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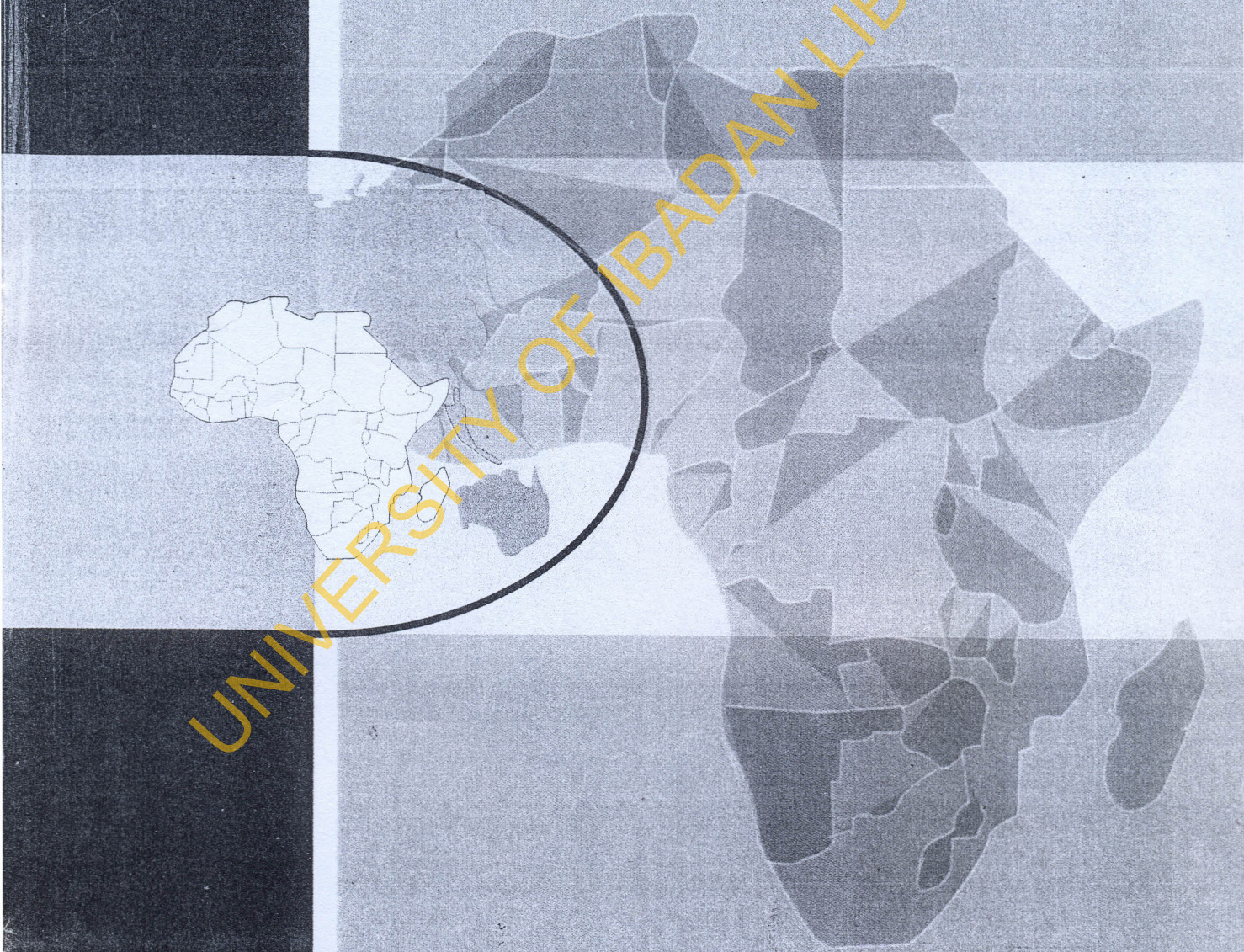

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CONTENT

Effect of Brainstorming on Students' Achievement in Junior Secondary School Mathematics: An Effort in Making Schools Effective

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Abstract

One of the measures of school effectiveness is the students' academic achievements (in this study Mathematics is used). The poor achievement of students in Mathematics both at school and public examinations has been a concern to Mathematics educators. The failure rate may be due to how the subject is taught. This study, therefore, examines the effect of brainstorming on students' learning outcomes in Junior Secondary School Mathematics. The study adopted a quasi experimental design with pre test – post test control group. Two instruments (Mathematics Achievement Test and Numerical Ability Test) were used to collect data. The result shows that students exposed to brainstorming strategy out performed those in the control group. Students with high numerical ability performed better than those with low ability. Students with high ability exposed to brainstorming are better achievers in Mathematics than the low ability students. The implication of the study is discussed.

