

## Game of Set: Effect on Adult Learners` Retention in Simple Arithmetic

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**Abstract:** This research was conducted to ascertain Game of Set: Effect on adult learners` retention in simple arithmetic in Nsukka Adult learners study centres. The study adopted quasi experimental research design. The study was guided by three research questions and three hypotheses. The study was conducted in Nsukka Local Government Area Adult literacy studying centres. The population of the study was 437 (156 male and 281 female), adult learners in all the three adult literacy centres in the area. The sample size was 48 and was obtained through a simple random sampling technique using intact classes of the two studying centres. The instrument for the study was Simple Arithmetic Retention Test (SART) of 25 multi-choice objective questions. Using spearman ranking correlation coefficient, 0.86 was obtained on the reliability retention test instrument. Mean and the standard deviation were used to answer the 3 research questions while Analysis of Covariance was used for the 3 hypotheses. The study found out that adult learners` taught simple arithmetic using Game of Set retained knowledge better than those taught with conventional method. Also, there was no significant difference in the mean retention scores of male and female adult learners taught simple arithmetic using game of Set. In conclusion, Game of Set is effective in improving adult learners` retention in simple arithmetic. Finally, some recommendations were made based on the findings from the study.

**Keywords:** Game of Set, Adult Learners, Retention, Simple Arithmetic and Gender

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### I. Introduction

Game-based learning has recently been hailed as a promising medium for promoting active engagement and engaged learning among adult learners. On the one hand, this is due to the fact that digital and manual games have a variety of engaging characteristics, including imaginary, obstacles, competitiveness, and excitement [1]. Some of these characteristics of game based learning being digital or manual, when well-integrated can transform a dull learning experience into something exciting and enjoyable especially when teaching adult learners who hardly pay attention to class work or lesson [2]. This is because certain game genres contain game characteristics that could aid in adult learners` learning. For example, quests and story-telling are common in massively multiplayer online role-playing games (MMORPGs), which could be beneficial in providing adult learners with a goal-oriented interactive learning setting [3]. Furthermore, the layout of Game of Set on shapes can be beneficial to adult learners' learning of hierarchical knowledge based on various shapes identification. A finding indicated that game quests have a positive impact on the perceptions of participants, especially in the aspects of enjoyment, goal orientation, and goal intensity. In other words, students reported more joyful learning experiences in the via-version, learned more information in completing the quest, and had stronger intentions to accomplish quests [2]. According to a study conducted across more than 192,000 students in 22 countries, the findings of the study show that video-gaming behaviour had little effect on psychometrically valid assessments of academic performance in science, mathematics, or reading. The results suggest that the impact of video-gaming on academic performance is too small to be considered problematic [4]. A possible explanation for this is that quests promoted interaction with NPCs and involved more expectations and satisfactions, which, in turn, affected students' perception of quests towards goal-pursuing. Since game-based learning through Game of Set has been suggested as a possible way to inspire adult learners to learn simple arithmetic by various literatures reviewed in this study, it appears that classroom subject learning may be improved by using game of Set when teaching adult learners. In this research article, we focus on adult learners` education or adult literacy and examine simple arithmetic as the subject matter. This is due to the fact that, despite adult learners` good ability in calculating real money, most Nsukka local government area adult learners shave a relatively negative attitude toward math learning and this could be as a result of the traditional method of teaching being used by most instructors.

A conventional teaching method is a classroom where no modern teaching materials are used to facilitate adult learners` understanding of a lesson. The conventional teaching method is a teaching method in which the instructor transmits information orally to the learners [5]. Most of the time, the instructor solved equations on the board while the adult learners copied down the equations the instructor solved on the blackboard and sometimes the instructor make use of the cardboard as an instructional materials by showing adult learners equation that has been solved on the cardboard. The conventional teaching method could be referred to as a traditional method of teaching before the invention of modern games that can be used when teaching simple arithmetic or other complex mathematics topics in adult learners` curriculum. It is believed that conventional teaching method in simple arithmetic could be recitation of numbers, dramatization and other conventional means of teaching the topic by an instructor [6]. Conventional teaching method is centered on the instructor and not the adult learners. Since adult learners` activity in the conventional classroom is passive and gullible, using Game of Set as an instructional material in the classroom could enhance adult learners` retention through adult literacy in the subject matter of simple arithmetic.

