



KHAN ACADEMY VIDEO-BASED INSTRUCTIONS AND STUDENTS' PERFORMANCE IN MATHEMATICS IN YENAGOA LOCAL GOVERNMENT AREA OF BAYELSA STATE

Diri, E.A.

Department of Science Education, Faculty of Education, Federal University Otuoke, Bayelsa State, Nigeria

*Corresponding author email: diriea@fuotuoke.edu.ng

Abstract

The aim of this study was to assess the impact of Khan Academy Video-based Instruction on students' performance in mathematics. Two research questions and hypotheses guided the investigation, employing a pre-test and post-test quasi-experimental design. The study population comprised Junior Secondary School II (JSS 2) students from Yenagoa Local Government Area (L.G.A.) of Bayelsa State, with a sample size of 100 students selected randomly from two secondary schools within the Yenagoa Education Zone. Data collection utilized the Mathematics Achievement Test (MAT), developed by the researchers and endorsed by three research specialists. The reliability of the instrument was determined using the Kuder-Richardson 20 (K-20) formula, resulting in a reliability index of .79. Analysis of research questions relied on mean and standard deviation calculations, while null hypotheses were assessed using a t-test. The study revealed that students exposed to Khan Academy videos during mathematics instruction demonstrated enhanced academic achievement compared to those taught through conventional methods. There was a significant difference between the mean scores of male and female students instructed in mathematics using Khan Academy Video-Based Instruction. As a recommendation, students should be allocated time to view Khan Academy videos outside of regular class hours, with teachers receiving full support to facilitate optimal learning outcomes from the instructional videos.

Keywords: Khan Academy Videos, Educational technology, Mathematics Education, Academic Performance

Introduction

In our society today, information and technology are essential for economic development and the development of the educational process respectively. Information societies have emerged as a result of the rapid advancement of information technologies, and it is now crucial for societies to adapt to new developments in technology. The integration of new technologies into the educational process has been made possible in large part by educational technology. Educational technology, according to Joseph (2024), is the philosophy and practice of creating and implementing cutting-edge instructional strategies to improve student accomplishment. To support learning, it integrates the usage of computer hardware, software, and educational theory and practice.

Educational technology is seen as a technology that usually helps in facilitating collaboration in an active learning environment. It can be used in the classroom by instructors in several ways. These include creating textbooks, and gamification, where games and activities are imported into class lessons to reinforce concepts in a fun and exciting way. More ways educational technology can be administered are through attendance, assignments, homework, quizzes and helping educators gauge students' performances. At a glance, educational technology can be used in creating real-time views on teaching material, style and format and pictures of students' progress. Technological usage in mathematics education has accrued significance in years past. Online learning platforms especially have generated in becoming the most effective tools for enhancing mathematical skills (Dickinson, 2016; Kelly, 2018). Khan Academy (KA) which is one such platform, creates vast usage and interaction in mathematics instruction. KA creates a personal learning experience that gives room for students in mathematics to build skills according to their individual learning needs. KA web-based educational software has over 10,000 videos and more than 150,000 exercises for interaction in mathematics and other sciences. Khan Academy also creates the opportunity for teachers to learn in their space, for students to learn at their own pace and also for parents to be able to interact with it in the comfort of their homes, with equal results not minding the environment they find themselves (Khan Academy, 2017). KA's innovative platform

offers an online source for everyone to have a personal learning experience with full access to content with the help of the internet.

Personalized learning experiences have been shown to improve student achievement and mathematical proficiency in studies. Students may instantly track their progress and receive comments through Khan Academy. Research by Kelly and Rutherford (2017) and da Silva and Coutinho (2020) has demonstrated that progress tracking and feedback improve student motivation and foster mathematical proficiency. Since KA is an internet platform, it offers widespread access to education in mathematics. As online learning platforms proliferate, a growing body of research has demonstrated their beneficial benefits on arithmetic learning and accomplishment. Learning networks such as Khan Academy are indicators of how educational technologies will be used in the future. Thus, new options for teaching mathematics are presented by technological improvements and digital resources. In addition to typical classroom settings, these internet resources can help pupils improve their mathematical abilities. Studies indicate that integrating technology into mathematics training enhances student performance and fosters the growth of mathematical abilities (Kelly & Rutherford, 2017; Lawless et al. 2013). Clear and understandable themes, examples, and practice questions are included in the KA learning materials. With the aid of visual and aural aids, these resources offer students an enhanced learning experience that improves their comprehension of mathematical ideas. According to Light and Pierson (2014) and Otobelli et al. (2018), students can enhance their confidence in mathematics, strengthen their comprehension of mathematical concepts, and develop their problem-solving abilities by utilizing the KA platform.

