

Effect Of Activity Based Instructional Strategy On Pupils' Academic Performance In Mathematics In Ilorin East Local Government Area, Kwara State

Abdulganju Oluwadayo SHITTU¹, Mariam Nike SAKA²

¹Department of Early Childhood and Primary Education, Kwara State University, Malete, Nigeria

²Department of Early Childhood and Primary Education, Kwara State University, Malete, Nigeria

Correspondence: E-mail: shittuabdulganju2019@gmail.com

Abstract: The study focused on the effect of the activity based instructional strategy on pupils academic performance in Mathematics. The study adopted a quasi-experimental research design. Two private schools were randomly selected to participate in the study. One validated and reliability-tested research instrument titled 'Mathematics Achievement Test' (MAT) was used. The reliability index of MAT was determined using Pearson Product Moment Correlation (PPMC). Two research hypotheses were formulated and tested at a standard level of significance with an Analysis of Covariance (ANCOVA). The findings indicated that there was a significant effect of the activity based instructional strategy on pupils academic performance in Mathematics. However, there was no significant interaction effect of treatment and gender on the academic achievement of pupils in Mathematics. Based on the findings, it was concluded that the activity based instructional strategy can improve the achievement of pupils. Based on the conclusion, it was recommended that the activity based strategy should be used to teach both male and female pupils in primary schools and that teachers should be trained in the use of the strategy.

Keywords: Academic achievement, Activity based, Mathematics, Pupils

Introduction

The importance of mathematics to man has accounted for its inclusion in school curriculum as a compulsory subject for every child of school age to acquire the appropriate mathematical skills that will enable him cope with life challenges. With regards to this, mathematics should be taught as a core subject to all pupils at primary and secondary school level in order to give a sound basis for scientific and reflective thinking, and prepare them for the next level of education. The importance of mathematics does not only lie in its contributions to scientific and technological development but also in its utility in day-to-day interactions at the market places, transportations, business of all sorts by both literate and illiterate members of the society (Golji & Dangpe, 2016). Mathematics is used either consciously or unconsciously in various aspects of life and is the basic tool for industrialization and national development. It is also recognized to play a vital role in contemporary society, making it indispensable for the existence of any nation (Asante, 2016).

Mathematics, which is one of the oldest fields of study in the history of mankind, has long been one of the most central components of human thought. It has been believed for centuries that mathematics sharpens the human mind, develops their logical thinking; enhances their reasoning ability and spatial power. It influences an individual's personal development and contributes to the wealth of the country. This is mainly because it is at the heart of many successful careers and successful lives. Mathematics is the bedrock to which the technological development of any nation is hinged, thus, mathematical skills for daily life are developed in school mathematics curriculum. Salman & Adeniyi (2012) affirmed that without mathematics there is no science and without science there is no technology and without technology there is no modern society. The importance of mathematics can be seen in its applications to science and technology, medicine, the economy, the environment, and in public decision making. Amobi, (2013) states that there can be no doubt that every child should study mathematics at school. He also highlights that most people regard the study of mathematics, together with that of English as being essential. A major reason for the persistence of the special place held by mathematics in the school curriculum is the way in which it has been used in the last two centuries as a screening device, or filter, for entry to numerous professions (Anderson, 2015).

Mathematics requires representations because of its abstract. Mathematics is also a body of knowledge essential for the achievement of a scientific/technological nation. (Arif & Jasmine, 2017) stated that the line of demarcation between the developed and the level of mathematical attainment and ingenuity. According to them, mathematics is an undisputed agent of national development and wealth creation. Mathematical knowledge indeed equips individuals with the skills to solve a wide range of practical tasks and problems they may encounter in life. Mathematics plays an utmost role in helping learners develop necessary skills for lifelong learning and is an important tool for learners to develop higher-level thinking skills (Anon, 2013). It was highlighted that the majority

of learners do not fail to understand mathematical concepts being taught when the high quality of mathematics education starts from pre-primary schools (Aremu, & Salami, 2013). Mathematics is also a body of knowledge essential for the achievement of a scientific/technological nation.

Mathematics is a field of science which is a means of thinking and communicating; a tool to solve various practical problems, whose elements are logic and intuition, analysis and construction, generality and individuality, while it has branches such as arithmetic, algebra, geometry, and analysis (Aremu, Salami, & Ishola, 2013). Austin, (2016) state that knowledge of mathematics promotes the habit of accuracy, logical, systematic and orderly arrangements of facts in the individual learner. It also encourages the habit of self-reliance and assists learners to think and solve their problems themselves. Mathematical knowledge indeed equips individuals with the skills to solve a wide range of practical tasks and problems they may encounter in life. The world is speedily becoming a global village and that makes it even more imperative that all individuals have a better understanding and appreciation of mathematical procedures and methods of reasoning to be carried along. (Arif & Jasmine, 2017) stated that the line of demarcation between the developed and the level of mathematical attainment and ingenuity. According to them, mathematics is an undisputed agent of national development and wealth creation.

