

GENDER DIFFERENCES IN MATHEMATICS RETENTION USING SKYPE AND RECORDED VIDEO INSTRUCTION

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ABSTRACT: *The study was undertaken to determine gender differences in Mathematics retention using Skype and recorded video instruction. The design of the study was a pre-test, post-test quasi- experimental design. The population of the study was seven hundred and fifty-two (752) senior secondary school two (SS2) students in 13 government approved private secondary school in Nkanu West Local government Area, Enugu State. One hundred and nine students were purposively sampled from three government approved private secondary school. The instrument used to collect data was Mensuration in Circle Retention Test (MCRT). The instrument Mensuration in Circle Retention Test (MCRT) was validated and Kuder Richardson formula 20 (KR-20) was used to establish a reliability coefficient of 0.86. Two research questions and two hypotheses guided the study. The research questions were answered descriptively using mean and standard deviation while Analysis of Covariance (ANCOVA) was used to test hypotheses. The study revealed Skype and Recorded video had no statistically differential effect on male and female students' retention. The study also revealed that there was no significant interaction effect between gender and approaches on students' retention of Mathematics concepts. Based on the findings it was recommended that Skype and Recorded video should be adopted in the teaching of Mathematics.*

INTRODUCTION

Mathematics occupies a key position in education and its application in science and developmental process. Nigeria is a developing country and in her strive towards scientific and technological advancement, nothing but a good performance in Mathematics is needed from both male and female students at all levels of schooling. Despite the importance of Mathematics, students' success rate has remained low and students continue to exhibit weakness in solving question in Mensuration among other areas (WAEC, 2018). One of the factors that may be associated with students' low performance in Mathematics is students' inability to remember what they have learnt. Retention is the ability of a person to keep, remember as well as recall the acquired knowledge or some part of the knowledge over a period of time (Bichi, 2000). Gubbard (2010) defined

retention as the ability to recall what has been learnt before. Retention is important in learning process and if a learner is unable to retain effects of previous learning experiences, it hinders the learners' progress of one practice period (Davis, 1979). Naturally man has the tendency to forget things. Retention can be said to occur when a learner is able to keep as well as recall what has been learnt at a later time.

It is believed that there is a connection between visual clues, the memory process and the recall of information. Video based instruction (recorded/taped or online streamed) is beginning to show promise in education. Software applications such as Skype and Zoom, among others are now used as educational tools because of their video-conferencing ability and specific features. Skype is a software program that allow users all over the world to send instant messages, make and receive voice and video calls, and do video conferencing online.

Video can be defined as a record or form of multimedia that conveys information through the aural and visual sensory channels simultaneously. When students receive information through the dual channels it creates a deeper understanding of a lesson resulting in more connections being made with prior knowledge (AbuSaada, Lin & Fong, 2013). In Mathematics teaching and learning, how well students retain and apply sequential procedures in solving problems in Mathematics is important.

LITERATURE REVIEW

The WAEC examiner's report (2018) suggested that Mathematical concepts need to be taught using more interesting strategies that is suitable for students both male and female. Because of the relevance of Mathematics in the society and economic prosperity, it is expected that both male and female students' excel in the subject without disparity. As seen by IFAD (2014), gender equality is the fair or equal treatment of boys and girls, male and female with regards to their respective needs, benefits, rights, obligations and opportunities. The role of gender (male and female) is very significant in the sustenance and development of any nation. Various studies on gender and academic performance in Mathematics exist with different views and findings. Some studies found that females perform better than their male counterparts (Fabiya, 2017; Ayodele, 2009). Some others establish that males perform better than the females (Mutai, 2016; Longe and Adedeji, 2003). Yet others found no significant difference in the performance between males and females (Charles-Ogan & George, 2016; Ajai & Imoko, 2015; Nonyelu & Anikweze, 2019).