Adult literacy in Nigeria can be dated back to the beginning of Western formal education. It was pioneered by European Christian missionaries and their Muslim counterparts from various Arab countries in the world. Adult literacy was initiated by the early missionaries as a way of teaching new converts into Christianity on how to read the Bible and sing hymns from the hymn book. The missionaries used their churches such as Methodist Church Nigeria, Church of Nigeria, Roman Catholic Church, and Nigerian Baptist Convention to promote adult literacy in Nigeria. The aim of these churches was to educate their converts in their native tongues [7]. Adult literacy was increasingly pushed to the background as the colonial government became more interested in education [8]. The colonial master penetrated through these churches and set up ambitious adult education programs in 1945 [9]. Since 1945 which adult education programme was set up by the colonial master, the programme has been growing tremendously that almost all the government owned universities in Nigeria now run a degree programme in adult education related courses. Also, the programme has grown beyond ability to read the Bible which was the major aim of setting up the programme in Nigeria by the colonial master to a complex curriculum on Mathematics and other subjects.

One of the most intertwined and nuanced problem of adult literacy is adult learners` retention. Retention is the product of meaningful learning. Since the ultimate purpose of teaching is to create a behavioral object and make learning more meaningful, the goal of teaching and learning certain concepts in simple arithmetic using various teaching methods such as Game of Set and conventional method is to establish a behavioral object and make learning more meaningful. Retention is described in as the mechanism or ability to remember things in the future [10]. When memories are based on repetition, retention occurs. The mind's preservative aspect is retention [11]. The type of content used to teach simple arithmetic has a significant impact on adult learners` retention. Different methods are used in the teaching and learning of simple arithmetic to make learning meaningful and to enable adult learners to remember what they have learned in a learning centre classroom. Since adult learners are always occupied with a lots of activities, good method that will ensure their retention level of what they have learnt must be used by instructors. It is on this ground that this study regards retention as the ability of adult learners to remember what they have been taught by the instructors irrespective of their numerous engagements. Adult learners' retention in learning is determined by factors such as instructors' skill, motivation, interest, and meaningfulness of the subject matter, method of instruction, and learner memory capability [12]. The present study believed that the Retention level of adult learners can be strengthened and increased as a result of various attributes Game of Set. The conditions of motivation at the time of learning may either help or hinder progress. In other words, it has the potential to improve memory or make it easier to forget [13]. Emotion, traumatic experience, and deliberately lost or repressed memories are only a few of the factors that can impact retention [13]. Gender could also be a factor that affects retention; some believes that males retain knowledge than females [10].

Simple arithmetic deals with the addition, subtraction, multiplication, division, fraction and mixed numbers, multiplying different signs, decimals, basic algebra, symbol used in arithmetic, percentage, and shapes. When you add, you're grouping things together. It assists you in deciding how many things you have. If you have seven (7) loaf of bread and someone gives you five (5) more, you will have a total of twelve (12) loafs of bread ( $7 + 5 = 12$ ). (The arithmetic symbol used when adding two digits together is "+"). It's also simpler to place larger numbers under each other. In simple arithmetic, subtraction implies taking something away from a group. It assists you in determining how much time you have left. If you have a bag that contains 15 loafs of bread and you decided to give 11 loafs of bread out from the bag to another adult learner in your class, you will have a total of 4 loafs of bag left in the bag ( $15 - 11 = 4$ ). When you subtract two items from each other, the arithmetic sign to use is "-". Multiplication is another form of addition under simple arithmetic which adult learners can be exposed to in the classroom. For example,  $8 \times 9$  (x is the arithmetic "sign" for multiplying). Going by addition, this is  $8 + 8 + 8 + 8 + 8 + 8 + 8 + 8 + 8 + 8$  (9 times) = 72 or  $9 + 9 + 9 + 9 + 9 + 9 + 9 + 9 + 9$  (8 times) = 72. To put it in another way,  $8 \times 9$  equals  $9 \times 8$ . The opposite of multiplication is division.