Academic performance is defined as how well students manage their education and how well they handle or complete the different assignments that are given to them by their teachers. Academic performance is the capacity to learn and retain information as well as the ability to express information verbally or in writing. According to research by Fatih and Hafize (2009), online groups outperform face-to-face groups in terms of accomplishment levels during the problem-based learning process. Regarding the sub-dimensions of task sharing, collaboration in problem-solving, feedback, and solution presentation, the online learning groups' accomplishment scores surpass those of the in-person learning groups. In their research, Ayeni et al. (2022) and Zengin (2017) found that there is a significant difference in performance between mathematics students in virtual learning to those exposed to conventional methods. According to research conducted by Kreller (2022), Hakan (2023), and Shafeak (2020), approximately 77% of students who took part in the Khan Academy program saw an improvement in their post-test scores. This suggests that the learning that occurred through the Khan Academy platform contributed to the positive outcome and validates the research hypothesis. Gender, on the other hand, is an important aspect that significantly influences students' academic achievement, especially in science-related courses. According to research findings, secondary school mathematics achievement varies by gender. Nonetheless, a wealth of study data indicates that females do not appear to be performing well in mathematics.

Statement of the problem

Even though teaching mathematics is deemed important, the majority of secondary school graduates struggle to comprehend mathematical ideas. By highlighting the importance of fundamental ideas in mathematics as they go through rank. With the use of technology, Khan Academy enhances and prolongs the learning process. Teachers have a lot of materials at their disposal, but it can occasionally be difficult to choose the finest ones to make the most of their teaching time. Few resources can compare to Khan Academy's reputation among secondary school math teachers. Because of the quantity and calibre of its numerous integrated lessons and tests, Khan Academy has grown to become one of the most popular online learning environments (Schwartz, 2014). For this reason, this study tends to examine the effect of Khan Academy videos on students' academic performance in mathematics.

Aim and Objectives of the Study

This study seeks to investigate the effect of Khan Academy video-based instructions on the students' performance in mathematics in Yenagoa LGA of Bayelsa State. Specifically, the study investigated the:

1. effect of Khan Academy video-based instruction on the performance of students in mathematics in Yenagoa LGA of Bayelsa State.
2. influence of gender on the performance of students taught mathematics with Khan Academy video-based instructional approach.

Research Questions

The following research questions guided the study:

1. What is the mean difference between the performance scores of students taught mathematics with Khan Academy videos and those taught using conventional teaching methods?
2. What is the mean difference between the performance scores of male and female students taught mathematics with Khan Academy videos?

Hypotheses

The following null hypotheses were formulated and were tested at a .05 level of significance:

H₀₁: There is no significant difference between the mean performance scores of students taught mathematics with Khan Academy videos and those taught using the conventional teaching method

H₀₂: There is no significant difference between the mean performance scores of male and female students taught mathematics with Khan Academy videos.

Materials and Methods

The investigation employed a quasi-experimental design with pre- and post-tests. The study population comprised all junior secondary school II (JSS 2) students in the Yenagoa Local Government Area of Bayelsa State. A sample of one hundred (100) students was randomly selected from two secondary schools within the Yenagoa Education Zone, with one school assigned as the experimental group and the other as the control. The experimental group consisted of 50 students (25 males and 25 females), while the control group also comprised 50 students, equally divided by gender. The experimental group received instruction in Mathematics through Khan Academy videos, while the control group underwent traditional instruction methods in conventional classroom settings. The age range of participants was between 13 to 14 years.

Data collection utilized a Mathematics Achievement Test Instrument (MAT) comprising 20 multiple-choice items with four options each, covering topics such as whole numbers, rational numbers, integers, and number systems. The test underwent review by a Mathematics teacher and two experts in the Department of Science Education and Measurement and Evaluation at the Federal University Otuoke, incorporating their suggestions into the final draft. The instrument demonstrated satisfactory reliability, with a reliability index of .79 estimated using the Kuder-Richardson 20 (K-R20) formula. Research assistants administered the MAT to participants in both experimental and control groups at their respective schools. Data analysis involved calculating mean and standard deviation, and null hypotheses were tested using a t-test. A probability value less than 0.05 indicated rejection of the null hypothesis.

Results

Research Question 1: What is the mean difference between the performance scores of students taught mathematics with Khan Academy videos and those taught using conventional teaching methods?

Table 1: Mean performance scores and standard deviations of students taught mathematics with Khan Academy video-based instruction and those taught using conventional method.

