

Effects of Reflective Inquiry Teaching Method on Students' Retention Ability in Domestic Installation Module in Technical Colleges of Yobe State, Nigeria

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Abstract: The aim of this study was to assess the effects of reflective inquiry teaching method on students' retention ability in domestic installation module in technical colleges of Yobe State, Nigeria. In guiding the study, two research questions and two hypotheses were formulated in line with the specific objectives. A pretest – posttest nonequivalent control group quasi experimental research design was adopted for the study. Four intact classes from 4 technical colleges were selected to give a sample size of 88. Domestic Installation Retention Test (DIRT) was used to generate data for the study. The instrument was validated by three validates from the department of Electrical Technology Education, Modibbo Adama University of Technology, Yola. To determine the reliability of the instrument, Cronchbach Alpha reliability method was used and a reliability coefficient of 0.84 was obtained. Mean statistic was used to answer the two research questions of the study while the two null hypotheses of the study were tested using t-test and ANCOVA at 0.05 level of significance. Findings of the study revealed among others that reflective inquiry teaching method enhances retention abilities in students when used in teaching domestic installation. It further revealed that male and female students' retention in domestic installation was high when taught using reflective inquiry teaching method. The study concluded that using reflective inquiry teaching method to teach students of electrical installation and maintenance works trade in Yobe State enhances the students' retention ability which is visible in the retention test scores. The study recommended among others that teachers should employ reflective inquiry teaching method while engaging students in more work that will enable them develop critical thinking abilities.

Keywords: Reflective Inquiry, Teaching Method, Retention, Domestic Installation, Module

1. Introduction

In Nigeria's technical college, Electrical Installation and Maintenance Works (EIMW) Trade is offered as one of the trade courses. EIMW exposes students to various skills in electrical maintenance works. NBTE (2004) established that, craftsmen in the field of electrical maintenance are anticipated to carry out diagnoses of electrical machines and appliances, test completed installations and fix faults on electrical lines, machines and equipment based on the required standard. Ogbuanya and Owodunni (2013) asserted that EIMW is a program that encompasses practical tasks for the adequate maintenance of all electrical structures, systems and circuits, electrical fitting, examination and test process etc. NBTE (2004) maintained that, the major aim of EIMW Trade is to train the beneficiaries with the necessary skills that will lead to the emergence of competent craftsmen, specialists (technicians) and other skilled personnel who will be innovative, inventive and self-reliant. The training and retraining of students of EIM are carried out by the use of systematical and sequential module consciously arranged to give the learner retention of learning experiences.

A module as defined by Shodeinde (2013) is a unit of tasks consciously prepared for the purpose of skills acquisition and can be a foundation or requirement for advanced work/task in the fields it is designed for. The EIMW trade program is basically used for employment purposes. Domestic installation module is intended to provide the trainee with the knowledge and skill to enable him carry out complete electrical installation in a building and its associated equipment (NBTE, 2001). Domestic installation module is the definitive guide to home wiring to professional standard (ETA, 2000).

Reflective inquiry, according to Anyima (2011), is an instructional method that makes the learners think critically about a certain task, deliberate and share their experiences within their sub-groups. Anyima maintains that, reflective inquiry teaching method incorporates a blend of scaffold learning, analysis, critical thinking, questioning, conversation, and cooperative learning in order to encourage effective teaching and learning. Reflective inquiry teaching method is not a one-way technique. Reflective inquiry instructional technique is also seen as an inquiry and constructivist approach to teaching, which emphasizes on student's active learning and creative problem solving.

Retention of learning is the repeated performance of a learner based on the earlier acquired behavior produced after a time interval (Bichi, 2002). The factors that affect retention include the processes of learning the task and the capacity learners' memory among other. Retention according to Ameh and Dantani (2012) is a detect correlate of positive transfer. The type of material included in teaching programmes, structured in a carefully formed sequence is quite resistant to forgetting. This implies that any instructional strategy which is effective in enhancing retention can as well be effective in enhancing achievement. Ibrahim, Adisa, Abdulkadir and Nene (2013) viewed retention as the ability to remember things. The author defines retention as the action of the learner to enable him holdfast that which was taught. Furthermore, Onwuka (2010) reported that for retention to be improved in learners in domestic installation, in other words students' achievement, activity-based learning is indispensable. Getso (2008) stated that if lesson taught are not readily applied to real life situations and deficiency in the process of lesson delivery could be barriers for effective retention of knowledge. Retention, thus, could depend mainly on teaching methods and strategies adopted by the teacher(s) in teaching a particular subject or topic.

