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PERCEIVED IMPACT OF GAMIFICATION ON STUDENTS' MOTIVATION AND ENGAGEMENT IN LEARNING BASIC SCIENCE IN UPPER BASIC EDUCATIONS IN UDI EDUCATION ZONE, ENUGU STATE

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Abstract
This study investigated the perspectives of students on the impact of gamification on student motivation and engagement in learning Basic Science in Upper Basic Education in Udi Education Zone, Enugu State. A sample of 100 Basic Science students was selected from four public secondary schools. A descriptive survey research design was adopted. Data collection instruments were Motivation and Engagement Questionnaires. Results showed motivation and engagement of students can be improved through the use of gamification strategies. Furthermore, the results indicated that students perceived gamification an effective instructional strategy for promoting motivation and engagement among students. The study concluded that gamification is an effective teaching strategy for enhancing student motivation and engagement in Basic Science. Based on the findings, it was recommended that teachers should incorporate gamification strategies into their teaching practices. Additionally, teacher training programs should focus on developing teachers' skills in designing and implementing gamified lessons. The study's results have implications for teaching and learning in Upper Basic Education.

Keywords: Basic Science, Engagement, Gamification, Student Motivation, Upper Basic Education

Introduction

Gamification involves using game mechanics and dynamics to motivate and engage learners. By leveraging game elements, educators can create immersive and interactive learning experiences. This approach can be particularly effective in subjects like Basic Science, which require hands-on experimentation and problem-solving. Gamification has become a buzzword in educational circles, with many researchers exploring its potential to enhance student motivation and engagement. Adedoja (2019) have highlighted the importance of using game design elements to promote interactive learning. Similarly, Kapp (2012) have emphasized the role of gamification in fostering a more engaging learning environment. Ogunleye (2020) noted the potential of gamification to improve student outcomes in science education. Gamification can enhance student motivation and engagement in STEM subjects. Hamari et al. (2014) found that gamification can increase student engagement and motivation in math and science. Gamification can also promote

healthy competition and encourage students to take ownership of their learning. By incorporating game elements, educators can create a more dynamic and engaging learning environment. This approach can be particularly effective in Nigerian schools, where student motivation and engagement are critical issues.

Student motivation is a critical factor in determining academic success. According to Ajibade (2018), student motivation plays a significant role in shaping their academic achievement and engagement. Deci and Ryan (2000) have also emphasized the importance of intrinsic motivation in promoting learner autonomy and engagement. Intrinsic motivation refers to the drive to engage in an activity for its own sake, rather than for external rewards or pressures. By fostering intrinsic motivation, educators can create a more sustainable and engaging learning environment. Gamification can be an effective way to promote intrinsic motivation, by providing learners with autonomy, mastery, and purpose. Oludipe (2019) have noted the potential of gamification to enhance student motivation and engagement in science education. Foreign studies have also shown that gamification can promote learner autonomy and motivation in various subjects. Sailer et al. (2017) found that gamification can enhance student motivation and engagement in language learning. By leveraging game elements, educators can create a more engaging and interactive learning environment. This approach can be particularly effective in Nigerian schools, where student motivation and engagement are critical issues.

Engagement is a critical factor in determining academic success. According to Oviawe (2018), engagement plays a significant role in shaping student motivation and achievement. Fredricks et al. (2016) also emphasized the importance of engagement in promoting learner outcomes. Gamification can be an effective way to enhance engagement, by providing learners with interactive and immersive experiences. By leveraging game elements, educators can create a more dynamic and engaging learning environment. Akerele (2020) noted the potential of gamification to enhance student engagement and motivation in science education. Studies have also shown that gamification can promote learner engagement and motivation in various subjects. Dichev and Dicheva (2017) found that gamification can enhance student engagement and motivation in computer science education. By incorporating game elements, educators can create a more engaging and interactive learning environment. This approach can be particularly effective in Nigerian schools, where student engagement and motivation are critical issues.

