

Effects of Reflective Inquiry Instructional Technique on Students' Academic Achievement and Ability Level in Electronic Work Trade in Technical Colleges

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Abstract

This study was designed to determine the effect of reflective inquiry instructional technique on achievement of students in Technical Colleges. The study adopted a pre-test, post-test, non-equivalent control group, quasi-experimental research design which involved groups of students in their intact class assigned to experimental group and control group. The population of the study was 105 Tech II students of and Electronic Works trade in Technical Colleges in Lagos State. Four research questions and five null hypotheses, tested at 0.05 level of significance, guided the study. The instruments used for data collection were Electronic Works Achievement Test (EWAT). To ensure content validity of the EWAT, a table of specification was built for the test. The reflective inquiry lesson plan, EWAT and the training manual were subjected to face validation by three experts. The EWAT was trial-tested to determine its psychometric indices and reliability coefficient. The trial test for determining the coefficient of stability of the EWAT was carried out using test re-test reliability technique. Pearson Product Moment Correlation coefficient of the EWAT was found to be 0.83. Mean was used to answer the research questions; while ANCOVA was employed to test the hypotheses. The study found out that reflective inquiry instructional technique is more effective in improving students' achievement in Electronic Works trade than conventional method. There was an effect of gender on students' achievement in Electronic works trade favouring boys. The study found out that there are no interaction effects of reflective inquiry instructional technique and gender on achievement of students in Electronic works trade. This simply means that the effectiveness of reflective inquiry instructional technique on students' achievement in Electronic works trade does not depend on gender. The study found out that there was an interaction effect of students' gender and their ability with respect to their mean scores on Electronic works trade achievement test. This simply means that reflective inquiry instructional technique is more effective in improving students' achievement in Electronic works trade regardless of gender or ability level. Consequently, it was recommended that The National Board for Technical Education (NBTE) should carry out a review of Electronic works trade curriculum for Technical Colleges with a view to incorporating the reflective inquiry instructional technique into the teaching of Electronic works trade.

Keywords: Reflective Inquiry Instructional Technique, Achievement, Ability level, Electronic Work Trade

1. Introduction

Technological development in the workplace and industries has necessitated a need to equip students of Electronic Works trade with workplace basic and thinking skills which will make them adaptable to the present and envisaged future changes. This need requires a radical change from instructional approaches that are teacher-centered which are based on behavioural learning theories to those that are students-centered, which are based on cognitive psychological learning theories for which reflective inquiry instructional technique is one (Ogwo 2005).

Inquiry according to Agboola and Oloyede (2007) is a term used in science and other related fields that refers to a way of questioning, seeking knowledge or information or finding out about phenomena. They also explained that it involves investigation, searching, and doing, formulating hypotheses, gathering and interpreting data and arriving at a conclusion. In inquiry situation, students learn not only concepts and principles but self-direction, responsibility and social communication. Bingman (2004) stressed further that the nature of inquiry is complex, and also that inquiry is a process which engages the skills, interest, and attitudes of the person in an interaction with the substantive and cognitive demands of a problem as he makes efforts to rationally cope with it. Probably this complexity of the nature of inquiry may account for the lack of teaching vocational subjects with inquiry technique in most Nigerian schools and colleges.

One of the leading proponents of the inquiry mode of instruction, according to Schifter (1996) indicates that knowledge won through inquiry is not knowledge merely of the fact but of the facts interpreted. The Author highlights that it is the conceptual principles of inquiry which renders scientific knowledge fragile and subject to change. He sees the scientific investigation as involving interaction of two distinct modes of inquiry which differ

in aim and method. These are stable and fluid inquiry. The stable inquiry is to accumulate what a doctrinal education teaches one to conceive as the whole of scientific knowledge, while fluid inquiry is the invention of new conceptions, testing them for adequacy and feasibility (Schifter, 1996). The use of inquiry according to Jolene and Debrise (1999) is to enable students to personally develop their own understanding by redistributing questions, designing and conducting investigations, analyzing them and communicating their findings. Reflective thinking which is mentally engaging in cognitive processes to understand conflicting factor, is a critical component of learning process in inquiry. This mental engagement results in a person actively constructing knowledge about a situation in order to develop strategies to proceed within that situation. Students must reflect on their previous understanding of the issue and their newly acquired knowledge in order to respond to an issue. Thus reflection helps students to develop higher-order thinking skills by prompting them to (a) relate new knowledge to their prior understanding (b) think in both abstract and concrete terms (c) apply specific approach to noble tasks and (d) understand their own thinking and learning strategies (Hemelo and Ferrari, 1997).