Poor retention of learning experiences by students as exhibited in their internal and external examinations has brought about much concern to teachers, parents and educationist. It is an established fact that poor teaching method affects learning outcome in learners and thereby affects their retention level. Reflective inquiry as a method of teaching in vocational and technical education, especially, electrical installation and maintenance works trade has not been ascertained whether it could prolong student retention when taught domestic installation module. In this regard, the study sought to determine the effect of reflective inquiry teaching method on students' retention in domestic installation module in technical colleges in Yobe State, Nigeria.

2. Purpose of the Study

The study aimed at determining the effect of reflective inquiry teaching method on students' retention ability in domestic installation module in technical colleges in Yobe State, Nigeria. The study was to:

1. Determine the mean retention scores of electrical installation and maintenance works students when taught domestic installation using reflective inquiry and conventional teaching methods in technical colleges in Yobe State.
2. Determine the mean retention scores of male and female students of electrical installation and maintenance works when taught domestic installation using reflective inquiry and conventional teaching methods in technical colleges in Yobe State.

3. Research Questions

The under listed research questions provided guidance to the study:

1. What are the mean retention scores of electrical installation and maintenance works trade students when taught domestic installation using reflective inquiry and conventional teaching methods in technical colleges in Yobe State?
2. What are the mean retention scores of male and female students of electrical installation and maintenance work when taught domestic installation using reflective inquiry and conventional teaching methods in technical colleges in Yobe State?

4. Hypotheses

The following null hypotheses were tested at 0.05 level of significance:

1. There is no significance difference between the mean retention scores of electrical installation and maintenance work trade students when taught domestic installation using reflective inquiry and conventional teaching methods in technical colleges in Yobe State.
2. There is no significance difference between the mean retention scores of male and female students of electrical installation and maintenance work when taught domestic installation using reflective inquiry and conventional teaching methods in technical colleges in Yobe State.

5. Methodology

5.1 Research Design

The study adopted pretest – posttest nonequivalent control group quasi experimental research design. According to Cohen, Manion and Morrisom (2007), quasi-experimental design is employed only when randomization was not possible and it is typically easier to set up than real experimental design. Similarly, to use a natural classroom setting for experimental research without random assignment, a nonequivalent group design of Quasi-experimental is considered more appropriate (Sambo, 2005). The conceptual model of the design is presented as follows:

E: O₁ X₁ O₂

C: O₃ O₄

O₁ = Pretest score of the experimental group; O₃ = Pretest score of the control group;

O₂ = Post-test score of the experimental group; and O₄ = Posttest score of the control group

X_1 = experimental treatment group.

Reflective inquiry method of teaching was used for experimental group while conventional (demonstration) method was used for control group.

5.2 Area of the Study

The study was conducted in Yobe State of Nigeria. Yobe State is located in North East part of Nigeria on latitude $12^{\circ}00'N$ and longitude $11^{\circ}30'E$ with the total land mass of 45,502km². Yobe State shared borders with Borno state to the east, Niger Republic in the north, Bauchi State to the west and Gombe State to the south (National Population Commission, 2010)

5.3 Population of the study

The study had a total population of 338 EIMW trade students in the eight technical colleges in Yobe State, Nigeria as at the 2019/ 2020 session.

5.4 Sample and Sampling Technique

The study adopted purposive sampling technique to select two technical colleges in Yobe State for the study. The two technical colleges are Government Girls Science and Technical College Potiskum and Government Science and Technical College Damagum (boys only). The total sample size was 84 year II intact classes students (68 female and 20 male)

5.5 Instrument for Data Collection

An instrument tagged “Domestic Installation Retention Test (DIRT)” developed by the researcher was used for data collection. The instrument was subjected to both content and face validation by three validators from the department of Electrical Technology Education, Modibbo Adama University of Technology, Yola, Adamawa State, Nigeria. A reliability coefficient of 0.84 was obtained using Cronbach Alpha reliability method after the draft instrument was trial tested on 20 NTC II students of technical college Gombe, Gombe State, Nigeria.

5.6 Method of Data Collection/Analysis

The collection of data which the study utilizes was done through the administration of posttest and retention test on the two groups. Mean was used to answer research questions, while t-test and Analysis of Covariance (ANCOVA) was used to test the hypothesis at 0.05 level of significance. To answer the two research questions of the study, both posttest mean scores of experimental and control groups were compared for mean difference. Higher mean score showed better retention. The decision for testing the two null hypotheses of the study was that; when the calculated t- and f- values were lower than the p- and α - values respectively, the null hypotheses were accepted, conversely, the null hypotheses were rejected.

6. Results

6.1 Research Question 1

What are the mean retention scores of electrical installation and maintenance works trade students when taught domestic installation using reflective inquiry and conventional teaching methods in technical colleges in Yobe State?

