Effects of Metalearning Instructional Approach On Students Performance In Technical Education

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Abstract

This study examines the effects of metalearning instruction approach on students' performance in technical education. The population of the study comprised of all the 260 Technical Class II (TC II) students in four technical colleges in Niger State. Thirty students were randomly selected from each of these colleges, which gave a sample of 120 students. The four colleges were divided into two groups, one group served as experimental while the other group was regarded as the control group. A pretest was administered to both groups to determine students entry-level equivalence and thereafter, a posttest was administered after three (3) weeks of instruction, to both groups, in Basic electricity. The experimental group was taught using metalearning instructional technique. The pretest and posttest results were analysed using mean, standard deviation and t-test. It was revealed that the experimental group performed significantly better than the control group. This is an indication that the application of metalearning instructional approach is instrumental to effective teaching and learning in technical education. It was therefore recommended among others that teachers of technical education should be sensitized on the relevance of metalearning instructional approach through workshops, seminars and conferences.

Introduction

Technical education is a comprehensive term referring to the educational process when it involves, in addition to general education, the study of technologies and related sciences and the acquisition of practical skills and knowledge relating to occupations in various sectors of the economic and social life (Osuala, 2004). The broad educational goals of technical education distinguish it from vocational training, which is directed to developing particular skills and related knowledge required by a specific occupation or group of occupations. Technical education is education design for upper secondary and lower tertiary levels to prepare middle-level personnel (technician) and university level, to prepare engineers and technologist for

higher management positions. Technical education includes general education, theoretical, scientific and technical studies and related skills training. The components of technical education may vary considerably depending on the type of personnel to be prepared and the education level.

A common goal of teachers of technical education is to make lesson presentation vital, interesting, alive, and lasting. Every teacher seek to convey to the students certain basic information, ideas, knowledge and skills in the shortest possible time and in accordance with the principles of learning. For this reason, new methods and approaches are continuously being sought to overcome the limitations of exhaustively verbal communication. Current development in both psychological research and in technology has given rise to adoption of improved methods of teaching and learning. These new methods have been found to be efficient in meeting today's need (Uba, 2006, Senchi, 2005). Uba (2006) affirmed that the aim of teaching is to effect changes in learners. Changes can only come as a result of sincere and accurate understanding of the teaching and learning situations.

Interestingly, metalearning instructional technique is developed to assist the learners to have a deeper awareness of the context and content of the learning process. Metalearning involves the activity of the learner who is intentionally aware of the learning processes such as learner's attention, thinking attitudes, beliefs, expectations, learning strategies, motivations, prior knowledge, memory and understanding (Ogwo and Oranu, 2006). They went further to outline the metalearning strategies as follows:

- Planning skills
- Executing skills
- Monitoring skills
- Evaluating skills

To achieve success, the following tips on utilizing the Metalearning Technique were suggested:

1. Discussing the instructional objectives with students before starting each lesson.
2. Outline the thinking process skills involved in every aspect of the lesson and the best techniques of assisting the students to think through them.
3. Use different attention-sustaining strategies to make students conscious of the tasks at hand.
4. Specify the various process evaluation tasks and questions needed for each stage of instruction.

The learner can plan, execute, monitor and evaluate the learning activities. Metalearning entails consciously working on one's self for the control of the thought process. Metalearning enables one's understanding of one's own cognitive processes and

products, through active monitoring constant regulation and orchestration of learning process in the service of some concrete objectives.

Conventional teaching methods, such as demonstration method, mostly adopted by teachers in teaching technical education subjects do not seem to address students different needs in the learning process. This is so because the demonstration method seems to be teacher-centred since the teacher does the talking and demonstration while students only listen and watch him demonstrate. Bala (2006) noted that the use of demonstration method in which the teacher is the most active often creates frustration and learning difficulties for most students. Metalearning instructional strategy with it's much emphasis on active learning, collaborative learning and project based learning seem to provide teachers with the instructional tools to cope with the diversity of abilities and learning preference amongst students in the classroom.

