nigeria depends largely on the effective method adopted by teachers in imparting the required knowledge, attitude and skills on the students.

Teachers constantly face the decision of how to design instruction which will best meet the needs of the learner. These decisions include selecting methods and techniques. The selection process requires not only that the teacher be aware of how to use various techniques, but that he/she know which types of students learn best with various techniques, which techniques should be used under various conditions and what levels or types of information can best be learned using various techniques (Agnew and Shinn, 1990). According to Olivas and Newstorom cited in Agnew and Shinn (1990), stated that the effectiveness of the methods depends upon the particular objective being served.

The best way to make learning more concrete is to make use of real objects (Akinwale, 2004). Real objects may not always possible due to safety and logistical reasons. Therefore, simulation may be best alternative. Simulation means to reproduce certain psychic activities by means of suitable programmes (Greco, 1986). Ughamadu (1992) sees simulation as a concentration of imitation of learning experience, specifically designed to represent real life activities by providing the learners with the essential element to model real activity. Farber (2000) defines simulation as a catch-all term for several different tutorial type programmes. Farber further stressed that simulation based learning is an effective way to learn and apply skills quickly. In other words, simulation is a method/technique that can be used by teachers of automobile trade to give automobile students the opportunity to practice behaviours under conditions that approach reality.

One of the advantages of simulation is the safety of learning/practicing new information of skills that may be dangerous when real objects are used. Safety is a pertinent factor to be considered when selecting a method/technique. The extent to which simulation is effective will depend upon the style of
simulation used (Olivas and Newstorom, 1981). Therefore, in order to input the principles of active participation/practice, simulation may be very active.

Purpose of the Study

The purpose of the study was to determine the influence of simulation on technical college auto-mechanics trade students’ academic achievement in Lagos State, Nigeria.

Specifically, the study sought to determine whether:

(1) There is any significant difference in the mean achievement scores of auto-mechanics students taught using simulation method and those taught using lecture method.

(2) There is any significant difference in the mean achievement scores of high ability and low ability auto-mechanics students taught using simulation method.

Research Questions

The following research questions will guide the study:

(1) Which of the group (simulation or lecture) performs better in an achievement test in auto-mechanics subjects as indicated in their mean achievement scores?

(2) Which of the group (simulation or lecture) according to their level of ability performs better in the achievement test in auto-mechanics subjects when exposed to simulation method?

Research Hypotheses

The following null hypotheses are formulated to guide the study:

(1) There will be no significant difference in the mean achievement scores of auto-mechanics trade students exposed to simulation method and their counterpart exposed to lecture method.

(2) There will be no significant difference in the mean achievement scores of high ability and low ability auto-mechanics trade students exposed to simulation method as measured by their mean achievement scores.

METHODOLOGY

Research Design

The study adopted the quasi-experimental research design. The type of quasi experimental research design that was used is the non-equivalent control group which involves two groups. The reason was that subjects are not assigned to the groups randomly.

Area of Study

The study was carried out in Lagos State. The state has four state owned technical colleges and one federal technical college. All the five technical colleges offer automobile trade.
Population of the Study

The population of the study comprised all the five technical colleges in Lagos State. The targeted population comprised all the final year auto-mechanics students of the technical colleges. The final year students were used for the study because they would be sitting for the National Technical Certificate Examination and they are likely to devote attention to the study since it will assist them a lot in their forthcoming examination. A simple random sampling was used to select the two technical colleges that were used for the study.

Sample and Sampling Technique

The sample consist one hundred and two auto-mechanics trade students and a simple random sampling was used to select two out of the five technical colleges that was used for the study. The selected technical colleges are Government Science and Technical College, Ikotun and has forty seven (49) students while Government Science and Technical College, Ado-Soba has fifty (55) students. In each of the technical college selected, the final year intact classes were used for the research exercise. This was necessary because the experiment required two intact classes: one experimental groups and one control group.

A simple ballot was adopted to select which of the technical colleges that was in the experimental and the control group respectively. The students in each of the intact class constituted the sample used for the study. However, the intact classes selected in each of the technical college chosen served as either experimental or the control group.

Instrument for Data Collection

Auto-mechanics Achievement Test (AAT) was the instrument used for the data collection for the study.

Auto-mechanics Achievement Test (AAT)

The Auto-mechanics Achievement Test (AAT) consisted thirty-item multiple choice objective test instrument, with four (4) options. The instrument covered the contents area of the topics selected for the study. The topic selected is auto-electricity.