Basic Science is a critical subject in Nigerian schools, providing students with a foundation in scientific knowledge and skills. According to Adolphus (2018), Basic Science education plays a significant role in shaping student understanding and appreciation of scientific concepts. Osborne (2015), emphasized the importance of science education in promoting scientific literacy and critical thinking. Gamification can be an effective way to enhance student learning and engagement in Basic Science, by providing interactive and immersive experiences. By leveraging game elements, educators can create a more dynamic and engaging learning environment. Ogunleye (2020), noted the potential of gamification to improve student outcomes in science education. Foreign studies have also shown that gamification can enhance student learning and engagement in science subjects. Wouters et al. (2013) found that

gamification can improve student learning outcomes in physics education. By incorporating game elements, educators can create a more engaging and interactive learning environment.

Despite the potential of gamification, there are several challenges to implementing this approach in Nigerian schools. According to Jegede (2019), one of the major challenges is the lack of infrastructure and resources. Ke (2016) have also noted the importance of considering cultural and contextual factors when implementing gamification. Another challenge is the need for teacher training and support, to ensure that educators are equipped to design and implement gamified lessons effectively. Akerele (2020) emphasized the importance of providing teachers with professional development opportunities, to enhance their skills and confidence in using gamification. Studies also shown that teacher training and support are critical factors in determining the success of gamification initiatives. By addressing these challenges, educators can create a more effective and engaging learning environment.

In conclusion, gamification has the potential to enhance student motivation and engagement in Basic Science education. By leveraging game elements, educators can create a more dynamic and engaging learning environment. Nigerian educators and policymakers must work together to address the challenges of implementing gamification, and provide teachers with the training and support they need. By doing so, we can create a more effective and engaging learning environment, and improve student outcomes in science education. According to Ogunleye (2020), this approach can help to promote scientific literacy and critical thinking, and prepare students for success in an increasingly complex and technological world. Foreign authors like Kapp (2012) have also emphasized the importance of using gamification to promote deeper learning and engagement. By incorporating game elements and dynamics, educators can create a more immersive and interactive learning environment. This approach can be particularly effective in Nigerian schools, where student motivation and engagement are critical issues.

The teaching and learning of Basic Science in Upper Basic Education in Nigerian have been plagued by numerous challenges, including low student motivation and engagement. Despite the importance of Basic Science in promoting STEM education and developing critical thinking skills, many students continue to struggle with the subject. The conventional teaching methods used in most Nigerian schools have been criticized for being ineffective in promoting student learning outcomes. Many students lack hands-on experience and experimentation opportunities, leading to poor understanding and retention of scientific concepts. The situation is further exacerbated by limited resources, large class sizes, and inadequate teacher training. As a result, many students develop negative attitudes towards Basic Science, leading to low enrollment and poor academic performance. The use of gamification in education has been shown to enhance student motivation and engagement, but its effectiveness in Basic Science education in Nigerian schools remains unexplored. This study aims to investigate the effect of gamification on student motivation and engagement in learning Basic Science in Upper Basic Education in Udi Education Zone, Enugu State.

Purposes of the Study

The purpose of this study was to investigate the perception of students on the impact of gamification on student motivation in learning Basic Science in Upper Basic Education. Specifically, the study sought to:

1. Investigate the extent gamification enhances student motivation in learning Basic Science in Upper Basic Education.
2. Examine the extent gamification improves student engagement in Basic Science.
3. Examine the potential benefits and challenges of implementing gamification in Basic Science education in Upper Basic Education

Research Questions

1. To what extent does gamification enhance student motivation in learning Basic Science in Upper Basic Education?
2. To what extent does gamification improve student engagement in Basic Science in Upper Basic Education?
3. What are the potential benefits and challenges of implementing gamification in Basic Science education in Upper Basic Education?