Traditionally, mathematics which included simple arithmetic is seen as the scientific study of quantities, including their relationship, operations and measurements expressed by numbers and symbols [14]. This meaning by Yadav show that adult learners can easily through simple arithmetic learn about numbers and basic arithmetical operations.

Research in the field of education has uncovered a lot about the gender disparity (inequality) in academic achievement and retention of adult learners. Gender is viewed as a set of socially assigned characteristics that distinguishes feminine from masculine behavior [15]. It's the fact that you're either male or female. Gender inequality in education is a global problem. When addressing differences between male and female adult learners' educational experiences, writers for both scholarly and mainstream audiences often use the word gender, and the distinction sometimes tends to be based on a conventional definition of the term sex [16]. Many people believe learner`s gender whether female or male, plays a role in deciding academic achievement and retention in a mathematically inclined subject such as simple arithmetic [15]. A study found out that male students retained knowledge slightly better than their female counterpart when taught Mathematical aspect of Economics but found no significance difference in both retention level [10]. Through the use of Game of Set in teaching and learning simple arithmetic, the researcher hopes to bridge the difference between male and female adult learners in simple arithmetic.

Various modern teaching techniques have been adopted in teaching adult learners simple arithmetic but Game of Set have been neglected despite the role Game can play in improving adult learners` retention if fully adopted by instructors when teaching simple arithmetic. Most instructors only limit the knowledge of their adult learners to manual way of solving simple arithmetic such as fingers counting and others without knowing how powerful Game of Set can help in teaching – learning process. The power of Game of Set as an educational tool for learning depends on how it is integrated into the classroom learning environment. Game of Set could serve as a way of retaining knowledge in adult learners if it is well integrated in teaching. The present study believes that to achieve this aim, educators need to shift from treating this Game of Set as simple Game and be more committed in its use. It is on this ground that this current study focused on Game of Set: Effect on adult learners` retention in simple arithmetic as a form of teaching support and conversation starter in the classroom towards promoting adult learners` retention in Nsukka Local Government adult learning centres.

The major aim of this study was to determine Game of Set: Effects on adult learners` retention in Nsukka Local Government Area studying centres. In particular, the study sought to:

- Find the mean retention scores of adult learners taught simple arithmetic using Game of Set and those taught with the conventional method.
- Find the mean retention scores of male and adult learners taught simple arithmetic using Game of Set.
- Determine the interaction effect of method and gender on the mean retention scores of adult learners in simple arithmetic.

The study was guided by the following three research questions which were well formulated.

- What are the mean retention scores of adult learners taught simple arithmetic using Game of Set and those taught with conventional method?
- What are the mean retention scores of male and female adult learners taught simple arithmetic using Game of Set?
- What is the interaction effect of method and gender on the mean retention scores of adult learners in simple arithmetic?

The following three null hypotheses formulated by the researchers guided the study.

**Ho<sub>1</sub>:** There is no significant difference in the mean retention scores of adult learners taught simple arithmetic using Game of Set and those taught with conventional teaching method.

**Ho<sub>2</sub>:** There is no significant difference in the mean retention scores of male and adult learners taught simple arithmetic using Game of Set.

**Ho<sub>3</sub>:** There is no significant difference in the interaction effect of method and gender on the mean retention scores of adult learners in simple arithmetic

## **II. Methods**

The research was performed in a quasi-experimental manner. Since intact groups of adult learners studying centers in Nsukka Local Government Area were used, a non-equivalent pre-test post-test control group design was used. To avoid selection bias among adult learners and to prevent adult learners from being rearranged, intact classes from the two learning centres were used. Quasi-experimental research design does not use random assignment of subjects, rather intact class is usually used and this made the present study to settle for quasi-experimental design [17]. The study was conducted in Nsukka Local Government Area of Enugu State, Nigeria covering the three functioning adult learning centres in the Local Government. The study area has a land mass of 1,810km<sup>2</sup>. Majority of the people in the study area are into farming and they are predominantly

Igbo Christians with very few Muslims population. The study area also house University of Nigeria and Federal Government Girls College. Lejja, Nsukka.

