

*Full Length Research Paper*

# Effect of career-related Instruction on Students' Mathematics Achievement in Senior Secondary Schools in Benue State, Nigeria.

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The study investigated the effect of career-related instruction on students' achievement in mathematics in Benue State, Nigeria. A non-randomized pretest-posttest quasi-experimental design was adopted for the study since intact classes were used in the sampled schools. Seven hundred and seventy-four senior secondary two (SS2) students drawn from eight secondary schools in the three education zones of Benue State were involved in the study. One instrument, Mathematics Achievement Test (MAT) was used for the collected data. A two-way analysis of covariance (ANCOVA) was used for analyzing the data collected. Finding of the study showed that students taught mathematics using career-related instruction had a significantly higher mean achievement score than their counterparts taught mathematics using conventional methods. It was concluded that career-related instruction enhances students' achievement in mathematics and should therefore be encouraged as an additional teaching strategy in Nigeria.

**Key Words:** Mathematics, Education, Career-Related Instruction, Achievement in Mathematics.

## INTRODUCTION

Mathematics plays a very important role in our daily lives. To successfully survive in the present age of science and technology one cannot totally avoid one aspect of mathematics or the other. It is in realization of the vast applications of mathematics that made Eraikhuemen (2003) to posit that a disciplined and ordered pattern of life can only be achieved through the culture of Mathematics. Unfortunately, students' achievement in this important subject over the years has not been encouraging at the primary, secondary and tertiary levels of education in Nigeria. Abakporo (2005) summarizes this by saying that the state of students' achievement in Mathematics had left much to be desired. This view is supported by the West African Examination Council's Chief Examiners' Report of 1991 to 2006 of Senior Secondary School Certificate Examination results (WAEC, 2006) which reported very low percentage passes in Mathematics at credit level in those years.

As Obodo (2004) points out, many students regard mathematics being made a compulsory subject at the primary and secondary school levels as a punishment. This is because many of them are not aware of the importance of mathematics to their career ambitions. Mathematics by nature has two aspects: (1) its structure, which is purely theoretical and (2) the functional aspect which deals with its applications in science, technology, other fields of learning and our daily lives.

The functional aspect of mathematics provides the basis for the relationship between mathematics and students' future career choices. Bolaji (2001) also reports that the chosen career, the students' perception of the necessity of using mathematics and the amount of mathematics required for a job are all highly correlated with the courses students choose to take in higher institutions.

Career-related instruction in mathematics is the teaching of mathematics topics by purposely and explicitly illustrating the practical utility of each topic in different career areas. This is part of career-related learning which is being explored in developed countries

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like Britain, U.S.A, Australia, Japan and many other countries of the world. In the United States of America, for example, Stern (2001) reports that fifteen years of California Studies indicated that career academy students (taught various subjects using career-related learning) outperform similar students in their schools in attendance, credits earned, grades and graduation rates. Career-related learning in mathematics is based on David Ausbels theory of meaningful learning. The strategy links mathematics topics to various career areas where the knowledge is applied in order to motivate students to make the learning of mathematics more meaningful for them. The essence of career-related instruction is to use the relationship between mathematics and various career areas to motivate students to improve their achievement in the subject. Among various reasons pointed out by different scholars, Amoo (2002) reports that poor learning interest and assimilation of mathematics ideas, concepts, principles and processes and teachers' failure to use appropriate and stimulating teaching methods are responsible for students' poor achievement in mathematics in Nigeria.

Parents and other stakeholders are worried about the present situation of mathematics education in Nigeria. This is because a credit level pass at the Senior Secondary School Certificate Examination (SSCE) is required for most courses at the tertiary level of education in the country. As Obodo (2004) lamented, many students in tertiary institutions in Nigeria today are not studying the courses they wanted to study because of not making the required SSCE grades in mathematics to gain admission to courses of their first choice. This attempt to use the relationship between students' career preferences and mathematics as a motivating factor to enhance their achievement (using career-related instruction) is supported by Korau (2001) who points out that motivation plays an important role in enhancing students' level of achievement in mathematics.

## METHODOLOGY

The study utilized the non-randomized pretest-posttest control group type of quasi-experimental design. The design was used because intact classes in the sampled schools were used for the study to avoid disorganizing school programmes. The choice of the design was also because the study was intended to establish the nature and scope of any cause-effect relationship between career-related instruction in mathematics and students' achievement in the subject.

Twenty seven senior secondary schools with double arts and science classes of SS2 students spread across Benue State constituted the target population of the study. These schools had a total of 4,655 SS2 students. The schools provided a good mixture of arts and science students.

Eight schools were selected from the twenty seven schools using random sampling technique. The total sample size of the study was 774 SS2 students made up of 386 students in the control group and 388 students in the experimental group. Four out of the eight schools were randomly selected as the experimental schools while the other four remaining schools served as the control group. Intact

classes were used in the eight schools and each of the schools was co-educational.

One instrument, Mathematics Achievement Test (MAT), constructed by the researchers was used for the collected data. MAT was validated by two lecturers in mathematics education and a lecturer in tests and measurement from Benue State University, Makurdi. MAT had 27 multiple choice items (each with four options) constructed from SS2 mathematics curriculum. MAT was scored out of 27 marks. The items were used for the pretest and reshuffled for the posttest after eight weeks of teaching. Using Kuder-Richardson formula 20, the reliability coefficient of MAT was found to be 0.98. Two lesson plans, one for the control group and another for the experimental group, were also used for the study. They were based on the SS2 Mathematics curriculum.

