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EFFECT OF RELATIONAL TEACHING APPROACH ON STUDENTS INTEREST AND PERFORMANCE IN MATHEMATICS IN MAKURDI LOCAL GOVERNMENT AREA, NIGERIA

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ABSTRACT

The study determined the effect of relational teaching approach on students' interest and performance in primary schools. The study was carried out in Makurdi local government area of Benue State. A sample size of forty (40) primary school pupils was used. The study was a quasi-experimental design. Data were collected using tow (2) instruments, namely: Mathematics Performance Test (MPT) and Mathematics Interest Inventory (MII). Four research questions and four research hypotheses were formulated to guide the study. The research questions were answered using mean and stand deviation while the hypotheses were tested at 5% level of significance. Results from the study revealed that students taught mathematics using relational teaching approach performed higher and also showed greater interest in learning mathematics than those taught with the instrumental approach. The study also revealed that the male students performed higher than the female students in mathematics in the experimental group, however, they showed similar interest in mathematics.

Keywords: Relational Teaching Approach, Interest, Performance, Mathematics.

INTRODUCTION

Mathematics is a powerful tool for global understanding and communication that organizes our lives and prevents chaos. Mathematics is an intellectually stimulating subject that affects every talent of human activities such as politics, economics, science and technology (Hassan, Abari, Aruwa, Benendict & Ndanusa, 2017). Mathematics helps us understand the world and provides an effective way of building mental discipline. Mathematics encourages logical reasoning, critical thinking, creative thinking, abstract or spatial thinking, problem-solving ability, and even effective communication skills (Yaeger, 2021). It is in view of this that, all over the world, educators and practitioners of mathematics have dedicated much effort and time to enhance teaching and learning of mathematics. Mathematics thinking is important for all members of a modern society as a habit of the mind for its use in the workplace, business, and for personal decision making. Mathematics is fundamental to understanding science, engineering, technology and economics (Amuta, 2014). Mathematics is so important in science and serve in so many of its branches that it has been called "the queen and servant of the sciences" (as cited by Eric, 1996 in Amuta, 2014).

The goals of the primary mathematics curriculum are to: stimulate interest in the learning of mathematics, help students understand and acquire basic mathematical concepts and computational skills, help students develop creativity and the ability to think, communicate, and solve problems. Mathematics at the primary level introduces children to concepts, skills and thinking strategies that are essential in everyday life and

support learning across the curriculum. It helps children make sense of the numbers, patterns and shapes they see in the world around them, offers ways of handling data in an increasingly digital world and makes a crucial contribution to their development as successful learners (Peterson, 2011). According to the National Association for the Education of Young Children, children knowledge of mathematics skills at the primary level "predicts their mathematics achievement for later years". Using different activities that allow children to use and develop mathematics skills develops strong logic and reasoning skills in children (McCarson, 2017).

Learning in mathematics was first explained by Richard Skemp, a mathematician and psychologist. The main 'thrust' of his argument is that learners construct schemata to link what they already know with new learning. According to Skemp, mathematics involves an extensive hierarchy of concepts – we cannot form any particular concept until we have formed all the subsidiary ones upon which it depends. Skemp also suggested that emotions play a dominant part in the way in which we learn. Skemp suggested that there are two kinds of learning in mathematics which are instrumental understanding and relational understanding (Evans, 2016).

Relational learning is a way of being with students from a social constructionist perspective where those involved in education – students, mentors, and professors – learn from each other through the sharing of ideas and together create the learning/teaching world. Relational learning are practices that invite both students and teachers to enter into a dialogue about learning (Oliverian, 2019). The involvement of multiple parties in the task of learning deconstructs the hierarchy within the traditional teaching relationship and opens space for more collaborative experiences (Toas, 2021). Relational understanding is a more meaningful learning in which the pupil is able to understand the links and relationships which give mathematics its structure which is more beneficial in the long term and aids motivation, e.g, writing 10 would be understood as " This is why we write 10 like this (in terms of place value)" in relational terms (Evans, 2016). Instrumental understanding is a mechanical, rote or 'learn the rule/method/algorithm' kind of learning which gives quicker results for the teacher in the short term, e.g writing 10 would be understood as "This is how we write 10" in instrumental terms (Evans, 2016; Lesleigh, 2015).