Table 1: Mean and Standard Deviation of Mean Retention Scores of Electrical Installation and Maintenance Work Students Taught Domestic Installation Using Reflective Inquiry and Conventional Teaching Methods

Group	n	Post-Test		Retention		Remark
		\bar{x}	σ	\bar{x}	σ	
Experimental (Reflective Inquiry)	43	73.00	16.63	64.50	13.63	High
Control (Conventional Method)	45	57.50	9.26	45.69	11.81	Moderately High

Key: N= Number of Students, \bar{x} = Means Scores, σ = Standard Deviation, Mean Diff. = Mean Difference, RMK = Remark

Results in Table1 showed the posttest and retention mean score of students in domestic installation. Students in the experimental group had 73.00 mean score in the posttest and 64.50 as retention mean score with a means difference of 14.5 while the control group had 57.50 in the posttest and retention mean score of 45.69 with a mean difference of 11.81. The result indicates that students in the experimental group had a higher retention level of domestic installation than those in control group.

6.2 Research Question 2

What are the mean retention scores of male and female students of electrical installation and maintenance work when taught domestic installation using reflective inquiry and conventional teaching methods in technical colleges in Yobe State?

Table 2: Mean and Standard Deviation of Mean Retention Scores of Electrical Installation and Maintenance Work Male and Female Students Taught Domestic Installation Using Reflective Inquiry and Conventional Teaching Methods

Gender		n	Post-test		Retention	
			\bar{x}	σ	\bar{x}	σ
n = 88						
n = 88						
Male						
	Experimental	27	68.56	14.36	61.79	13.63
	Control	25	53.69	9.66	50.50	9.03
Female						
	Experimental	16	65.73	13.57	60.65	11.09
	Control	20	50.59	9.67	37.65	8.59

Key: N= Number of Students, \bar{x} = Means Scores, σ = Standard Deviation,

Results in Table 2 showed the posttest and retention score of male and female students in domestic installation. The students (male) in the experimenting group had 68.56 mean score in the posttest and 61.79 as retention mean score respectively. Meanwhile, the control group (male) had 53.69 in the posttest while retention score of 50.50 was obtained. The result indicates that a higher retention level of domestic installation was observed in the students taught using reflective inquiry method than those taught using conventional method. The result in Table 2 further revealed the mean scores of female students' learning posttest and retention test in domestic installation. Female students taught using reflective inquiry method (Experimenting group) have a posttest score of 65.73 and 60.65 as retention test score respectively. While the female in the taught using conventional method (control group) has a posttest score of 50.59 and retention score of 37.65 respectively. The result indicated that the female students in the experimental group had a higher retention level of domestic installation than those in control group.

6.3 Hypothesis 1

There is no significance difference between the mean retention scores of electrical installation and maintenance work trade students when taught domestic installation using reflective inquiry and conventional teaching methods in technical colleges in Yobe State.

Table 3: Analysis of t- test Comparison of Retention Scores of Students Taught Domestic Installation Using Reflective Inquiry and Conventional Teaching Methods

Teaching Method	N	\bar{x}	σ	df	t	P-Value	Remark
Reflective Inquiry (Experimental)	43	64.50	13.63	86	9.088	0.000	Sig.
Conventional Method (Control)	45	45.69	11.81				

Key: N= Number of Students, \bar{x} = Means Scores, σ = Standard Deviation, Df = Degree of Freedom, Sig. = Significant

Table 3 presented the comparative analysis of t-test on the test of significant in the retention scores between those taught using reflective inquiry teaching method and those taught using conventional (demonstration) teaching method. The results in Table 3 show that there was significant difference in the retention mean scores of students taught domestic installation using reflective inquiry teaching method and those taught using conventional teaching method, [$t_{66,0.05} = 9.088$, $p < 0.05$]. The null hypothesis was therefore rejected since the mean retention of those in the experimental group had a significantly higher retention [$\bar{x} = 64.50$] than those in the control group ($\bar{x} = 45.69$). It was concluded that the reflective inquiry teaching method was more effective in making student to retain what they have been taught.

6.4 Hypothesis 2

There is no significance difference between the mean retention scores of male and female students of electrical installation and maintenance work when taught domestic installation using reflective inquiry and conventional teaching methods in technical colleges in Yobe State.