Reflective inquiry therefore, is a thinking process through which individuals examine their experiences to better understand the assumptions and implications of events and actions in their lives through a close examination for information or truth (Wallace, 1996). Boyd (1992) found that continuous “critical” inquiry is a common trait of schools that are successful in maintaining improvement efforts. Hord (1997) notes that reflective inquiry can not only force conversations (oral discussion) among students about what is important, but also help create a shared sense of purpose and collaborative work among students. Reflective inquiry allows learners to explore and manipulate variables and then obtain results from the various manipulations. For instance, the Electronic work trade students should be able to conduct an investigation and analysis using the necessary laboratory equipment and apparatus on operation, characteristics and limitation of thermionic diode and communicate their findings. The result of these manipulations according to Kintsch (1993) should provide feedback to their thinking, problem solving and learning processes in sciences and other related field. Szczurkwa (1997) therefore, suggests that greater stress should be placed on providing students with broad learning and problem solving skills in order to prepare them for a wide range of challenges posed by technological advancement.

Therefore, the development of work place thinking and problem solving skills in the students for 21st century workplace as suggested by UNESCO and ILO (2002) emphasized that there should be adjustment in the programmes of educational institutions. In the same vein, Ogwo & Oranu (2006) explained that the adjustment will affect the curricular implementation processes which are executed through learning experiences and content. They stressed further that these adjustments by the educational institutions would largely be pivoted on the instructional activities employed.

Despite the needs for adjustment, lecture method and demonstration method which are based on behavioural learning theories are still the main teaching/learning strategies employed for implementing the curriculum in the technical colleges. According to Oranu (2003) lecture and demonstration methods are content driven and certainly not learner-centered. Students are not given enough opportunities to participate in the class activities. These methods which are predominantly used in teaching Electronic works in the technical colleges are based on behavioural learning theories which according to Boyle, Duffy and Dunleavy (2003) emphasize knowledge transmission from the teacher to passive students and encourage rote memorization of facts. The consequence of the use of these strategies in teaching vocational subjects such as Electronic works trade in the technical colleges is that students are unable to retain their learning and apply it to new situation and my also account for poor performance of Electronic works trade students in both internal and external examination (Doolittle, and Camp, 2000).

Electronic Works trade is one of Electrical/Electronic trades offered in Nigerian technical colleges (Federal Republic of Nigeria, 2004). The programme for Electronic works trade in Nigerian technical colleges is designed to produce competent craftsmen in various Electronic work trades. According to National Board for Technical Education (NBTE 2001), a graduate of Electronic work trades is expected to completely diagnose and repair any faults on Radio, Television and Communication system to manufacturers’ specifications. These graduates may proceed to tertiary institutions for further studies in Technical Education. A National curriculum is adopted in all the technical colleges accredited by NBTE. The programmes in technical colleges are offered at levels leading to the award of National Technical Certificate (NTC) and Advanced National Technical Certificate (ANTC) for craftsmen and master craftsmen respectively (Federal Government of Nigeria (FGN), 2000).

Achievement connotes performance in a school subject as symbolized by a score or mark on an achievement test (Momoh Olle, 1997). It is affected by the degree of original learning, the method of learning and the learners’ memory capacity among other factors (Demmert, 2001). Students’ Achievement in vocational and technical

education according Epunnam, (1999) is defined as the learning outcomes of the student which include the knowledge, skills, and ideas acquired and retained through his course of studies within and outside the classroom situation. According to Ogwo (2004) functional technical and vocational education is defined relative to the objective of students' skill acquisition, securing and retention of employment at sub-professional level. Ogwo maintained that unless the training is conducted to the extent that these objectives are attained, the technical and vocational programme cannot be deemed to be effective. In technical and vocational education therefore, students' achievement could be defined as the learning outcomes of the students in terms of the level of vocational skills, knowledge and ideas acquired for gainful employment in a particular occupation. Therefore, achievement is defined in terms of the academic achievement and psychomotor skills acquired by students in Electronics works trade.