Both are deemed important for mathematics. In Relational understanding and Instrumental understanding Skemp contrasts two perspectives of mathematics. Using the terms relational and instrumental from Stieg Mellin-Olsen, Skemp introduces relational understanding as "knowing both what to do and why" and instrumental understanding as the ability to execute mathematical rules and procedures. Skemp propose three advantages of instrumental mathematics that make it preferred amongst many mathematics teachers: (a) within its own context, instrumental mathematics is often easier to understand (b) the rewards for following a procedure and getting a correct answer are more immediate and (c) because less knowledge is involved, it's often correct answers come more easily and reliably. In contrast, Skemp identifies four advantages to relational mathematics: (a) it is more adaptable to new tasks (b) it is easier to remember (c) relational knowledge can be effective as a goal in itself and (d) relational schemas are organic in quality.

Instrumental mathematics center around rote learning, memory, rules and correct answers. Relational mathematics focus more on establishing connections, building understanding over time, applying concepts to other problems, and gradual increases in complexity (Currell, 2018). An emphasis on the Relational approach leads pupils to a deeper understanding of mathematics and a boosted confidence in the long run. The Instrumental (or procedural) method can sometimes be easier to pick up. It provides rules to get the right answers, and can be a rewarding option for arriving at the correct answer quickly. However, it does not promote a deeper understanding of mathematics as found in the Relational (or connected) approach - where what is learnt can be adapted to new tasks, becomes easier to remember, and exists on an intuitive, organic level.

Mathematics interest has been justified to be correlated with mathematics achievement (Kin, Jiang & Song, 2015). The low-interest problem for almost all students is usually accompanied by low motivation (Krapp, 1999). Furthermore, students with continuously low performance in mathematics may eventually

lose their interest and refuse to learn further (Schraw et al. 2001). This could be seen as a serious impediment to learning.

School performance otherwise called academic performance is the measurement of student achievement across various academic subjects. Torres and Rodriguez (2006 quoted by Willcox, 2011) define school performance as the level of knowledge shown in an area or subject compared to the norm, and it is generally measured using the terminal examinations.

There is a large body of international research on sex differences in academic performance in mathematics. Education has been considered among the basic rights of human beings. From the learning perspective, the sex has seemed to play a significant role. The role plays an essential role in motivation, attitudes, and achievement of students (Mousa, 2017).

The purpose of this study is to investigate the effect of relational teaching approach on student's interest and achievement in mathematics in Makurdi local government area of Benue State. Specifically, it is to:

i. Determine the mean performance scores of primary school pupils taught arithmetic using relational approach and those taught using instrumental approach.
ii. Determine the mean interest rating of primary school pupils taught arithmetic using relational approach and those taught using instrumental approach
iii. Determine the mean performance scores of male and female primary school pupils taught arithmetic using relational approach
iv. Determine the mean interest rating of male and female primary school pupils taught arithmetic using relational approach

Research Questions: This study provided answers to the following research questions:

i. What is the mean performance scores of primary school pupils taught arithmetic using relational approach and those taught using instrumental approach?
ii. What is the mean interest rating of primary school pupils taught arithmetic using relational approach and those taught using instrumental approach?
iii. What is the mean performance scores of male and female primary school pupils taught arithmetic using relational approach?
iv. What is the mean interest rating of male and female primary school pupils taught arithmetic using relational approach?

Research Hypotheses: The following hypotheses will be formulated and tested at 0.05 level of significance to guide the study:

i. There is no significant in the mean performance scores of primary school pupils taught arithmetic using relational approach and those taught using instrumental approach.
ii. There is no significant in the mean interest rating of primary school pupils taught arithmetic using relational approach and those taught using instrumental approach.
iii. There is no significant in the mean performance scores of male and female primary school pupils taught arithmetic using relational approach.
iv. There is no significant in the mean interest rating of male and female primary school pupils taught arithmetic using relational approach.

