

EFFECT OF MASTERY LEARNING ON LOWER PRIMARY SCHOOL PUPILS NUMERACY SKILL ACQUISITION

Abimbola Omotola AJIBADE^{1*} Victor Idowu AJIBADE² Bukola BADEJI-AJISAFE³

¹Department of Counselling Psychology, Early Childhood Education Unit. Bamidele Olumilua University of Education, Science and Technology Ikere Ekiti, Nigeria. Email: ajibadebim2@gmail.com

²Institute of Education, University of Ibadan. Oyo State, Nigeria, Email: ajibadevic2@gmail.com

³Department of Mathematical and Physical Sciences. Afe Babalola University, Ado Ekiti, Email: bukola@abuad.edu.ng

*Corresponding Author; Email: ajibadebim2@gmail.com

Paper presented at the Maiden International Conference on education, Science and Technology (ICEST 2021)

Abstract: *The study was designed to develop teaching package for teaching lower primary school pupils number work using mastery learning approach in Ekiti State. It examined the performance of the learners using mastery learning approach and conventional method. The study adopted the quasi experimental research design with pretest-posttest control group. Two hypotheses guided the study. The participants for the study consisted of pupils in selected primary schools in Ikere Local Government Ekiti State. The sample consisted of two intact classes selected using simple random sampling technique. One school was assigned to experimental group and one school to control group. Two research instruments were developed by the researcher with reliability coefficient of 0.82, data collected were analysed using mean, standard deviation and T –test. The result showed that there is a significant effect of treatment on pupil’s numeracy skill acquisition { $X = 18.6500$ $S.D = 1.08942$ }. Those exposed to conventional method { $X = 8.9000$, $S.D = 1.16529$ }. there is no significant mean difference between the numeracy acquisition of male and female lower primary school pupils using mastery learning approach. Male ($X = 18.6000$, $t = -405$, $P < 0.05$) and female ($X = 18.8000$, $t = -405$, $P < 0.05$). Based on the finding, it was concluded that mastery learning approach facilitates acquisition of numeracy skill better than using the conventional method of teaching. It is therefore recommended that the curriculum planners should include mastery learning approach in the curriculum*

Keywords: mastery learning, number work, numeracy skill, learning, mastery learning approach.

INTRODUCTION

The ability to learn, remember, symbolize information, and solve problems, exists at a simple level in young infants who can perform cognitive tasks such as recognizing small numbers of objects. During childhood, learning and information processing increase in speed, memory becomes increasingly longer. In Young children intellectual development passes through many stages. It is important for parents, teacher, and caregivers to monitor this vital growth by watching for predictable milestones that should be achieved by certain ages (Sandy, 2005).

Early childhood is a period when the child has rapid development and start to learn basic concept actively. Children in this period progress from pre-operation stage to concrete operation. In other word, the child passes from visual thinking to mental development during the early childhood period (Jacobson, 2001). Infants’ cognitive abilities develop rapidly during the first

year of life. New born have only the most rudimentary control of their bodies and have limited ability to express learning. By three months of age however, babies have gained minimal control of their hands and make noises intentionally. They follow things with their eyes and recognize bottle or breast at feeding time. Six month-old babies gather information from all their senses, recognize familiar faces and can hold objects to inspect them. One year old, begin to imitate adults, start to talk and can play simple games such as “patty-cake”. By the second year toddlers should know about 50 words and most can identify common items by name. They can solve problems by thinking them through. Toddlers also look at books, can plain and will look for missing items even when they did not see where they were put. Two years-old can be fearful of unfamiliar or unknown things that they have difficulty understanding. They understand many words and can follow oral directions. Barry (2012).

Furthermore, Barry (2012) opined that at 3-4 years old, preschool children learn to identify colors and begin to understand that printed words are related to spoken words. Preschoolers recognize their printed names and generally know some letters and sounds. They can copy drawings of squares and circles. They can repeat familiar rhymes and count small numbers of items. Three- and four year-old children play pretend games, may have imaginary playmates and play games that have rules.

Five-year-old children are generally able to do many of the beginning school skills. They can count past 10, know most of the letters and sounds and can spell their first names. Some may be beginning to read, they understand position of words, such as in and behind, and can follow multiple-step directions.