Despite the fact that mathematics is essential for daily life and plays a crucial role in school curriculum, pupils' performance in mathematics remains very low. Federal Ministry of Education, Nigeria has made efforts to reduce the incessant poor performance of pupils in mathematics by embarking on several programs such as the introduction of new mathematics textbooks, different mathematics competitions, workshops and seminars yet the problem seem to continue. Moreover, attempts to find a solution to the incessant failure rates of learners have made researchers in education to consider several factors. Poor academic performance could be attributed to many factors among which are the teachers' teaching methods; this means that mathematics concepts cannot be well understood if learners are not taught with an effective teaching method. This caused an outcry from mathematics teachers, mathematics educators, parents, and pupils. One of the main issues for the outcry was the pupils' poor performance in the subject (Minarni & Napitupulu, 2017). Pupils' academic performance has been an issue of great concern since the beginning of modern education. Majority of the countries have realized that in the heart of educational process are the pupils. Furthermore, it has been noted that all the innovations being seen in education without good performance are destined for failure (Becker, 2014). In the teaching of mathematics, strategies that involves critical thinking and the generation of innovative minds needs to be employed.

Activity based instructional strategy is a method adopted by a teacher that emphasizes his or her technique of teaching through action in which the learners take interest comprehensively and are included in taking interest rationally and physically. It is a method of teaching through activity in which the learners participate rigorously and bring about coefficient learning experiences. Activity based instructional strategy acts as a dynamic problem solver for learners, it improves innovative part of experience and gives reality for learning. It gives various experiences to learners to encourage the acquisition of information, experience, abilities and qualities. Activities brings activeness and smartness among the learners because education means all round improvement of the child so teachers have to organize numerous activities to build up the learner's personalities in several ways. Dunn (2008) said that activity based strategy may meet all the major demands that apply to modern mathematics, such as preparing pupils to represent and analyze real situations, solving problems, making decisions using mathematical reasoning, communicating their thinking and making connections. Furthermore, learning by doing creates more neural networks in the brain and throughout the body, making the entire body a tool for learning (Doran, 2019). In an activity based learning class, learners are actively involved in hands-on minds-on experiences and get chance to relate abstract ideas and theories with concrete observation, this helps them to make deep understanding of scientific concepts. Celik (2018) describes that activity based learning activities improves learners' academic achievements and attitudes towards activities. Activity based mathematics instruction is based on activity by involving learners in reading, discussion, practical activities, engagement in solving problems, analysis, synthesis and evaluation (Festus, 2013). Ekon (2018) affirm that motor memory system is present in activity-based strategy that provides an additional pathway for the encoding and retrieval of target information to and from long term memory. Activity based instructional strategy allows learners engage in activities that are learners initiated; that is, activities that are built upon the natural curiosity of the learners and real-life related issues are used as the pivot of mathematics learning.

The discussion of gender and Mathematics and science learning is far from being concluded. Scholars are still grappling with the issue in order to determine whether the causal relationship between mathematics teaching learning and the gender factor is biologically related or it is socially or environmentally related. Many studies still reveal that female pupils are unable to perform as their male counterparts in mathematics (Gilbert, & Gilbert, 2019) while some research findings show that the gap between male and female pupils' performance in Mathematics is disappearing (Haury, & Rillero, 2017). In other words, gender of both teachers and pupils influences the quality and the quantity of the interaction in the classroom. In view of the fact that using learning corners by boys and girls may have impact on pupil interaction, gender differences in classroom interaction have been examined for some time resulting in a substantial body of literature (Erdoğan, 2018). The importance of examining social interaction in relation to gender is based primarily on differences between girls and boys. Traditionally, boys are expected to be

active and dominance, in a study discovered that gender composition has a significant relationship with classroom interaction and that gender composition has a significant influence on secondary school pupils' academic performance (Ewers, 2019). Heller, & Finley, (2018) argued that the gap between a male and a female child in mathematics could be diminished and that this gap can be successfully eradicated by using better teaching methods.

The use of the teacher-centered method of teaching, which is often used by teachers, has been confirmed to be responsible for the poor performance of pupils in internal and external examinations in primary mathematics. The use of instructional strategies that encourage the active participation of pupils in teaching and learning activities has been suggested by researchers. Part of such a strategy is Activity Based Instructional Strategy. Several studies have been conducted on Activity Based Instructional Strategy.

Some studies have also been conducted on the effect of Activity Based Instructional Strategy on learners' academic achievement in different school subjects other than social studies. Furthermore, empirical studies have been carried out on the Activity Based Instructional Strategy on students' achievement at secondary and tertiary levels of education but none of these studies was carried out to examine the effect of Activity Based Instructional Strategy on pupils' academic achievement in primary Mathematics. Hence, it is against this background that this study investigated the Activity Based Instructional Strategy on primary school pupils' Mathematics achievement in Ilorin, Kwara State.