Introduction

Mathematics is an important subject that cannot be separated from the world of technology. Johnson and Rising (1972) note that no subject has greater application as much as Mathematics because Mathematics finds its usefulness in virtually all subjects since all fields of knowledge are dependent on it for solving problems and predicting outcomes. It is an indispensable tool in creating new knowledge. It is the most important instrument for understanding and exploring scientific, economic and social world.

Knowledge and skills obtained in Mathematics could assist students in making intelligent guesses and estimations, it also helps them in evaluating and interpreting results obtained from outcomes of a programme. Thus, the ability to solve mathematical problems is likely to boost students' performance not only in Mathematics but in virtually all subjects. Apart from using the knowledge and skills of Mathematics to solve every day problem, it is also a gateway into choices of career (Oladeji, 1997).

As important as Mathematics is, it is unfortunate that the general mass failure in the subject by students at secondary school level of educational system in Nigeria has caused many people to raise question on the effectiveness of schools (Adewale, 2004). It has also given Mathematics educators a high level of concern. Mathematics has caused great fear or anxiety in the mind of many students because they perceive the subject as being too difficult and abstract but at the same time, many educational careers require that students should have at least a credit pass in it. Some factors have been documented to impede students' achievement in Mathematics, some of them are: students negative attitude in the subject (Okpala, 1985); inadequate number of organized seminars, workshops and in service training for Mathematics teachers (Farombi, 1998); inability of the students to possess Mathematics textbooks and other instructional aids (Farombi, 1998); too much of control of classroom teaching by syllabus and examination (Adewale, 2004); etc.

In order to raise school effectiveness, attention should be given to how teaching and learning take place in a school setting. What students learn depends not only on what they are taught but also on how they are taught (Saskatchewan education 1991). Unfortunately, many teachers of Mathematicsadopt some dull methods of teaching the subject and little efforts are made in updating teachers' knowledge of correct methods of disseminating mathematical knowledge (Iroegbu, 2006). Some of the methods used by teachers are: cooperative learning strategies including peer tutoring (Ogundipe, 2003); adoption of problem-based learning strategies (Adewale, 2002); use of modeling instructional techniques; adoption of regular and regulated exercises and drills with immediate feedback (Adewuyi, 2002) use of programmed instruction (Ajiboye, 1996;

Adu, 2002); adopting practical approach to Mathematics teaching (Iroegbu, 2006); discovery method using instructional materials which employs manipulative ability of the students and laboratory approach (Oladeji, 1997). Although, many of these methods have been used and are still being used, not much has been recorded in the achievement level of students in Mathematics. Therefore, such method of teaching as brainstorming is advocated.

Brainstorming is a process of developing solutions to problems. Sternberg and Lubart, (1995), define brainstorming as a technique in which children are encouraged to come up with creative ideas in a group, play off each other's ideas, and say practically whatever comes to mind. Children are usually told to hold off from criticizing others' ideas, at least until the end of the brainstorming session. Creative children are not afraid of failing or getting something wrong. They may go down twenty dead-end-street before they come up with an innovative idea. Brainstorming works by focusing on a problem, and then deliberately coming up with as many solutions as possible and by pushing the ideas as far as possible. It is also a group technique for generating new and useful ideas and promoting creative thinking. A good creativity strategy is to come up with as many new ideas as possible. The more ideas children produce, the better their chances of creating something unique (Rickards, 1999). Brainstorming is a useful way of getting started or generating new ideas. It can be done as a class, in small groups, or by individual students. Once students are familiar with the process, students can use this technique on their own when they are stuck revising their work.