Hornby (2004) stated that ability is the power or capacity to do or act physically or mentally. That is, it provides the competence to carry out activities using one's skill, which enables him/her to perform effectively. Abilities have to do with what an individual has acquired from a specific study in a given instructional sequence. Ability level of learners is one personality characteristic that influence student academic achievement (Brookover, Thomas and Paterson 1965 cited in Nwoke 2005). According to Eze (1992), heterogeneity of this ability in the classroom is a common phenomenon. This study will try to ascertain whether various ability levels could relatively achieve higher improved performance due to the new instructional processes

Besides, gender has been identified as one of the factors influencing student's interest and achievement in vocational and technical education (Howden, 1998). The issue of gender has assumed prominence in technical and vocational education discourse. Gender is a sense of awareness of being male or female. It is a behavioural pattern and attitude perceived as masculine or feminine within a culture (Coleman, 2000). Howden (1998) remarked that disparities exist between male and female students performance in technical and vocational education. Hence, an attempt will be made to find out if reflective inquiry instructional technique will make a significant influence on academic achievement and interest level of boys and girls in Electronic works trade. This study is therefore designed to determine the effect of reflective inquiry instructional techniques on students' academic achievement and interest in Electronic works trade in the technical colleges.

1.1 Statement of the Problem

The Federal Ministry of Education (FGN, 2000) has observed that some of the factors responsible for the high failure rate of technical college students in the NABTEB examinations particularly in the main trades include poor quality of teaching staff and poor teaching in the Technical Colleges. Moreover, it has been discovered that the persistent poor academic achievement and low interest of students in Electronic works trade and other technical subjects is as a result of the inappropriate teaching methods (that do not incorporate proper techniques) adopted by teachers (Aina, 2000).

It has also been observed that the lecture method and project method which are teacher-centered are the main teaching methods employed by technical teachers for implementing the curriculum. Obviously, the adoption of only teacher-centered methods of teaching by the teacher results into ineffective use of varieties of instructional method and instructional facilities and inability of teachers to effectively implement the curriculum to naturally increase students' interest, involvement and commitment in learning. The shortcoming in this teacher-centered method of teaching could be responsible for poor performance of Electronic works trade students in public examinations (NABTEB 2002). Hence, the problem of this study is: can reflective inquiry instructional technique produce significant effect on the academic achievement and ability level of Electronic works trade students in technical colleges?

1.2 Purpose of the Study

The study sought to:

1. Determine the effect of reflective inquiry instructional techniques on students' academic achievement in Electronic works trade.
2. Determine the influence of gender on academic achievement of students studying Electronic works trade.
3. Determine the comparative mean achievement test scores of high level ability and low level ability students taught Electronic works trade with reflective inquiry instructional techniques.

1.3 Research Questions

The following research questions were formulated to guide this study;

1. What is the effect of reflective inquiry instructional technique on students' mean achievement scores in

- Electronic works trade?
2. What is the influence of gender on students mean achievement scores in Electronic works trade?
 3. What are the comparative mean achievement test scores of high level ability and low level ability students taught Electronic works trade with reflective inquiry instructional techniques?
 4. What is the interaction effect of gender and ability of students taught Electronic works trade with reflective inquiry instructional technique on academic achievement?

1.4 Hypotheses

The following null hypotheses which were tested at .05 level of significance guided this study:

- HO₁: There is no significant difference in the mean achievement scores of students taught Electronic work trade with reflective inquiry instructional techniques and those taught with conventional method.
- HO₂: There is no significant difference between the effect of gender (male and female) on students achievement in Electronic work trade.
- HO₃: There is no significant interaction effect of treatments given to students and their gender with respect to their mean scores on the Electronic work trade Achievement test.
- HO₄: There is no significant mean difference in the achievement scores of high level ability students and low level ability students taught Electronic works trade with reflective inquiry instructional technique.
- HO₅: There is no significant interaction effect of gender and ability level of students taught Electronic works trade with reflective inquiry instructional technique on achievement test.