Group	N	Pre-test		Post-test		Mean gain	Mean diff
		Mean	SD	Mean	SD		
Experimental	50	13.04	1.94	15.76	1.99	2.72	1.32
Control	50	11.34	1.98	12.74	2.03	1.40	

Table 1 indicates that students instructed with Khan Academy Videos achieved higher mean scores compared to those taught through traditional methods. This is evidenced by the experimental group's greater gain in mean score of 2.72, compared to the control group's gain of 1.40. Consequently, there is a mean difference of 1.32 in favour of the experimental group.

Research Question 2: What is the mean difference between the performance scores of male and female students taught mathematics with Khan Academy videos?

Table 2: Mean performance scores and standard deviations of male and female students taught mathematics using Khan Academy videos (post-test).

Group	Gender	N	Mean	SD	Mean diff
Experimental	Male	25	16.80	1.53	2.08
	Female	25	14.72	1.86	

Table 2 illustrates that male students taught through Khan Academy exhibit higher mean performance scores than their female counterparts, with males averaging 16.80 ± 1.53 and females averaging 14.72 ± 1.86 . This results in a mean difference of 2.08 in favour of male students.

H₀₁: There is no significant difference between the mean performance scores of students taught mathematics with Khan Academy videos and those taught using the conventional teaching method

Table 3: Summary of t-test analysis of the difference between the mean performance scores of students taught mathematics with Khan Academy videos and those taught using conventional methods

	Levene's Test		t-test for Equality of Means						
	F	Sig	t	df	p-value	MD	SED	95% CI	
								LB	UB
Equal variances assumed	.52	.47	7.52	98	.00	3.02	.401	2.22	3.82

* significant at $p < .05$

Table 3 demonstrates that the t-value of 7.52 is highly significant at $p = .000$, which is below the predetermined significance level of .05 for the study. Consequently, the null hypothesis is rejected. This indicates a significant disparity between the mean scores of students instructed in mathematics using Khan Academy Videos and those taught through conventional methods.

H₀₂: There is no significant difference between the mean performance scores of male and female students taught mathematics with Khan Academy Videos.

Table 4: Summary of t-test post-test scores of male and female students taught mathematics using Khan Academy Videos.

	Levene's Test		t-test for Equality of Means						
	F	Sig	t	df	p-value	MD	SED	95% CI	
								LB	UB
Equal variances assumed	.15	.71	4.32	48	.000	2.08	.48	1.11	3.05

* significant at $p < .05$

Table 4 indicates that the t-value of 4.32 is highly significant at $p = .000$, falling below the .05 significance level established for the study. As a result, the null hypothesis is rejected. This signifies a significant difference between the mean scores of male and female students instructed in mathematics using Khan Academy Video-Based Instruction.

Discussion

The research findings demonstrated that students taught with Khan Academy Videos performed better compared to those taught using the conventional method. This was shown in the pretest and posttest scores in mathematics of the experimental and control groups. This implies that the Khan Academy videos were a more effective learning approach. This result is consistent with the majority of previous studies on Khan Academy's effectiveness in raising student achievement, suggesting that the program is, at the very least, moderately successful. According to research by Kreller (2022), Hakan (2023), and Shafeak (2020), 77% of students who took part in the Khan Academy program saw an

improvement in their post-test scores. This suggests that the learning that occurred through the Khan Academy platform contributed to the positive outcome and validates the research hypothesis. The study's additional conclusion showed that, in comparison to female students, male students outperformed female students in mathematics when exposed to Khan Academy video-based instruction.

The study's results are consistent with those of Ayeni et al. (2022), who found that female pupils perform less well in mathematics than male students. More female students ought to be interested in online education. The hypothesis was evaluated, and the results indicated a substantial difference in the mean scores between male and female students who watched Khan Academy videos to learn mathematics.

Conclusion

This study seeks to investigate the effect of Khan Academy video-based instructions on the students' performance in mathematics. The results of the analysis revealed that students who learned using Khan Academy Video-based Instructions recorded higher achievement than those taught using the conventional teaching method. The integration of Khan Academy Video-based Instruction has proven to be an effective approach to enhancing students' achievement and proficiency in mathematics. As educators continue to adapt and refine their teaching strategies, integrating technology, online resources and videos will undoubtedly remain a useful tool for optimizing learning outcomes and preparing students for success in mathematics.

Recommendations

Based on the findings, the following recommendations were proffered:

1. Before classes begin, students should have some time to view the Khan Academy videos on their own.
2. Teachers should be fully supported in the process to enable learners exactly benefit from the videos.
3. The present study covered whole numbers, rational numbers, integers and number systems. Other concepts in mathematics could be replicated to determine the extent to which Khan Academy videos can achieve.
4. Workshops, conferences or seminars should be organized by the Ministry of Education on the need for integration of Khan Academy videos and learning resources into students' indoor and outdoor learning.

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