The idea of brainstorming started in the 1950's when an advertising executive, Alex Osborn, wanted to find a better way for teams to generate creative ideas. And he came up with solution called brainstorming which he describes as a structured team decision-making process whereby team members directly interact to generate as many alternative solutions to the problem as possible, piggyback on ideas of others, and avoid evaluating anyone's ideas during the idea generation stage. However, in research, Flener (1976) was the first to recommend the brainstorming technique as one that enhances better understanding.

Brainstorming requires team members to abide by the rules that encourage divergent thinking and minimize evaluation apprehension. One of the rules is *No criticism.* The most important rule in brainstorming is that no one should criticize any ideas that are presented. Without criticism, team members might be more willing to suggest crazy solutions to the problem, which results in a larger number and potentially better ideas. The second rule being considers here is e*ncourage freewheeling which* deals with welcoming wild and strange ideas which are the seeds of divergent thinking in the creative process. The third rule, *piggyback ideas*, which encourages team members to combine and improve on the ideas already presented. The next rule, *encourage many ideas*, is based on the idea that of quality, increases with the number of ideas presented. *Don't over control* is the next rule. Amabile (1993), says that telling children exactly how to do things leaves them feeling that any originality is a mistake and any exploration is a waste of time. Letting children select their interests and supporting their inclinations are less likely to destroy their natural curiosity than dictating which activities they should engage in. Amabile (1993) also believes that when adults constantly hover over children, the children feel they are being watched while they are working, then their creative risk taking and adventurous spirit wane. Another rule is *encourage internal motivation.* The excessive use of prizes, such as gold stars, money or toys, can stifle creativity by undermining the intrinsic pleasure children derive from creative activities.

In brainstorming session, the time involved is between fifteen to thirty minutes, but the session may last as long as the group continues to offer new ideas. The steps for brainstorming are: gathering the learners or participants and forming into small group with a leader. The teacher serves as the overall facilitator. The facilitator writes down a brief description of the problem. He takes control of the session, initially defines the problem to be solved with any criteria that must be met and then keeps the session on course.

Brainstorming begins with an idea-generating session. Students should generate as many ideas as possible, without evaluation or censorship. Quantity of ideas at this stage is more important than quality. Students should be encouraged to include wild ideas, new and different approaches,

ideas that build on previous suggestions, and those that have worked for them in the past. One person should be designated to record the ideas as they are given and placed where the whole group can see and read them. In the group, the students discuss the ideas generated and work to create a condensed list or a plan for moving forward.

Another variable which is considered to affect students' achievement in Mathematicsis students' numerical ability. There is the assumption that students whose numerical ability is high are very likely to perform well in Mathematics (Emeke & Adegoke, 2001). This claim is based on the fact that the manipulation of figures has its practical application in Mathematics. Numerical ability has also been shown to influence students' achievement in Mathematics (Emeke & Adegoke, 2001; Adu, 2002). Adu (2002) tests the influence of numerical ability and gender among other independent variables on students' academic achievement in Economics. The study found a significant influence of numerical ability on students' academic achievement. Emeke and Adegoke (2001) also examine the effect of test response mode, students' numerical ability and gender on the cognitive achievement of senior secondary school Mathematics students. The study reveals that the higher the numerical ability of students the better their performance in the Mathematics achievement test. This may be expected in the sense that Mathematics is quantitative in nature. Therefore students with high numerical skills are most likely to record higher performance in Mathematics achievement test than their counterparts with low numerical ability (Falaye, 2006).

Also, Saayman (1991) investigates students' proficiency with numerical tools and formal logic operations required for the study of college Mathematics. The result of the study reveals that the evaluation of the quantitative competence of the students is a good predictor of academic potentials of students in Mathematics. Iroegbu (1998) shows that high numerical ability students achieve significantly higher mean score than either medium ability or low ability students in Physics. Eriata (1994) examined the relevance of numerical ability to performance in Geography, reports that students' performance in some geography courses was dependent on their numerical knowledge. In the light of various studies reviewed, it is considered appropriate to examine the extent to which

brainstorming method of teaching will affect students' achievement in Mathematics. Therefore, this study determines the effect of brainstorming method of interactive instruction on students' achievement in Mathematics through an experimental study.

