Effects of Kumo Teaching Strategy on Students' Achievement in Electrical/Electronics in Technical Colleges in Niger State
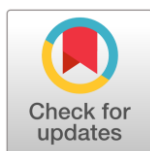
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Abstract: The study investigated the effects of kumon teaching strategy methods on students' achievement in electrical/electronic in technical colleges in Niger State. The study adopted a pretest-posttest quasi-experimental design with non-equivalent control group. The sample for the study consisted of 122 technical college III electrical/electronic students. Purposive sampling was used to select four schools in Minna education zone. The instrument used for the study is the Electrical/Electronic Achievement Test (EAT) designed by the researcher. Section A of the instrument contained 20 multiple-choice items, section B contained 2 essay questions all for the measurement of students' achievement in electrical/electronic. Four research questions and four hypotheses were formulated to guide the study. The hypotheses were tested at 0.05 level of significance. The data collected were analyzed using mean and standard deviation and ANCOVA statistical tools. The results showed that ability level of students significantly influence achievement in electrical/electronic. The high ability students outperformed their medium and low ability students. Gender was not a significant factor. The interaction effect of gender and method was not statistically significant. There was a significant difference in the mean achievement scores of students taught electrical/electronic using problem-solving and those taught using discussion teaching methods. Finally it was recommended that teachers of electrical/electronic should adopt the use of kumon teaching strategy. This will go a long way in improving problem-solving skills of students no matter their ability level.

Keywords: Kumon, Teaching, Technical Schools, Students, Electrical/Electronics.

Introduction

Technical College student low achievement in some core subjects and has been largely attributed to inefficient and ineffective way the subject is taught (Musa, 2012). The teaching of electrical/electronic at the technical college level is handled using the traditional method only, as pointed out by Olaitan, (2014). Odili, (2013), expressed that several instructors like the conventional age-long approach of delivering instruction and do not often adopt new approach to teaching and learning as revealed by researchers in educational field.

Educational scholars like Akubilo (2014) as well as Ibe (2017), in separate studies revealed that, even though several knowledge acquisition pattern and propositions exist several instructors disseminate knowledge via the utilization of conventional orthodox approach irrespective of whether learners assimilate or not. The conventional orthodox approach are non practical-based and teacher centered, rather than being task-focused as well as student-focused. In conventional orthodox approach the instructor or tutor is the major partaker while the students pay attention and observe for the purpose of recalling afterwards. In this approach, Ameh, Daniel and Akus (2012) revealed that, the instructor performs most of what learners are anticipated to carry out after the instructional process by describing to tutees the way carrying out a task sequentially.

As indicated by Carribbean (2011), electrical and electronics innovation is a field of study that gives both hypothetical and hands-on information on flow electrical and electronics gadgets and circuits. Consequently, electrical and electronics innovation (EET) education schedule is intended to give the basic essential information and the scientific, viable and exploratory skills fundamental for a long lasting vocation in the field of electrical and electronics innovation. It additionally gives understudies central information and skills for the working environment and expert instructional method skills in electrical and electronics field.

In the interim, for successful teaching and learning of electrical and electronics innovation education, instructional materials and offices are fundamental. Instructional materials and offices on their own assistance to encourage teaching and learning and are utilized to impact concrete and lasting change in technical conduct

Kumon is a method which develops computational skills and enables students to work within prescribed time and in more complex situation. It enables the students to make rich connections among different concepts of electrical/electronic. By doing such activities, without any conscious thought, students can perform basic functions and fundamentals of electrical/electronic.

Kumon method is time-framed method of learning with emphasis on building ability of independent learning among students. Kumon lectures or lessons are planed according to needs of every student, which encourages each student to get more and more.

Gender is one of the elements that may influence students accomplishment in electrical/electronic. Gender is characterized by Bassow (2011) as a mental term portraying conduct and qualities expected of people based on being brought into the world either a male or a female. Keller (2013) composing on the embrassive idea of gender saw that, it is a social build created by society to recognize the jobs, practices, mental and passionate qualities among male and female. Embankment and Abimbola (2010) stated that gender is evident from birth and kids are mingled ahead of schedule into suitable sex-composed occupations. Subsequently gender differential valuation of male and female has been seen as an indispensable piece of the socialization procedure and the improvement of the grown-up male and female characters.

