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Gamification as an Innovative Strategy for Sustainable Educational Technology Among Lecturers and Students in Port Harcourt Metropolis

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Abstract

This study investigated gamification as an innovative strategy for sustainable Educational Technology (ET) among lecturers and students in Port Harcourt Metropolis (PHM). The study was guided by four objectives, corresponding research questions, and two hypotheses. A descriptive survey was employed. The study's population comprised 1,999 lecturers and students in ET from the three universities in PHM. Using simple random sampling, a sample of 400 participants, comprising 50 lecturers and 350 students, was drawn. The instrument, titled Gamification Strategies for Digital Natives in Educational Technology Questionnaire, was developed, validated, and found reliable, with an overall Cronbach's alpha of 0.84. Frequency, percentage, mean, and standard deviation were used to answer the research questions, while independent-samples z-test and PPMC were used to test the null hypotheses at a 0.05 significance level. Findings revealed that technology educators commonly utilise gamification elements such as points and scoring systems, leaderboards, levels/progression systems, simulation games, and immediate feedback mechanisms in classroom instruction. The study also found no noteworthy difference between the perceptions of students and lecturers towards the use of gamification strategies, indicating a shared appreciation of its educational value. The study concluded that gamification has emerged as an innovative strategy for enhancing sustainable ET among digital natives in PHM. The study recommended, among others, that ET educators should adopt a wider range of gamification strategies, including simulations, digital quizzes, badges, and storytelling, to enhance learning experiences.

Keywords: Gamification, Innovative Strategy, Sustainable, Educational Technology, Digital Natives

Introduction

The advent of new digital technologies has changed the way education works, particularly for those who have grown up in the digital age. These learners, also known as “digital natives” or Generation Z, are accustomed to living in a world that is always on, mobile, and interactive, learning through visual engagement, interactivity, and personalization. Digital natives have short attention spans – an average of 47 seconds per screen before switching – and have a preference for bite-sized, interactive, and collaborative learning experiences compared to traditional lectures that last long periods of time (Dichev & Dicheva, 2017; Ibáñez & Delgado-Kloos, 2021). The pedagogical approaches that are required in ET must be reconsidered to match the cognitive and behavioral features of the 21st-century learners.

The role of ET in practical skills in computing, design, and innovation is still very important to national development (Rapanta et al., 2021). In many tertiary institutions in Nigeria, including the metropolis of Port Harcourt, however,

teaching and learning are still based on a teacher-centred lecture style, which sometimes alienates digital natives. This has led to teaching-learning gaps that result in low motivation, high dropouts, and poor performance in technology courses. Thus, ET must be “levelled up” with the use of more engaging, interactive, and digital native learning approaches.

New empirical research shows that gamification can make a big difference in how engaged and motivated students are, as well as how well they learn (Ibáñez & Delgado-Kloos, 2021). Cernasev et al. (2023) found that gamified learning boosted the success of the course from 78% to 90%, and excellence rates rose from 18% to 41%. Although these benefits are global, it is noted that gamification in higher education in Nigeria has contextual challenges. The results of the systematic review showed that only 3% of the studies included in the review focused on teacher training in gamification strategies and that the lack of teacher training is a fundamental impediment to the proper implementation (Sitra et al., 2022). Other challenges are the lack of infrastructure, unsuitability for various learning styles, as well as the fragmented application of gamification, limited to individual subjects. However, empirical evidence of the level of gamification that lecturers currently employ, the specific strategies they use, and students' perceptions of gamification tools, as well as challenges that hamper its use, is scant in PHM, specifically. The study aligns with the report by the United Nations Educational, Scientific and Cultural Organization (UNESCO, 2023), which revealed that technological infrastructure, internet connectivity, and access to digital resources are noteworthy challenges to technology-enhanced learning in many developing countries.