Mastery learning is a set of group-based, individualized, teaching and learning strategies based on the premise that children will achieve a high level of understanding in a given domain if they are given enough time Anderson(1975) in Osayimwense (2017) Also mastery learning is a teaching method that allows children to learn the content of work/ subject at mastery level Adegbile (2011). Mastery Learning Approach (MLA) is an instructional method where children are allowed unlimited opportunities to demonstrate mastery of content taught (Kibler, 1981). It involves divisions of subject matter into units that have predetermined objectives or unit expectations. The strategy allows children to study materials unit after unit they master it. Mastery of each unit is shown when the students acquire the set pass mark of a diagnostic test. Additional time learning is prescribed for those requiring remediation and children continue to cycle until mastery is met. Mastery learning is committed to criterion referenced evaluation and to a strong emphasis on feedback and corrections throughout the learning experience. The major components of the strategy are: specifying objectives, division of course content, formative diagnostic evaluation, remedial instruction, and summative evaluation. Mastery learning approach is implemented in a group based and teacher-placed format (Liddle, 2002). The Four optional steps identified by Liddle (2002) are (a) Defining mastery (b) Planning for mastery (c) Teaching for mastery (d) Grading for mastery. Normal specification of cognitive objectives, division of course content

into units, formative diagnostic, remedial instruction and criterion referenced summative evaluation.

Furthermore, essential for mastery learning is the development of a learning unit that takes between one and many hours for children to learn. The children work to master the learning unit rather than an entire course of curriculum. Majid and Zahra (2010) opined that, mastery learning method includes two systems each being derived from different theories but they are common in learning goals and standards. The first system is "Keller Personalized System of Instruction" which is an individual method in which some large groups are taught. Basis of this system is on a behavioral model of which development and progress depend on success of the learners in doing their homework in the curriculum. The second system is "Mastery for Learning Group-Based Approach" which is applied as communal approach. This idea was presented in John Carroll learning model (1963-1965) and was expanded later by Bloom (1968). In Carroll model, classroom learning is a time-based phenomenon that is the longer the time of learning, the higher the rate of learning will be. Bloom confirming this material believed that if the students were provided with learning opportunity and quality of instruction is commensurate with their personal need, about 95% of them reach mastery learning level. Bloom converted theoretical model of Carroll to a practical model for classroom learning, so that one can provide opportunity in the classroom that all learners can achieve high level of academic achievement and their differences in learning can be minimized. Bloom believes that there are three dependent variables in classroom learning and if they are considered carefully, the schools will be able to take step toward an educational system free from mistake. On the basis of this theory, change in cognitive entry behaviors and affective entry characteristics and learning quality determine learning outcome (Bloom, 1976).

Every child possesses naturally the trait of curiosity, as such, children tend to develop a variety of mathematical ideas prior to preschool and give meaning to all behavior observed in the community. Numeracy is embedded in daily human activities of sweeping, brushing, cooking,

eating, timing and sharing. (Adeleke, 2010). Numeracy means understanding how mathematics is used in the real world and being able to apply it to make the best possible decisions. It's as much about thinking and reasoning as about 'doing sums'. It means being able to: Interpret data, charts and diagrams, process information, Solve problems, check answers, understand and explain solutions, make decisions based on logical thinking and reasoning. Numeracy as core life skills, the acquisition of which has profound consequences for individuals, families, communities and nations. In the western world, numeracy is aligned to skills needed in employment and linked to work related objectives, (OECD, 2002). Yet numeracy is not acquired automatically. The achievement of the functional level of numeracy required for success in our complex society needs significant investment both by child and family and within the wider societal context.

Educating learners is very difficult for the caregiver to carry all the learners along at the same time, as the learners cannot learn at the same pace because the children are from different background, which psychologist referred to as individual differences. In making the learners to learn at the same pace, then a special teaching methodology must be used by the caregiver.

The specific objectives of the study are to;

(a) investigate the effects of mastery learning approach on lower primary school pupils numeracy skill acquisition.

(b) determine the differences in the numeracy acquisition between male and female lower primary school pupils using mastery learning approach.

Research Hypotheses

The following research hypotheses were formulated to guide the study;

Ho₁: There is no significant main effect of mastery learning approach on children's numerical skill acquisition and

Ho₂: There is no significant main difference between numeracy skill acquisition of male and female lower primary school pupils using mastery learning approach.