Students' accomplishment indicates scholastic execution in school subject as represented by a score or imprint on an accomplishment test. As indicated by Anene (2015), students scholastic accomplishment is evaluated by a proportion of the students scholarly remaining corresponding to those of different understudies of his age. Atherson (2003) fought that students accomplishment in teaching and learning is dictated by a few variables among which are educators' disposition and excitement, instructional techniques, learning condition just as students demeanor and foundation. Instructors with

great teaching strategies challenge understudies to verbalize their insight and thinking (verbalization) at higher scholarly level. Thus, this study seeks to investigate the effects of kumon teaching strategy in technical colleges.

Statement of the Problem

The longing for quality and powerful guidance conveyance has been a long standing goal of technical education. The rising worry for the poor accomplishment of understudies in school science and its resultant outcome on the creation and advancement of future researcher, architects and innovations had prompted the quest for instructional techniques that advance compelling and improved science learning. Thus, science guidance has become a focal point of examination for at least two decades. Science information is huge; its extension in each control is on the expansion. Technical instructors have come to understand that attempting to show electrical/electronic as a rundown of realities to be remembered as opposed to comprehended is a useless exercise.

It was seen that there is a lack of observational concentrating on instructional techniques that can improve teaching and learning of electrical/electronic. Scholastic accomplishment of understudies in electrical/electronic has been constantly low, electrical/electronic comprehensive NABTEB Examiners' reports demonstrate that understudies are not well arranged towards the ideas of electrical/electronic. The report identified drawing of poor electrical/electronic diagrams, poor understanding of electrical/electronic concepts and poor performance on questions related to technical education as candidate's weakness in electrical/electronic, invariably leading to their poor achievement in the subject. The need to redress this alarming

academic problem necessitated exploring the effect of kumon teaching strategy on students' achievement across ability level in electrical/electronic.

Purpose of the Study

1. Effects of kumon teaching strategy methods on achievement of students in electrical/electronic.
2. Effects of kumon teaching strategy methods on achievement of students in electrical/electronic across ability levels, and
3. The influence of gender on students' achievement in electrical/electronic when taught using kumon teaching strategy.
4. The interaction effect of gender and teaching method on achievement of student in electrical/electronic.

Research Questions

1. Is there a difference in the mean achievement scores of students taught electrical/electronic using kumon teaching strategy and those taught using traditional method.
2. Is there a difference in the mean achievement scores of students taught electrical/electronic using kumon teaching strategy and those taught using traditional method across ability levels.
3. Is there a difference in the mean achievement scores of male and female students of different ability levels taught electrical/electronic using kumon teaching strategy and those taught using traditional method.
4. Is there interaction effect of gender and teaching methods on students achievement in electrical/electronic.

Hypotheses

The following hypotheses were tested at 0.05 level of significance.

Ho₁: There is no statistically significant difference in the mean achievement scores of students taught electrical/electronic using kumon teaching strategy and those taught using traditional method.

Ho₂: There is no statistically significant difference in the mean achievement scores of students taught electrical/electronic using problem solving instruction and those taught using discussion method across ability levels.

Ho₃: There is no statistically significance difference in the mean achievement scores of male and female students taught electrical/electronic using problem solving and discussion teaching methods

Ho₄: There is no statistically significant interaction of gender and teaching methods on students achievement in electrical/electronic.