The reviews suggests that students' attitude, social and cultural beliefs, teaching materials, classroom interaction and leaning styles among other factors may be attributed to the gender differences. Paechter (1998) stressed that Mathematics lessons are organized to accommodate the male learning patterns which is the reason why the males retain and outperform the female students. Gender differences in Mathematics could be traced to the social and cultural belief that Mathematics is a masculine subject, and the females are not expected to perform as high as their male counterparts. This belief may lead to low motivation in the females and increase the gender gap in the performance of the students in favour of the males. Regardless of gender, male and female students should be given equal opportunities and challenges to gain, compete and collaborate with one another. Appropriate teaching and learning Mathematics environment that suits both male and female students is necessary.

One of the goals of education is for learners to acquire knowledge. The teacher is usually faced with the task of how to help students improve on their ability to assimilate

and retain what they have learnt. Hence, it is important that a teacher presents Mathematics concepts in a way that can help the students' to recall easily.

Dale (1969) asserted that a learner will generally retain 10% of what they read, 20% of what they hear, 30% of what they see and the percentage continues to increase to 90% when the learner can perform a task. Dale's cone of experience suggests that the more sensory channels possible in interacting with a resource, the better chance that many students can learn from it. Importantly, the ability to pause, rewind, stop and play video lesson helps students replay important points that they need to remember, which is essential for memory retention (Khan, 2012). In a conventional classroom it is easy to miss what the teacher says at a given moment, but with a video lesson, information in its entirety and notes can be rechecked for accuracy.

Skype a software application and online service founded in 2003 with the purpose of breaking down barriers to communication, is used today by teachers around the world in unique ways to fulfil educational goals. Researchers Yeo, 2018; and Strang, 2012, revealed the effectiveness of Skype as an educational tool in learning Mathematics as well as other disciplines. Researchers support the use of video for instruction as revealed in Igbojinwaekwu, 2013; Nonyelu and Anikweze, 2019; and Gamabri, Shittu, Dramola, Jimoh, 2016). Instructional videos whether Recorded or online streamed are not meant to replace the traditional/conventional method of teaching but to supplement them. Bevan (2020), opined that videos assist in the learning of all subjects especially those topics that are complex and require sequential procedures to find solutions to.

In a traditional classroom, teaching with video based instruction might be time consuming but with careful consideration of what the desired outcomes are for a particular activity or lesson and smart time planning, the students can develop a wide variety of learning experiences. It is worthwhile to see how Skype and recorded video would bridge the gap between male and female students' retention in Mathematics.

Lev Vygotsky theory of cognitive learning

As the saying goes Man is dynamic in nature. While making meaning out of his environment, man can possibly solve the problems within the environment. Learning they say is the acquisition of knowledge and it relates from new information to old knowledge. Cognitive processes vary and involve the processes of perception, memory, recall, recognition, retention and reasoning. Lev Vygotsky, a Russian psychologist, is of the view that cognition could be developed through socialization. Vygotsky (1978) focused on human development from a sociocultural point of view through interpersonal processes that lead to higher mental processes where a learner from interpersonal interactions connect and interact with another who has higher or more advanced knowledge, hence zone of proximal development.

Lev Vygotsky believed that a child is in a zone of proximal development. A zone between what he/she knows and what he/she do not yet know. The zone of proximal development is the gap between what a child can achieve himself and what a child can achieve with the help and encouragement of a more skilled person. A child can acquire the knowledge of what he/she is yet to know through the help of a more knowledgeable other. In early stages of development, this is likely to be a parent, but it can also be a teacher, peers, or a technology. With the current changes in the educational landscape, emphasis is now placed on using technological tools that engage learners more. The use of Skype and Recorded video offer students' opportunity to learn, interact, collaborate virtually not only with their teachers and peers but with other classrooms, teachers and subject experts

anywhere in the world. It is believed that when students' auditory and visual senses are aroused it evokes emotions in the students and excitement in the classroom environment that reduce abstraction and perceived difficulty in the subject (Mathematics).

