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Full Length Research

Impact of career-related instruction on rural secondary school students' attitude to mathematics in Benue state

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ABSTRACT

This study set out to determine the impact of career-related instruction on rural senior secondary two (SS2) students' attitude towards mathematics. Stratified proportionate sampling was used to sample twelve rural schools (schools outside local government headquarters). Three intact classes were chosen from three of the sampled schools in Zone A, one intact class from one sampled school in zone B and two intact classes from two sampled schools in zone C were randomly chosen (with 189 students) as the experimental group. The same number of intact classes were chosen as the control group (with 125 students), bringing the total sample size to 314. Separate schools were used for experimental and control groups. An Attitude to Mathematics Rating Scale (AMRS) developed by the researcher and validated by experts was used for data collection. The instrument had 20 items. A four point Likert type of scale (SA=4, A=3, D=2 and SD=1) was used for scoring the items after four weeks of teaching. The design of the study was quasi-experimental (pre-test-post-test control group design). Two research questions and two hypotheses were used to guide the study. Means and standard deviations were used to answer the research questions and analysis of covariance (ANCOVA) was used to test the hypotheses. Findings from the study indicated that the students taught mathematics using career-related instruction had significantly higher mean attitude rating than their other rural counterparts. However there was no significant difference between the mean attitude ratings of male and female rural students. The study therefore recommended the exposure of secondary school teachers to the use of career-related instruction in teaching mathematics through in-service workshops.

Keyword: Rural Students, attitude, vocational and academic educational paths, career, academic achievement.

INTRODUCTION

The number of research studies conducted in mathematics education over the past three decades has increased drastically. Findings from these studies indicate that certain teaching strategies and methods are worth careful consideration as teachers strive to improve their mathematics teaching practices.

A student who wants to move forward in school will have to be successful in mathematics. While some excel in this subject, majority find it difficult and quickly label it as the most hated. Mathematics can be a stumbling block in the road of educational success if a student gives up on it. That is why it is important to change students' attitude towards the subject.

Most students often feel that the study of mathematics is all about things they won't need in life. Others look at mathematics as the master and servant of most disciplines and thus a source of enlightenment and understanding of the universe. In a similar vein, Setidisho (2001) submitted that no other subject forms a strong binding force among various branches of science as mathematics and without it knowledge of science often remains superficial. Thus, the importance of mathematics goes beyond all definitions and the prosperity of any nation, to a large extent, is dependent on the volume and quality of mathematics offered in its school system.

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 and other fields of learning and our daily lives. Relating mathematics and students' future

career options in secondary schools may serve as a motivation factor to students' participation, interest in and attitude towards the subject. This notion is supported by Sidhu (2006) who asserted that efficient study of mathematics raises the students' competency in different vocations. By pointing out its applications, teachers could render valuable services in stimulating students' interest and promoting positive attitudes toward the subject.

Generating positive attitudes towards mathematics among students is an important goal of mathematics education. Research conducted over the last two decades has shown that positive attitude can impact on students' inclination for further studies and careers in mathematics-related fields (Trusty, 2001). Ereikan, McCreith and Lapointe (2005) in a recent study using the Third International Math and Science Study (TIMSS) data from Canada, Norway and the United States found attitudes towards mathematics as the strongest predictor of student's participation in advanced mathematics.

Addressing students' mathematical disposition, including students' confidence, interest, perseverance and curiosity in learning mathematics, is particularly, in the middle years of schooling and above (ages 12 to secondary school graduation), is not an easy task. It has been reported that it is in the middle years of schooling that students' level of enjoyment with mathematics tends to decline considerably and the gender difference in mathematics confidence widens, favouring boys over girls (Dossey, Mullis, Linquist and Chambers, 1988; Seegers & Boekaerts, 1996; Strutchens, Lubienski, McGraw, & Westbrook, 2004;). For students to persist in advanced mathematics, teachers need to develop students' positive attitudes, not just their concepts and skills. Developing positive attitudes creates fertile ground in which teachers can plant the seeds of deeper mathematics learning and cultivate independent, advanced math learners.

Attitude is someone's opinion or general feeling about something (Microsoft Encarta, 2009). Odogwu (2002) sees attitude as a predisposition to respond in a certain way to a person, an object, an event, a situation or an idea. Attitude towards something consists of a person's collection of facts about the subject, which may enable the individual to develop a particular type of feeling towards it.