The topics selected included bearings, circle theorems (geometry) quadratic and simultaneous equations and change of subject of formulae (algebraic processes), approximations and significant figures, percentage errors, sequence and series (general arithmetic) probability and everyday statistics (statistics), commission and discount, financial partnership, profit and loss, simple and compound interest (commercial arithmetic). The items were spread from comprehension to evaluation levels of Bloom's levels of the cognitive domain. The psychometric indices of MAT were also confirmed satisfactory before the experiment. Mathematics teachers of five years experience and above were trained to teach the experimental group using career-related instruction while equally experienced mathematics teachers were trained to teach the control group using traditional methods.

The use of quadratic equations in the invention of computers, DVD players, cars and mobile phones for example, may have effect on students being taught the topic in the experimental group.

The research question was answered using the mean scores and standard deviations of the experimental and control groups in the mathematics achievement test (posttest MAT). The hypothesis was tested using analysis of covariance (ANCOVA) at 0.05 level of significance.

## RESULTS

The means and standard deviations of students' Mathematics achievement scores are presented in Table 1.

### Research Question

What is the difference between the mean achievement score of students taught mathematics using career-related instruction and that of students taught using traditional methods?

From Table 1, it can be seen that the posttest mean achievement score of the control group was 8.42 with a standard deviation of 3.03 while that of the experimental group was 11.64 with a standard deviation of 3.73. This gives a positive gain difference of 3.22 in favour of the experimental group. Thus the experimental group achieved higher than the control group. This means that the students taught mathematics using career-related instruction achieved higher than those taught mathematics using conventional methods. This answers the research question.

**Table 1.** Mean Achievement Scores and Standard Deviations Per Group Per Test

Group	Type of Test	Number	$\bar{X}$	SD
Experimental	Pretest	388	7.13	2.62
	Posttest		11.64	3.73
Control	Pretest	386	7.07	2.63
	Posttest		8.42	3.03
<b>Total</b>		<b>774</b>		

**Table 2.** Results of the two-way Analysis of Covariance of the Effect of Career-Related Instruction on Students' Mathematics Achievement

Sources of variation	Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	5063.603	4	1265.901	166.554	.000
Intercept	2078.173	1	2078.392	273.424	.000
Pretest	2804.392	1	1957.662	368.972	.000
Post-test	1957.662	1	93.755	257.568	.000
Error	5844.827	769			
<b>Total</b>	<b>88729.000</b>	<b>774</b>			
<b>Corrected Total</b>	<b>10908.430</b>	<b>773</b>			

Computed at alpha = 0.05

## Hypothesis Testing

Ho<sub>1</sub>: There is no significant difference between the mean achievement score of students taught mathematics using career-related instruction and that of students taught using conventional methods.

From Table 2 the result of the main effects on the experimental and control groups indicated by F-ratio of 257.568 at 1 degree of freedom (and  $p < 0.05$ ) is significant at 0.05 alpha level. The (Ho<sub>1</sub>) hypothesis is therefore rejected. This result shows that there is a significant difference between the mean achievement scores of students taught mathematics using career-related instruction ( $\bar{x} = 11.64$ ) and those taught mathematics using conventional methods ( $\bar{x} = 8.42$ ). Thus the experimental group achieved higher in the posttest scores than the control group.

## DISCUSSION OF FINDINGS

The result of this study has shown that students taught mathematics using career-related instruction had a higher mean achievement score than those taught mathematics using conventional methods. This finding agrees with that of Stern (2001) who reports that students of Career Academies (where students are taught various subjects with particular references to their relevant career areas) in California outperformed other students in terms of

school attendance, credits earned, grades and graduation rates. The findings of this study also agrees with that of Okereke (2006) who found from his own study that prior knowledge of career implications of mathematics topics facilitated the interest and achievement of students in mathematics. Relating mathematics content with relevant career areas as was done in this study serves as motivation for students. This motivation, as Korau (2001) reports, enhances students' level of achievement in mathematics.

As Watt and Bornholt (2000) pointed out, utility values as well as mathematics participation are factors that determine to a great extent students' attitude towards mathematics, their achievement in the subject and their career choice. Sidhu (2002) also stresses that it is necessary to study mathematics because of its values. The roles being played by mathematics in various career areas as utilized in this study, provide enough motivation to make students improve their achievement in the subject.

## RECOMMENDATIONS

Mathematics is a necessity for the development of any nation. The improvement of students' achievement in the subject should therefore attract serious attention both in Nigeria and other developing countries. Career-related instruction in mathematics should therefore be used as

an additional teaching strategy to other traditional methods of teaching mathematics. This could help in improving students' achievement in the subject.

## CONCLUSION

Career-related instruction enhances students' achievement in mathematics. Since achievement of students is a focal objective of teaching mathematics, a greater attention needs to be paid to the use of career-related instruction as a teaching strategy. Nigeria needs to embrace career-related learning in mathematics which is available in developed countries of the world such as U.S.A., Britain, Australia and Japan. This is because various strategies used in teaching mathematics in our secondary schools have not yielded the much desired improvement in students' achievement in the subject.

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