The population of the study was 437 (156 male and 281 female) adult learners in all the three functioning adult literacy centres in Nsukka Local Government Area; namely Ugwuoye adult learning centre, Opi adult learning centre and Edem adult learning centre. The sample size of the study was 48 adult learners in two out of the three functioning adult literacy centres in the Local Government Area. Simple random sampling technique was used to select two centres out of the three centres. Simple Arithmetic Retention Test (SART) was used as the instrument for collecting data. The SART was a 25 items multi-choice objective questions adopted from Simple Arithmetic Achievement Test (SAAT) but was well shuffled to prevent adult learners for cramming of answers accordingly. Three experts did face validity of the test instrument while content validity of the test instrument was done through table of specification. Two of the experts were in Adult Education and one in Measurement and Evaluation, all in the faculty of Education, University of Nigeria, Nsukka. The retention test instrument was subject to thorough scrutiny by these experts so as to ensure that its contents were in line with the purpose of the study, research questions and hypotheses formulated to guide the study. To ascertain the reliability level of the test instrument, a pilot study was conducted in Udenu Local Government Area which is not under the control of the study area or in any way related to the study area. Using spearman man ranking correlation coefficient, a reliability value of 0.86 was obtained from the SART instrument which shows that the Simple Arithmetic Retention Test instrument was highly reliable.

Two groups were used for the study. The two groups were (Game of Set and the conventional method). The Game of Set groups were given treatment for three weeks using Game of Set in instructing the adult learners while the second groups were only taught in the conventional method way of chalk and blackboard for the same number of weeks. After three weeks of instructing both groups a posttest was administered on adult learners of both groups. The adult learners in both adult learning centres were subjected to posttest in which two weeks of no treatment was ensured before another test named retention test was administered on the adult learners. The researchers collated the answer sheet and marked them to obtain the posttest scores of both the experimental and the control group adult learners. After two weeks the same test was re-shuffled and re-administered as retention test on both the experimental group and the control group. The researchers again collated the answer sheets and marked them to obtain the retention test scores of both the experimental and the control group adult learners. The scores of adult learners in the two tests conducted were later subjected to statistical computation through statistical package for social sciences (SPSS) version 23. The three research questions that guided the study were answered using mean and standard deviation while the hypotheses were tested using Analysis of Covariance (ANCOVA). Hence, hypothesis that is greater than 0.05 was accepted and hypothesis that is less than 0.05 was rejected.

### III. Result

#### Research Question 1

What are the mean retention scores of adult learners taught simple arithmetic using Game of Set and those taught with conventional method? Data for answering research question 1 are presented in Table 1.

**Table 1**  
**Post-test and Retention-test Mean Scores of Game of Set and Conventional Method in the Retention Test**

Method	N	Posttest		Retention Test		Mean Gain
		$\bar{x}$	SD	$\bar{x}$	SD	
Game of Set	25	66.96	5.89	59.28	5.35	7.68
Conventional Method	23	50.35	7.90	47.13	6.32	3.22

\*N = Number of students,  $\bar{x}$  = Mean and SD = Standard Deviation

The result presented on Table 1 showed that the experimental group that was taught simple arithmetic using Game of Set) had a posttest mean achievement score of 66.96 with a standard deviation score of 5.89 and a retention test mean retention score of 59.28 with standard deviation score of 5.35 leading to a posttest-retention test gain of 7.68. The control group taught simple arithmetic using conventional method had a posttest mean score of 50.35 with a standard deviation score of 7.90 and a retention test mean retention score of 47.13 with a standard deviation score of 6.32 resulting to a posttest-retention test mean gain of 3.22. This result reveals that, the adult learners in the experimental group taught with Game of Set performed better in the retention test than the adult learners in the control group taught with conventional method. Hence, the adult learners taught simple arithmetic using Game of Set displayed higher retention of learning than those taught with conventional method.

#### Hypothesis One

**Ho<sub>1</sub>:** There is no significant difference in the mean retention scores of adult learners taught simple arithmetic using Game of Set and those taught with conventional method.

