



Students' Attitude Towards Gamification-Based Teaching in Mathematics in Basic Schools

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ABSTRACT

The study investigates students' attitudes towards gamification-based teaching in mathematics in basic schools in Kwara State. The study adopted a descriptive design of the survey type. The population for this study were all junior secondary students in Kwara State. The target population for this study was all junior secondary students. A purposive sampling technique was used to select a sample size of 64 students. To ensure the validity of the instrument, a pilot study was carried out in a non-participating school outside the scope of the study and a value coefficient of .77 was obtained using Cronbach alpha. The findings of the study revealed that students in junior secondary schools had a positive attitude towards gamification-based teaching and there is no significant difference in the male and female students' attitude towards gamification-based teaching in mathematics. The study concluded that attitudes toward gamification-based teaching had a significant impact on students' outcomes. It was therefore recommended among others that All teachers in junior secondary schools should adopt the usage of gamification-based teaching in the teaching and learning of mathematics as it can produce positive results in teaching effectiveness and student performance.

ARTICLE INFO

Article History:

Submitted/Received 02 Jan 2024

First Revised 23 Feb 2024

Accepted 13 Apr 2024

First Available online 16 Apr 2024

Publication Date 01 Mar 2024

Keyword:

*Gamification,
Gamification-based teaching,
Mathematics,
Students' attitude.*



1. INTRODUCTION

Education serves as a foundation for national growth, survival, and nourishment. Education is the acquisition of knowledge, skills, values, and critical thinking ability. The successful integration of the gamification framework into the curriculum to raise students' motivation, academic performance, and attitudes toward lessons can be referred to as the gamification of educational processes (Ibrahim, 2017). However, several elements, such as students' attitudes toward the subject, teacher instructional strategies, and school environment, have an impact on students' learning and performance in mathematics (Mazana et al., 2018). The idea of attitude refers to a person's way of thinking, acting, and behaving (Mensah et al., 2013). The amount of effort a student will likely put into learning a subject depends on their attitude. It describes a person's fundamental preference for or aversion to a topic (Reddy et al., 2020). A long-term favorable or unfavorable emotional inclination toward mathematics could be characterized as attitude. Insecurity, apathy, and math anxiety can significantly affect the student's learning environment and their overall arithmetic accomplishment. A person's attitude toward mathematics can be summarized as either liking or disliking the subject, tending to engage in or avoid mathematical activities, either thinking they are good at mathematics or terrible at it, and thinking mathematics is either helpful or useless (Kibrislioglu, 2015). Teachers' attitudes and the way they offer instruction in the classroom may have an impact on student's attitudes toward mathematics (Tuimavana & Datt, 2017). A bad attitude toward arithmetic may be caused by a strong unfavorable perception, a lack of confidence, being overwhelmed by complex and difficult math problems, and an inability to appreciate the usefulness of math in the real world. Surprisingly, when it comes to math instruction, it appears that the student's attitudes toward learning make it difficult for the learners to handle the subject matter. Students typically have a fairly unfavorable attitude toward mathematics (Emerson et al., 2019). According to Aguiar-Castillo et al. (2020), a student's attitude toward innovation and learning plays a favorable and important effect on their intention to utilize gamified apps. Mazana et al. (2018) examined the attitudes of students about learning mathematics. The findings revealed that while students originally demonstrated a good attitude toward mathematics, as they advance to higher levels of study, this attitude begins to change. Students' attitudes and performance have a moderately good link. The impact of gamification on fifth-grade students' academic performance and attitudes toward mathematics courses was examined by Karamert and Vardar (2021) gamification components were used to teach fractions. As tools for gathering data, achievement tests, and attitude measures were employed. The results of the attitude scale, however, did not show a significant difference.