Research Questions

Four research questions were asked and answered in order to guide this study. The questions are:

1. Is there a significant main effect of treatment on students' achievement in Mathematics?
2. Is there a significant main effect of students' ability on their achievement in Mathematics?
3. Is there a significant interaction effect of treatment and ability on students' achievement in Mathematics?
4. What is the composite and relative contribution of treatment and ability on students' achievement in Mathematics?

Methodology

The study adopted quasi experimental design with pre test – post test control group. Two treatment groups were used (the experimental group and the control group). The students in experimental group were assigned to the brainstorming instruction while the students in the control group were exposed to the conventional instruction and the same topics were taught to both groups. The moderating variable was the students' numerical ability at two levels (high and low). The dependent variable was the students' achievement in Mathematics.

The target population of the study comprised the Junior Secondary School students in Ibadan North Local Government of Oyo State, Nigeria. Four of the Junior Secondary School were randomly selected as the samples for the study, while an arm of the Junior Secondary School three (JSS 3) was chosen with all the students (intact classes) as the sample. The selected arms of the JS 3 students were randomly assigned to control and experimental groups. The instruments used for this study are classified into two, the response instruments and the stimulus instruments. The response

instruments are two – Achievement Test in Mathematics (ATM) and General Ability Test (GAT). ATM is a thirty question constructed under simultaneous linear equation which is one of the topics in JS 3 Mathematics syllabus. The choice of this topic is based on the fact that many of the students in the four schools expressed that the topic was difficult to understand. The test items are in form of multiple choice items with 4 options A to D from which the students were to choose the correct option. The thirty questions were selected from a pool of an initial 50 items after they had been exposed to face, content and empirical validations. Some of the items were wrongly worded, and corrections were made on them. In addition, some items had very low facility indices (too difficult items) while some of the items had very high facility indices (too easy items). Those too difficult and too easy items were removed to get the thirty items used for this study. The thirty items have facility indices ranging from 0.2 to 0.6 as suggested by Thorndike (1997). A Kuder-Richardson (KR) 20 (which shows the internal consistency and construct validity of the test) measure of 0.79 was obtained.

GAT is a twenty multiple choice items with 4 options A to D from which the students were to choose the correct option. The instrument was pilot-tested on a sample of 30 students in a school in another Local Government (Ibadan North East) not used in the study and a KR 20 of 0.72 was obtained. The stimulus instruments are the instructional packages designed for the brainstorming strategy and the convectional method of teaching. The use of the stimulus instruments lasted six weeks.

ATM and GAT were administered on the experimental and control groups prior to the instruction. The scores obtained after administering ATM served as pre-test while the scores from GAT was used to classify the students into high and low ability groups. The students who scored below the mean score in GAT are classified as low ability students while those whose scores range between mean score and above were classified as high ability students. The students in the two groups were taught geometry (this is one of the difficult topics in Mathematics according to chief examiners' reports, 2000) – the experimental group with the use of brainstorming strategy and the control group with the use of conventional method. And at the end of the six weeks, the post test in Mathematics

achievement was administered on the two groups. A two-way Analysis of Covariance (ANCOVA) was used to analyse the data obtained. Normally, one would have used a t-test analysis to compare the experimental and control groups; and at the same time use t-test to compare low and high numerical ability students, but the researcher is also interested in interaction effect. Moreover, ANCOVA was used to remove initial differences between the students in the experimental and control groups.

Results and Discussion

The findings of this study are presented in the following tables.

Research Question 1

Is there a significant main effect of treatment on students' achievement in Mathematics?

Table 1: Summary of Analysis of Covariance (ANCOVA) on Achievement.

Source	*Sum of Squares*	*df*	*Mean Square*	*F*	*Significant*
Covariates (Pre Test)	3033.344	1	3033.344	189.021	.000
Main Effects:	2632.543	2	877.514	54.682	.000
Treatment	2561.511	1	2561.511	159.619	.000
Ability	82.718	1	82.718	5.155	.025
2-way Interactions	106.072	1	106.072	6.610	.011
Treatment X Ability	106.072	1	106.072	6.610	.011
Model	5875.314	8	734.414	45.764	.000
Residual	2519.487	157	16.048		
Total	8394.801	165	50.878		