LITERATURE REVIEW

Benefits of mastery learning approach in numeracy skill acquisition

Teaching number work for mastery involves whole-class interactive teaching all pupils work together and progress at the same rate Maria (2019). Only once children have a deep understanding of the number work concepts they are taught, then they will move on to more advanced lessons. Lessons taught using the number work Mastery learning approach involve discussions, questioning, a variety of fun mathematics activities and demonstrations of concepts. Perhaps most importantly, they are enjoyable as well as informative. Making number work lessons fun improve learning retention and help children develop long-term knowledge and abilities Maria (2019).

Maria (2019) continued by explaining the benefit of mastery learning approach (MLA), MLA helps teachers to develop their knowledge and skills, and children are learning number work more securely. So number work Mastery helps children achieve academic success .Mastery in number work is about supporting children to develop a deep understanding in an environment that's accessible and fun, rather than overwhelming them with concepts they're not yet ready to learn. Also number work mastery makes sure children have all the necessary foundational knowledge to grasp more advanced concepts. It starts with the basics and ensures every child has a solid understanding of one topic before moving on to another topic. The teaching for mastery approach recognises all number work concepts are connected some concepts can't be grasped without a good understanding of other topics.

Also Amerischool, (2021) enumerated the benefit of MLA which include provision of solid foundation to build and develop children knowledge, gives pupils ability to work at their own pace through online , adaptive technology, it gives more peers interaction for shared learning moments , it also gives one-on one interaction , it give pupils the opportunity to learn beyond the classroom and have possibilities for growth within the community, also it helps students to develop a strong connection with their education.

Gender Gap in numeracy skills acquisition

The existence of gender gaps in academic achievement has been extensively documented, the evolution of such gaps over the life cycle has not attracted the same level of attention and analysis (Organisation for Economic, co-operation and Development (OECD, 2018). Existing evidence on the evolution of gender gaps in the acquisition of competencies across life is scarce, focuses on early childhood and is generally restricted to English-speaking countries (OECD 2018). Gender differences in quantitative abilities arise during primary school. For example, males and females appear to perform similarly in tests of mathematical reasoning between the ages of 4 and 10 (Spelke, 2005) but a gender gap starts to appear as children complete primary school and move into secondary education (Beilstein and Wilson, 2000). The teenage years are generally identified as the point when gender gaps in quantitative abilities widen (Lindberg, 2010) Machin and McNally, 2005 opined that by the end of secondary school males generally outperform females in quantitative abilities

Furthermore, it has become a general feeling or stigma that mathematics is boys domain. A study carry out by Hyde, Fennema, & Eamon (1990) reveals that males tend to do better on mathematics tests that involve problem-solving while females tend to do better in computation, and there is no significant gender difference in understanding mathematics concepts. Another study shows that females tend to earn better grades than males in mathematics Sabahat 2015). Fennema and Sherman (1978 in Sabahat 2015) identified as critical, beliefs about the usefulness of and confidence in learning mathematics, with males providing evidence that they were more confident about learning mathematics and believed that mathematics was, and would be, more useful to them than females. Females were found to be strong, not believing in stereotype that mathematics was not their subject while their male counterparts did not strongly stereotype mathematics as a male domain Sabahat (2015). (Campbell, Goldberg, & Stemler, 2000) opined that mathematics achievement scores of each gender group were close to each other at the primary and middle school years . Hall (1999) examined gender differences of 5th-8th grade American students in mathematics. They found that, there were no substantial differences found

in terms of gender however, in the final year of secondary school, evidence was found for gender differences in mathematics achievement.

METHODOLOGY

This study employed Quasi experimental design with pretest-posttest control group where the independent variable: mastery learning approach is used to present numeracy concepts to pupils of lower primary school and the effects were measured and compared. The dependent variable was being performed on numeracy skill acquisition.

Population for the Study comprised of all the pupils in lower primary school in Ikere Local Government Area in Ekiti State. The study adopted simple random sampling technique; one local government was randomly selected from sixteen Local Governments in Ekiti state, Nigeria. Two lower primary schools were randomly selected from the local government. An Intact class of primary one from each school was randomly selected. One experimental group and one control group were used for the study. The experimental group was exposed to mastery learning approach while the control group was taught using conventional method.