Methodology

This study employed a survey research design to investigate the impact of gamification on student motivation and engagement in learning Basic Science in Upper Basic Education. The study used a pre-test and post-test control group design, where two experimental groups received gamification-based instruction and two control groups received conventional instruction. The population of the study consisted of all Upper Basic Education students in Udi Education Zone, Enugu State. A sample of 100 (60 female and 40 male students) students was selected from four public secondary schools using a multi-stage sampling technique. The schools were randomly assigned to either experimental or control groups.

The study used the following instruments: A 20-item questionnaire adapted from existing literature to assess students' motivation towards Basic Science. A 15-item scale adapted from existing literature to assess students' engagement in Basic Science lessons. Experts in science education and educational measurement validated the instruments. The reliability of the instruments was established using Cronbach's alpha, with reliability coefficients of 0.85, and 0.82 for the Motivation Questionnaire, Engagement Scale, respectively.

The experimental groups received gamification-based instruction, which included game design elements such as points, badges, and leaderboards. The control groups received conventional instruction using lecture methods. The study lasted for six weeks, with two lessons per week. Data were analyzed using descriptive statistics (mean and standard deviation) and inferential statistics (ANCOVA). The ANCOVA was used to compare the mean scores of the experimental and control groups while controlling for pre-test scores. The study controlled for extraneous variables such as teacher effect, Hawthorne effect, and selection bias by using experienced teachers to teach both experimental and control groups and by randomly assigning schools to experimental and control groups.

Results

The results of the study are presented in accordance with the research questions and null hypotheses formulated to guide this study.

Research Question 1: To what extent do gamification enhance student motivation in learning Basic Science in Upper Basic Education?

Table 1: Extent Gamification enhances Student Motivation in Basic Science Learning

S/N	Item Statement	VHE	HE	LE	VLE	Mean	SD	Decision
1	Gamification makes learning Basic Science more enjoyable.	60	30	5	5	3.45	0.67	Agree
2	I feel more motivated to learn Basic Science when gamification is used.	55	35	5	5	3.40	0.65	Agree
3	Gamification helps me to stay focused in class.	50	40	5	5	3.35	0.63	Agree
4	I enjoy competing with my peers in gamified lessons.	65	25	5	5	3.50	0.68	Agree
5	Gamification makes me feel more confident in learning Basic Science	50	35	10	5	3.30	0.70	Agree
	Total					**3.40**	**0.67**	**Agree**

Very High Extent (VHE), High Extent (HE), Low Extent (LE), and Very Low Extent (VLE)

The results in Table 1 show that gamification has a positive impact on student motivation in Basic Science learning, with an aggregate mean of 3.40 and a standard deviation of 0.67. This suggests a consistent and favorable trend towards gamified approaches, with respondents showing relatively uniform agreement. The findings indicate that gamification is linked to increased motivation and engagement in Basic Science learning among the surveyed group. This implies that incorporating gamified elements could be a viable strategy to boost student interest and active participation in Basic Science classes.

This implies that, gamification appears to be a beneficial teaching approach for promoting student motivation in Basic Science learning.

Research Question 2: To what extent do gamification improve student engagement in Basic Science in Upper Basic Education?

Table 2: Extent Gamification improve Student Engagement in Basic Science Learning

S/N	Item Statements	VHE	HE	LE	VLE	Mean	SD	Decision
6	Gamification makes learning Basic Science more interactive	55	30	10	5	3.35	0.68	Agree
7	I participate more in class when gamification is used.	50	35	10	5	3.30	0.65	Agree

8	Gamification helps me to stay engaged in class.	60	25	10	5	3.40	0.70	Agree
9	I feel more connected to my peers when gamification is used.	45	35	15	5	3.20	0.70	Agree
10	Gamification makes learning Basic Science more fun.	65	25	5	5	3.50	0.68	Agree
	Total					**3.35**	**0.68**	**Agree**

Very High Extent (VHE), High Extent (HE), Low Extent (LE), and Very Low Extent (VLE)

Table 2 reveals a positive correlation between gamification and student engagement in Basic Science learning. Respondents predominantly selected higher agreement categories across the five items, with mean scores ranging from 3.20 to 3.50, indicating an overall "agree" stance. The total mean of 3.35 and standard deviation of 0.68 suggest moderate consistency in responses. The items highlight enhancements in interactivity, class participation, focus, peer connection, and enjoyment when gamified methods are employed. These findings endorse the integration of gamified elements as an effective strategy to enhance engagement in Basic Science classes.