Table 2 Multiple Classification Analysis on Achievement. Grand Mean = 17.27

Variables	*N*	*Unadjusted Deviation*	*Eta*	*Adjusted Deviation*	*Beta*
Post test:					
Treatment:					
brainstorming	85	4.39		4.15	
control	81	-4.39	.618	-4.15	.584
Ability:					
low	84	-2.13		-1.74	
high	82	2.16	.261	1.76	.205
R					.822
R^2					.675

There is a significant difference between students exposed to brainstorming and those exposed to conventional method of teaching ($F_{(1, 157)} = 159.619$; $P < 0.05$). From Table 2, the students exposed to brainstorming performed better ($17.27 +^{1} 4.15 = 21.42$) than those exposed to conventional strategy ($17.27 + (-4.15) = 13.12$). This result implies that the experimental group performed significantly better than the control group in the post test and that their performance also improved significantly after the treatment. This show that the brainstorming interactive instruction strategy provided a favourable effect on the experimental group and the effect leads to improvement in student's achievement in Mathematics.

Research Question 2

Is there a significant main effect of students' ability on their achievement in Mathematics?

The result reveals that students ability has significant effect on students achievement in Mathematics ($F_{(1, 157)} = 5.155$; $P < 0.05$). From Table 2, the students who had high general ability performed better ($17.27 + 1.76 = 19.03$) than those with low general ability ($17.27 + (-1.74) = 15.53$) in Mathematics.

Research Question 3

Is there a significant interaction effect of treatment and ability on students' achievement in Mathematics?

The result shows that the interaction effect of treatment and ability on students' achievement in Mathematics is significant ($F_{(1, 157)} = 6.610$; $P < 0.05$). This implies that students' numerical ability is sensitive to the treatment.

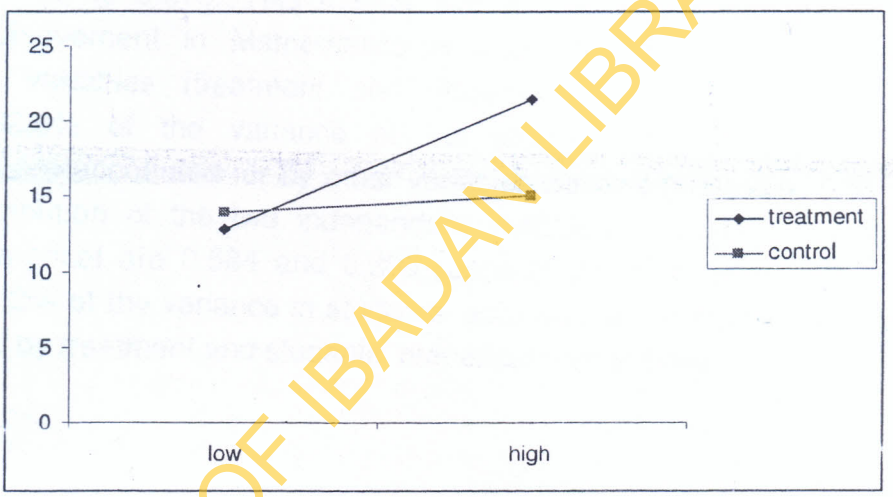

Fig.1 Interaction Effect of Treatment and Numerical Ability on Students' Achievement in Mathematics

Fig. 1 is a disordinant interaction effect of treatment and numerical ability on students' achievement in Mathematics. The figure shows that the students with high numerical ability became better when exposed to brainstorming treatment than the comparable group (control) in achievement in Mathematics. The students with low numerical ability did not perform well in the achievement test in Mathematics even when they were exposed to the brainstorming intervention. There is a little gain between students with low and high numerical ability in their achievement in Mathematics in the control group with students with high numerical ability, having an hedge over the low ability students.

[1] + is used for adding the grand mean and the adjusted mean deviation

Research Question 4

What is the composite and relative contribution of treatment and ability on students' achievement in Mathematics?

Table 2 reveals that there is a high multiple correlation between the students' achievement in Mathematics (dependent variables) and treatment and students' numerical ability (independent variables). A correlation coefficient of 0.822 is observed. Therefore, the coefficient of determination R^2 is 0.675. This means that 67.5% of the variance in students' achievement in Mathematics is accounted for by the two independent variables (treatment and students' numerical) and the remaining 32.5% of the variance in the students' achievement in Mathematics are accounted for by other variables beyond this study. The relative contribution of the two independent variables – treatment and students' numerical are 0.584 and 0.205 respectively. This implies that 34.1% and 4.2% of the variance in students' achievement in Mathematics are explained by treatment and students' numerical respectively.