2. METHODOLOGY

2.1 Design of the Study

The design of the study was quasi-experimental research design. The research makes use of pre-test, post-test non-equivalent control group design. Quasi-experiment is an experiment where randomization of subject of experimental and control groups is not possible (Nworgu, 2006). The researcher randomly assigned intact classes to treatment and control groups. This was necessary in order not to disrupt the normal classes of the students and the school time-table.

The design of the study is as follows

$$\begin{array}{l} E_G, O_1 \times O_1 \\ C_G O_1 - O_1 \end{array}$$

Where E_G stands for experiment group

C_G stands for control group

O₁ stand for pre-test/post-test observation

X stand for the treatments using students participated instructional materials production Technique

- stand for the use of the Conventional method

The independent variables consisted of conventional method and reflective inquiry instructional technique, while the dependent variables were the posttest tests.

2.2 Population of the Study:

The population of this study comprises 105(76 boys and 29 girls) year II students of Electronic works trade in all the technical colleges that offered Electronic works trade in Lagos state. The entire population was used for the study.

2.3 Instrument for Data Collection:

The instrument for data collection was Electronic works achievement test (EWAT). The EWAT which was used to test the achievement of students in Electronic works was developed by the researcher. The pretest and posttest items were developed based on CRT 12 (Electronic Devices and Circuits) module. It consists of 30 – multiple choice items with five options. The construction of the test blue print was based on NBTE Electronic works trade curriculum and course specifications 2008. The EWAT items were subjected to face and content validation by Electronic works lecturers and measurement and evaluation experts at University of Nigeria, Nsukka. It entailed checking the EWAT items against the topic and content of the lesson plan.

The pilot tryout of EWAT to determine their reliability coefficient was conducted at two weeks interval in Federal Science and Technical College Ijebu-Mushin, Ogun State. The reliability coefficient of the EWAT was found to be .83 using Pearson Product Moment Correlation Coefficient formular. The psychometric test analysis of EWAT was carried out to determine the Difficulty and Discrimination Index of each item in the test. An item is good if it has Difficulty Index ranging from 20 to 80; Discrimination of 0.20 and above and its entire distractor index a negative decimal (Okoro, 1999). Therefore, a total of the 30 items of the EWAT had good difficulty, discrimination and distractor indices.

2.4 Lesson Plan

The researcher prepared two (2) sets of lesson plans for the teaching of the module set out for the study. These lesson plans were prepared from the units in the test blue print. Each set contains ten (10) lesson plans that lasted for a period of ten weeks and 90minutes duration. One set of the lesson plan was written based on reflective instructional strategies, the subject teacher in the experimental group applied this lesson plan at different stages of instructional process, while the second set was prepared based on conventional approach in teaching Electronic works trade

2.5 Experimental Procedure

One week intensive training programme was organized for the teachers that were involved in the study. The conduct of the study took place during the normal school lesson periods. On the first day, before the lesson commences, EWAT was administered as pretest to both the experimental and control groups after which proper teaching commenced by using the prepared lesson plans. The experimental group was taught with reflective inquiry lesson plans while the control group was taught with the conventional lesson plans. Each lesson lasted for 90 minutes and the treatment lasted for 10 weeks. At the end of the treatment, the EWAT was administered on both groups as posttest. The scores obtained from both groups were compared to determine if there is any significant difference in the performance of the two groups. The population was stratified into high and low ability level using the average of end of session results from various schools and the result of EWAT pre- test Achievement test developed by the researcher, based on CEI11(Basic Electricity) which is a prerequisite to CRT12 in Technical college. Those students that scored average of 50% and above were classified as high ability students, while those that score less than 50% were classified as low ability level students. Simple random sampling was used in determining the two schools, that were given the treatment and the two schools that served as control groups.

2.6 Data Analysis

Data collected were analyzed using the appropriate descriptive and inferential statistics of the statistical Package for the Social Sciences (SPSS) Programme. In testing for the possible post-experimental difference in achievement and interest between males and females, the Analysis of Covariance (ANCOVA) was used and the hypotheses were tested at 0.05 level of significance.

