



Re-Branding Mathematics: An Approach to Enhancing Students' Performance in Mathematics in Anambra State, Nigeria

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ABSTRACT

This study investigated the effect of Re-branding Mathematics Approach (RMA) on students' achievement in probability. Two research questions and three null hypotheses guided the study. A quasi – experimental design, specifically the non-randomised control group pre-test post-test non-equivalent design was used for the study. The sample consisted of 189 senior secondary class two (SSII) students located in four secondary schools in Onitsha Metropolis of Anambra state, Nigeria. Four intact classes were randomly drawn, one each from each of the four schools. The instrument for the study Probability Achievement Test (PAT) was developed by the researchers to measure students' achievement. The experimental group was taught probability using re-branding mathematics approach (RMA) while the control group was taught the same topics using Conventional lecture Approach. The study lasted for four weeks. Mean and standard deviation were used to answer the research questions while the null hypotheses were analysed using analysis of covariance (ANCOVA). The study revealed that re-branding mathematics approach was more statistically significant, ($F_{1,188}=6.282, p<.05$) in enhancing students' achievement than the Conventional Approach. The result also indicated that Re-branding Mathematics Approach was very effective in teaching male and female student probability, ($F_{1, 188}=6.989, p<.05$). To attain scientific and technological development in the year 20:2020, it was recommended among others, that Re-branding Mathematics Approach be made use of in Nigerian school system for the teaching and learning of mathematics.

INTRODUCTION

The scientific and technological development of a nation depends largely on the mathematical understanding of its citizens. This has necessitated the Nigeria government to make mathematics one of the core subjects in both primary and senior secondary school curricula (FRN, 2004). Despite this importance accorded mathematics in Nigeria's quest for scientific and technological development, some students still dislike, hate and fear mathematics, leading to mass failure and consistent abysmal performance in ordinary level (O/Level) mathematics examination over a decade now (Maduabum and Odili, 2006).

This consistent mass failure and abysmal performance in mathematics over a decade has cast doubts on the country's hope of the attainment of scientific and technological development by the year 20:2020 (Usman and Nwabueze, 2011). This situation of consistently poor achievement worries the researchers, stakeholders of mathematics education, Nigeria government and all those involved in mathematics education.

A number of mathematics education researchers like Usman (2003) and Kurumeh (2006) have identified some factors responsible for this mass failure and consistent abysmal mathematics performance to include use of inappropriate and ineffective teaching approaches among others. Others include students' hatred, phobia, dislike and their perception of mathematics as a difficult subject reserved for talented students. The National Council for Curriculum Assessment (NCCA, 2005) and Sidhu (2006) asserted that many students view mathematics as a difficult and an elitist subject reserved for only the best students. Musa and Agwagah (2006) asserted that if students find the study of mathematics more appealing then performance can be better when they perceive the subject matter as interesting, motivating, useful and relevant to their daily living. Ekwue and Umukoro (2011) observed that students learn, retain and understand when what they are taught are linked correctly and meaningfully to their experiences and when real life examples are used (Adekoya 2009).

The answer for this call is the introduction of Re-branding Mathematics Approach (RMA) to the teaching and learning of mathematics in Nigerian secondary schools as an innovative teaching strategy. The aim is to lay a solid foundation for an emerging knowledge – based science and technology –driven and globally competitive mathematics education achievement (Isohun, 2005). To concretize this, the Federal government canvassed for a reform agenda of revamping or revitalising Nigeria science, technology and mathematics and the entrenchment of innovative systems for bettering achievement, enterprise, development and economic growth (Ukonu, 2010). This Re-branding of mathematics as a wake-up call is in line with the awaking spirit of the following associations in Nigeria including the Science

Teachers Association of Nigeria (STAN), Nigeria Association of Technology Teachers (NATT), Chemical Society of Nigeria (CSN), Science Association of Nigeria (SAN) and Mathematical Association of Nigeria (MAN).

Against this background, O'Tudor (2009) submitted that successful nations started with re-branding and now have brands associated with them. For example, India has the education system regarded as the best in the world. Japan too came to be among great world powers through re-branding. Since it has worked in these countries by great changes, can it not also bring positive changes in mathematics in all its ramifications in Nigeria. This study wants to find out whether it will work in mathematics classroom, hence the present study.

