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Effect of Integrating YouTube as a Teaching Tool on the Academic Achievement of Senior Secondary School Students in Mathematics

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Abstract
The study looked into how senior secondary school students' achievement in mathematics was affected by a YouTube teaching approach. For the study, a pre-test, post-test, and control group quasi-experimental approach was used. Eighty (80) respondents from two senior secondary schools (SS1) in the Ijebu-Ode Local Government Area of Ogun State, Nigeria, were included in the study's sample. Three developed hypotheses that were evaluated at the 0.05 level of significance guided the study. A researcher-developed Mathematics Achievement Test (MAT) with a reliability index of 0.70 was used for data collection. Analysis of covariance (ANCOVA) was used to examine the data that were gathered. The results showed that senior secondary school students' academic success in mathematics is significantly impacted by the YouTube teaching tool. The results also show that gender has no noticeable effect on senior secondary school students' achievement in mathematics. Furthermore, the study demonstrated a noteworthy relationship between teaching approach and gender in mathematics achievement of senior secondary school students. The study concluded that the use of YouTube as a teaching tool impacted the mathematical achievement of senior secondary school students positively. It was suggested that teachers of senior secondary schools incorporate YouTube as a teaching tool into their lessons along with other multimedia platforms, apply it to real-world scenarios, and modify YouTube videos to fit curriculum goals.

Keywords: Academic Achievement, Gender, Mathematics, Strategy, YouTube

Introduction

Mathematics, as the science of magnitude and number, holds immense significance across various disciplines (Schenkel, 2020). Its utility extends to problem-solving and outcome prediction in virtually all fields of study, making competency in Mathematics essential for both individuals and nations (Waikato, 2018). According to Sunday et al. (2023), mathematics is without a doubt the cornerstone of all sciences, and a nation's level of scientific and technical advancement is exclusively dependent on its mathematical basis. Odebode (2020) asserts that mathematics is the domain of sciences and technology and that without sufficient investigation into the subject, no country can hope to make significant progress in science and technology. Because of its place in the national curriculum and its contribution to the advancement of technology and industry, mathematics is required in elementary, intermediate, and postsecondary education. Researchers emphasize its indispensability due to its pervasive use in human activities and its integral role in other academic subjects (Asanre et al., 2023).

Despite its importance, there's a concerning trend of declining academic achievement in Mathematics among students over time, highlighting the need to prioritize students' achievement in Mathematics education. Since achievement is viewed as the result of conceptual mastery. As a result, achievement may also be defined as the capacity to carry out the intended job. The skill or degree of competence obtained in school activities is known as academic accomplishment. It is often assessed using grades or units determined by standardized testing norms determined from a large sample of students' success. Cognitive or psychomotor skills may be necessary for academic achievement. The development of cognitive skills and learning are included in the cognitive domain, Koko (2022). Abiodun et al. (2022) highlight two key factors contributing to students' below-average performance in Mathematics: Mathematics teachers' inability to utilize student-centred teaching methods and the abstract nature of Mathematics. Echoing this sentiment,

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Asanre et al. (2021) advocate for more effective instructional strategies and increased emphasis on learner-centred approaches to teaching and learning Mathematics, aiming to enhance students' achievement in the subject. According to Ogunfowote and Asanre (2019), teachers must use effective teaching strategies that are appropriate for a given goal and its intended consequences to aid in the process of information transfer. These days, concerns regarding how well teaching strategies affect students' learning have continuously generated a great deal of interest in the area of educational research.

In recent years, Information and Communication Technology (ICT) has undergone rapid advancements, profoundly transforming educational landscapes worldwide. According to Abiodun et al. (2023), digital technology is essential for helping people working in a range of professions, industries, businesses, and environments such as homes, offices, and educational institutions. Since most countries have strong educational policies in place due to the relevance of digital technologies, they should give digital technologies the utmost consideration. This likewise holds for the circumstances in Nigeria. Education stakeholders and officials need to be conscious of the complete integration of digital technology into the educational system. The Federal Government of Nigeria's ICT plan, which is outlined in their 9–3–4 educational policy, is reflected in the National Implementation Guidelines for ICT in Education. ICT encompasses a wide array of digital tools, platforms, and applications that facilitate access to information, communication, and knowledge sharing.