This knowledge gap is an issue because, to be effective, gamification has to start with the basics, namely the current situation. Given the lack of detailed descriptions of what is actually happening in Port Harcourt classrooms, it is hard for educators, curriculum designers, and policymakers to help target interventions aimed at improving ET in those classrooms. The study thus seeks to describe the levelling up of ET in the use of gamification strategy by digital natives in PHM.

For the 21st century, ET is expected to go beyond the traditional lecture methods and adopt a learner-centred approach. The Gamification phenomenon has been identified as a feasible solution for improving engagement, motivation, and learning outcomes in technology-related courses all over the world. In the majority of tertiary institutions in Nigeria, including some institutions in PHM, the teaching and learning of ET still has a high level of teacher dependency with little or no integration of interactive learning methods.

Research works from other settings have found positive impacts of gamification on students' engagement, but empirical studies are scarce on the current status of gamification use in ET in PHM. The extent of exposure is unknown, as is which gamified tools or techniques are being used, and what difficulties are preventing them from being utilised in local classrooms. As a result of this knowledge gap, it is hard for educators, curriculum planners, and policymakers to make informed decisions about the integration of gamification in the field of ET. Therefore, this study investigates gamification as an innovative strategy for sustainable ET among lecturers and digital natives in PHM.

This study aimed to investigate gamification as an innovative strategy for sustainable ET among lecturers and digital natives in PHM. In Specific terms, this study intends to;

1. Identify the types of gamification tools most used in ET classes in PHM
2. Describe the extent to which digital natives are exposed to gamification in learning technology
3. Describe students' and teachers' perceptions of gamification for ET
4. Identify the challenges militating against the use of gamification strategies in PHM

The research questions are:

1. What types of gamification strategies are currently used in ET classes in PHM?
2. To what extent are digital natives exposed to gamification in their technology classes?
3. What are the perceptions of students and lecturers toward gamification for learning technology?
4. What challenges hinder the use of gamification strategies in PHM?

The hypotheses

1. There is no significant difference in the perceptions of students and lecturers toward the use of gamification strategies for ET in PHM.
2. There is no significant association between the extent of exposure to gamification and the challenges militating against its use in ET among digital natives in PHM.

Methodology

This study adopted a descriptive survey research design to examine the extent of use, perceptions, and challenges. The population consisted of 1,999 students and lecturers in Educational Technology at three tertiary institutions in Port Harcourt (UNIPORT, IAUE, and RSU). Multi-stage sampling was employed, including purposive selection of institutions, stratified random sampling across institution levels, and simple random sampling for 400 respondents, comprising 350 students and 50 lecturers. A structured questionnaire, "Gamification Strategies for Digital Natives in Educational Technology Questionnaire (GSDNETQ)," was used to gather data, which was divided into four parts: Demographic data, Extent of gamification usage, Perceptions, and Challenges. This instrument comprised a 4-point Likert scale and rating scales. It was evaluated for content validity by three experts (Educational Technology & Measurement & Evaluation) and showed a Cronbach's alpha of 0.84 in a pilot test, indicating reliability. The questionnaires were administered in person during the lecture period, with permission from the departmental authorities, and collected on the same day to ensure a high return rate. The data were analyzed using descriptive statistics, including frequencies, percentages, means, and standard deviations, in SPSS v 26. Items on extent and perception were analyzed using a mean cut-off of 2.50. Independent t-tests and Pearson's Product Moment Correlation (PPMC) at a 0.05 level of significance were used to test the hypotheses.