METHODOLOGY

The design adopted for this study was quasi-experimental design of non-equivalent group. The population for this study are all the primary five pupils in the primary schools in Makurdi Local Government Area of Benue State. Four primary schools were selected for the purpose of this study and the sample for the study was 40 pupils (20 male and 20 female).

For the purpose of this research work, Mathematics Performance Test (MPT) and Mathematics Interest Inventory (MII) were used. The MPT is a test instrument that covers all the areas of Arithmetic that will be taught with regard to this study. The MPT is a fifteen (15) items multiple choice (with options A – D) instruments prepared for primary five. The MII is divided into two sections (Section A and B). Section A contains the Bio-data of each respondent, while section B contains information of the research problem. A Likert-type scale of Strongly-agree, Agree, Disagree and Strongly-disagree was used to determine the opinion of the respondents, with regards to their feelings on the effect of teaching style under study.

The researcher administered the pre-MPT, pre-MII, post-MPT and post-MII to all the primary pupils in the two groups. The researcher administered the pre-MII by visiting the studied schools, in which he had a direct contact with the respondents through hand to hand process and the pre-MII and pre-MPT were retrieved or collected on the same day. At the end of each teaching session the post-MII and post-MPT was administered. Students noted their responses in a normal classroom situation. Data collected were analyzed using descriptive statistics of mean and standard deviation to answer the research questions.

RESULTS

The data is presented according to research questions and hypotheses.

Question 1: What is the mean performance scores of primary school pupils taught arithmetic using relational approach and those taught using instrumental approach?

Table 1: Mean Performance Scores and Standard Deviation

Teaching Style	Type of Test	Mean	Standard Deviation
Relational Approach	Pre-MPT	69.65	9.88
	Post-MPT	80.00	10.98
Instrumental Approach	Pre-MPT	68.00	9.13
	Post-MPT	75.00	9.80

In table 1, the mean pretest scores for the relational application group is 69.65 with standard deviation 9.88 and the mean pretest for the instrumental method group is 68.00 with a standard deviation of 9.13. However, the mean of posttest for the relational application method group is 80.00 with a standard deviation of 10.98 while the mean of the posttest score for the instrumental method group is 75.00 with a standard deviation of 9.80. From the mean scores for both groups it could be seen that the relational application method group has a higher mean score than the instrumental method group. To prove if the mean difference in the performance scores of the students in statistics between the two groups is significant, hypothesis 1 was tested at 0.05 level of significance.

Hypothesis 1: There is no significant in the mean performance scores of primary school pupils taught arithmetic using relational approach and those taught using instrumental approach.

Table 2: Summary of ANCOVA Result of Students Performance in both groups

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	3580.315[a]	2	1790.158	84.303	.000
Intercept	68.011	1	68.011	3.203	.082
pre	3330.315	1	3330.315	156.834	.000
Group	113.090	1	113.090	5.326	.027
Error	785.685	37	21.235		
Total	244616.000	40			
Corrected Total	4366.000	39			

From table 2, the p-value for groups is 0.027. Hence $p<0.05$, the null hypothesis is rejected. This implies that there is a significant difference between the relational method group and the instrumental method group. It therefore means that the students that were taught arithmetic using relational approach improve

upon their performance in mathematics than those taught mathematics using instrumental approach perform well.

Question 2: What is the mean interest rating of primary school pupils taught arithmetic using relational approach and those taught using instrumental approach?

Table 3: Mean Interest Scores and Standard Deviation

Teaching Style	Type of Test	Mean	Standard Deviation
Relational Approach	Pre-MII	17.25	2.29
	Post-MII	18.30	1.08
Instrumental Approach	Pre-MII	16.60	3.07
	Post-MII	16.60	3.15

Results in table 3 shows that the mean interest scores of students taught mathematics with relational application method was 18.30 with standard deviation of 1.08 while that of the students taught mathematics with instrumental application method was 16.60 with a standard deviation of 3.15. Therefore, the mean interest rating of the students taught mathematics with relational teaching approach is higher than those taught mathematics with the instrumental teaching method. This implies that the students taught arithmetic using the relational teaching approach showed higher interest in learning mathematics than the students in the instrumental method group. To show if the mean interest rating in mathematics of students between the experimental and control group is significant, hypothesis 1 was tested at 0.05 level of significance.