Methodology

The design of the study is quasi experimental group design. The study was carried out in Niger state Technical Colleges. The population of the study consists of all the 689 Technical colleges (TC II) electrical/electronic students in the state owned technical colleges in Niger State. A total of about 122 Technical Colleges (TC II) electrical/electronic students consisting of (71) male and (52) female students constituted the sample for the study. TC II students were used because contents scope electrical/electronic is in TC III curriculum. One instrument was used for data collection: The Electrical/electronic Achievement Test (EAT) while the students' annual electrical/electronic achievement was obtained from the school management and will be used to classify the students into low, medium, and higher ability levels. The

research instruments electrical/electronic achievement test (EAT) was validated by two experts in department of Industrial and Technology Education, Federal University of Technology, Minna. The instruments was subjected to trial testing. It was administered on (20) TC II students of Government Technical College, Lafiagi Kwara State and Government Technical College, Ilorin, Kwara State. The choice of these schools is made on the assumption that it is comparable in terms of staff strength, population and administrative competence to the ones that are selected for the final study. The trial testing enabled the researcher to determine the clarity of wordings, readability of the items as well as determine time for the test. The students were allowed enough time to finish the EAT test. The average time taken by the first, middle and last subjects to complete the test 50 minutes was taken as the actual time for the test. The data obtained from the response of this subject in this test was used to calculate the reliability of the instrument, the reliability of the EAT test. The reliability of the objective items was established at 0.85 cronback α (KR20) and the interrater consistency of the essay items was 0.87 (using Kendell). The instrument was administered directly to respondents. The researcher made arrangements with some class teachers and the research assistants before the post-test was conducted at the end of the forth week. The same EAT used for the pretesting was administered to the subjects as the post-test. The same procedure and conditions used while conducting the pre-test was adopted. The research assistants marked and scored the scripts using the marking guide. The scores were collected and organized for data analysis.

Mean scores and standard deviations scores was used to analyze the data to provide answers for the research questions. The hypotheses will be tested at 0.05 level of significance using analysis of covariance (ANCOVA).

Results

Research Question 1:

What are the mean achievement scores of students taught electrical/electronic using kumon teaching strategy and those taught using conventional method?

Results in Table 1 show that the group taught electrical/electronic using kumon teaching strategy had a pretest mean of 9.16 with a standard deviation of 4.29 and a posttest mean of 17.80 with a standard deviation of 7.05. The difference between the pretest and posttest mean was 8.64. The group taught electrical/electronic using conventional method had a pretest means of 8.66 with a standard deviation of 2.06 and a posttest mean of 15.04 with a standard deviation of 2.53. The difference between the pretest and posttest means was 6.38. However, for each of the groups, the posttest means were greater than the pretest means with the group taught using kumon teaching strategy having a higher mean gain. This is an indication that kumon teaching strategies have more effect on students' achievement in electrical/electronic than the conventional method.

Research Question 2:

What are the mean achievement scores of students taught electrical/electronic using kumon teaching strategy and those taught using conventional method across ability levels?

Results in Table 2 show the effect of students' ability level on their achievement. Result shows that the high ability students under kumon teaching strategy had a pretest mean of 13.13 with a standard deviation of 4.18 and a posttest mean of 25.13 with a standard deviation of 4.39. The difference between the pretest and posttest means was 12.00. The medium ability students under kumon teaching strategy had a pretest mean of 7.85 with a standard deviation of 2.86 and a posttest mean of 15.96 with a standard deviation of 5.16. The difference between the pretest and posttest means was 8.11. The low ability students under kumon teaching strategy had a pretest mean of 6.21 with a standard deviation of 2.12 and a posttest mean of 11.53 with a standard deviation of 3.22. The difference between the pretest and posttest means for the low ability students was 5.32. Result also shows that the high ability students under conventional method had a pretest mean of 9.08 with a standard deviation of 1.61 and a posttest mean of 17.15 with a standard deviation of 2.79. The difference between the pretest and posttest means was 8.07. The medium ability students under conventional method had a pretest mean of

9.35 with a standard deviation of 1.92 and a posttest mean of 14.65 with a standard deviation of 2.01. The difference between the pretest and posttest mean was 5.30.The low ability students under conventional method had a pretest mean of 7.41 with a standard deviation of 2.06 and a posttest mean of 13.94 with a standard deviation of 2.07. The difference between the pretest and posttest means was 6.53.However, for each of the groups, the posttest means were greater than the pretest means with the high ability students having a higher mean gain followed by the average ability students and lastly the low ability students. This is an indication that students' ability level have effects on their achievement in electrical/electronic.