Two instruments were used in this study. The instruments are categorized into two groups. These are (1) stimulus instrument (2) Response instrument Stimulus instruments are the materials developed and used in this study to impart numeracy skills through mastery learning approach. These instruments were not meant to elicit responses from respondents.

The stimulus instruments are;

- 1a. Mastery Learning Approaches instructional method (MLAIM)
- 1b. Convectional instructional method (CBIM)

Mastery Learning Approaches instructional method (MLAIM)

The instrument was designed by the researcher to teach the experimental group some topic in mathematics (counting of number, addition and subtraction of number, time and of the day measurement and classification of objects) through mastery learning approach each topics were divided into sub topic that will improve their understanding in number work.

Conventional-Based Instructional Method (CBIM)

This instrument was designed to teach the control group some topic in mathematics as in experimental group to improve their knowledge in number work, by using conventional based instruction method.

2. Response Instrument

The response instrument is instruments that elicit responses from the respondents. Number work achievement test (NWAT)

Table 1 Score of pupils before treatment.(Pretest)

	Descriptive Statistics				
	N	Minimum	Maximum	Mean	Std. Deviation
Pretest control group	20	5.00	9.00	7.2000	1.28145
Pretest experimental group	20	5.00	9.00	7.0000	1.02598
Valid N (listwise)	20				

Source: Authors' computation

Table 1 shows the score of the pupils before the implementation of the treatment. The table revealed that there is no difference in the performance of all the pupils in both experimental

Both face and content validation of the instruments were done by lower primary school mathematics teachers and experts in early childhood education. The reliability coefficient of 0.82 was obtained using Crobach Alpha.

RESULTS

The results are presented according to the sequence of the hypotheses which were tested in the study. The interpretation of the results were given after which a discussion of findings were presented

group and control group before the treatment. Control group $X=7.2000$ S.D =1.28145 and experimental group $X=7.000$ S.D=1.02598

Table 2 There is no significant main effect of mastery learning approach on lower primary school pupil's numerical skill acquisition.

	Descriptive Statistics				
	N	Minimum	Maximum	Mean	Std. Deviation
Posttest control group	20	7.00	11.00	8.9000	1.16529
Posttest experimental group	20	16.00	20.00	18.6500	1.08942
Valid N (listwise)	20				

Source: Authors' computation

Result in table 2 shows the level of pupil's numeracy skill acquisition. It can be seen that pupils in experimental group performed better $X= 18.6500$ S.D=1.08942 than pupils in control group $X=8.9000$, S.D =1.16529.This

implies that there is significant effect of mastery learning approach on pupil's numerical skill acquisition. Therefore, the null hypothesis is rejected.

Table 3: There is no significant main difference between numeracy skill acquisition of male and female lower primary school pupils using mastery learning approach

Sex	N	Mean	S.D	Error mean	Mean diff	T	df	Sign
Male	10	18,6000	.51640	.16330	-.2.0000	-.405	18	.003
Female	10	18.8000	1.47573	.46667	-.2.0000	-.405	11.172	.003

Source: Authors' computation

Independent sample T-Test was conducted to show the difference between the numeracy skill acquisition of male and female lower primary school pupils using mastery learning approach. Table 3 shows that there is no difference in the numeracy skill acquisition of male and female pupils of lower primary school using mastery learning approach. Male ($X=18.6000$, $t=-405$, $P<0.05$) and female ($X=18.8000$, $t=-405$, $P<0.05$). Therefore, the null hypothesis is accepted

Discussions

Result shows that the students perform better when using mastering learning and achieved statistically higher score as compared to their pretest and post-test scores. This implies that mastery learning approaches is more effective in enhancing pupil's numeracy skill acquisition. This agreed with block (1990) and Bloom (1990) who through their studies on mastery learning suggested that the learning procedure enhanced achievement mainly in mathematics and science since the learning in these subject area are ordered and sequential. It also agreed with Maria 2019 that using mastery learning approach makes number work lesson enjoyable as well as informative which helps in improving learning; retention and development of long term knowledge and ability

Also, in the study of Maria 2019, she opined that mastery learning approach helps learners to achieve academic success. The result of this study also agree with Amerischool, (2021) that mastery learning give learners the opportunity to learn beyond the classroom and have the possibilities for growth within the community which help learners to develop a strong connection with their education.