Vygotsky's theory is relevant to the present study particularly in the learning and retention of Mathematics concepts because it emphasized cognitive development through interaction with a stimulating environment and materials that allow students' gain higher mental functions.

Statement of the Problem

The influence of gender on students low success rate in Mathematics has remained a main focus of concern among educational researchers, yet no consistent results have emerged. A developing country like Nigeria that is aspiring to be adept in science and technology need nothing short of mathematically literate citizens. The report from WAEC examiner (2018) emphasized that students consistently show their inability and weakness to answer questions in some areas in Mathematics such as Mensuration and geometry. Could it be that teachers' failure to use appropriate teaching approaches that enhance students' retention of Mathematics concepts? These uncertainties are what this study sought to address. It is therefore necessary to investigate gender differences in Mathematics retention of students using Skype and Recorded video approaches.

Aims and Objectives of the Study

The aim of the study was to determine gender differences in Mathematics retention using Skype and Recoded video instruction. Specifically, the study's objectives are to:

- 1 Determine effect of Skype and Recorded video on the male and female students' retention in Mathematics?
- 2 Determine interaction effect of approaches (Skype and Recorded video) and gender on students' retention of Mathematics concepts.

Research Questions

1. To what extent do Skype and Recorded video affect the male and female students' retention in Mathematics?
2. What is the interaction effect of approaches (Skype and Recorded video) and gender on students' retention of Mathematics concepts?

Hypotheses

To guide this study, three null hypotheses were tested at 0.05 level of significance.

1. There is no significant difference in the mean retention scores of male and female students taught Mathematics with Skype and those taught with Recorded video.
2. There is no significant interaction effect of approaches (Skype and Recorded video) and gender on students' retention of Mathematics concepts.

METHODOLOGY

The design adopted for this study was pretest, posttest quasi experimental design. In this design two experimental groups and one control group were used. The students in the first experimental group were taught Mathematics using Skype, the second group were taught using Recorded video while the control group were taught using Conventional teaching approach. The study was carried out in Nkanu West, Enugu State. The population was seven hundred and fifty-two (752) senior secondary school two students in thirteen (13) government approved private secondary schools in Nkanu West Local Government Area. The sample size for the study was one hundred and nine (109).

Purposive sampling technique was employed to sample three schools from the thirteen government approved private secondary schools. The three schools sampled had a minimal difference between the number of male and female students; Mathematics concept 'Mensuration in Circle' had not been taught in the schools. The three schools had presented students for external examination for over seven years. The schools had classroom space and access to electricity and internet connectivity. The schools were located far from each other so the students would not be involved with discussing the test procedures. Random sampling was used in the selection of one intact class from each school. Mensuration in Circle Retention Test (MCRT) was the instrument used for data collection. The items of MCRT were validated by two Mathematics educators and two senior school Mathematics teachers. The reliability coefficient of MCRT was found to be 0.86 using Kuder-Richardson 20 formula (KR20). The research questions were answered using mean and standard deviation. The hypotheses were analyzed using Analysis of Covariance (ANCOVA) and tested at 0.05 level of significance.

RESULTS

Research Question 1: To what extent do Skype and Recorded video affect the male and female students' retention in Mathematics?

Table 1: Mean and Standard deviation of male and female students' retention in Mathematics.

Gender	N	Post-test Mean	SD	Retention Mean	SD	Mean Gain
Male	47	16.68	4.01	19.87	5.13	2.93
Female	62	17.03	3.63	20.19	4.58	3.16

Table 1 showed the mean retention scores of male and female students. Table 1 revealed the mean retention score of 19.87 for the male students while the female counterpart had a retention score of 20.19. The difference in the mean of male and female students in the MCRT was 0.32 in favour of the female students.

Research Question 2: What is the interaction effect of approaches (Skype and Recorded video) and gender on students' retention in Mathematics?

Table 2: Mean and Standard deviation on effect of approaches and gender on students' retention in Mathematics.