Table 1. Mean and Standard deviation of pretest and posttest scores of students taught electrical/electronic using kumon teaching strategy and those taught using conventional methods

Variable	Pre test			Post test		
Methods of Teaching	**N**	**$\bar{x}$**	**SD**	**$\bar{x}$**	**SD**	**Mean gain**

Kumon Teaching Strategy (E₁)	69	9.16	4.29	17.80	7.05	8.64
Conventional Method (E₂)	53	8.66	2.06	15.04	2.53	6.38

Table 2. Mean and Standard deviation of pretest and posttest scores of students taught electrical/electronic using kumon teaching strategy and those taught using conventional method across ability levels

Variable				Pretest		Posttest		
Methods of Teaching		Ability Level	N	$\bar{x}$	SD	$\bar{x}$	SD	Mean gain
Kumon Teaching Strategy		High Ability Average Ability	23	13.13	4.18	25.13	4.39	12.00
			27	7.85	2.86	15.96	5.16	8.11
		Low Ability	19	6.21	2.12	11.53	3.22	5.32
Conventional		High Ability Average Ability	13	9.08	1.61	17.15	2.79	8.07
			23	9.35	1.92	14.65	2.01	5.30
		Low Ability	17	7.41	2.06	13.94	2.07	6.53

Table 3. Mean and Standard deviation of pretest and posttest scores of male and female students taught electrical/electronic using Kumon teaching strategy

Variable		Pretest		Posttest		
Gender	N	X	SD	X	SD	Mean gain
Male	71	9.58	2.97	17.54	5.99	7.23
Female	51	8.06	3.98	15.29	5.06	

Table 4. Mean and Standard deviation of pretest and posttest scores of the interaction effect of methods and gender on students' achievement in electrical/electronic

Variable			Pretest		Posttest		
Teaching Methods	Gender	N	X	SD	X	SD	Men gain
Kumon Teaching Strategy	Male	39	9.82	3.72	19.08	7.57	9.26
	Female	30	8.30	4.87	16.13	6.02	7.83
Conventional Method	Male	32	9.28	1.71	15.66	1.99	6.38
	Female	21	7.71	2.22	14.10	2.99	6.39

Research Question 3:

What are the mean achievement scores of male and female students taught electrical/electronic using kumon teaching strategy?

Result in Table 3 shows the influence of gender on students' achievement in electrical/electronic when taught using kumon teaching strategy. Result shows that the female students had a pretest mean of 8.06 with a standard deviation of 3.98 and a posttest mean of 15.29 with a standard deviation of 5.06. The difference between the pretest and posttest mean for the male students was 7.23. The male students had a pretest mean of 9.58 with a standard deviation of 2.97 and a posttest mean of 17.54 with a standard deviation of 5.99. The difference between the pretest and posttest mean was 7.96. However, for each of the groups (i.e. male and female), the posttest means were greater than the pretest means with the male students having a higher mean gain. This is an indication that gender may have some effects on students' achievement in electrical/electronic.

Research Question 4:

What is the interaction effect of methods and gender on students' achievement in electrical/electronic?

Results in table 4 show the interaction effect of methods and gender on students' achievement in electrical/electronic. Result showed that the female students taught electrical/electronic using kumon teaching strategy had a pretest mean of 8.30 with a standard deviation of 4.87 and a posttest mean of 16.13 with a standard deviation of 6.02. The difference between the pretest and posttest means for the female group kumon teaching strategy was 7.83. The male students taught electrical/electronic using kumon teaching strategy had a pretest mean of 9.82 with a standard deviation of 3.72 and a posttest mean of 19.08 with a standard deviation of 3.57.

The difference between the pretest and posttest means for female group was 9.26. Result in table 4 also shows that the female students taught electrical/electronic using conventional method had a pretest mean of 7.71 with a standard deviation of 2.22 and a posttest mean of 14.10 with a standard deviation of 2.99. The difference between the pretest and posttest means for the female group was 6.39. The female students taught electrical/electronic using conventional method had a pretest mean of 9.28 with a standard deviation of 1.71 and a posttest mean of 15.66 with a standard deviation of 1.99. The difference between the pretest and posttest mean for male group was 6.38. However, for each of the groups, the posttest means were greater than the pretest means. This is an indication that the interaction between method and gender appears not to have some effect on students' achievement in electrical/electronic. This is because the achievement of male and female students appear to be the same.