Statement of the Problem

The declining performance of students in technical education has been a matter of great concern to many vocational educators. This may be attributed to the abstract nature of teaching method (s) adopted by teachers. Despite the effectiveness of metalearning instructional strategies in enhancing meaningful learning, its extensive use in technical education institutions is yet to be established. This study therefore attempts to determine the effect of using metalearning instructional strategy on students' performance in technical education (Basic electricity).

Research Questions

The following research questions guided the study

1. What is the difference in performance of students taught Basic Electricity with metalearning instructional technique and those taught without this technique?

2. Does any gender difference in performance exist when metalearning instructional technique is used?

Research Hypotheses

The following hypotheses were tested at 0.05 level of significance.

1. Students taught Basic Electricity with metalearning instructional technique will perform better than those taught without this technique.

2. The performance of boys taught Basic Electricity using metalearning instructional technique will be better than that of girls taught with the same technique.

Significance of the Study

This study on effects of metalearning instructional approach on students' performance in technical education will solve the problem of abstractness of technical subject by concretization of learning processes. It is also hope that teachers, students, parents and curriculum planners will be provided with relevant data needed for scientific advancement and help improve efficiency and productivity of technical teachers in the teaching process.

Sample and Methods

The sample for the study consists of 120 (60 males and 60 females) students randomly selected from a population of 260 Technical class two (TC II) students in four (4) Technical Colleges in Niger State. Thirty students were selected from each school. Two colleges comprising of 60 students served as experimental group (students taught Basic Electricity using the metalearning instructional approach) and the other two also made up of 60 students were the control group (students taught basic electricity using traditional demonstration method).

A pre-test was administered to both groups to determine the entry-level equivalence. The pre-test was followed by three (3) weeks instruction on basic electricity topics which include: structure of Matter, electromotive force (EMF) and electrical circuits to both experimental and control groups and thereafter a post test was administered to both groups after a week revision. The distribution of student in each school is shown in Table 1.

Table 1
Sampled schools and students

S.No.	SCHOOL	MALE	FEMALE	TOTAL
1.	Government Technical College, Chanchaga Minna	15	15	50
2.	Government Technical College, New-Bussa	15	15	30
3.	Suleiman Barau Technical College, Suleja	15	15	30
4.	Government Technical College, Pandogari	15	15	30
	TOTAL			**120**

Research Instrument

Two instruments were used for this study. These include the pre-test and post-test instruments. The pre-test instrument used for the research consists of 50 test items drawn

from topics in Basic Electricity. The topics are Structure of Matter, Electromotive Force (EMF) and Electrical Circuits. The Instrument was administered to the students before the treatment was given in order to determine their entry behaviour in the topics chosen. The instrument designed by the researchers which covered these Basic Electricity topics is titled Basic Electricity Entry Behaviour Test (BEEBT). Each question on the selected topics is followed by five multiple-choice optional answers (A – E). Each correct answer earns one mark and the overall score is then converted to percentage. The BEEBT was administered to both experimental and control groups as pre-test.

Description of the Post-test Instrument

The test Instrument consisted of 40 Multiple Choice Achievement Test items on Basic Electricity (MCATIOBE). The test which lasted for one hour was administered to students in both groups in order to determine their performance after the treatment. The test was supervised by the researchers. The Validated Marking Scheme was used to score students work. Each correct answers earned one mark and any wrong answer earned zero. The total scores were then converted to percentage. The data obtained from both the pre-test and post-test were analysed statistically using the mean, standard deviation and t-test.

Validation of Instrument

Two experts in Electrical/ Electronics from Federal University of Technology Minna validated the Instrument. The validators checked the appropriateness of test items before use.

Reliability of Instrument

The Instrument was subjected to pilot-testing. The test-retest method was used for the reliability of Instrument. A reliability coefficient of 0.75 derived from Kuder Richardson 21 was recorded which is an indication that the Instrument is reliable.

Analysis of Result

Table 2
Pre-test result for Experimental and Control Groups.