The way that students approach mathematics affects how well they perform in mathematics in class. Accordingly, it was discovered that students would perform better if they had a positive attitude toward mathematics, while students would do worse if they had a negative attitude (Mensah et al., 2013). According to Da-Rocha et al. (2016), students' attitudes improved when gamification components were used in their classes. The impact of students' attitudes toward their mathematics learning. The study discovered that although most children had a positive attitude toward mathematics and believed it to be possible, attainable, and significant, this did not convert into high academic performance. Yildirim (2017) revealed that gamification-based teaching can improve student performance and attitudes toward lessons as well as their attitudes. Also, students in experimental groups performed better than those in a control group. Ibrahim (2020) looked at the efficacy of using the e-gamification technique to raise the academic achievement and attitudes of the

Dammam City preparatory pupils. The study's conclusions demonstrated that students who were taught using the game strategy had more positive attitudes than those who were taught using conventional teaching techniques and that employing the game strategy changed student patterns. The attitudes of education students on the use of gamification for the development of skills were examined by [Galbis-Córdoba et al. \(2017\)](#). The major findings indicate that perceptions of focus, relevance, and assurance have a direct and beneficial impact on students' views on using online educational video games to hone their skills. In their investigation of high school students' attitudes and academic performance in mathematics under the conditional cash transfer program, [Emerson et al. \(2019\)](#) found that respondents fairly performed in their arithmetic achievement. Additionally, it was discovered that the students' attitudes and their mathematical achievement are significantly related. The study concluded that students' views toward mathematics have a greater influence on their academic achievement. Furthermore, the impact of gamification methods on students' academic performance and attitudes toward mathematics was studied by [Türkmen and Soybas \(2019\)](#). The achievement and attitude scores of the pupils in the experimental and control groups did not differ statistically significantly from one another. According to [Haruna and Umar \(2021\)](#), the experimental group's attitude toward mathematics was greatly impacted by the math game app. The perspectives and attitudes of the students toward gamification are significantly different. Compared to male users, female users considered gamified experiences to be more enjoyable. In an experimental study, gamified software interventions affected sixth-grade students' math achievement. To compare student motivation before and after gamification, an attitude survey was performed. Students in the gamified group started the year with a more favorable attitude toward math, according to the results of the attitude study. Students in the gamified group had a more favorable attitude toward arithmetic at the end of the school year compared to the conventional control group. The test findings revealed that the change in attitude did not correspond to using the gamified program. [Smith \(2017\)](#) investigated the effects of gamified modules on attitudes and learning in an introductory statistics course. The experimental group's students were contrasted with earlier cohorts taking the identical course without the gamified tasks. The study's findings demonstrate that gamified modules were effective in changing students' attitudes for the better and subsequently raising performance. [Alabbasi \(2018\)](#) researched to see how teachers feel about gamification approaches used in online learning. The findings showed unfavorable attitudes and views toward game components, which could hamper efforts to introduce gamified learning systems in educational institutions. Using Keller's ARCS model (1987) as a research model, [Galbis-Córdoba et al. \(2017\)](#) investigated the key factors influencing students' attitudes toward the use of gamification as an educational methodology to develop their competencies. The study used a sample of 128 undergraduate students enrolled in a private higher education institution in Spain and tested the results using partial least squares (PLS). The key findings indicated that students' attitudes regarding using online educational video games to improve their abilities are directly and favorably influenced by perceptions of attention, relevance, and confidence.

Furthermore, Gender can also influence attitude. [Jonah et al. \(2013\)](#) stated that gender disparities in attitudes toward learning mathematics are explained by learners' perceptions of the subject's significance. Many people believe that boys perform better in math than girls. The issue of gender differences recurs frequently in academic literature in general and math literature in particular. Boys are frequently thought to perform better than girls in mathematics, both in terms of attitudes and self-concept. In contrast, research indicates no appreciable differences in mathematics school performance and grades between boys and

girls (Scafidi & Bui, 2010; Lindberg et al., 2010). Asante (2012) investigated the attitudes of secondary school pupils toward mathematics. The results of the data analysis showed that attitudes toward mathematics between boys and girls differed significantly. Similarly, Yasar (2016) looked into how pupils felt about mathematics. The study's statistics indicate pupils' views about mathematics are on the middle side. Additionally, it was shown that there is no appreciable correlation between students' attitudes toward them and their gender. This is supported by Mohammed and Waheed's (2011) study on pupils' attitudes toward mathematics at a chosen Maldivian school. The findings showed that there is no gender difference in the students' sentiments and that their favourable attitudes about mathematics are moderate. Students' attitudes as well as their views of instructor and peer support were evaluated by Mata et al. (2012). The findings underlined the key influences of grade and math achievement on these attitudes and showed that pupils generally had favorable attitudes about mathematics. Even though the girls' attitudes consistently deteriorated as they moved through the educational system, there was no gender effect seen. The association between attitude toward mathematics and academic achievement in math was examined by Mubeen et al. (2013) among secondary school students in the 9th and 10th classes. The outcome demonstrated that boys and girls performed differently in math. Girls outperformed boys in terms of academic performance. As a result, there was a disconnect between attitude toward math and math achievement. The main purpose of the study was to investigate students' attitudes toward gamification-based teaching in mathematics in basic schools in Kwara State. Specifically, the study;