Table 5. Analysis of Covariance (ANCOVA) of the significant difference in the mean achievement scores of students taught electrical/electronic using kumon teaching strategy and those taught using conventional method

Source	Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	2140.882[a]	4	535.221	34.781	.000
Intercept	660.192	1	660.192	42.902	.000

PRETEST	1734.827	1	1734.827	112.736	.000
GROUP	127.607	1	127.607	8.292	.005
GENDER	7.932	1	7.932	.515	.474
GROUP * GENDER	14.923	1	14.923	.970	.327
Error	1800.438	117	15.388		
Total	37553.000	122			
Corrected Total	3941.320	121			

Table 6. Analysis of Covariance (ANCOVA) of the significant difference in the mean achievement scores of students taught electrical/electronic using kumon teaching strategy and those taught using conventional method across ability levels

Source	Sum of Squares	Df	Mean Square	F	Sig.
Corrected Model	2740.210[a]	6	456.702	43.727	.000
Intercept	1152.834	1	1152.834	110.378	.000
Pretest	355.050	1	355.050	33.994	.000
Group	114.492	1	114.492	10.962	.001
Ability Level	443.065	2	221.532	21.211	.000
Group * Ability Level	193.206	2	96.603	9.249	.000
Error	1201.110	115	10.444		
Total	37553.000	122			
Corrected Total	3941.320	121			

Hypothesis 1

There is no statistically significant difference in the mean achievement scores of students taught electrical/electronic using kumon teaching strategy and those taught using conventional method.

The result in Table 5 shows that the significant difference in the mean achievement scores of students taught electrical/electronic using kumon teaching strategy and those taught using conventional method. Result shows that with respect to the groups taught electrical/electronic using kumon teaching strategy and those taught using conventional method, an F-ratio of 8.29 was obtained with associated probability value of .005. Since the associated probability value of 0.01 was less than 0.05 set as level of significance, the null hypothesis (H_{01}) which stated that there is no significant difference in the mean achievement scores of students taught electrical/electronic using kumon teaching strategy and those taught using conventional method is rejected. Thus, inference drawn therefore is that there was a significant difference in the mean achievement scores of students taught electrical/electronic using kumon teaching strategy and those taught using conventional method with those taught using kumon teaching strategy having a higher mean gain. This shows that kumon teaching strategy has more effect on students' achievement in electrical/electronic than the conventional method.

Hypothesis 2

There is no statistically significant difference in the mean achievement scores of students taught electrical/electronic using kumon teaching strategy and those taught using conventional method across ability levels

The result in Table 6 shows that the significant difference in the mean achievement scores of students taught electrical/electronic using kumon teaching strategy and those taught using conventional method across ability levels. Result shows that with respect to the groups taught electrical/electronic using kumon teaching strategy and those taught using conventional method across ability levels, an F-ratio of 21.211was obtained with exact associated probability value of 0.00. Since the associated probability value of 0.00 was less than 0.05 set as level of significance, the null hypothesis (H_{02}) which stated that there is no significant difference in the mean achievement scores of students taught electrical/electronic using kumon teaching strategy and those taught using conventional method across ability levels is rejected. Thus, inference drawn therefore is that there was a significant difference in the mean achievement scores of students taught electrical/electronic using kumon teaching strategy and those taught using conventional method across ability levels with the high ability level students having a higher mean gain. This shows that students' ability level has effects on their achievement in electrical/electronic.