Research Hypotheses

Ho1: There is no significant effect of treatment on the academic achievement of pupils in Mathematics.

Ho2: There is no significant interaction effect of treatment and gender on the academic achievement of pupils in Mathematics.

Methods

The study adopted a quasi-experimental research design with a factorial design of 2X2. A simple random sampling technique was used to select two (2) public primary schools in the Ilorin East Local Government Area of Kwara State. Primary four pupils in each of the selected schools were involved in the study. One of the two schools was the experimental group while the other was the control group.

The research instrument used in the study was the researchers' designed achievement test titled 'Mathematics Achievement Test (MAT)'. The MAT was drawn from the mathematics scheme of work for primary six, and it consisted of twenty-five (25) multiple-choice questions. The drafted questions for the MAT, Activity Based Instructional Guide (ABIG), and Conventional Instructional Guide (CIG) were given to lecturers in the Department of Early Childhood and Primary Education, Kwara State University who validated the instrument. To establish the reliability of the MAT, the test-retest method was used.

The test was administered twice, with an interval of two weeks, to 20 pupils in primary six who were not part of the study. Data from the two administrations were correlated using Pearson Product Moment Correlation (PPMC) and the reliability coefficient was established at .962. The study lasted for 6 weeks and data collected were analyzed using Analysis of Covariance (ANCOVA).

Results

Table 1. Summary of analysis of covariance (ANCOVA) showing the effect of treatment on the academic achievement of pupils in Mathematics.

Source	Type III Sum of Squares	Df	Mean Square	F	Sig.	Partial Eta Squared
Corrected Model	305.808 ^a	8	38.226	1.713	.135	.307
Intercept	655.288	1	655.288	29.368	.000	.486
Pretest	188.558	1	188.558	8.451	.073	.214
Main Effect						
Treatment	31.545	1	31.545	1.414	.003	.344
Gender	89.199	2	44.599	1.999	.153	.114
School type	.608	1	.608	.027	.870	.001
Two Way Interaction						
treatment * gender	.140	1	.140	.006	.937	.000
treatment * school type	2.779	1	2.779	.125	.727	.004
gender * school type	18.161	1	18.161	.814	.374	.026
Three Way Interaction						
treatment * gender * school type	.000	1	.130	.004	.837	.000
Error	691.692	51	22.313			
Total	14320.000	60				
Corrected Total	997.500	39				

a. R Squared = .307 (Adjusted R Squared = .128)

Table 1 shows that there was a significant main effect of treatment on pupils' academic performance ($F_{(1,51)} = 1.41$; $p < 0.05$; $\eta^2 = 0.34$). The effect size is 3.4%. Therefore, hypothesis 1 is rejected. In order to determine the magnitude of treatment size, table 2 presents the estimated marginal mean score.

Table 2: Estimated Marginal Mean Score of Pupils Academic Performance in Mathematics by Treatment

Treatment	Mean	Std. Error	95% Confidence Interval	
			Lower Bound	Upper Bound
Experimental	13.397 ^a	.350	12.695	14.595
Control	10.299 ^a	.355	9.586	11.099

a. Covariates appearing in the model are evaluated at the following values: Pretest = 7.0167.

Table 2 shows that the pupils exposed to experimental group had higher mean score (mean = 13.39) than pupils exposed to the control strategy group (mean = 10.29). Though experimental group had the higher mean score and the difference in the mean score is statistically significant.

Hypothesis 2: there is no significant main effect of gender on pupils' academic performance in Mathematics in Ilorin East Local Government Area, Kwara State

Table 1 shows that there was no significant main effect of gender on pupils academic performance in Mathematics ($F_{(2,51)} = 1.99$; $p > 0.05$; $\eta^2 = 0.11$). Therefore hypothesis 2 is not rejected.

Discussion of Findings

The findings of the study revealed that there was a significant main effect of treatment on pupils' academic achievement in mathematics. This implies that pupils taught mathematics using Activity Based Instructional Strategy performed significantly better than their counterparts taught with Conventional Method. The reason for the result may be attributed to the fact the pupils were active in classroom instruction as they had opportunities to interact with other pupils.

This finding is in tandem with the finding of Ahmed and Solomon (2019),) which unfolded that there were significant differences in the achievement of students taught using Activity Based instructional strategies and the conventional (lecture) method. The finding also supported the finding of Tui (2014). Furthermore, the finding of the study aligned with the finding of Durojaiye, Jekayinfa & Oloda (2021)) who reported that students taught with the use of Activity Based performed better than their counterparts taught with the convention method. On the other hand, however, the research report of Samuel *et al.*, (2017) uncovered that activity based was not effective in knowledge acquisition.