- (i) Determine the attitude of Junior secondary school students towards gamification-based teaching in mathematics
- (ii) Examine gender difference of Junior secondary school students towards gamification-based teaching in mathematics

Research question is what attitude of Junior secondary school students toward gamification-based teaching in mathematics. The research hypothesis is H_{01} : there is no significant difference in the male and female students' attitudes toward gamification-based teaching in mathematics.

2. METHOD

The study adopted a descriptive research of the survey type. The population for this study were all junior secondary students in Kwara State. The target population for this study was all junior secondary students in basic 2 (J.S.S 2) in Kwara-North, Nigeria. A purposive sampling technique was used to select a sample size of 64 students. The instrument used for data collection was titled Junior Secondary School Students' Attitude Towards Gamification-Based Teaching Questionnaire Experience (JAGBAEQ)". Two components made up the questionnaire: The biodata of junior secondary school students are included in Section A, while Section B is a ten-question item with a 4-point Likert scale response of Strongly Agree (SA), Agree (A), Disagree (D), and Strongly Disagree (SD). JAGBAEQ was validated by three lecturers in the Department of Educational Technology at the University of Ilorin. To ensure the validity of the instrument, a pilot study was carried out in a non-participating school outside the scope of the study and a value coefficient of 0.77 was obtained using Cronbach alpha. Both descriptive and inferential statistics were used to analyze the data that was gathered. Descriptive statistics using Frequency counts, mean scores, and percentages were used to answer the research question, while inferential statistics using t-test was used to analyze the research hypothesis.

3. RESULTS AND DISCUSSION

3.1. Demography of Respondents

According to **Table 1**, 36 of the individuals were female while 28 of the sample size were male. This suggests that the experimental group had more females than males.

Table 1. Gender distribution of participants.

Participants	Frequency	Percentage
Male	28	43.8
Female	36	56.3
Total	64	100.0

3.2. Research Question One: What is The Attitude of Junior Secondary School Students Towards Gamification-Based Teaching in Mathematics?

Table 2 shows the mean responses on the attitude towards gamification-based teaching in mathematics. With a grand mean score of 3.07 higher than the benchmark of 2.5, it can be concluded that students in junior secondary schools had a positive attitude toward gamification-based teaching.

Table 2. Mean of the respondents on the attitude towards gamification-based teaching in mathematics.

No	Items	Mean
1	Gamified learning allowed me to collaborate with others in the class.	3.91
2	Winning badges through gamification apps makes me feel important	3.86
3	Gamified learning improved my rapid-thinking abilities	3.83
4	Mathematical formulae can be recalled more easily thanks to the gamification method	3.80
5	My interest in mathematics has grown as a result of assessment via a gamification platform.	3.83
6	By using gamification in the classroom, I can study challenging material while having fun.	3.72
7	My interest in learning maths is piqued by online gaming learning.	3.86
8	I much prefer learning arithmetic the old-fashioned way.	2.80
9	gamified learning is not different from conventional classroom	3.31
10	I feel indifferent to gamification-based teaching	2.50
11	Gamified learning makes me more diligent in learning	3.33
12	I don't feel bored in gamification lessons	3.48
13	Gamified teaching in class did not motivate me to study	2.39
14	Story elements of gamification transcend my fantasy to the real-world scenario.	3.48
15	The storytelling elements bore me	2.52
16	If the leaderboard displays a huge gap between the top 1 and others, I don't feel confident enough to continue playing.	1.89
17	I don't like competing in general, so I hate the feature of leader boards which makes me compete to get points for every exercise or activity	1.92
18	Whenever I do an exercise, I look at the rewards or points that the system gives me. If it's small, I won't be motivated to do it.	2.02
19	I prefer in-class quizzes, online quizzes don't work for me	1.81
Grand Mean		3.07

3.3. Research Hypothesis one: H_{01} : There is No Significant Difference in The Male and Female Students' Attitudes Towards Gamification-Based Teaching in Mathematics

Table 3 shows that there was no significant difference in gender and attitude towards gamification-based teaching in mathematics ($F_{(7,54)} = 1.786$; $p > .05$). Hence hypothesis one was

not rejected. Therefore, there is no significant difference in the male and female students' attitudes towards gamification-based teaching in mathematics

Table 3. T-test analysis of male and female students' attitudes toward gamification-based teaching in mathematics.