Hypothesis 3

There is no statistically significance difference in the mean achievement scores of male and female students taught electrical/electronic using problem solving and conventional teaching methods

The result in Table 5 shows that with respect to the mean scores of male and female students taught electrical/electronic using

kumon teaching strategy, an F-ratio of 0.515was obtained with associated probability value of 0.47. Since the associated probability value of 0.47 was greater than 0.05 set as level of significance, the null hypothesis (H_{03}) which stated that there is no statistically significant difference in the mean achievement scores of male and female students in electrical/electronic is not rejected. Thus, inference drawn therefore is that the mean scores of male and female students did not differ significantly when taught electrical/electronic using kumon teaching strategy. This means that gender is not a significant factor in determining students' achievement in electrical/electronic.

Hypothesis 4

There is no statistically significant interaction effect of methods and gender on students' achievement in electrical/electronic.

Result in table 5 shows that an F-ratio of 0.970 with associated probability value of 0.33 was obtained for interaction between methods and gender on students' achievement in electrical/electronic. Since the associated probability value of 0.33 was greater than 0.05 set as level of significance, the null hypothesis (H_{04}) which stated that there is no statistically significant interaction effect of methods and gender on students'' achievement in electrical/electronic was not rejected. Thus, inference drawn is that there was no significant interaction effect of methods and gender on posttest mean achievement of students in electrical/electronic.

Discussion of Results

The findings from Table 1 showed that students taught electrical/electronic with kumon teaching strategy recorded a posttest mean score of 17.80 with a standard deviation of 7.05. The posttest mean score for students taught electrical/electronic with conventional method was 15.04 with standard deviation of

2.53. This shows that kumon teaching strategy enhance achievement better than conventional method.

Following the statistical analyses in table 5, it was found that the difference in mean achievement scores for post-test was significant at 0.05 probability level. F-ratio of 8.29 was obtained with associated probability value of 0.01. Since the associated probability value 0.01 was less than 0.05 set as level of significance, we reject the null hypotheses $(H0_1)$ which stated that there is no significant difference between the mean achievement scores of students taught electrical/electronic using kumon teaching strategy and those taught using conventional method.

Thus, there is a statistically significant difference in the mean achievement scores of students taught electrical/electronic using kumon teaching strategy and those taught using conventional method.

These findings are similar to those of Festus and Ekpete (2012) who conducted a study on the influence of problem-solving techniques on students' performance and attitude towards chemistry. The result of the study showed that the calculated mean score of the experimental group (56.2) was higher than those of the control group (51.9). On a very close note too, Araz and Sunger (2009) studied the effectiveness of problem-based learning (PBL) and traditional lecture-based instruction on elementary school students' achievement and performance skills in a science unit on electrical/electronic in an urban area in Ankara Turkey. Multivariate analysis of the covariance result showed that the problem-based learning students had higher academic achievement and performance skills score (M = 11.4 and M = 2.67 respectively) when compared with those in traditional classes (M = 10.9 and M = 2.20 respectively). Orhan and Ruhan (2013) found that there was no significant difference in achievement of 7th grade students taught science using problem solving and those

taught using traditional lecture based method. The difference can be attributed to factor like perception as pointed in the review literature.

The result in Table 2 shows that for each of the groups, the posttest means were greater than the pretest means with the high ability students having a higher mean gain followed by the medium ability students and lastly the low ability students. This implies that students' ability level have effects on their achievement in electrical/electronic. The difference in the ability level was tested using ANCOVA; table 5. The result indicated that there was a significant difference in the mean achievement scores of students taught electrical/electronic using kumon teaching strategy and those taught using conventional method across ability levels. The null hypotheses $(H0_2)$ which stated that there is no statistically significant difference in the mean achievement scores of students taught electrical/electronic using kumon teaching strategy and those taught using conventional method across ability levels is rejected and stated thus: There is a statistically significant difference in the mean achievement scores of students taught electrical/electronic using kumon teaching strategy and those taught using conventional method across ability level.

A similar study was conducted by Adeyemo (2010) on students ability level and their competences in problem-solving task in physics. The result of the findings showed that students' ability level have significant influence on problem-solving task. These findings are in contrast to that of Adesoji (2008) who investigated the impact of problem-solving instructional strategy on the performance of students of different ability levels in chemistry. The result showed that there was no significant difference in the performance of students in the three ability groups in posttest after exposing them to the teacher directed problem-solving strategy. These difference could be attributed to other

factors like students interest and perception as pointed out in the background.