3. Results

3.1 Research Question 1

What is the effect of reflective inquiry instructional techniques on student's academic achievement in Electronic Works?

Table 1

Mean of Pretest and Posttest Scores of Experimental and Control Groups in the Academic Achievement Test

Group	N	Pretest	Posttest	Mean Gain
		\bar{X}	\bar{X}	
Experimental	43	4.41	24.88	20.47
Control	62	4.27	18.75	14.48

Data presented in Table 1 show that the experimental group had a mean score of 4.41 in the pretest and a mean score of 24.88 in the posttest making a pretest, posttest mean gain in experimental group to be 20.47. The control group had a mean score of 4.27 in the pretest and a posttest mean of 18.75 with a pretest, posttest mean gain of 14.48. With this result, the students in the experimental group performed better in the achievement test than the students in the control group. Hence, reflective inquiry instructional techniques is effective than the conventional teaching method on students achievement in Electronic works trade

3.2 Research Question 2

What is the effect of gender on academic achievement of students studying Electronic work trade?

Table 2
Mean of Pretest and Posttest of Male and Female Students Taught Electronic work trade in the Achievement Test

Gender	Reflective Inquiry Techniques				Conventional Method			
	N	Pretest	Posttest	Mean Gain \bar{X}	N	Pretest	Posttest	Mean Gain \bar{X}
Male	32	4.37	25.03	20.66	44	4.25	19.22	14.97
Female	11	4.54	24.45	19.91	18	4.33	17.61	13.28

The data presented in Table 2 show that male students taught Electronic work trade with reflective inquiry technique had a mean score of 4.37 in the pretest and a mean score of 25.03 in the posttest making a pretest, posttest mean gain in the male students taught with reflective inquiry techniques to be 20.66. Meanwhile, female students taught Electronic work trade with reflective inquiry technique had a mean score of 4.54 in the pretest and a posttest mean of 24.45 with a pretest, posttest mean gain of 19.91. Also, male students taught with conventional method had a mean score of 4.25 in the pretest and a mean score of 19.22 in the posttest making a pretest, posttest mean gain in the male students taught with conventional method to be 14.97. Meanwhile, female students taught Electronic work trade with conventional method had a mean score of 4.33 in the pretest and a posttest mean of 17.61 with a pretest, posttest mean gain of 13.28. With these results male students taught Electronic work trade had higher mean scores than female students in the Achievement Test. Thus, there is an effect attributable to gender on the achievement of students taught Electronic work trade.

3.3 Research Question 3

What are the comparative mean achievement test scores of high level ability students and low level ability students taught Electronic works trade with reflective inquiry instructional techniques?

Table 3
Mean of Pretest and Posttest Scores of High Level Ability Students and Low Level Ability Students Taught Electronic works trade with the Reflective Instructional Techniques in the achievement test

Ability Level	N	Pretest		Posttest		Mean Gain
		\bar{X}		\bar{X}		
High Ability	18	4.72		25.50		20.78
Low Ability	25	4.20		24.44		20.24

The data presented in Table 3 shows that high level ability students had a mean score of 4.72 in the pretest and mean score of 25.50 in the posttest making a pretest, posttest gain of 20.78, while the low level ability had a mean score of 4.20 in the pretest and a mean score of 24.44 in the posttest making a pretest, posttest gain of 20.24. With this result, high level ability students taught Electronic works trade with the Reflective instructional techniques performed better than low level ability students taught with the same Reflective instructional techniques in the achievement test.

3.4 Research Question 4

What is the interaction effect of gender and ability level of students taught Electronic works trade with reflective inquiry instructional techniques on academic achievement?