Re-branding Mathematics Approach and Mathematics Teaching and Learning

Re-branding Mathematics is changing the mind set or behaviour of people, ethical transformation, being born again and throwing the past behind, charting a course for the future, reorienting our students for hard work and changing the dented image of mathematics for better performance. It is a process of influencing, appealing, communicating and consulting with a group for good (Ukonu, 2010). Re-branding is an attitudinal and repositioning of the mind for understanding of what should be, what is wrong, what should be corrected, what went wrong and what is the way forward. The course of re-branding was chanted and propagated in Nigeria by Professor Dora Akunyili, the former NAFDAC Boss for changing the image of Nigeria to other countries and for realization of developmental dreams. It means further improving the quality and quantity of the product for better appreciation and higher pricing which in turn lead to higher sales.

The concept of re-branding was announced by the Federal Government in 2009 as a new way of attaining the vision 2020 which aimed at achieving sustainable human development in Nigeria. Muiyiwa (2009) stated that the concept of re-branding involves internal configuration which is total change in all sectors of our economy, including Nigeria's attitude. More so, Oluniyi (2009) reiterated that all the areas that need to be re-branded seriously is the education sector that always gets a low priority from various tiers of government, and called on the government to vote enough money for education if she wants to attain greatness in 2020. Therefore, education should be re-branded, total change in the methodology through the use of modern techniques in teaching and learning, particularly mathematics education.

Re-branding the view of Madu (2011) is the creation of a new name, new term, new symbol, design, or a combination of them for an established brand with the intention of developing a differentiated (new) position in the minds of stakeholders and competitors. It is a redefinition of every facet of mathematics concepts and

activities and engages wholly in the process of mathematical renewal or rebirth to attain a height of obtaining better and higher mathematics performance which leads to a change of attitude of students (Daniel, 2009).

The need to re-brand mathematics cannot be over emphasized since most people and students in particular are derailed of the usefulness of mathematics in daily living, in science and technology, even the roles it plays in the growth of national economy. It is worthy of note that our problem on sustainability of science and technology advancement has been inability to access the wealth found in mathematics since mathematics is the queen of science and technology. This is because no nation can advance scientifically and technologically above its mathematical knowledge. Many students lack mathematical knowledge whose application is found in science and technology. This lack of mathematical knowledge is showcased in poor funding of education, lack of transparency of public officers, tribal sentiments, short circuiting of funds meant for research and misappropriation or embezzlement of funds (Ukonu, 2010).

There is the need to revive or rejuvenate the teaching and learning of mathematics since mathematics occupies *prima facie* and contentious place in promoting and piloting technological development and seven point agenda requiring firm technological exploit to survive (Etukudo, 2011). Changes in technological development are implicative for change in curriculum of many countries for foundational mathematics curricula in Nigeria. Crop (2005) pointed out that modern technology influences mathematics in diverse ways which include expansion of scope of mathematics, entrenchment of experimentation and practical way of teaching, inculcate the love for problem solving and engender the application of computational and higher skills. This demand on mathematics exposes a noticeable lag which only re-branding can cover as to exploit the eagerness in learners and achieve faster learning congruent with the modern society.

Since mathematics is a bedrock of science and technology, for man to solve his problem using science and technology, there is need to make mathematics viable, revamp or revitalise mathematics and ginger students to love and show interest in mathematics by re-branding. If we do not re-brand well through good and sufficient ideas and funding, we will be recycling ideas that are obsolete which cannot lead to better, realistic and achievable advancement in mathematics.

The impetus of re-branding will address the present putrid nature of mathematics performance, which has been a blending of hope and despair and of optimism and pessimism, stamp in self-reliant, self-confidence in the students and love and appreciation of mathematics and its related courses. With re-branding of mathematics, a good percentage of Nigerians and Nigerian students will be sensitized on the right application of deep-well mathematical and scientific knowledge available to

Nigerian students, and thus help Nigeria as a nation to achieve our developmental targets. Re-branding mathematics will capture the attention of the present students to rethink and make a trial of attending mathematics lesson/classes.