**Table 2: Analysis of Covariance (ANCOVA) of the Significant Difference in the Mean Retention Scores of Adult Learners Taught Simple Arithmetic Using Game of Set and Those Taught With Conventional Method.**

Source	Type III Sum of Squares	Df	Mean Square	F	Sig.
Corrected Model	1802.670 <sup>a</sup>	4	450.667	12.656	.000
Intercept	1392.088	1	1392.088	39.092	.000
Posttest	24.236	1	24.236	.681	.414
Method	505.264	1	505.264	14.189	.000
Gender	9.105	1	9.105	.256	.616
Method * Gender	.016	1	.016	.000	.983
Error	1531.247	43	35.610		
Total	140508.000	48			
Corrected Total	3333.917	47			

The result presented in Table 2 showed that an F-cal of 14.189 with associated probability of 0.000 was obtained with respect to the difference in the mean retention scores of adult learners taught simple arithmetic using Game of Set and those taught with conventional method. Since the associated probability (0.000) was less than 0.05 level of significant set as the criterion for taking decision, the null hypothesis ( $H_{01}$ ) was rejected. It was therefore concluded that there is a significance difference in the mean retention scores of adult learners taught simple arithmetic using Game of Set and those taught with conventional method.

**Research Question 2**

What are the mean retention scores of male and female adult learners taught simple arithmetic using Game of Set? Data for answering research question 2 are presented in Table 3.

**Table 3  
Posttest and Retention-test Mean Scores of Male and Female Adult Learners Taught Simple Arithmetic using Game of Set in the Retention Test**

Gender	N	Posttest		Retention Test		Mean Gain
		$\bar{x}$	SD	$\bar{x}$	SD	
Male	9	66.44	5.27	58.67	3.61	7.77
Female	16	67.25	6.36	59.62	6.21	7.63

\*N = Number of students,  $\bar{x}$ = Mean and SD = Standard Deviation

The result presented on Table 3 show that the male group had a posttest mean retention score of 66.44 with a standard deviation score of 5.27 and a mean retention score of 58.67 with a standard deviation score of 3.61. The difference between (mean gain) the posttest and retention test for male group was 7.77. The female group had a posttest mean retention score of 67.25 with a standard deviation score of 6.36 and a retention test score of 59.62 with a standard deviation of 6.21. The difference between (mean gain) the posttest and retention test mean score for the female group was 7.63. For each of both male and female, the retention test mean was less than the posttest retention mean with the male group having higher mean gain. With this result, Male adult learners taught simple arithmetic had higher mean gain than their female counterpart. Thus, there is an influence attributed to gender on the retention level of adult learners taught simple arithmetic using Game of Set.

**Hypothesis 2**

**H<sub>02</sub>:** There is no significant difference in the mean retention scores of male and adult learners taught simple arithmetic using Game of Set.

The result in Table 2 shows that an F-ratio of .256 with associated probability value of .616 was obtained with respect to the significance difference in the mean retention scores of male and female adult learners taught simple arithmetic using Game of Set. Since the associated probability (.616) was greater than 0.05 set as the level of significance and the criterion for taking decision, the null hypothesis ( $H_{02}$ ) was not rejected. Based on this, it was therefore concluded that there was no significant difference in the mean retention scores of male and adult learners taught simple arithmetic using Game of Set.

**Research Question 3**

What is the interaction effect of method and gender on the mean retention scores of adult learners in simple arithmetic? Data for answering research question 3 is presented in table 4.

**Table 4**  
**Mean and Standard Deviation of the Interaction Effect of Method and Gender on the Mean Retention Scores of Adult Learners in Simple Arithmetic**

Variables		N	Posttest		Retention Test		Mean Gain
Method	Gender		$\bar{x}$	SD	$\bar{x}$	SD	
Game of Set	Male	9	66.44	5.27	58.67	3.61	7.77
	Female	16	67.25	6.36	59.62	6.21	7.63
Conventional	Male	8	50.25	2.71	46.50	4.75	3.75
	Female	15	50.40	9.72	47.47	7.15	2.93