Career-related learning is that which takes place when the content of what is being learnt in school is related to the world of work. This could generate students' interest in what is being taught. Teaching students with a focus on their career interest has many advantages such as motivation and capturing their interest in the subject which may result in improved academic achievement. This may explain the reason behind the popularity of institutions that emphasize career-related education in developed countries such as the United States of America, Australia, Britain and Japan (O'Kwu, 2008). In the United States, interest in the transition from school to work has led to the emergence of the combination of vocational and academic educational paths which can improve students' chances of college and career success (Stern, 2001). Some studies (O'kwu and Aligba, 2004; O'Kwu, 2008) found that urban students achieved higher than rural students in mathematics. Could this be because of their attitude to mathematics?

There is a large public outcry about the Nigerian students' underachievement in mathematics, especially in the Senior School Certificate Examination (SSCE). The West African Examination Council's (WAEC) reports indicate that between 2000 and 2010, the percentage of candidates who registered and passed mathematics at credit level and above was abysmally low. Various reasons have been advanced for the under-achievement of students in mathematics. Prominent among such is students' poor attitude towards the subject and teachers' failure to use appropriate teaching methods. It is in view of the above that this study sought to investigate the extent to which career-related instruction will affect students' attitude towards mathematics among rural students in Benue State, Nigeria.

Research Hypotheses

The study was guided by the following hypotheses which were tested at .05 level of significance.

H_{o1}: There is no significant difference between the mean attitude ratings of rural students taught mathematics using career-related instruction and those taught mathematics using conventional methods.

H_{o2}: There is no significant difference between the mean attitude ratings of male and female students taught mathematics using career-related instruction in the rural areas of Benue State.

RESEARCH METHOD

The study adopted quasi-experimental setting of non-equivalent pre-test- post-test control group design. The design was adopted because intact classes were randomly assigned to experimental and control groups respectively, since it was not possible to have complete randomization of subjects, to avoid disrupting schools programmes.

Purpose of the Study

The purpose of the study was to expose SS2 students to career-related instruction in mathematics to determine its impact on students' attitude towards the subject in rural areas of Benue State. The study was also aimed at determining the influence of gender on rural students'

attitude to mathematics when they are taught mathematics using career-related instruction.

Population, Sample and Sampling

The study involved a target population of all senior secondary school two (SS2) students in the three education zones of Benue State. Stratified proportionate sampling was used to sample twelve rural schools (Schools outside local government headquarters), with six schools from zones A, two schools from zone B and four schools from zone C. Further, three intact classes were chosen from three of the sampled schools in zone A, one intact class from one sampled school in zone B and two intact classes from one sampled school in zone B and two intact classes from two sampled schools in zone C. (Random sampling was used to select one intact class from each of the sampled schools). These intact classes were used as the experimental group while the other sampled schools in the three education zones constituted the control group (with one intact class from each sampled school also randomly selected) for the study. The number of students in the experimental group was 189 while that of students in the control group was 125, bringing the total sample size to 314 SS2 students. Separate schools were used for experimental and control groups.

Instrumentation

One instrument, Attitude to Mathematics Rating Scale (AMRS) developed by the researcher was used for the study. Section A of the instrument contained information about the name of the students' school, preferred career (from a list of career areas prepared by the researcher) and sex of the student. Section B of the instrument contained 20 items about students' attitude to mathematics.

The instrument was validated by one expert in tests and measurement and two experts in mathematics education from Benue State University, Makurdi. The instrument was administered on the students before the commencement of the experiment (Pre-AMRS) reshuffled and again administered on the students' after four weeks of teaching students mathematics using career-related instruction (Post-AMRS). A four point Liker-type rating scale of strongly Agree (SA), Agree (A), Disagree (D) and Strongly Disagree (SD) with 4,3,2 points and 1 point respectively was used for scoring AMRS.

Using Cronbach Alpha, the reliability co-efficient of AMRS was found to be 0.82 which established the internal consistency of the instrument.

Method of Data Collection

The researcher used six regular mathematics teachers of the sampled schools as research assistants and gave them a-one day training on how to relate the mathematics topics they had to teach SS2 students in their schools to various career areas, where such knowledge was useful in real life (career-related instruction). This was prepared by the researcher. Only the experimental group was exposed to this career-related instruction. Six other research assistance from the remaining sampled schools were given a one-day training to teach the control group using conventional methods (without being exposed to any career relationship with the topics). A Pre-AMRS was given to the students before the commencement of the experiment. The experiment was carried out for a period of four weeks after which the post-AMRS was administered on the students. The researcher personally went round the twelve schools to administer the research instrument on both experimental and control groups, with the research assistants at the end of the period.