Discussion

Students exposed to brainstorming learning strategy performed better than those in the control group. This confirms the report of researchers who had been involved in the use of brainstorming strategy on students' achievement with this conclusion that brainstorming improves students' achievements, attitudes, maximize intellectual potentials and ability to understand and solve real life problems. Wilborn (1994), designed practicum to improve third grade students' problem solving abilities through brainstorming strategy and the result indicated that students' performance improved significantly and they enjoyed solving Mathematics problems. Seamon and Kenrick (1992) in discussing a case of a seven year old girl discover that even gifted individuals find unchallenging assignments and school work boring, but brainstorming brings out the best in them and enhances their performance. Brainstorming is so important that Sears and Barbee (1977), concluded that if the mentally gifted children are not adequately challenged by given them such roles as leading brainstorming sessions, they could turn out to be misfits. However, if team members do

not abide by the rules of brainstorming, its use will be limited to arguments which may eventually lead to fight as some of the students in brainstorming session are most likely to criticize one another, discourage freewheeling – wild and strange ideas, discourage piggyback ideas – share credit and their accomplishments, discourage so many ideas, over bearing (some students are opinion leaders and their opinions must be followed.)

The study also reveals that students with high numerical ability perform better than those with low numerical ability in Mathematics. The result is not a puzzling one because Mathematics is quantitative in nature, so, students with high numerical skills are expected to return higher scores in Mathematics achievement test than their counterparts with low numerical ability. This corroborates the study of Saayman (1991) who concludes that students' proficiency with numerical tools and formal logic operations are the basic requirements for students studying college Mathematics. This is in line with Emeke and Adegoke (2001) study where they reveal that the higher the numerical ability of students the better their performance in the Mathematics achievement test. Also, this study corroborates the findings of Falaye (2006) where she finds that students with high numerical ability outperformed their counterparts with low numerical ability in Geography achievement test. Iroegbu (1998) also shows that high numerical ability students achieved significantly higher mean score that than either medium ability and low ability students in Physics achievement test. Numerical ability has also been shown to influence students' achievement in other subjects in the social sciences like Economics and Geography. Adu, (2002) found a significant influence of numerical ability on students' academic achievement in Economics. In addition, Eriata (1994) reports that students' performance in some Geography courses was dependent on their numerical abilities.

Conclusion and Recommendation

The result of this study shows that brainstorming is a potent interactive instructional strategy that can be used when students are beginning a new phase or when individual students or groups feel stuck and in need of new ideas. Brainstorming as an interactive instructional strategy is time

consuming and may not produce immediate benefits but students, teachers and parents should not be worried about this as the long-range benefits of teaching through brainstorming is very high leading to better retention, transfer and higher future achievement. Therefore, for effective teaching, learning, understanding and mastering Mathematics concepts, the use of brainstorming is being recommended for the Mathematics teachers of all grades.

The joint effects of brainstorming and numerical ability yielded a stronger result. Students with high numerical ability performed better than the students with low numerical ability both in the experimental and control groups. However, students with high numerical ability performed extra ordinarily in Mathematics achievement test. It is thus recommended that if brainstorming is used as an interactive instructional strategy for students with high numerical ability, their performance will be further enhanced.

Although, this study did not focus entirely on teachers, it is however, recommended that Mathematics educators should organize workshops and seminars to educate teachers on brainstorming strategy and they should also give them established guidelines which teachers can use as immediate tool in their own classrooms for effective teaching learning process. To this effect, government should mount in-service training for all Mathematics teachers to enable them effectively use brainstorming as an interactive instructional strategy in their classrooms. It will not be out of place if the curriculum developers could carefully plan the curriculum in a way that will give room for the development of brainstorming abilities in students.

References

Adewale, G. (2004). Examination Malpractice: A Stigma on School Effectiveness in Nigeria. Nigerian Journal of Educational Research and Evaluation Vol.5 No.1 (pp 1 – 10).