The statistical analyses in Table 3 show that female subjects in problem-solving and conventional methods obtained higher mean scores (19.08 and 15.66 respectively) than their male counterparts (16.13 and 14.10 respectively). Further analyses show that the gender difference in the two groups was found not significant. F-ratio of 0.515 was obtained with associated probability value of 0.47. Since the associated probability value of 0.47 greater than 0.05 set as level of significance, the null hypotheses ($H0_3$) which stated that there is no statistically significant difference in the mean achievement scores of male and female students in electrical/electronic is not rejected. This means that gender is not a significant factor in determining students achievement in electrical/electronic. A closer look at the mean and mean gain scores table 4 show that the conventional teaching method is gender friendly in favour of the male students. Hence, the two methods have been found to be good teaching methods for teaching/learning of problematic topic like electrical/electronic and other topics.

Smith (2014) investigated gender as a factor in problem-solving in the use of grid map to study plant distribution in an abandoned school garden. The result of the analysis indicated no significant difference in the achievement of male and female students. Olagunju (2011). Shayer & Adey (2013) and Oladipe (2012) found that there was no significant difference in the achievement of male and female students in problem solving in mathematics, and science. On the contrary Bynne & Pope (2014) opined that boys have more positive science attitudes and achievement than girls, in Agreement with Adey (2013) reported that male students were superior over their female counterparts in problem-solving and achievement in chemistry. However, Catsambis (2015) and Ahiakwo (2009) reported that girls performed

better than boys in science. These differences may be attributed to other factors such as teacher quality, environment and motivation as pointed in the background.

The statistical analyses in table 4 and 5 showed that problem-solving and conventional methods had significant effects on students' achievement. But that the students' gender did not affect their achievement in electrical/electronic. The finding is contrary to the finding of Gallagher and Delisi (2012) who found a significant covariant gender x problem type interaction. Female students outperformed male students on conventional problem and male students outperformed female students on unconventional method. Despite the controversy, it is obvious that some difference might occur due to other factors like nature of learners, interest, perception and teacher quality as pointed out in the background and literatures reviewed.

Achievement must have been caused only by the two instructional methods used. Hence the problem-solving and conventional methods have been recommended as good instructional methods for all students in science.

Conclusion

One of the important attributes of sciences is solving problems. Consequently, no science students can do without solving problems. The findings of this study served as a bases for making the following conclusions: problem-solving and conventional methods of teaching enhance students' achievement in electrical/electronic in Minna education zone. The results of the study also indicated that students could be better problem-solvers if they are of high ability level, but those with low ability could also perfect their problem-solving skills if they are exposed to kumon teaching strategy. Therefore, it could be concluded that kumon teaching strategy

methods are good instructional methods for teaching electrical/electronic. Adoption of kumon teaching strategy and conventional teaching methods by the electrical/electronic teachers would go along way in improving students' performance in electrical/electronic.

Recommendations

The following recommendations have been made based on the findings and conclusion of the study:

1. Teachers and students should learn the psychological model of Gestalt theory of problem solving and Gagner's theory of hierarchal learning. Gestalt theory provide insight on how problem solvers devise a way of representing the problem that enables solution. Gagner's model of learning provides different learning processes at different levels, emphasize structure, organizing and sequencing information to facilitate optimal processing. In other words electrical/electronic problem solving involve the application of electrical/electronic principles in order to generate a solution. The study thus recommends the scientific approach to kumon teaching strategy because they motivate the learners and develop the spirit of exploration and discovery.

2. Authors and textbook writers should apply and provide illustrations of electrical/electronic problems in different areas of electrical/electronic. This may enable the students to generate their own algorithm and generalize it into specific set of application into electrical/electronic.

3. The study recommends that further research is needed in different educational settings to determine the effects of problem-solving instruction on the effective learning outcomes (e.g. interest, attitudes and motivation).

4. Seminars and in-service programs should be organized by delegations of education and the pedagogic offices for biology teachers in the field to be acquainted with teaching of electrical/electronic using kumon teaching strategy methods.

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