The copies of the questionnaire collected from the students were given to the research assistants who were made to score students from schools other than their own at the end of the exercise.

Data Analysis

The means and standard deviations of the data collected were used to answer the research questions while Analysis of covariance (ANCOVA) was used to test the hypotheses at .05 level of significance.

Research Question 1

How does the mean attitude rating of rural students taught mathematics using career-related instruction differ from that of rural students taught using conventional methods?

From Table 1 the mean attitude rating for the experimental group was 63.46 with a standard deviation of 10.55 while the mean attitude rating for the control group was 58.59 with a standard deviation of 10.92. This shows that the rural students taught mathematics using career-related instruction developed a much higher attitude rating towards mathematics than their counterparts who were taught mathematics using conventional methods.

Research Question 2

How do the mean attitude ratings of rural male and female students differ when they are taught mathematics using career-related instruction?

Table 1. Means and standard deviation of attitude ratings of rural students to mathematics (AMRS)

Group	Number of Students	Mean	Standard deviation
Experimental	189		
Pre-test		55.80	15.57
Post-test		63.46	10.55
Control	125		
Pre-test		54.73	12.46
Post-test		58.59	10.92

Table 2. Means and standard deviations of attitude ratings of rural male and female students towards mathematics.

Group	Number of Students	Mean ($\bar{x}$)	Standard deviation
Male	101		
Pre-test		56.64	15.63
Post-test		63.81	10.66
Females	88		
Pre-test		54.83	15.54
Post-test		63.06	10.48

Table 2 shows that the mean attitude rating of rural male students in the post-test was 63.81 with a standard deviation of 10.66 while that of female students was 63.06 with a standard deviation of 10.48. This shows that there was very little difference between the mean attitude ratings in the post test for male and female students.

Hypothesis 1

The mean attitude rating of rural students towards mathematics when they are taught using career-related instruction does not differ significantly from that of their counterparts taught using conventional methods.

The analysis (ANCOVA) in Table 3 shows the F-ratio for the group effect (Group) is 26.124 which is significant at .05 level of significance (p=.000<.05). This means that there is a significant difference between the mean attitude rating of rural students taught mathematics using career-related instruction and that of rural students taught mathematics using conventional methods. The students taught mathematics using career-related instruction had a much higher mean attitude rating (x=63.46) than their counterparts taught using conventional methods (x=58.59).

Hypothesis 2

The mean attitude ratings of rural male and female students taught mathematics using career-related instruction do not differ significantly.

From the analysis (ANCOVA) in Table 3, the F-ratio gender (sex) effect is .011 which is not significant at .05 level of significance (p=.917>.05). This means that there is no significant difference between the mean attitude ratings of male and female rural students taught mathematics using career-related instruction.

DISCUSSION OF FINDINGS

The result from hypothesis one shows that rural students taught mathematics using career-related instruction had a significantly higher mean attitude rating than other rural students taught mathematics using conventional methods. This finding is in agreement with that of Sidhu (2006) who reported that, by pointing out the applications of mathematics, teachers could stimulate students' interest and positive attitude towards the subject. Trusty (2001) concluded from studies within the last two decades that positive attitudes can have impact on students' inclination for further studies and careers in mathematics-related fields.

The result from hypothesis two shows that there is no significant difference between the mean attitude ratings of male and female rural students when they are taught mathematics using career-related instruction. This finding is supported by that of Ifamuyiwa and Akinsola (2008) who used self and cooperative instructional strategies to

Table 3. Analysis of covariance (ANCOVA) of attitude ratings towards mathematics of rural students.

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	20943.642	4	5235.911	98.031	.000
Intercept	18538.182	1	18538.182	347.087	.000
Pre Attitude	18969.756	1	18969.756	355.167	.000
Group	1395.321	1	1395.321	26.124	.000
Sex	.588	1	.588	.011	.917
Group * Sex	4.641	1	4.641	.087	.768
Error	16450.511	308	53.411		

Computed using alpha = 0.5

investigate students' attitude towards mathematics in Ogun State. The finding, however contradicts that of Nosek and Banaji (2001) and that of Watt (2002) which indicate that females have more negative attitude towards mathematics than males.

CONCLUSION AND RECOMMENDATIONS

The study has shown that career-related instruction as a teaching strategy has a positive impact on rural secondary school students' attitude towards mathematics. It is therefore recommended that mathematics teachers should be exposed to the use of career-related instruction as additional teaching strategy through in-service workshops.

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