Adewale, J. G, (2002). Modern Trends in Physics Teaching at the Secondary Schools Level in S. O. Ayodele (ed.) Strategies Across the Curriculum – Modern Methods of Teaching. (pp 230-241).

Adewuyi J. O. (2002). The effect of Feedback and Remediation on Students' Learning Outcomes in Senior secondary school Economics Unpublished Ph.D Thesis, University of Ibadan.

Adu, E.O. (2002). Two problem-based learning strategies: Quantitative Ability and Gender as Determinants of students' Academic Achievement in Economics. Unpublished Ph.D. Thesis, University of Ibadan.

Ajiboye, J. O. (1996). A self-learning programme, the modified lecture method and students' cognitive and affective outcomes in some population education concepts. A Ph.D. Thesis, University of Ibadan, Ibadan

Amabile, T. M. (1993). What does a theory of creativity require? *Psychological Inquiry, 4,* 179-181.

Emeke, E.A. and Adegoke, B.A. (2001). The interaction effects of test response mode, students' numerical ability and gender on cognitive achievement in senior secondary school Physics, in Y. Awosika etal (eds). *Topical issues in Education.* Paper in honour of Professor C.O. Udoh.

Eriata, B.O. (1994). The relationship between prior Mathematics knowledge and students' academic performance in Geography. *Journal of Teacher Education,* 3 (182), pp62-72.

Falaye, F.V. (2006). Numerical ability, course of study and gender differences in students' achievement in practical Geography. *Research in Education.*

Farombi, J. G. (1998): Resource Concentration, Utilization and Management as Correlates of Students' Learning Outcomes: A Study in School Quality in Oyo State. A Ph.D. Thesis at the International Centre for Educational Evaluation, University of Ibadan, Ibadan.

Flener, F. O. (1978). Reflections on a problem solving study International Journal of Mathematics Education Science and Technology, 9 (1), pg. 9 – 13.

Iroegbu, T. O. (2006). Methods of teaching Mathematics. A seminar paper presented at the Osun National Union of Teachers' House.

Iroegbu, T.O. (1998). Problem – based learning numerical ability and gender as determinants of achievement in line graphing skills and meaningful leaving in energy concepts. An unpublished Ph.D thesis, University of Ibadan.

Johnson, D. A. and Rising, G. R. (1972). Guidelines for Teaching Mathematics, 2nd Ed., Belmont, CA., Wadsworth.

Ogundipe, B. D. (2004). The effects of peer-tutoring-assisted instruction, class size and test anxiety on senior secondary students achievement in physics in Ibadan. An unpublished PhD thesis, University of Ibadan.

Okpala, P.N. (1985). Teachers' Attitudinal Variables in Instructional Assessment Practices as correlates of Learning outcomes in Physics. Unpublished ph. D Thesis, University of Ibadan.

Oladeji, F. A (1997). The effect of a problem solving strategy on students learning outcomes in secondary school Mathematics. Unpublished M.Ed project Dept. of Teacher Education University of Ibadan.

Rickards, T. (1999). Student perceptions of interpersonal behaviours: An on-line education perspective. Paper presented at annual meeting of the Queensland Secondary Information Technology Educators state conference, Brisbane, Australia.

Saayman, R. (1991). A diagnosis of the mathematical and scientific reasoning ability of first-year physics undergraduates. Journal of Physics Education. (26)359-366.

Saskatchewan Education (1991). Instructional Approaches: A framework for professional Practice Regina.

Seamon, J. G., Kenrick, D. T. (1992). *Psychology*. Englewood Cliffs: Prentice Hill..

Sears, P.S., & Barbee, A.H. (1977). Career and life satisfaction among Terman's gifted women. In J.C. Stanley, W.C.

Sternberg, R.J. & Lubart, T. (1995). An investment approach to creativity. In S.M. Smith, T.B. Ward, and R.A. Finke (eds.) The Creative Cognition Approach. Cambridge: MIT Press.

The West African Examinations Council (2000). Chief Examiners' Reports for November/December. Research Division of WAEC, Lagos, Nigeria.

Thorndike, R.M., (1997). Measurement and Evaluation in Psychology and Education, New Jersey: Prentice Hall.