Results

Table 1: Frequency and Percentage of the types of gamification strategies currently used in ET classes in PHM

S/N	Items	Yes		No	
		Freq	%	Freq	%
.1	Points and scoring system for tasks/assignments	311	77.8	89	22.3
.2	Leaderboards to rank student performance	314	78.5	86	21.5
.3	Badges/achievement rewards for completing modules	102	25.5	298	74.5
.4	Quizzes/games using Kahoot, Quizizz, or Mentimeter	179	44.8	221	55.3
.5	Simulation games for technical skills practice	226	56.5	174	43.5
.6	Levels/progression system in coursework	314	78.5	86	21.5
.7	Storytelling/narrative in learning activities	84	21.0	316	79.0
.8	Immediate feedback system during learning	216	54.0	184	46.0

Respondents (n=400)

The results of the study, shown in Table 1, identified the kind of gamification strategy adopted in ET classes in PHM. Additionally, 311 respondents (77.8%) said they use points and scoring systems for tasks and assignments, while 89 respondents (22.3%) said they did not. Leaderboards that rank student performance were used by 314 respondents (78.5%) compared to 86 respondents (21.5%). Furthermore, the findings showed that badges and achievement rewards for finishing modules are not being used extensively, as 102 (25.5%) respondents reported using badges and achievement rewards, while 298 (74.5%) respondents reported non-use.

It also shows that the quizzes and games (e.g., Kahoot, Quizizz, Mentimeter) are utilized by 179 respondents (44.8%) and not used by 221 respondents (55.3%). In addition, 56.5% of the respondents use simulation games for technical skills practice, while 43.5% do not use simulation games for technical skills practice. 314 (78.5%) respondents reported that a levels or progression system is used in coursework, with 86 (21.5%) saying that this is not used. Moreover, only 84 (21.0%) of the respondents confirmed the use of Storytelling, and 316 (79.0%) indicated non-use of the strategy, making it the least used strategy. Lastly, 216 respondents (54.0%) indicated that they used immediate feedback systems during learning activities, and 184 respondents (46.0%) said they did not use immediate feedback systems during the activities.

Table 2: Mean and Standard Deviation of the extent to which digital natives are exposed to gamification in their technology classes

S/N	Items	Students (n=350)		
		$\bar{x}$	SD	Remark
.9	My lecturer incorporates game elements into lessons	2.82	0.93	HE
.10	I engage in competitive activities during technology classes	2.83	1.26	HE
.11	Learning tasks are structured like game levels or missions	2.75	0.98	HE
.12	I receive instant feedback on my performance during class	3.44	0.75	HE
.13	Digital platforms/apps are used for interactive quizzes	2.10	0.49	LE
.14	Rewards are given for active participation and correct answers	2.12	0.53	LE
	Grand Mean	2.68		

Criterion Mean = 2.5, Mean $\geq$ 2.5, High Extent (HE), Mean < 2.5, Low Extent (LE)

Table 2 shows the extent to which digital natives are exposed to gamification in their technology classes. The result revealed that a good number of the students indicated a great extent to items 9-12, since the mean scores are higher or equal to the benchmark of 2.5, while some respondents think otherwise about the items. On the contrary, a good number of the students indicated a low extent to items 13 & 14, since the mean scores are higher or equal to benchmark of 2.5. The grand mean of 2.68 shows that a good number of the digital natives are exposed to gamification in their technology classes to a great extent.

Table 3: Mean and Standard Deviation of the perceptions of students and lecturers toward gamification for learning technology

S/N	Items	Lecturer (n=50)			Student (n=350)		
		$\bar{x}$	SD	Remark	$\bar{x}$	SD	Remark
.15	Gamification makes ET classes more interesting	3.36	0.75	Agree	3.34	0.76	Agree
.16	Using game elements improves my motivation to learn technical concepts	3.16	0.71	Agree	3.15	0.72	Agree
.17	Gamification helps me understand difficult technology topics better	3.16	0.71	Agree	2.99	0.78	Agree
.18	I prefer gamified learning activities to traditional lectures	3.08	0.75	Agree	2.99	0.78	Agree
.19	Gamification increases collaboration among students	3.12	0.72	Agree	3.01	0.76	Agree
.20	Gamification is a waste of time for serious technical courses	2.30	0.65	Disagree	2.25	0.58	Disagree
.21	Lecturers should adopt more gamification strategies in teaching	3.44	0.50	Agree	3.21	0.80	Agree
	Grand Mean	3.09			2.99		