ICT integration in education has transformed conventional teaching strategies and opened up new possibilities for dynamic and captivating learning environments. Adetunji (2023) emphasizes the significance of the internet in this evolution, highlighting the emergence of online platforms as vital resources for educational content. Among these platforms, YouTube stands out as a widely utilized online video-sharing platform with an extensive library of educational videos. YouTube serves as a dynamic medium for delivering instructional content across various subjects, including mathematics, which is often perceived as challenging by students. According to Koko (2022), YouTube videos offer the benefits of accessibility, adaptability, a wide range of information, and up-to-date resources, which support educators and learners in creating and contributing to course content and enhancing student participation in class activities.

Adetunji (2023) suggests that YouTube, as an instructional strategy, offers a combination of visual and auditory elements that can effectively address challenges encountered by students in learning mathematics. Through its diverse range of visual aids, tutorials, and demonstrations, YouTube provides an alternative approach to learning, enhancing comprehension and clarifying abstract concepts. The platform's flexibility allows instructors to assign video lessons as homework, enabling students to independently absorb new materials. As a result, classroom time can be dedicated to problem-solving, discussions, and interactive activities, optimizing collaboration and engagement among students. Fedrick et al. (2020) stated that YouTube possesses significant potential to enhance the acquisition of mathematical ideas and abilities. It introduces students to a variety of teachers-both the classroom teacher and the instructors they observe in the videos. As a result, students encounter many approaches, methods, and techniques for elucidating mathematical ideas, abilities, and problem-solving processes. They said that watching videos on YouTube improves learning outcomes for mathematical skills as it offers high-quality films that can be paused and resumed at a later time. It also makes videos available anytime, anywhere.

Examining the impact of YouTube-based instruction in mathematics across genders can shed light on potential disparities in academic achievement and engagement. It is crucial to ensure that the educational advantages offered by YouTube are accessible and beneficial to all students, regardless of gender, thereby promoting inclusivity and equity in educational outcomes (Ching et al.,2017). A child's learning of mathematics is influenced by a variety of factors and circumstances other than their gender, according to Omole (2019), who stated that a simple explanation for the differences in genders' aptitude in mathematics is impossible. Likewise, there might be a variety of reasons for gender inequalities in mathematics, including socioeconomic position, ethnicity, the educational environment, and the teacher's attitude toward the students. Asanre (2023) expounded on the gender implications on mathematics success among students, showing that female students outperformed male students in mathematics. Moreover, research on mathematics achievement has shown a gender disparity favouring male students. Furthermore, a sizable section of the populace believes that male pupils are more mathematically proficient than female students (Asanre et al., 2021).

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The rapid integration of ICT, or information and communication technology, has introduced novel approaches to teaching and learning, with YouTube emerging as a significant platform for educational content delivery. This research intends to look at how senior secondary school students in Ogun State's Ijebu Ode local government area perform in mathematics when using YouTube as a method of instruction.

Aim and Objective of the Study

The purpose of this research is to determine how using YouTube as a method of instruction affects senior secondary school students' mathematics proficiency in the Ogun State local government area of Ijebu Ode. The precise goals are as follows:

1. To investigate how senior secondary school students' achievement in mathematics is impacted by the YouTube teaching approach.
2. To investigate how gender affects senior secondary school students' achievement in mathematics.
3. To investigate the impact of the interaction between gender and the teaching approach on the academic achievements of secondary school students in mathematics

Hypotheses

H_{01}: The use of YouTube as a teaching tool does not have a significant effect on the academic achievement of senior secondary school students in mathematics.

H_{02}: Gender has no significant effect on senior secondary school students' achievement in mathematics.

H_{03}: The academic achievement of senior secondary school students in mathematics is not significantly impacted by the interaction between gender and teaching approach.