Hypothesis 2: There is no significant in the mean interest rating of primary school pupils taught arithmetic using relational approach and those taught using instrumental approach.

Table 4: Summary of ANCOVA Result of Students Interest in both groups

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	164.432[a]	2	82.216	40.309	.000
Intercept	30.242	1	30.242	14.827	.000
pre	135.532	1	135.532	66.448	.000
group	15.308	1	15.308	7.505	.009
Error	75.468	37	2.040		
Total	12420.000	40			
Corrected Total	239.900	39			

From table 4, the p-value for groups is 0.009. Hence $p<0.05$ the null hypothesis is rejected. This implies that there is a significant difference in the interest rating of both groups. It therefore means that the students in the relational method group has higher interest in learning mathematics than those in the instrumental method group.

Question 3: What is the mean performance scores of male and female primary school pupils taught arithmetic using relational approach?

Table 5: Mean Performance Scores and Standard Deviation

Teaching Method	Gender	Type of Test	Mean	Standard Deviation
Relational Teaching	Male	Pre-MPT	70.55	8.67
		Post-MPT	79.00	10.78
	Female	Pre-MPT	67.10	10.05
		Post-MPT	76.00	10.43

In table 5, the mean performance score in statistics of male and female students in the relational teaching method pre-test is 70.55 and 67.10 with standard deviation of 8.67 and 10.05 respectively. This implies

both the male and female students in the relational application method were almost at the same level of knowledge in mathematis before the treatment, although the male had a little higher mean score. However, the mean performance scores in mathematics for the male and female students in the posttest of the relational application method group are 79.00 and 76.00 with a standard deviation of 10.78 and 10.43. This implies that both the male students in the relational application method group improved upon their interest in mathematics but a little higher with the male students. However, there is no much difference between the male and female students mean performance scores in mathematics even though the male students slightly performed above their female counterpart. To ascertain the significance of this finding, hypothesis 3 was tested at 5% level of significance.

Hypothesis 3: There is no significant in the mean performance scores of male and female primary school pupils taught arithmetic using relational approach.

Table 6: ANCOVA Result for the Performance of Students in relational approach

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	2129.981[a]	2	1064.990	47.824	.000
Intercept	34.338	1	34.338	1.542	.231
pre	1863.531	1	1863.531	83.684	.000
Group	101.837	1	101.837	4.573	.047
Error	378.569	17	22.269		
Total	123099.000	20			
Corrected Total	2508.550	19			

In table 6, the significance value of posttest of male and female students within the groups is 0.47. Hence $p<0.05$, the null hypothesis is rejected. This result shows that there is a significant difference in the mean performance scores in mathematics between male and female students in relational application method group. This implies that the male students performed higher than their female counterpart in the relational teaching method group.

Question 4: What is the mean interest rating of male and female primary school pupils taught arithmetic using relational approach?

Table 7: Mean Interest Scores and Standard Deviation

Teaching Method	Gender	Type of Test	Mean	Standard Deviation
Relational Teaching	Male	Pre-MII	17.29	2.83
		Post-MII	17.81	2.52
	Female	Pre-MII	16.53	2.55
		Post-MII	17.45	2.48

Results in Table 7 show that the mean interest rating of the male and female students in the relational teaching method was 17.81 and 17.45 respectively. The result implies that there is no much difference between the male and female students' mean interest rating in mathematics. However, hypothesis 4 will be tested to determine if the difference in the mean interest rating between male and female students' is statistically significant or not.

Hypothesis 4: There is no significant in the mean interest rating of male and female primary school pupils taught arithmetic using relational approach.