Criterion Mean = 2.5, Mean $\geq$ 2.5, Agree, Mean < 2.5, Disagree

Table 3 revealed the perceptions of students and lecturers toward gamification for learning technology. The result revealed that a good number of the lecturers agreed with items 15-19 & 21, since the mean scores are higher than or equal to the benchmark of 2.5, while just a few of the respondents disagreed with the items. On the contrary, a good number of the lecturers disagree with item 20, since the mean scores are less than the benchmark of 2.5. Also, a good number of the students agree with items 15-19 & 21, since the mean scores are higher than or equal to the benchmark of 2.5, while some respondents think otherwise about the items. On the contrary, a good number of the students disagree with item 20, since the mean scores are higher or equal to the benchmark of 2.5. Conclusively, the grand mean of 3.09 for lecturers and 2.99 for students shows that both lecturers and students expressed positive perceptions toward gamification for learning technology.

Table 4: Mean and Standard Deviation of the challenges that hinder the use of gamification strategies in PHM

S/N	Items	Respondents (n=400)		
		$\bar{x}$	SD	Remark
.22	Lack of digital infrastructure, such as internet access and computers, hinders gamification	3.15	0.56	Agree
.23	Lecturers lack training on how to design gamified lessons	2.80	0.81	Agree
.24	Large class size makes it difficult to implement gamification	3.25	0.59	Agree
.25	Time constraints prevent lecturers from preparing gamified activities	3.03	0.74	Agree
.26	The high cost of gamification software/apps is a barrier	3.24	0.61	Agree
.27	Some students see gamification as unserious or distracting	3.19	0.71	Agree
.28	An unstable power supply affects the use of digital gamification tools	3.03	0.68	Agree
	Grand Mean	3.10		

Criterion Mean = 2.5, Mean $\geq$ 2.5, Agree, Mean < 2.5, Disagree

Table 4 shows the challenges that hinder the use of gamification strategies in PHM. The result revealed that good number of the respondents agreed to items 22-28, since the mean scores are higher or equal to benchmark of 2.5, while some respondents think otherwise about the items. The grand mean of 3.10 shows that the majority of lecturers and students agreed that the listed challenges were responsible for hindering the use of gamification strategies.

Table 5: Summary of analysis of independent z-test analysis on the difference in the perceptions of students and lecturers toward the use of gamification strategies for ET in PHM

Respondents	n	$\bar{x}$	SD	df	t_{cal}	t_{tab}	Sig.	Decision
Lecturers	50	10.94	1.56	398	0.68	1.96	0.50	Accept: H_{01}
Students	350	11.10	1.59					

Table 5 indicates that $t_{cal} = 0.68$, $df = 398$, and $t_{tab} = 1.96$. Therefore, since $t_{cal} < t_{tab}$ and $p > 0.05$, there is no noteworthy difference in the perceptions of students and lecturers toward the use of gamification strategies for ET in PHM. Hence, the null hypothesis is accepted at the 0.05 level of significance.

Table 6: Summary of PPMC of the relationship between the extent of exposure to gamification and the challenges militating against its use in ET among digital natives in PHM

Variable	n	r-value	p-value	df	Sig.	Decision
Exposure to Gamification vs Challenges	400	0.73**	0.00	399	0.50	Reject: H_{03}

**. Correlation is significant at the 0.05 level (2-tailed).

Table 6 revealed the relationship between the extent of exposure to gamification and the challenges militating against its use in ET among digital natives in PHM. The results indicated a positive and noteworthy association between exposure to gamification and challenges militating against its use in ET among digital natives ($r = 0.73$, $r \geq \pm 0.60$ to ± 0.79); hence, the null hypothesis is rejected at the 0.05 level of significance.