Approaches	Gender	Post –test	SD	Retention	SD	Mean Gain
		Mean		Mean		
Skype:	Male	19.43	3.88	24.00	4.96	4.57
	Female	19.14	3.20	24.10	3.13	4.96
Recorded Video:	Male	17.60	3.22	20.93	3.84	3.33
	Female	17.57	2.83	20.17	3.30	2.60
Conventional:	Male	13.78	2.73	15.78	2.73	2.00
	Female	13.89	2.95	15.67	3.01	1.78

Table 2 showed the mean gain scores of 4.57, 3.33 and 2.00 for the male students' retention in Mathematics taught with Skype, Recorded video and Convectional approaches respectively while their female counterparts had mean gain scores of 4.96, 2.60 and 1.78 respectively.

H₀₁: There is no significant difference in the retention of male and female students taught Mathematics using Skype and those taught using Recorded video.

Table 3: Summary of ANCOVA test for difference in the retention of male and female students' taught Mathematics using Skype and those taught using Recorded video Tests of Between-Subjects Effects

Dependent Variable: Retention

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	2147.177 ^a	2	1073.589	330.342	.000
Intercept	.147	1	.147	.045	.832
Post-test	2144.419	1	2144.419	659.836	.000
Gender	.230	1	.230	.071	.791
Error	344.492	106	3.250		
Total	46332.000	109			
Corrected Total	2491.670	108			

Table 3 showed the gender significant value of 0.791 which is greater than 0.05 alpha level of significance. Thus the hypothesis was retained. Therefore, there was no significant difference in the retention scores of male and female students taught using Skype and those taught using Recorded.

H₀₂: There is no significant interaction effect of approaches (Skype and Recorded video) and gender on students' retention in Mathematics.

Table 4: Summary of ANCOVA test for interaction effect of approaches and gender on students' retention in Mathematics.

Tests of Between-Subjects Effects

Dependent Variable: Retention

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	2192.098 ^a	6	365.350	124.396	.000
Intercept	11.495	1	11.495	3.914	.051
Post-test	1302.195	1	1302.195	443.379	.000
Gender	6.418	1	6.418	2.185	.142
Approach	28.011	2	14.005	4.769	.010
Gender * approach	18.464	2	9.232	3.143	.057
Error	299.572	102	2.937		
Total	46332.000	109			
Corrected Total	2491.670	108			

Table 4 showed the approach and gender significant value of 0.57 which is greater than 0.05 alpha level of significance. Thus, the hypothesis was retained. Therefore, the interaction effect of approaches (Skype and Recorded video) and gender on students' retention in Mathematics was not significant.

DISCUSSION OF FINDINGS

The result on table 1 showed that the female students had a higher mean gain in the retention of Mathematics concepts than their male counterpart. Furthermore, table 3 showed that there was no significant difference in the mean retention scores of male and female students taught Mathematics using Skype and those taught using Recorded video.

The findings of this study is in agreement with Ajai and Imoko, 2015; Job and Akinboboye, 2019; who observed no significant difference in retention ability of male and female students.

Table 4 showed that there was no significant interaction effect of approaches (Skype and Recorded video) and gender on students' retention of Mathematics concepts. The findings is in agreement with Umoru and Adekunle (2019) that the interaction effects of teaching methods and gender was not significant on students' retention in business studies.

CONCLUSION

Based on the findings the following conclusions were drawn:

- 1) There is no significant difference between mean retention scores of male and female students taught Mathematics using Skype and Recorded video.
- 2) There is no significant interaction effect between approaches, gender and students' retention of Mathematics concepts.

RECOMMENDATIONS

In view of the findings the following recommendations were made

- 1) Innovative approaches such as Skype and Video based instructions should be used to supplement the conventional teaching approach and enhance students retention of Mathematics concepts.
- 2) Male and female students should be given exactly the same opportunities and challenges to compete and collaborate in a Mathematics classroom.

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