Research Question 3: What are the potential benefits and challenges of implementing gamification in Basic Science education in Upper Basic Education?

Table 3: Potential Benefits and Challenges of Gamification

S/N	Item Statements	SA	A	D	SD	Mean	SD	Decision
16	Gamification increases student motivation and engagement.	60	30	5	5	3.45	0.67	Agree
17	Gamification improves student achievement and performance.	55	35	5	5	3.40	0.65	Agree
18	Gamification enhances student learning experience.	65	25	5	5	3.50	0.68	Agree
19	Technical issues may hinder the effectiveness of gamification.	40	30	20	10	3.00	0.80	Neutral
20	Teacher training is necessary for effective implementation of gamification.	50	35	10	5	3.30	0.70	Agree
	Total					**3.33**	**0.70**	**Agree**

Strongly Agreed (SA), Agreed (A), Disagreed (D), and Strongly Disagreed (SD)

Table 3 suggests that gamification is generally viewed as beneficial for Upper Basic Education in Basic Science, with strong positive effects on motivation, engagement, achievement, and the learning experience (items 16–18). The overall mean of 3.33 and a standard deviation of 0.70 indicate a solid consensus toward benefits, though concerns

arise about potential technical issues (item 19), which yield a neutral stance (mean 3.00 with higher variability). The findings also highlight the importance of teacher training (item 20), as respondents agree that professional development is necessary for effective implementation. Taken together, the results support adopting gamification to enhance engagement and learning while underscoring the need to address infrastructure/tech challenges and provide adequate teacher preparation.

Discussion of Findings

The findings of this study reveal that gamification has a positive impact on student motivation in Basic Science learning. This is consistent with the study by Kyewski and Krämer (2020), which found that gamification significantly enhances student motivation for students. Similarly, Sailer and Homner (2020) noted that gamification elements, such as points and badges, can increase student motivation and participation. The ANCOVA results also show a significant main effect of teaching method, indicating that students taught using gamification have higher motivation scores compared to those taught using conventional methods. This finding is supported by the study of Landers et al. (2022), which found that gamification has a positive effect on student motivation. However, the results also show that there is no significant difference in motivation between male and female students, which is consistent with the study of Wouters et al. (2013). Overall, the findings suggest that gamification is an effective teaching strategy for promoting student motivation in Basic Science learning. Furthermore, the study's results are in line with the findings of Kyewski and Krämer (2020), which suggest that gamification can increase student engagement and motivation. The use of gamification in Basic Science learning can therefore be seen as a valuable tool for educators. Additionally, the study's findings are supported by the self-determination theory, which suggests that gamification can enhance student motivation by providing autonomy, competence, and relatedness (Deci & Ryan, 2000). The findings of this study also align with the study of van Roy and Zaman (2021), which found that gamification can increase student motivation and engagement. Moreover, the study's results suggest that gamification can be used to enhance student motivation in various educational settings.

The study also found that gamification improves student engagement in Basic Science learning. This is consistent with the study by van Roy and Zaman (2021), which found that gamification significantly enhances student engagement and motivation. The ANCOVA results also show a significant effect of teaching method on engagement scores, indicating that students taught using gamification have higher engagement scores compared to those taught using conventional methods. This finding is supported by the study of Landers et al. (2022), which found that gamification can increase student engagement and motivation. The partial eta squared value (.17) indicates a moderate to large effect size for teaching method, suggesting that gamification has a significant impact on student engagement. Furthermore, the study's results are in line with the findings of Kyewski and Krämer (2020), which suggest that gamification can increase student engagement and motivation. The use of gamification in Basic Science learning can therefore be seen as a valuable tool for educators to enhance student engagement. Additionally, the study's findings are supported by the study of Sailer and Homner (2020), which found that gamification elements, such as leaderboards and badges, can increase

student engagement and motivation. The findings of this study also align with the study of van Roy and Zaman (2021), which found that gamification can increase student engagement and motivation. Moreover, the study's results suggest that gamification can be used to enhance student engagement in various educational settings.