Validation of the Instrument

Three experts in Vocational and Technical Education from Tai Solarin University of Education, Ijagun in Ogun State Nigeria validated the instrument. Their observations and corrections were incorporated into the modified test items.

Experiment Procedure

The experiment involved the experimental group (taught with simulation method) and the control group (taught with lecture method). The experimental group was taught using simulation method while the control group was taught using the lecture method.

Students using simulation method did not use the auto-electrical system rather they used simulation activity while those using lecture method received instruction and explanation using the auto-electrical
system. None of the students in the two groups have the knowledge of auto-electrical system before the treatment. Adopting Agnew and Shinn (1990), the simulation involved the use of a set of schematic symbols on 3” x 5” cards connected together by colour coded wire connectors to form a specific auto-electrical system defined by the activity sheet provided for the students.

Step was taken for the control of every extraneous variable to the study. The pre-test was administered before the treatment and after the treatment a post-test was administered to the two groups.

Method of Data Collection

Scores generated from the pre-test and post-test administered to the automobile students of the technical colleges using Auto-mechanics Achievement Test (AAT) were used as the data collected for the study.

Method of Data Analysis

Mean and standard deviation was used to answer the research questions while t-test was used for testing the hypotheses at a significance level of 0.05.

RESULTS AND DISCUSSION

The data collected were analyzed and presented according to the research questions and the null hypotheses.

Research Question 1

Which of the group (simulation or lecture) performs better in an achievement test in auto-mechanics subjects as indicated in their mean achievement scores?

Table 1: Mean and Standard Deviation of PreTest and Post-Test Scores of Experimental and Control Groups in the Achievement Test

<table>
<thead>
<tr>
<th>VARIABLES</th>
<th>N</th>
<th>MEAN</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>EXPERIMENTAL (TAUGHT USING SIMULATION METHOD)</td>
<td>49</td>
<td>8.59</td>
<td>1.35</td>
</tr>
<tr>
<td>CONTROL (TAUGHT USING LECTURE METHOD)</td>
<td>55</td>
<td>3.59</td>
<td>2.13</td>
</tr>
</tbody>
</table>

The data in Table 1 indicated that the experimental group taught using simulation method had a mean score of 8.59 and standard deviation of 1.35 while the control group taught with lecture method had a mean score of 3.59 and a standard deviation of 2.13. This result revealed that the students in the experimental group performed better in the achievement test than the students in the control group.

Research Hypothesis 1
There is no significant difference in the mean achievement scores of auto-mechanics trade students exposed to simulation method and their counterpart exposed to lecture method.

Table 2: Test of Significance between the Mean Scores of Experimental and Control groups in the Achievement Test

<table>
<thead>
<tr>
<th>VARIABLES</th>
<th>N</th>
<th>MEAN</th>
<th>SD</th>
<th>TC</th>
<th>TV</th>
<th>DF</th>
</tr>
</thead>
<tbody>
<tr>
<td>EXPERIMENTAL</td>
<td>49</td>
<td>8.59</td>
<td>1.35</td>
<td>14.13</td>
<td>1.98</td>
<td>102</td>
</tr>
<tr>
<td>CONTROL</td>
<td>55</td>
<td>3.59</td>
<td>2.13</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

On table 2, the t-calculated (t_c) is 14.13 which is greater than the table value (t_V) of 1.98 at 0.05 level of significance. This indicated that the difference in the mean achievement scores of auto-mechanics trade students exposed to simulation method and their counterpart exposed to lecture method was significant. Hence, hypothesis 1 is rejected. With this result, there is significant difference in the mean achievement scores of automobile trade students exposed to simulation method and their counterpart exposed to lecture method.

Research Question 2

Which of the group according to their level of ability performs better in the achievement test in auto-mechanics subjects when exposed to simulation method?

Table 3: Mean and Standard Deviation of Post-Test Scores of High Ability and Low Ability in the Achievement Test

<table>
<thead>
<tr>
<th>VARIABLES</th>
<th>N</th>
<th>MEAN</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>HIGH ABILITY (TAUGHT USING SIMULATION METHOD)</td>
<td>57</td>
<td>14.43</td>
<td>3.37</td>
</tr>
<tr>
<td>LOW ABILITY (TAUGHT USING SIMULATION METHOD)</td>
<td>37</td>
<td>5.43</td>
<td>1.46</td>
</tr>
</tbody>
</table>

The data in Table 3 shows that the high ability group taught using simulation method had a mean score of 14.43 and standard deviation of 3.37 while the low ability group taught with lecture method had a mean score of 5.43 and a standard deviation of 1.46. This result revealed that the high ability students performed better in the achievement test than the low ability students.