Conclusion

Based on the findings of the study, it can be concluded that activity based instructional strategy improves the academic achievement of pupils in Mathematics regardless of gender. Based on the conclusion, the study recommended that primary school teachers should adopt the use of activity based instructional strategy in teaching mathematics; Seminars, workshops, and conferences should be organized for teachers on how to use activity based instructional strategy.

Authors' Note

The authors declare that there is no conflict of interest regarding the publication of this article. The authors confirmed that the paper was free of plagiarism.

References

- Adamu Garba (2020) Effect of Teaching Methods on The Performance of Mathematics Pupils in Public Primary Schools in Makurdi Metropolis, Benue State, Nigeria. *Int. Jr. of Mathematical Sciences & Applications Vol. 10, No. 1, (January-June, 2020)* Copyright: Mind Reader Publications ISSN No: 2230-9888 www.ijmsa.yolasite.com.
- Ahmed, A., & Solomom, A.D. (2019). The impact of activity based learning on students' motivation and academic achievement: A study among 12th grade science and environment students in a public school in Oman. *Specialty journal of knowledge management 2019, vol, 4(4): 44-53*
- Ale, S. O. and Adetula, L. O. (2016). The national mathematical centre and the mathematics improvement project in nation building. *Journal of Mathematical Sciences Education. 1(1):1-19.*

- Amobi, F.A. (2013). Beyond the call: preserving reflection in the preparation of 'high qualified' teacher. *Teacher Education Quarterly*, 33(2), 23-33.
- Anderson, L. W. (2015). Increasing teacher effectiveness. UNESCO. Retrieved From <http://www.unesc.o.org/iiep>.
- Anwer, F. (2019). Activity based teaching, students' motivation and academic achievement. *Journal of education and educational development*, 6(1), 154-170. <https://eric.ed.gov/?id=EJ1216784>.
- Anon (2013). Keeping America Competitive: Five Strategies to Improve Mathematics and Science Education, Report by Education Commission of the States, <http://www.ecs.org/clearinghouse>.
- Arif, H., & Jasmine, L. S. H. (2017). Performance Task Assessment in Mathematics: A primary school experience. *Proceedings: EARCOME 4: 4th East Asia Regional Conference on Mathematics Education* (pp. 128-134). Penang, Malaysia.
- Aremu, A. & Salami, I.A. (2013). Preparation of primary teachers in pupil centred Activity! Based mathematics instructions and its Model. *European Scientific Journal, Special Edition*, 2, 356-371.
- Aremu, A., Salami, I.A. & Ishola, A.A. (2013). Effect of Demonstration Strategy on the Acquisition of Activity! based Lesson Planning Skills of Pre-service Primary Mathematics Teachers in Nigeria. *Publication of the ICMCS*, 5, 257-277.
- Asante, K.O. (2016). Sex differences in mathematics performance among senior high students' in Ghana. Retrieved on August 13, 2020 from www.faqs.org/periodicals/201012/2187713381.html/ixzz/15yodot3.
- Austin, S.S. (2016). Changing the faces of mathematics: perspectives on gender. *Mathematics Teaching in the Middle School*, 7(7), 408.
- Awolola, O.I. & Fabunmi, M.B. (2012). Pupils' violence and teaching-learning activities in colleges of education in southwestern Nigeria. *Journal of Pedagogical Thought*, 5: 1-12.
- Ayaş, A., Çepni, S., & Akdeniz, A. R. (2014). Development of the Turkish secondary science curriculum. *Science Education*, 77(4), 433-440.
- Becker, J.R. (2014). Gender and mathematics: an issue for the twenty first century. *Teaching Children Mathematics*. 9(8), 470!475.
- Berube, C. & Glanz, J. (2019). Equal Opportunity: reframing gender differences in science and math. *Principal leadership* 8(9), 28!41.
- Bilgin, İ. (2020). The effects of hands-on activities incorporating a cooperative learning approach on eight grade pupils' science process skills and attitudes towards science. *Journal of Baltic Science Education*, 1(9), 27-37.
- Bligh, D. A. (2018). What's the use of lectures? San Francisco: Jossey-Bass Publishers.
- Bonwell, C. & Eison, J. (2012). Active learning: creating excitement in the classroom *ASHE-ERIC higher education report*. Retrieved from www.oid.ucla.edu/./active.learning-eric on 27th march, 2012.
- Bredderman, T. (2018). Effects of activity-based elementary science on pupils' outcomes: A qualitative synthesis. *Review of Educational Research*, 53(4), 499-518.
- Camci, F. (2012). *Effects of activity based teaching grounded on active learning on students' academic skills and learning process* (Unpublished master's thesis). Adiyaman university, institute of sciences.