Table 8: ANCOVA Result for Interest of students in relational approach

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	1911.554[a]	2	955.777	42.934	.000
Intercept	27.571	1	27.571	1.238	.281
pre	1831.554	1	1831.554	82.274	.000
gender	1.698	1	1.698	.076	.786
Error	378.446	17	22.262		
Total	130290.000	20			
Corrected Total	2290.000	19			

From table 8, the p-value for groups is 0.786. Hence p>0.05, the null hypothesis is accepted. This implies that there is no significant difference between the interest rating of male and female students in the relational method group.

DISCUSSION

In table 1, the mean pretest scores for the relational application group is 69.65 and the mean pretest for the instrumental method group is 68.00. From the mean scores, it is revealed that the subjects of the study were almost at the same entry level in their knowledge of mathematics before the commencement of the treatment. However, the mean of posttest for the relational application method group is 80.00 while the mean of the posttest score for the instrumental method group is 75.00. From the mean scores for both groups it could be seen that the relational application method group has a slightly higher mean score in mathematics than the instrumental method group. Hypothesis 1 confirms this in table 2 where the significant value of the dependent variable (posttest) in the two methods is 0.000. Since this value is less than the level of significance of 0.05, the null hypothesis is rejected. It shows that there a statistical significant difference in the mean performance scores of primary schools pupils taught mathematics in experimental group and control group. This reveals that students taught mathematics with relational application improved on their performance in mathematics more than those taught mathematics with the instrumental teaching method.

In table 3, the pre-MII result for experimental group and control group was 17.25 and 16.60 respectively. This means that students in the two groups had a similar level of interest in mathematics before the commencement of the study. However, the mean interest scores of students taught mathematics with relational application method was 18.30 with a standard deviation of 1.08, while those taught mathematics with instrumental approach was 16.60 with standard deviation 3.15. Therefore, the mean interest rating of the students taught mathematics with the relational approach method is slightly higher than those taught mathematics with the instrumental method. This implies that the students taught mathematics using the relational application method showed higher interest in learning mathematics than the students in the instrumental method group. Hypothesis 2 was test at to confirm that the mean interest rating in mathematics of students between the experimental and control group is significant. The result shows that the p-value for the groups is 0.09. Hence p>0.05 the null hypothesis is accepted. This implies that there is no significant difference in the interest rating of both groups. It therefore means that both the students in the relational method group and those in the instrumental method group have interest in mathematics.

In table 5, the mean performance score in mathematics of male and female students in the relational teaching method pre-test is 70.55 and 67.10. This implies that both the male and female students in the relational application method were almost at the same level of knowledge in mathematics before the treatment, although the male had a little higher mean score. However, the mean performance scores in mathematics for the male and female students in the posttest of the relational application method group are 79.00 and 76.00. This implies that both the male students in the relational application method group improved upon their interest in mathematics but a little higher with the male students. However, there is no much difference between the male and female students mean performance scores in mathematics even

though the male students slightly performed above their female counterpart. To ascertain the significance of this finding, hypothesis 3 in table 6 was tested at 5% level of significance. In table 6, the result shows that the covariance is not significantly the same with the dependent variable thus a significant value of 0.000. However, the significance value of posttest of male and female students in statistics within the groups is 0.047. Hence 0.047 is greater than 0.005, the null hypothesis is accepted. This results shows that there is no significance difference in the mean performance scores in mathematics between male and female students in relational application method group. This implies that both the male and female students performed equally in the mathematics taught during this study. The mean performance scores of male and female students using relational method did not differ statistically significantly. This indicates that both the male and female students performed equally, though the male students in relational application method performed slightly higher than their female counterparts.

Results in Table 7 show that the mean interest rating of the male and female students in the relational teaching method were 17.81 and 17.45 respectively. The result implies that there is no much difference between the male and female students' mean interest rating in mathematics. In table 8, hypothesis 4 was tested to determine if the difference in the mean interest rating between male and female students is statistically significant or not. The result shows that the p-value for groups is 0.786. Hence $p>0.05$, the null hypothesis will be accepted. This implies that there is no significant difference between the interest rating of male and female students in the relational method group. This implies that both the male and female students in the experimental group indicated a similar level of interest in mathematics.

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