Furthermore the result showed that there was no significant difference between the mean scores of male and female after implementing the mastery learning approached to the pupils. This agreed with the finding of Spelke, (2005) that male and female perform similarly in test of mathematical reasoning between the age 4 and 10. It also agreed with the of Hall, (1999) that there were no substantial difference found in term of gender, performance in mathematics. But the result of this study disagree with the study of Hyde, Fennema & Eamon (1990) that males tends to do better on mathematics test that involves problem solving while female tend to do better in

computation and there is no significant gender difference in understanding mathematics Also, the study of Sabahat, (2015) disagree with the result that female tend to learn and earn better grades than male in mathematics.

CONCLUSION

Based on the result of the study, it can be concluded that mastery learning approach (MLA) facilitate pupils leaning of number work better than using convectional method of teaching. The result also revealed that there is no significant difference between achievement score of male and female pupils exposed to mastery learning approach. Mastery learning approach can enhance numeracy skill acquisition which is very important in the life of the learners. Therefore lower primary school teachers are encouraged to use mastery learning approach in teaching the learners

Recommendation

This study has provided data on effectiveness of mastery learning approach (MLA) in enhancing academic achievement. Curriculum developers should include mastery learning approach as method of teaching lower primary school pupils in the curriculum. Also lower primary school teachers should properly implement mastery learning approach in their various classrooms.

REFERENCE

- Adegbile, J. A. (2011). Continuous Assessment in curriculum and Instruction. Somerest Ventures Lagos. ISBN; 978-978-49876-7-7
- Amerishools (2021). The benefit of mastery based learning 1333 West Camelbach Road phoenix AZ 85013
- Barry Bogin (2012). Human Growth and Development. *Journal of ScienceDirect* www. Sciencedirect.com Second Edition.
- Beilstein, C. and J. Wilson (2000), "Landmarks in Route Learning by Girls and Boys", Perceptual and Motor Skills, 91/3, pp. 877-882, <http://dx.doi.org/10.2466/pms.2000.91.3.877>.

- Bloom B. (1992) The two yma problems. The method of Grap instruction as effective on- -n –on tutoring ducatin research 13(6), 416
- Fennema, E.H & Sheerman, J.A (1978) Sex related difference jn mathematic achievement And related factors: a futher study. *Journal for research in mathematics education*, 9(3)189-203; 189-203
- Kimball, M. (1989), “A new perspective on women's math achievement”, *Psychological Bulletin*, 105/2, pp. 198-214, <http://psycnet.apa.org/buy/1989-24048-001>
- Lindberg, S. et al. (2010), “New trends in gender and mathematics performance: a meta-analysis., *Psychological bulletin*, Vol. 136/6, pp. 1123-1135, <http://dx.doi.org/10.1037/a0021276>.
- Machin, S. and S. McNally (2005), “Gender and Student Achievement in English Schools”, Oxford *Review of Economic Policy*, 21(3), 357-372, <http://dx.doi.org/10.2307/23606826>.
- OECD (2002), PISA 2000 Technical Report, OECD Publishing, Paris, <http://www.oecd.org/education/school/programmeforinternationalstudentassessmentpisa/33688233.pdf> (accessed on 08 February 2018).
- Organization for Economic co-operation and development (OECD) 2018 the evolution of gender gap in numeracy and literacy between childhood and adulthood. OECD Education work No 184 by Francessca Borgomovi (OECD), Alvaro Choi (university of Barcelona) and Marco Paccagnella (OECD).
- Osayimwense Omoroghomwan (2017). A Literature Review on mastery Learning. Academia Premium. [Academia.edu/33129456/A Literature Review on Mastery Learning](https://www.academia.edu/33129456/A_Literature_Review_on_Mastery_Learning)
- Spelke, E. (2005), “Sex Differences in Intrinsic Aptitude for Mathematics and Science?: A Critical Review.”, *American Psychologist*, Vol. 60/9, pp. 950-958, <http://dx.doi.org/10.1037/0003066X.60.9.950>.

This article should be cited as:

Ajibade, A.O., Ajibade, V.I. & Badeji-Ajisafe, B. (2022). Effect of Mastery Learning on Lower Primary School Pupils Numeracy Skill Acquisition, *Journal of Economic, Social and Educational Issues*, 2(1), 1-7.