Group	N	Mean ($\bar{X}$) % Score	Standard Deviation	t-value cal	t-value critical	Remarks
Experimental	60	48.2	5.46	0.18	2.00	Ns
Control	60	48.2	5.33			

Ns = **Not significant at 0.05 level**

The Pre-test result in Table 2 for experimental and control groups were not significantly different at the 0.05 level (t=0.18). The two groups were found to be equivalent before treatment commenced.

Research Question 1: What is the difference in performance of students taught Basic electricity with Metalearning Instructional technique and those taught without this technique? Data related to this research question are presented in Table 3.

Table 3
Post-test result for experimental and control groups

Group	N	Mean ($\bar{X}$) % Score	Standard Deviation	Difference in Performance	t-value cal	Remark
Experimental	60	56.4	7.2	6.2	12.85	S
Control	60	50.2	6.8			

Significant at P<0.05 level

Table 3 revealed the mean, standard deviation and difference between the experimental and control groups. The mean score for the experimental group was 56.4 percent and 50.2 percent for control group. The difference in performance is 6.2 percent.

Research Question 2: Does any gender difference in performance exist when metalearning instructional technique is used?

Table 4
Performance of Boys and Girls taught Basic Electricity applying metalearning Instructional strategy in the post-test

Group	N	Mean ($\bar{X}$) % Score	Standard Deviation	t-value cal
Boy	30	55.9	7.5	11.26
Girls	30	56.0	7.6	

Table 4 revealed the mean, standard deviation and t-test value of boys and girls

taught Basic Electricity applying metalearning Instructional strategies. The mean score for the boys was 55.9 percent and 56.0 percent for the girls. The standard deviation for boys and girls are 7.5 and 7.6 respectively.

Discussion of Findings

Table 2 shows the result of pre-test for experimental and control groups. The mean pretest score for experimental group is 48.2 percent while that of the control group is also 48.2 percent. It is clear from the result that there is no difference between the two groups at the 0.05 significant level (t=0.18).

Results revealed in Table 3 show that the mean score of experimental and control groups was 56.4 percent and 50.2 percent respectively. This implies that the experimental group performed significantly better than the control group because of the application of the treatment. It can be deduced from the study that the use of metalearning for instruction in Basic Electricity has improved the performance of students in the selected topics.

Hypothesis 1 (one) was therefore upheld, since there exist a significant difference in the performance of both groups. Hence, there is significant difference in the performance of the experimental and control group in the Basic Electricity posttest. The diference in performance is caused by the use of metalearning instructional technique. This is in agreement with the findings of Baya (2006) who asserted that the use of metalearning instructional strategies in schools for teaching and learning has brought about remarkable changes in the areas of lesson preparation and presentation. Ike (2004) also observed that teaching Basic Electricity using metalearning instructional strategies in teaching does only motivate the students for better performance, but also reduce the burden of workload on teachers.

The mean score of 55.9 percent for boys and 56.0 percent for girls as shown in table 4 is an indication of no significant difference in their performance. Hypothesis two (2) is therefore rejected. Hence, there is no significant difference in the performance of girls and boys taught Basic Electricity applying metalearning instructional strategies. This is in line with Ayeduso (2001) who asserted that the female have equal potential and ability as their male counterparts to undertake any course of study/discipline if given desired support and motivation.

Conclusion

Based on the results of the analysis of data collected from the research carried out on the effect of metalearning instructional approach on students performance in technical education, it is clear that the application of metalearning instructional strategies in education has improved the quality of teaching and learning in technical schools under study. Also the study showed that there was no

significant difference in performance between male and female students when metalearning instructional strategy is applied on both sex.

Recommendations

Based on the effects of metalearning, the following recommendations are presented.

- Teachers of technical education should be sensitized on the relevance of metalearning instructional approach through workshops, seminars and conferences.
- Teachers training curriculum should be modified to include this technique in order to equip trainees with metalearning skills.
- Metalearning instructional technique should be used at Technical college level and lesson plan should contain the thinking/metalearning skills involved at every stage of instruction.

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