Table 4: Analysis of Covariance (ANCOVA) Comparison of Mean Achievement Scores of Male and Female Students in Domestic Installation When Taught Using Reflective Inquiry and Conventional Teaching Methods

Source	Type III Sum of Squares	Df	Mean Square	F	Sig.
Corrected Model	7005.084 ^a	7	1000.726	5.942	.000
Intercept	39424.011	1	39424.011	234.106	.000
Pretest	1266.211	1	1266.211	7.519	.008
METHODS	1156.167	3	385.389	2.289	.085
METHODS * Pretest	77.654	3	25.885	.154	.927
Error	13472.189	80	168.402		
Total	327750.000	88			
Corrected Total	20477.273	87			

a. R Squared = .342 (Adjusted R Squared = .285)

Table 4 showed the F-calculated value of mean retention scores of male and female students when taught domestic installation using reflective inquiry teaching method and conventional teaching method. The F-calculated value for male and female students' scores is 0.154 with a significance of F at 0.927 which is greater than 0.05 alpha levels. With this result, it means there is a significant difference between the mean retention score of male and female students taught domestic installation using reflective inquiry teaching method and conventional teaching method. The null hypothesis is therefore rejected at 0.05 level of significance, so, there is significant difference between the mean retention scores of male and female students taught electrical installation and maintenance work using reflective inquiry teaching method and conventional teaching method.

7. Study Findings

The following were the finding of the study based of the results presented in tables:

1. Reflective inquiry instructional technique enhances higher retention level in students when used in teaching domestic installation
2. Male and female students' retention in domestic installation is high when taught using reflective inquiry teaching method compared with the conventional teaching method.
3. There was significance difference between the mean retention scores of electrical installation and maintenance work trade students when taught domestic installation using reflective inquiry and conventional teaching methods in technical colleges in Yobe State.
4. There was significance difference between the mean retention scores of male and female students of electrical installation and maintenance work when taught domestic installation using reflective inquiry and conventional teaching methods in technical colleges in Yobe State.

8. Discussion of Findings

The findings of the study in respect to the two research questions revealed that reflective inquiry instructional technique enhances higher retention level in students (both male and female) when used in teaching domestic installation. Findings with respect to research question three of this study revealed that reflective inquiry instructional technique enhances higher retention level when used to teach domestic installation. This finding is in tandem with Agboola and Oloyede (2007) and Hassan (2010) in their separate studies found out that reflective inquiry teaching method enhances students' performance as the students are engaged in critical thinking and though provoking questions which led to their proper understanding of the lesson. To further buttress the finding, Akinwale (2004) reported that reflective inquiry enables the learner to reflect on what has been taught and thereby create solvable problems from the lesson which form a guide to the learner and a basis for inquiry into the unknown.

Finding on hypothesis one indicated a significant difference in the retention scores of students when taught domestic installation using reflective inquiry and conventional teaching methods in technical colleges in Yobe State. This finding is in agreement with Ibrahim, Adisa, Abdulkadir and Nene (2013) who reported that in technical colleges, the performance and retention abilities of the students are high when appropriate method is employed for the sole purpose of teaching/ and learning. Mbah (2012) in his study also found out that there was significant difference between retention mean scores of students taught Bricklaying using reflective inquiry instructional technique and conventional lecture method.

Findings of this study in relation to hypothesis two also revealed that male and female students' retention in domestic installation was high when taught using reflective inquiry teaching method thereby engendering equity between both sexes when compared with the conventional teaching method which is gender bias. This finding is in contrast with Ogbuanya and Owodunni (2013) whose study revealed that gender as an intervening variable, had significant influence on the academic achievement and interest of students in RTV in favor of boys. This finding is in tandem with findings of Ibrahim, Adisa, Abdulkadir and Nene (2013) who found out from separate achievement test administered on both male and female students taught Bricklaying using reflective inquiry instructional technique and conventional lecture method, that there was significant difference. The finding is also in agreement with findings of Ali (2014) who reported that there was significant difference between the male and female students' mean achievement scores taught using Inquiry-based Learning Method and conventional lecture method.

9. Conclusion and Recommendations

In commemoration of the findings made in this study which is visible in the retention test scores, the study concluded that using reflective inquiry teaching method to teach students of electrical installation and maintenance works trade in technical colleges of Yobe State, Nigeria enhances the students' retention ability. The adoption of reflective inquiry teaching method for teaching of domestic installation and other courses in technical colleges of Yobe State and environs will expose students of electrical installation and maintenance works trade to various learning opportunities through acquisition of skills by way of inquiry. It will help students in removing the cognitive conflicts and increase their knowledge and understanding of the subjects thereby improve their retention abilities and also encourage low level ability students to achieve higher. The study therefore recommended the following:

1. Teachers should be encouraged to employ reflective inquiry teaching method while engaging students in instructional activities that will enable them develop critical thinking abilities
2. Retention test should be given to the students periodically to test their retention ability even when they had left prior levels

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