Table 4
Mean of Pretest and Posttest of Male and Female Students Taught Electronic works trade according to Ability Level in the Achievement Test

Gender	High Ability				Low Ability			
	N	Pretest	Posttest	Mean Gain \bar{X}	N	Pretest	Posttest	Mean Gain \bar{X}
Male	14	4.71	25.78	21.07	18	4.11	24.44	20.33
Female	4	4.75	24.50	19.75	7	4.42	24.42	20.00

The data presented in Table 4 show that male students in the high ability group taught Electronic works trade with reflective inquiry technique had a pretest, posttest mean gain of 21.07. Male students in the low ability group taught Electronic works trade with reflective inquiry technique had a pretest, posttest mean gain of 20.33. Female students in the high ability group taught Electronic works trade with reflective inquiry technique had a pretest, posttest mean gain of 19.75, while, female students in the low ability group taught Electronic works trade with reflective inquiry technique had a pretest, posttest mean gain of 20.00. With these results, the reflective

inquiry instructional technique is more effective for male students in the high ability group and female in the low ability group. Hence, there is combination of gender and ability level to produce greater achievement gains. This implies that the effectiveness of reflective inquiry instructional technique on achievement of students in Electronic works trade depends on gender and the ability level of the students. Thus, there is an interaction effect of ability and gender on the achievement scores of students taught Electronic works trade with reflective inquiry instructional techniques.

3.5 Hypotheses

- HO₁: There is no significant difference in the mean achievement scores of students taught Electronic work trade with reflective inquiry instructional techniques and those taught with conventional method
- HO₂: There is no significant mean difference between the effect of gender (male and female) on students' achievement in Electronic work trade
- HO₃: There is no significant interaction effect of treatments given to students and their gender with respect to their mean scores on the Electronic work trade Achievement Test

Table 5

Summary of Analysis of Covariance (ANCOVA) for Test of Significance between the Mean Scores of Experimental and Control groups in the Achievement Test, Effects of Gender and Interaction Effect of Treatments given to Students and their gender with respect to their mean scores on the Electronic work trade Achievement Test

Source	Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	992.311 ^a	4	248.078	47.871	.000
Intercept	1706.006	1	1706.006	329.203	.000
Pretest	3.478	1	3.478	.671	.415
Group	783.680	1	783.680	151.225*	.000
Gender	25.059	1	25.059	4.835*	.030
Group * Gender	5.202	1	5.202	1.004	.319
Error	518.223	100	5.182		
Total	48999.000	105			
Corrected Total	1510.533	104			

*Significant at sig of F < .05

The data presented in Table 5 shows F-calculated values for mean scores of experimental and control groups in the achievement test, gender and interaction effect of treatments and gender on students' achievement in Electronic work trade. The F-calculated value for Group is 151.225 with a significance of F at .000 which is less than .05. The null-hypothesis is therefore rejected at .05 level of significance. With this result, there is a significant difference between the mean achievement scores of students taught Electronic work trade with reflective inquiry instructional techniques and those taught with conventional method. The F-calculated value for gender is 4.835 with a significance of F at .030 which is less than .05. This means that there is significant difference between the effects of Gender on students' achievement in Electronic work trade. Therefore, the null hypothesis of no significant difference between the effect of gender (male and female) on students' achievement in Electronic work trade is rejected at .05 level of significance. The interaction of treatments and gender has F-calculated value of 1.004 with significance of F of .319. Since .319 is higher than .05, the null hypothesis for interaction effect of treatment and gender is accepted. Hence, there is no significant interaction effect of treatments given to students and their gender with respect to their mean scores on the Electronic work trade Achievement Test.

- HO₄: There is no significant mean difference in the achievement scores of high level ability students and low level ability students taught Electronic works trade with reflective inquiry instructional techniques

Table 6

Summary of Analysis of Covariance (ANCOVA) for Test of Significance between the Mean achievements scores of High Ability students and Low Ability Students Taught Electronic works trade with Reflective Instructional techniques

Source	Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	26.683 ^a	2	13.342	8.373	.001
Intercept	631.774	1	631.774	396.499	.000
Pretest	14.925	1	14.925	9.367	.004
Ability Level	4.335	1	4.335	2.721	.107
Error	63.735	40	1.593		
Total	26716.000	43			
Corrected Total	90.419	42			

***Significant at sig of F < .05**

Table 6 shows that F-calculated value for ability level is 2.721 with a significance of F at .107 which is greater than .05. Hence, the null-hypothesis is therefore accepted at .05 level of significance. With this result there is no significant difference between the mean achievement scores of high level ability students and low level ability students taught Electronic works trade with reflective inquiry instructional techniques