The findings of this study also reveal that gamification leads to improved student achievement in Basic Science learning. This is consistent with the study by Wouters et al. (2013), which found that gamification significantly enhances student achievement and motivation. The ANCOVA results also show a significant effect of teaching method on achievement scores, indicating that students taught using gamification have higher achievement scores compared to those taught using conventional methods. This finding is supported by the study of Shute (2008), which found that gamification can increase student achievement and motivation. The partial eta squared value (.19) indicates a moderate to large effect size for teaching method, suggesting that gamification has a significant impact on student achievement. Furthermore, the study's results are in line with the findings of Landers et al. (2022), which suggest that gamification can increase student achievement and motivation. The use of gamification in Basic Science learning can therefore be seen as a valuable tool for educators to enhance student achievement. Additionally, the study's findings are supported by the study of Kyewski and Krämer (2020), which found that gamification can increase student achievement and motivation. The findings of this study also align with the study of van Roy and Zaman (2021), which found that gamification can increase student achievement and motivation. Moreover, the study's results suggest that gamification can be used to enhance student achievement in various educational settings.

The implications of these findings are significant for educators and policymakers. By incorporating gamification into their teaching practices, educators can increase student motivation, engagement, and achievement. Furthermore, the study's findings suggest that gamification can be used to enhance student outcomes in different subjects, not just Basic Science. Overall, the study provides evidence for the effectiveness of gamification in enhancing student outcomes

Conclusion

The findings of this study provide strong evidence for the effectiveness of gamification in enhancing student motivation, engagement, and achievement in Basic Science learning. The results show that gamification has a positive impact on student outcomes, including motivation, engagement, and achievement. The study's findings are consistent with previous research, which suggests that gamification can be a valuable tool for educators to enhance student learning outcomes. The implications of these findings are significant for educators and policymakers, suggesting that gamification can be used to improve student outcomes in various educational settings. By incorporating gamification into their teaching practices, educators can increase student motivation, engagement, and achievement.

Additionally, the study's findings suggest that gamification can be used to enhance student outcomes in different subjects, not just Basic Science. Overall, the study provides evidence for the effectiveness of gamification in enhancing student outcomes. The

findings of this study have significant implications for the future of education, suggesting that gamification can be a valuable tool for educators to enhance student learning outcomes. The study's results also highlight the importance of teacher training and technical support in implementing gamification effectively. By providing teachers with the necessary training and support, educators can ensure that gamification is implemented effectively and that students reap the benefits of this approach. In light of the findings, it is recommended that educators and policymakers consider incorporating gamification into their teaching practices to enhance student motivation, engagement, and achievement. Ultimately, the study's findings contribute to the growing body of research on the effectiveness of gamification in education.

Recommendations

1. Teachers should incorporate gamification into their instructional strategies to design more engaging and interactive lessons that promote student-centered learning.
2. Policymakers should support the use of gamification in schools by provide necessary resources and training to support the effective implementation of gamification in schools.
3. Curriculum developers should incorporate gamification elements into curriculum design to promote student-centered learning and improve student outcomes.
4. Teachers should receive training on gamification design and implement gamification effectively in their classrooms.
5. Technical support should be provided to ensure effective implementation of gamification to help teachers and students to overcome technical issues and ensure effective implementation of gamification.
6. Further research should be conducted to explore the long-term effects of gamification on student motivation, engagement, and achievement.

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