In a Re-branding Mathematics classroom, the environment is friendly, student-centred, interactive, homely and involving. Every student in the class is part and parcel of the class and is made to participate actively in the class activities. There is enough room for question and answer, discussion, dialogue and clearing of doubts. Each student's contributions is important. The teacher begins the class with explaining the concept or topic in question, and what they stand to gain by making sure the students are carried along. The teacher makes the students see the importance of mathematics in every day living: in the home, in the kitchen, in their lives, in the market, farm, on the streets in every aspect of life endeavour, mathematics is there and how anyone who does not know mathematics, is lost in the society. This is to say that the utilitarian aspect of mathematics and that of the topic in question must be exposed to the students in the classroom.

Since the cardinal goal of re-branding set to achieve is to revamp or revitalise the image of mathematics and to bolster students' confidence, the teacher must not forget to expose the importance of mathematics in scientific, technological and economic advancement of already advanced nations and that of yet to advanced nations like Nigeria and what each country stands to gain or loss without success in mathematics.

It is very important that the teacher explains the relevance of mathematics to the society, individuals, economy, career choice and the consequences of failing mathematics. The teacher really needs to fine-tune the students in the beginning of the lesson, in the middle and towards the end and explain the application of the topic in the world of work.

The students are made to observe the inter-relatedness of mathematics to different courses and why mathematics is made compulsory in primary and secondary schools. Explain to them how mathematics is the solution to most of our problems in national economy, curbing the excesses of the militants, kidnappers, religious crisis, criminal incursions, decay in justice, political gangsters, embezzlement of public funds etc.

The teacher then encourages them as leaders of tomorrow to take their study of mathematics serious so that they will be successful in their examinations since advantages in its success outweighs its disadvantages in failure. All these exposures will open their minds to a lot of excitement and experience to arouse their interest, change stereotypical attitudes and be confident in their studies. This gospel of mathematics surely will begin to burn the zeal of change to seriousness and hard work leading to greater performance.

Statement of the Problem

The consistent low achievement of secondary school students in mathematics is an issue of major concern. Some Students perform poorly because they have strong hatred and phobia for mathematics (WAEC, 2007). They perceive mathematics as difficult, abstract, unattractive, boring, not captivating and not motivating and not related to their daily living. So they make little or no effort to study mathematics. They may not have been exposed to the relevance of mathematics to their lives. They cannot relate what they learnt in the classroom to what happens in their environment. This study then wants to focus on what Re-branding Mathematics Approach can do to reduce abysmal performance in mathematics in secondary school level of education. It will as well address gender disparity in achievement in mathematics. Literature search shows that there is empirical gap of information in this area; hence the problem investigated in this study.

Purpose of the Study

The main purpose of this study is to determine the effect of Rebranding Mathematics Approach (RMA) in teaching and learning of probability in senior secondary school. Specifically, the study will

- i. determine the effect of Rebranding Mathematics Approach on students' achievement in probability;
- ii. examine the effect of Rebranding Mathematics Approach on Students' achievement according to gender; and
- iii. determine the interaction effect of teaching approach and gender on students' achievement scores in probability.

Research Questions

The following research questions guided the study:

1. What is the effect of Rebranding Mathematics Approach on the mean achievement scores of students in probability?
2. What is the effect of Rebranding Mathematics Approach on mean achievement scores of male and female students in probability?

Hypotheses

The following hypotheses were formulated and tested, at the $p > 0.05$ level of significance:

1. There is no significant difference between the mean achievement scores of students taught probability using Rebranding Mathematics Approach and those taught the same probability using Conventional Approach.
2. There is no significant difference between the mean achievement scores of male and female

students taught probability using Rebranding Mathematics Approach.

3. The interaction effect of approach and gender on mean achievement scores of students in probability is not significant.

METHODOLOGY

A quasi-experimental design, specifically the pre-test post-test non- equivalent control group design was used for the study. Intact classes were used to avoid disrupting the normal school programme. The sample consists of 189 SS2 students of 8 senior secondary schools within Onitsha Metropolis, in Anambra State. To fulfil the criteria for selection, a multi-stage sampling technique was used. The first stage was to select schools with mathematics teachers who are holders of B.Ed or B.Sc(Ed) degree in mathematics teaching SS2 classes. Second stage was selecting single sex schools that had not less than four streams and had presented students for School Examination annually over the last three years. Two boys and two girls' schools totalling four schools were randomly selected. From each school selected, only one class was randomly selected for the study by hat-draw method. Since intact classes were used, the entire students of each selected class were used for the study.