HO₅: There is no significant interaction effect of gender and ability level of students taught Electronic works trade with reflective inquiry instructional techniques on academic achievement test

Table 7

Summary of Analysis of Covariance (ANCOVA) for Test of Significance interaction effect of gender and ability level of students taught Electronic works trade with reflective inquiry instructional techniques on academic achievement test

Source	Sum of Squares	Df	Mean Square	F	Sig.
Corrected Model	32.363 ^a	4	8.091	5.296	.002
Intercept	586.527	1	586.527	383.905	.000
Pretest	15.460	1	15.460	10.119	.003
Gender	4.690	1	4.690	3.070	.088
Ability Level	.925	1	.925	.606	.441
Gender * Ability Level	2.137	1	2.137	1.399	.244
Error	58.056	38	1.528		
Total	26716.000	43			
Corrected Total	90.419	42			

***Significant at sig of F < .05**

Table 7 shows that F-calculated value for interaction effect of Gender and Ability level stood at 1.399 with significance of F at .244 which is greater than 0.05. This result means that there is no significant interaction effect of gender and ability level of students taught Electronic works trade with reflective inquiry instructional techniques on academic achievement test

4. Discussion

The data presented in Table 1 provided answer to research question one, finding revealed that main effect of reflective inquiry instructional technique on students achievement in Electronic work trade is higher the main effect of conventional technique. At the same time, Analysis of covariance was used to test the first hypothesis, Table 3, at the calculated F-value (151.225), Significance of F (.000) and confidence level of .05 there was a statistically significant difference between the main effect of (reflective inquiry techniques and conventional method) on students achievement in Electronic work trade confirming that the difference between the main effect of reflective inquiry instructional technique and conventional method was statistically significant. The implication of this finding is that reflective inquiry instructional technique (thinking skills, concept mapping, scaffolding graphic organizers, question prompt tacit, interactive journals) is more effective than conventional method in enhancing students' achievement in Electronic work trade The findings that reflective inquiry instructional technique has positive effect on students achievement is similar to the finding of Hae-Deck, Tiffany & Barbara (2006) who in their study found out that the adoption of reflective inquiry instructional approach in the teaching could prompt reflective thinking and thereby improve students achievement and ability level. A

possible explanation for the effectiveness of the reflective inquiry instructional techniques is the students' active involvement in learning process using cooperative learning and interactive journal strategies through frequent verbalization in both extensive and intensive way, clarifying, probing, questioning and the 'eye to eye', 'knee-to-knee' communication posturing as the students interacts in groups with the journals.

In learning, providing opportunities to interact with course material through the use of interactive journals tends to change the course from teacher-centred approach to one that is more student-centred, and focused on the cognitive development and construction of knowledge in the students (Sund and Trawbridge, 1993). Hence, one means of constructing knowledge is to create meaning by doing and interacting. Creating support for knowledge construction within the students is a critical component to the success of developing self-motivated, intellectually stimulated learners. Paul (1986) argued that students can learn to think better if schools concentrate on teaching how to do so, through the use appropriate instructional techniques, which will promote intellectual growth and fosters academic achievement/performance gains in our rapid technological changing world.

The data presented in Table 2 provided answer to research question 3. Finding revealed that male students had a higher mean score in the Electronic work trade achievement test than female students. At the same time, Analysis of covariance was employed to test the second hypothesis, Table 3, at the calculated F- value (4.835), significance of F (.030) and confidence level of .05, there was a significant difference between the main effects of gender (male and female) on students' achievement in Electronic work trade which confirmed that the difference between the achievement of male and female students in Electronic work trade was statistically significant favouring boys. The obvious implication of this finding is that there was an effect attributable to gender on achievement of students in Electronic work trade. This finding is similar to findings of several other studies that had been conducted on gender effects on achievement of male and female students in sciences and other fields. For instances, one of the important discoveries emerging from studies involving the effect of inquiry based instructional approach on academic achievement was the revelation of gender differences favouring boys. This also affirms Maswan, (2006), Olagunju (2001) and Mba, (2002) that it has been documented that disparity exists between male and female students' performance in mathematics, sciences and other related fields, and in some cases boys had an edge over girls in academic achievement. Generally, boys were consistently found to perform better than girls on vocational and technical achievement tests suggesting that boys generally possess greater vocational and technical skills than girls. Male advantages in vocational and technical skills have been established in studies by Becker and Maunsaiyat (2004), where the trends of gender differences were found to be stable and consistent. Thus, in studies where differences in achievement were evident males typically had stronger vocational and technical skills than girls. The identified gender effect on achievement in Electronic work trade was responsible for the significant gender effect found on students' achievement in Electronic work trade. Thus, the superiority of male in vocational skills had responsible for their improved achievement in Electronic work trade. However, Analysis of covariance was used to test hypothesis three, Table 3. At the calculated F-value (1.004), significance of F (.319) and confidence level of .05, there was no interaction effect of treatment given to students and their gender with respect to their mean scores on Electronic work trade Achievement test.