Research Hypothesis 2

There is no significant difference in the mean achievement scores of high ability and low ability of auto-
mechanics trade students exposed to simulation method as measured by their mean achievement scores.

Table 4: Test of Significance between the Mean Scores of High and Low Ability Levels in the Achievement Test

<table>
<thead>
<tr>
<th>VARIABLES</th>
<th>N</th>
<th>MEAN</th>
<th>SD</th>
<th>T C</th>
<th>T V</th>
<th>DF</th>
</tr>
</thead>
<tbody>
<tr>
<td>HIGH ABILITY</td>
<td>57</td>
<td>14.43</td>
<td>3.37</td>
<td>39.43</td>
<td>1.99</td>
<td>92</td>
</tr>
<tr>
<td>LOW ABILITY</td>
<td>37</td>
<td>5.43</td>
<td>1.46</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 4 shows that the t-calculated ($t_c$) is 39.43 which is greater than the table value ($t_V$) of 1.99 at 0.05 level of significance. This shows that the difference in the mean achievement scores of high ability students exposed to simulation method and low ability students exposed to lecture method was significant. Hence, hypothesis 2 is rejected. With this result there is significant difference in the mean achievement scores of high ability and low ability of auto-mechanics trade students exposed to simulation method as measured by their mean achievement scores.

Discussion

The data presented in Table 1 provided answer to research question one. The findings showed that students taught using simulation method performed significantly better that those taught lecture method. This is an indication that the use of simulation method in teaching auto-mechanics improved students’ achievement than teaching using lecture. This result corroborated with Anikweze (1988) that simulation was found to be more effective than the conventional lecture method.

Again, t-test was used to test hypothesis one on table 2, the t-calculated ($t_c$) was greater than the table value ($t_V$). This is an indication that the difference in the mean achievement scores of auto-mechanics trade students exposed to simulation method and their counterpart exposed to lecture method was significant. With this result, there is significant difference in the mean achievement scores of automobile trade students exposed to simulation method and their counterpart exposed to lecture method.

This result then agrees with Frass (1993) who carried out a study on effect of simulation game on students’ performance as well as the talk-chalk traditional lecture method. In his work, he made use of one hundred and twenty (120) students. Sixty (60) were treated to simulation and games model (experimental group) while the other sixty (60) were treated with lecture/discussion method (control group). The result of the study revealed that those students treated with the use of simulation games method performed better.

The data presented in Table 3 was also used to answer research question two. The findings revealed that high ability students performed significantly better that the low ability students. The t-test was as well used to test hypothesis two on table 4, the t-calculated ($t_c$) was greater than the table value ($t_V$).
This shows that the difference in the mean achievement scores of high ability students exposed to simulation method. With this result, there is significant difference in the mean achievement scores of high ability and low ability of auto-mechanics trade students exposed to simulation method as measured by their mean achievement scores. The result confirms Okoye (1995) in his research work on the effects of teaching methods (simulation and lecture) on academic based on ability levels. The research was a quasi-experimental non-equivalent control group design. The result shows that the high ability groups taught using simulation performed significantly better than the low ability group in academic achievement. However, the result of this study contradicted Uchegbu (1986) and Osuafor (2001) that students with low ability gained more than those with high ability when exposed to simulation technique.

Conclusion and Recommendation

The use of simulation in the teaching and learning condition can not be overemphasized. It has been used in various work places including aeronautics, military, executive effectiveness, pharmacology and medicine, and was found as one of the best technique or method to solve various challenges in the aforementioned fields including complicated and complex tasks. Most auto-mechanics trade teachers in technical college are ignorant of this technique and this will make this research more pertinent. From the findings of this study, simulation can be effectively used to deliver cognitive information related to the study of various systems in automobile.

Therefore, since simulation can be considered as an effective method of teaching as against the lecture method, the simulation method of teaching is hereby recommended for the teaching of auto-mechanics subjects in the technical colleges in Nigeria.

REFERENCES


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