From the four schools selected, one male and one female school were randomly selected for experimental and Control groups respectively by flip of a coin. From each of the school types selected, one class was chosen simple randomly by the flip of a coin. All the classes that chose head became experimental while those that chose tail became control groups for the study. Different schools were assigned to experimental and control to avoid students exchanging idea about the lesson. The experimental and control groups were taught probability by Re-branding Mathematics Approach and Conventional Approach, respectively. The research instrument used for the study was Probability Achievement Test (PAT) constructed by the researchers. The PAT initially was a 36-Multiple choice achievement test items of five options. PAT instrument with its marking scheme and the lesson plans were given to three university mathematics education and two secondary school mathematics teachers for face validation. Their comments, suggestions and corrections were used to modify PAT resulting to 25 items for the study. PAT was used to measure students' performance in probability. PAT was trial tested on 36 SS2 secondary school students from another school who were not part of this study. The reliability coefficient of PAT was computed using Kuder- Richardson (K-R(21)). The reliability coefficient of PAT was 0.76. Thus, the instrument was considered reliable. The researchers used regular mathematics teachers of each school as research assistants. A training programme was organised for these research assistants. They were exposed to all the essential steps of using Re-branding Mathematics Approach and Conventional Approach as applicable. All

necessary Instructional materials for the study were made available for the teachers. Before the commencement of the study, PAT was administered by each teacher to each group as pre-test and collected back before the lesson started. The experimental group was taught probability using Re-branding Mathematics Approach while the control group was taught the same topic using Conventional Approach. The normal period of 40minutes was observed per lesson. The researchers supervised while the lesson was going on to be sure the treatment was properly carried on. The study lasted for four weeks. The teacher administered PAT as post-test at the end of the study to both groups. The scripts were collected, marked and scored over hundred by the teachers using the marking scheme prepared by the researcher. The

scores as the data collected were subjected to further analysis using two analysis of covariance (ANCOVA).

RESULTS

The results of this study are presented according to the research questions and their corresponding hypotheses.

Research Question 1

What is the effect of Rebranding Mathematics Approach on the mean achievement scores of students in probability?

The result is presented in Table 1.

Table 1: Mean and Standard Deviation Scores of Students' Pre-test and Post-test Performance Scores of the Experimental and Control Groups in PAT

Groups		Pre- test	Post- test	N	Mean Difference
Experimental	Mean(X)	7.91	43.54	100	35.63
	Standard Deviation SD	4.61	11.73		6.12
Control	Mean(X)	9.29	40.22	89	30.83
	Standard Deviation SD	5.77	11.04		5.27

The result from Table 1 indicates that Experimental group had a mean achievement score of 7.91 and the standard deviation of 4.61 in the Pre-PAT while the Control group had a mean and standard deviation of 9.29 and 5.77 respectively in pre-PAT. Similarly, in post-PAT, the Experimental group had mean achievement score and standard deviation of 43.54 and 11.73 respectively, while the Control group had the mean achievement score and standard deviation of 40.22 and 11.04 respectively. The mean difference between the Pre-PAT for the Experimental and Control groups are 35.63 and 30.83

respectively. This implies that students taught probability using Re-branding Mathematics Approach (RMA) improved more in PAT than those taught the same topic using Conventional Approach.

HO1:

There is no significant difference between the mean achievement scores of students taught probability using Re-branding Mathematics Approach and those taught using Conventional Approach.

Table 2: Analysis of Covariance (ANCOVA) Results For Experimental and Control Groups

Source of	Sum of squares	dF	Mean Squares	F	Sig	Remark	Variance
Corrected Model	1581.807	4	395.452	3.457	.009	S	
Intercept	78149.146	1	78149.146	683.105	.000	S	
Pre-test	251.344	1	251.344	2.197	.140	NS	
Groups	718.658	1	718.658	6.282	.013	S	
Gender	799.599	1	799.599	6.989	.009	S	
Group*Gender	546	1	.546	.005	.945	NS	
Error	21050.108	184	114.403				
Total	355692.000	189					
Corrected Total	22631.915	188					

S= Significant NS =Not Significant

The ANCOVA statistics was computed as shown in Table 2. The result in Table 2 shows that the difference observed between the mean achievement scores of the Experimental and Control groups is statistically significant in favour of the Experimental group ($F_{1,188}=6.282; p<0.05$). Hence, the null hypothesis of no significance is rejected.