\*N = Number of students,  $\bar{x}$  = Mean and SD = Standard Deviation

The result presented in Table 4 shows the interaction between method and gender on the mean retention scores of adult learners in simple arithmetic. Result shows that the male group of those adult learners taught Simple Arithmetic using Game of Set had a posttest mean of 66.44 with a standard deviation of 5.27 and a retention test mean of 58.67 with a standard deviation of 3.61. The difference between (mean gain) the posttest and retention for male group is 7.77. The female group had a posttest mean of 67.25 with a standard deviation of 6.36 and a retention test mean score of 59.62 with a standard deviation of 6.21. The difference between (mean gain) the posttest and retention mean for the female group was 7.63. For each of the two genders, the retention scores were lesser than the posttest retention means with the male group having higher mean gain. Result in Table 4 also shows that the male group of those adult learners taught Simple Arithmetic using conventional method had a posttest mean of 50.25 with a standard deviation of 2.71 and a retention test mean score of 46.50 with a standard deviation of 4.75. The difference between the posttest and retention test mean scores for male group was 3.75. The female group had a posttest mean score of 50.54 with a standard deviation score of 9.72 and a retention test mean score of 47.47 with a standard deviation of 7.15. The difference between the posttest and the retention test mean for the female group was 2.93. For each of the two groups, the retention test mean scores were lesser than the posttest means scores. The male group in the Game of Set gained more scores than the female group while the male of the conventional group gained more scores than their female counterpart. This means there was no interaction between method and gender on adult learners` retention in Simple Arithmetic.

**Hypothesis 3**

**Ho<sub>3</sub>:** There is no significant difference in the interaction effect of method and gender on the mean retention scores of adult learners in simple arithmetic.

The result in Table 2 shows that an F-ratio of .000 with associated probability value of .983 was obtained with respect to the interaction effect of method and gender on adult learners` retention scores in Simple Arithmetic. Since the associated probability (.983) which was greater than 0.05 level of significance set as the criterion for taking a decision, the null hypothesis (Ho<sub>3</sub>) was accepted. Thus, the conclusion drawn was that there is no significant interaction effect of method and gender on the mean retention scores of adult learners in Simple Arithmetic.

**IV. Findings and Discussion**

The use of Game of Set improved the mean retention scores of adult learners taught simple arithmetic using Game of Set than those taught with conventional method. The result on table one further shows that there was significance difference in the mean retention scores of adult learners taught simple arithmetic using Game of Set and those taught with conventional method. The findings of this study was in cognizance with a According to a study conducted across more than 192,000 students in 22 countries, the findings of the study that show that video-gaming behaviour had little effect on psychometrically valid assessments of academic performance in science, mathematics, or reading [4]

For both male and female groups, the posttest achievement means were greater than the retention test means with the male group having higher mean gain of 7.77 which was slightly higher than 7.63 for their female counterpart. The result further shows that there was no significance difference in the mean retention scores of male and female adult learners taught simple arithmetic using Game of Set. This study was in agreement with a study that found out that male students retained knowledge slightly better than their female counterpart when taught Mathematical aspect of Economics but found no significance difference in both retention levels [10].

For male and female groups exposed to both methods (Game of Set and Conventional method), the posttest means were greater than the retention test means with male group having higher mean gain than their female counterparts when using Game of Set, while the male groups also still have higher mean gain than their female counterpart when using the conventional method. The result further show that there was no significance difference in the mean retention scores of adult learners taught simple arithmetic.

## V. Conclusions

From the foregoing findings, and discussion it could be concluded that adult learners taught Simple Arithmetic using Game of Set performed excellently better in the retention test than those adult learners taught Simple Arithmetic using Conventional method. This shows that Game of Set was more effective than the Conventional method in adult learners` retention in Simple Arithmetic while the male group taught Simple Arithmetic using Game of Set mean retention score was slightly higher than their female counterpart but was not statistically significant. Finally, there was no significant interaction effect of method and gender on the mean retention scores of the adult learners taught Simple Arithmetic.

## VI. Recommendations

Going by the findings of this study, the study therefore made the following recommendations:

- As the use of Game of Set as been found effective in retaining adult learners retention in simple arithmetic and also since this teaching method is relatively new in Nigeria when instructing adult learners, it should be emphasized and integrated into the adult learners scheme of work and adult instructor should be taught on how to use this method during their undergraduate years in higher institutions.
- Both male and female practicing adult instructors in Nigeria at the moment should also be educated on how they can use Game of Set when instructing adult learners any aspect of basic mathematics since the method did not discriminate between the retention level of male and female adult learners taught using it.

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