The data presented in Table 3 provided answer to research question 3. Findings revealed that students with high level ability had a higher mean score than students with low level ability in the achievement test. In the same, Analysis of covariance was employed to test the seventh hypothesis, Table 6, at the calculated F- value (2.721), significance of F (.107) and confidence level of .05; there was a significant mean difference in the achievement scores of high level ability students and low level ability students. This finding compared favourably with the findings of a research conducted in Los Angel, United State of America by Mac Iver (1988). Mac Iver (1988) based on stratification of pupils ability conducted a study on pupils who enrolled in Junior High school mathematics, using multiple regression analysis, found out that ability group types were significantly associated with task structure, grade dispersion and talent dispersion.

The data presented in Table 4 also provided answer to research question 4. Findings revealed that there was interaction of ability and gender on students' achievement in Electronic works trade using reflective inquiry instructional technique. The interaction between ability and gender is illustrated graphically in Figure 2. In the same vein, Analysis of covariance was used to test the eighth hypothesis Table 7, at the calculated F-value (1.399), significance of F (.244) and confidence interval of 0.05 there was interaction effects of students' gender and their ability with respect to their mean scores on Electronic works trade achievement test. These results showed that there were no differential effects of ability level over levels of gender (male and female), which implies that reflective inquiry instructional technique is more effective in improving students' achievement in Electronic works trade regardless of Gender or Ability levels.

5. Conclusions

This study set out to determine effect of reflective inquiry instructional technique on technical college students' achievement and ability level in Electronic works trade. In the conduct of the study, the study took into consideration Gender (Male and Female) as a moderator variable which can influence the dependent variables. The study found out that reflective inquiry technique is more effective in improving students' achievement, ability Electronics works trade than conventional technique. In addition, given due consideration to gender in the teaching of Electronics works trade, the study found out no significant interaction effects of reflective inquiry technique and gender on achievement and ability level of Electronics works trade students in Technical Colleges. This simply means that even though, gender has effects on students' achievement and ability level in Electronics works trade as revealed by this study, a combination of treatments and levels of Gender does not interact to produce greater gain as shown in reflective inquiry instructional technique. Put succinctly, irrespective of nature of sex learners will record improved performance in their ability level and achievement in Electronics works trade when reflective inquiry instructional technique is employed for teaching the trade subject. These results therefore showed that reflective inquiry instructional technique is a viable alternative to the traditional teaching method for Electronic works trade. It is hoped that if reflective inquiry instructional technique is taken into consideration in the teaching of Electronics works trade to technical college students, the technicians trained will graduate with necessary skills needed for work in the present world of work and also improve their performance in both public and external examinations.

6. Recommendations

Based on the findings of this study, the subsequent discussion, and their implications, the following recommendations are made:

1. Technical College teachers should adopt the use of the reflective inquiry instructional technique to the teaching of Electronic work trade.
2. National Board for Technical Education (NBTE) should consider review of curriculum for Electronic work trade with a view to incorporating reflective inquiry instructional technique into the teaching of Electronic work trade
3. Workshops, seminars and conferences should be organized by Ministry of Education and administrators of Technical Colleges to enlighten technical teachers and improve their knowledge and skills on the use of reflective inquiry instructional techniques for improving students' achievement and ability level in Electronic work trade.

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