Research Question 2

What is the effect of Re-branding Mathematics Approach on mean achievement scores of male and female students in probability?

The results are presented in Table 3.

Table 3: Mean and Standard Deviation (SD) of Male and Female Students of Experimental Groups in PAT

	Test Type			Gender		
	Male			Female		
	Mean	SD	N	Mean	SD	N
Pre-PAT	8.47	5.15	47	7.42	4.05	53
Post- PAT	45.91	10.67	47	41.43	10.73	53
Mean Difference	37.44	5.52		34.02	6.68	

From Table 3, the differences between the mean achievement scores of male and female students are 37.44 and 34.02 respectively. The table indicates that both male and female students improved upon their mean scores in the post PAT. The male students scored 3.42 higher than the female students in the post-PAT as observed from the table.

Hypothesis 2: (Ho2)

There is no significant difference between the mean achievement scores of male and female students taught probability using Re-branding Mathematics Approach.

The results are presented in Table 2.

The difference observed in the mean achievement scores of male and female is statistically significant in the post-PAT ($F_{1, 188}=6.898; p<.05$). Then the null hypothesis of no significance difference was rejected.

HO3:

The interaction effect of approach and gender on mean achievement scores of students in probability is not significant.

From Table 2, it is observed that the interaction effect between Approach and gender on achievement is not significant ($F_{1, 188}=.005; p<.05$). This null hypothesis is not rejected.

DISCUSSION

The findings of this study revealed that Re-branding Mathematics Approach had significant effect on students' achievement in probability. The experimental groups had higher mean achievement score (43.54) than their counterparts in the control groups (40.22) in the post-test as shown in Table 1. Results in Table 2 further confirmed

this finding by indicating statistically significant effect of Re-branding Mathematics Approach on students' achievement in probability. This implies that the efficacy of Re-branding Mathematics Approach was more positive with mean difference by 3.32 in enhancing and facilitating students' achievement in probability. This supports the research carried out by Muiyiwa (2009) who emphasis on the degree of total change in output that can result from total change in strategy. This better performance could be as a result of finding the subject matter more appealing, interesting, and relevant to their living (Musa and Agwagah, 2006). Again this is in agreement with the study of Kurumeh (2006) where the experimental group enhanced students' mean achievement score more than the control group and the change in performance was significant.

The results presented in Table 3 also revealed that male students had higher mean achievement score (45.91) than their female counterpart with mean achievement score of 41.43 in the post-test. Table 2 indicated that gender had statistically significant effect on students' achievement in probability ($F_{1, 188}=6.989, p<.05$). This implies that Re-branding Mathematics Approach is effective for teaching male and female students alike. This is in agreement with Ukonu (2010) who said that Re-branding makes all citizen wake to work irrespective of gender, religion or race.

CONCLUSIONS

On the basis of the major finding of this study, it was concluded that the use of Re-branding Mathematics Approach is more positive and effective in improving students' performance in probability more than the Conventional Approach. Secondly, it was concluded that gender is an influencing factor in the achievement of students taught probability using Re-branding Mathematics Approach. That teaching method and

gender do not interact to influence achievement of students in probability.

RECOMMENDATIONS

Based on the findings and conclusions of this study, the researchers recommend as follows:

1. Mathematics teachers in secondary schools should incorporate Re-branding Mathematics Approach as one of the techniques that will be used to bring a total change in teaching mathematics contents in order to increase students' achievement in mathematics particularly probability.
2. Relevant professional bodies like Mathematics Association of Nigeria (MAN) and Science Teachers Association of Nigeria (STAN) should organise seminar or workshops during annual conferences to train teachers on the use of this approach.
3. Teacher trainers should integrate Re-branding Mathematics Approach among instructional strategies being inculcated into the students.

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