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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.

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Educational scholars like Akubilo (2014) as well as lbe (2017), in separate studies revealed that even though several knowledge acquisition pattern and propositions exist several instructors disseminate knowiedge via the utilization of conventional orthodex approach irrespective of whether learners assimilate or not. The conventional erthodox 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

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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.

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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, llorin, 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 asthe 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).

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4.18 and a posttest mean of 25.13 with a

Results

Research Qion 1:

standard deviation of 4.39. The difference

between the pretest and posttest means was

12.00. The medium ability students under

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.

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 of9.35 with a standard

deviation of 1.92

and a posttest mean of 14.65 with a standard

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?

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

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

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

SD

SD

Mean gain

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|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
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| 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 |  | Pos |  |  |
| Methods of Ability Level | N | x | SD | x | SD | Mean |
| Teaching |  |  |  |  |  | gain |
| Kumon Teaching High Ability Average | 23 | 13.13 | 4.18 | 25.13 | 4.39 | 12.00 |
| Strategy  Ability | 27 | 7.85 | 2.86 | 15.96 | 5.16 | 8.11 |
| Low Ability | 19 | 6.21 | 2.12 | 11.53 | 3.22 | 5.32 |
| High Ability Average | 13 | 9.08 | 1.61 | 17.15 | 2.79 | 8.07 |
| Conventional Ability | 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 |  |  | Prete |  | Postte |  |  |
| 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 |

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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 | 2140.882a | 4 | 535.221 | 34.781 | .000 |
| Intercept | 660.192 | 1 | 660.192 | 42.902 | .000 |

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|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| 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 | 2740.210a | 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 (Ho1) 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.

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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 (Ho2) 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 (Ho3) 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 (Ho4) 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

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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 (H01) 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 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 differenice 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 hig ability students having a higher mean gain followed by the medium ability students and lastly the low ability students. This impliet 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 (H02)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

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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 (H03) 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

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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 findingsand 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 solversdevise 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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References

Adesoji, F.A. (2008). Students' ability levels and effectiveness of problem-solving instructional Strategy,Journal of Social Science, 17(1),5-8.

Adeyemo, A.S. (2010). Students' ability level and their competence in problem solving tasks in

Physics. International Journal of Educational Research and Technology, 1(2), 35-47. Retrieved

June 12,2014 from http://www.socagra.com.

Ahiakwo, M.J. (2009). Cognitive style and students' problem-solving behaviour in chemistry. Unpublished Ph.D thesis,UJniversity of Ibadan.

Akubuilo,D.U.(2014). & Ibe, A. (2017). Effect of problem solving international strategies on

students' achievement and retention in biology, Science Teacher Association Journal,24 (1 &

2),94-100.

Ameh, I.E., Daniel B.P. & Akus, Y. (2012). Research and methods in the Social Sciences,Rowis publishers, Ankpa.

Anene, G.U. (2015). Home economics and the academic performance of a child. Journals of home economics research, 6 (1), 99-103.

Araz,G.& Sungur, S. (2009). Effectiveness of problem based on learning on academic performance

in electrical/electronic, Journal of Biochemistry and Molecular Biology Education,35(6),448-

451.

Atherson, J.S. (2013). Learning and teaching intelligence. Retrieved on 30th January,2016.from www.dmu.ac.uk

Bassow, S. A. and Howe, K. G. 〔2011). Evaluation of college professors: effects of professors' sex-type and sex, and students' sex, Psychological Reports, 60(67) 1-8.

Bynne, M. Johnstone, A. & Pope, A. (2014). Reasoning in science: A language problem revealed, School Science Review, 75 (272,103-107).

Carribbean EC (2011). Electrical and electronics

www.cxc.org/Homes/Examinations/Cape/Listofsubject. December,1.2012.

technology

Catsambis, S.(2015).Gender, race, ethnicity and science education in the middle grades.

Dike, G. & Abimbola, J.O. (2010). Gender influence of biology students, Concept mapping, ability and achievement in evolution, Journal of Science, Teaching and Learning, 3(1 & 2), 8-17.

Festus, C. & Ekpete, O.A. (2012). Improving students' performance and attitude towards chemistry

through problem-based-solving techniques, International Journal of Academic Research in

Progressive Education and Development, 1(1),167-174.

Gallagher, M. Ann & Delisi, Richard (2012) Gender difference in scholastic aptitude test

Mathematics problem solving among high-ability students, Journal of Educational

Psychology,86(2),2004-211.

Gender, race, ethnicity, and science education in the middle grades, Journal of Research in Science Teaching,32(3),243-257.

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Keller,E.F. (2013). Gender and science. In E. Thermey(Ed.) Women's studies encyclopedia. Peter Beduck, New York. 153-156.

Musa, Y.U. (2012). Performance rates of students in electronics in technical colleges in Niger State, Journal of Vocational and Technical Educators, 2(4)43-45.

Odili A. O. (2013). Radio Television in Nigeria Technical schools: teaching perspective, Anachuna educational books,Port-harcourt.

Olagunju, S.O. (2011). Sex, Age and Performance in Mathematics, ABACUS: The journal of Mathematics Association of Nigeria, 26(1),8-16.

Olaitan, S.O. (2014). Electronic education in the tropics methodology for teaching Radio Television. London: Macmillan Publishers.

Oludipe, D.I. (2012). Gender difference in Nigeria junior secondary students' academic achievement in basic science. Journal of Educational and Social Research, 2, (1),93-99.

Orhan,A. and Ruhan, O.T. (2013). Effects of problem based active learning in science education on students' academic achievement, altitude and concept learning, Eurosia Journal of Mathematics Science and Technology Education,3(1)71-81.

Shayer, M., & Adey, P.(2013):Accelerating the development of formal thinking in middle and high school students. Post project effects on science achievement, Journal of Research in Science Teaching, 29,81-92.

Smith, M.U.(2014).A view from biology.In Smith M.U. (Ed), Toward a United Theory of Problem Solving: Views from the Content Domains: Hillside: Lawrence Eribaum and Association.

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