Methodology

For this study, a quasi-experimental study design with control, post-test, and pre-test phases was employed. All of the senior secondary public schools in Ogun State's Ijebu-Ode Local Government Area made up the population, of Nigeria. The sample comprised 80 respondents, with forty SSS1, or Senior Secondary School I students from complete classes selected from two public senior secondary schools that were chosen. A self-constructed Mathematics Achievement Test (MAT) was administered to the students, consisting of 50 multiple-choice questions to evaluate their mathematical academic achievement. The instrument underwent revalidation by a senior colleague and secondary sources to ensure face and content validity. Additionally, using a teaching guide, the experimental group was instructed, ensuring a different learning process from the conventional teaching experienced by the control group. The MAT instrument's reliability coefficient was computed to be 0.70. Data analysis was conducted via means of covariance analysis (ANCOVA).

Results

Table 1: Analysis of Covariance (ANCOVA) on the main effect of teaching approach, gender and interaction between gender and teaching approach on senior secondary school students in mathematics achievement scores.

Source	SS	df	MS	F	Sig.
Corrected Model	2068.180[a]	4	517.045	23.068	.000
Intercept	1245.503	1	1245.503	55.569	.000
Pretest	49.983	1	49.983	2.230	.140
Approach	715.019	1	715.019	31.901	.000
Gender	19.623	1	19.623	.876	.352
Interaction	427.362	1	427.362	19.067	.000
Error	1681.020	75	22.414		
Total	47554.000	80			
Corrected Total	3749.200	79			

a. R Squared = .552 (Adjusted R Squared = .528)

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H_{01}: The use of YouTube as a teaching tool does not have a significant effect on the academic achievement of senior secondary school students in mathematics.

According to the data analysis in Table 1 above, the experimental group's F value is 31.901 with a significant p-value of .000, which is less than 0.05 alpha value when compared, therefore, the null hypothesis was rejected at the significance threshold of 0.05. As a result, the achievement of secondary school students in mathematics is significantly impacted by the YouTube teaching tool.

H_{02}: Gender has no significant effect on senior secondary school students' achievement in mathematics.

Also, findings show that the gender had an F value of .876 with a p-value of .352, which is greater than the 0.05 alpha value when compared, therefore, the null hypothesis was retained at the significance threshold of 0.05. As a consequence, gender has no significant impact on senior secondary school students' mathematics achievement.

H_{03}: The academic achievement of senior secondary school students in mathematics is not significantly impacted by the interaction between gender and teaching approach.

More so, according to the results in Table 1 above, the F value is 19.067. with a p-value of .000, which is less than 0.05 alpha value when compared. Therefore, the null hypothesis was rejected at the significance level of 0.05. As a consequence, senior secondary school students' achievement in mathematics is significantly impacted by the interaction between gender and the teaching approach.

Discussion

The study revealed a noteworthy impact of the use of YouTube as a teaching approach or tool on secondary school students' mathematical academic achievement, which is consistent with the findings of Otchie et al. (2020) and Frederick-Jonah et al. (2020), who highlighted the efficacy of YouTube videos as an effective pedagogical tool and a suitable instructional strategy for enhancing students' achievement in Mathematics due to its blended nature. Additionally, the results indicated no substantial impact of gender on mathematics achievement among senior secondary students, aligning with the conclusions reached by Abiodun et al. and Asanre et al. in 2022, who decided that gender did not affect students' academic achievement in mathematics, as the quality and efficacy of instructional techniques are paramount. Furthermore, the study demonstrated a significant interaction effect between gender and teaching approach on achievement in mathematics among students in senior secondary schools, consistent with the findings of Asanre et al. (2022), suggesting that student academic progress in mathematics is unaffected by gender.

Conclusion

It is determined by the results that the use of YouTube as a teaching tool significantly impacts the mathematics academic achievement of students attending senior secondary schools in Ogun State, Nigeria's Ijebu Ode Local Government Area.

Recommendations

1. To improve students' learning results, educators are advised to integrate YouTube into their lesson plans.
2. School authorities should provide supervision and support to ensure the effective usage of this approach in the teaching and learning process.

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