Gender	N	x	SD	df	t	Sig. (2- tailed)	Remark
Male	28	33.75	0.244	63	0.092	0.152	Accepted
Female	36	71.97	0.208				
Total	64						

3.4. Discussion of Findings

Findings from research question one showed that junior secondary school students have a positive attitude towards gamification-based teaching. Those with positive attitudes towards gamification-based teaching had higher post-performance mean scores than their counterparts who displayed negative attitudes towards gamification-based teaching. This result also demonstrated how gamification-based teaching promoted higher attention and sparked interest through interaction with mathematics using different game features like points, badges, narratives, leaderboards, and feedback. These components inspire; learners, grab their interest, and give them a variety of activities. This result is consistent with the findings of [Yildirim \(2017\)](#) who found gamification has a positive effect on students' academic progress and attitudes toward the subject matter of the lesson. In a similar vein, [Da-Rocha et al. \(2016\)](#) found that introducing gamification components in classes increased students' attitudes, which is in line with the findings of this study. The nexus between the earlier study and this present study is that the students under study though in different geographical scopes exhibited a positive attitude towards gamification-based teaching. This is an indication that gamification-based learning influences learners' choice of action, belief, and behavioral tendencies toward mathematics.

Additionally, the findings of the study are in agreement with [Aguiar-Castillo et al. \(2020\)](#), and [Haruna and Umar \(2021\)](#) whose studies revealed that Gamification-based teaching can have a positive impact on achievement and students' attitudes toward lessons as well as their attitudes. The reason for the agreement between these empirical studies and this study is that the respondents exhibited a positive attitude toward gamification. This further explicit that students' attitude toward learning as well as innovation has a positive and significant role in a student's intention to use a gamified app. Conversely, this study disagrees with [Mazana et al. \(2018\)](#) who reported a positive weak correlation between students' attitudes and performance. The reason for the disagreement is that this study revealed a highly positive attitude towards gamification-based teaching while [Mazana et al. \(2018\)](#) revealed a weak correlation between students' attitudes towards gamification-based teaching. The findings of the hypothesis showed that there is no significant difference in the male and female students' attitudes toward gamification-based teaching in mathematics. The finding of this study is in agreement with [Mohammed and Waheed \(2011\)](#), who reported that there is no gender difference in the students' attitudes and their level of favorable attitude toward mathematics is average. The study's findings concur with those of [Yasar \(2016\)](#), who found that there is no appreciable variation between students' genders and attitudes toward them. The basis for the agreement between [Mohammed and Waheed \(2011\)](#); [Yasar \(2016\)](#) and this present study is that gamification-based teaching did not significantly account for the difference in gender and attitude towards it after treatment. The results of this study are not in agreement with those of Koivisto and Hamari, who claimed that there is a substantial difference in how

students perceive and approach gamification. Compared to male users, female users considered gamified experiences to be more enjoyable. Even though Koivisto and Hamari employed perception as the dependent variable in their investigation, this study contradicts them. Students' attitudes, on the other hand, are shaped by psychological tendencies that develop as a result of experience and have an impact on how people perceive gaming and how to react to it.

4. CONCLUSION

The results of this study also showed that attitudes toward gamification-based teaching had a significant impact on students' outcomes. while gender had no significant impact on junior secondary school student's performance in mathematics. According to the study's findings, the following recommendations were deemed appropriate: (i) All teachers in junior secondary schools should adopt the usage of gamification-based teaching in the teaching and learning of mathematics as it can produce positive results in teaching effectiveness and student performance. (ii) Mathematics teachers should leverage the capabilities of gamification to improve junior secondary school students' performance in mathematics.

5. AUTHORS' NOTE

The authors declare that there is no conflict of interest regarding the publication of this article. The authors confirmed that the paper was free of plagiarism.

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