Discussion

The first research question was found to have points and scoring systems, leaderboards, and levels/progression systems as the most commonly used gamification strategies in ET classes in PHM. The result also indicated that simulation games and immediate feedback systems are moderately used, and badges/achievement rewards and storytelling/narrative based learning activities are not widely used. This means that teachers are more likely to use gamification features that can be used within a traditional school environment and are relatively simple to monitor. The result is in line with the study conducted by Dichev and Dicheva (2017) that revealed the most common gamification elements in education are points, leaderboards, and progression systems. The discovery also aligns with Hamari et al. (2014),

who claimed that the most common game mechanics used are reward systems, competition, and performance tracking, which improve learner engagement and motivation. In addition, Kapp (2012) said that teachers sometimes start to gamify with simple game aspects like points and levels, but then move on to more complex aspects like stories and more immersive experiences in the game. The lack of use of storytelling and achievement badges in the current study might reflect limited knowledge and tools available for implementing gamified instruction at a higher level.

The second research question was answered, and the result showed that digital natives of PHM are exposed to gamification to a great extent in their technology classes. The findings revealed that students frequently encounter certain practices related to the use of games in the learning process, including game competition in class, classroom-level activities, lecturers' integration of game elements, and immediate feedback. But the level of exposure to interactive quizzes and reward systems on digital platforms was relatively low. It implies that gamification is accepted in ET, but its use of it is not uniform in the instructional field. The discovery parallels the systematic review carried out by Zainuddin et al. (2020), which revealed that gamification has been growing in popularity across an educational context, and a range of game elements are constantly presented to learners that encourage engagement, participation, and feedback. In the case of higher education, the students usually have positive exposure to gamified learning activities, especially when the teachers purposefully employ motivational game design elements in their teaching (Subhash & Cudney, 2018). Hence, the level of exposure reported in this study is very high, which has been attributed to the increasing use of innovative teaching methods in ET.

The third research question was found to have a positive perception of students and lecturers of gamification for learning technology. The result indicated that both groups agreed that gamification can make ET more interesting, motivate learners, help understand challenging concepts, encourage collaboration, and that the use of gamification should be more widespread in the classroom. They also didn't agree on the notion that gamification is not useful in serious tech courses. The results of these findings show that gamification is widely accepted as an effective teaching approach. The related hypothesis was that there is no noteworthy difference between students' and lecturers' perceptions of the application of gamification strategies on ET in PHM. This seems to indicate that both groups are in line with each other about the usefulness and effectiveness of gamification to support the learning outcomes. This result is in line with Sailer et al. (2017), who showed that gamification benefits the learner's motivation, engagement, and satisfaction via psychological needs. The results correspond to the results of Zainuddin et al. (2020), who found that, in general, the students' and instructors' perceptions of gamification as a positive method for teaching are in line. Additionally, Hamari et al. (2014) found that gamification is frequently able to create positive attitudes among users, as one of the main reasons is that learning activities are more enjoyable and interactive. A lack of difference between lecturers and students in the present study could be due to the experiences they have had together with gamified instructional practice.

The results found in the fourth research question showed that major problems that factor into the ET class using the gamification approach are: digital infrastructure, lecturer training, large class size, time limitation, the cost of software applications, unstable power supply, and negative student attitudes. The grand mean score is high (agreement), which means that the factors discussed are important to the effectiveness of gamification implementation. The hypothesis tested showed a strong positive and noteworthy association between the level of exposure to gamification and challenges militating against gamification in the ET of digital natives in PHM. Thus, the null hypothesis was rejected. This discovery suggests that while students are more and more likely to engage in gamified learning experiences, there are still noteworthy obstacles to the successful implementation of gamification. The exposure may also make students and lecturers more conscious of the challenges of gamification in practice. The discovery is consistent with Ogunode and Musa's (2024) finding that the lack of adequate ICT facilities, inadequate ICT staff training, poor electricity supply, and funding constraints remain challenges to the implementation of ICT in higher institutions of learning in Nigeria. Likewise, Dichev and Dicheva (2017) noted technical support, institutional commitment, and preparedness of instructors as common issues that impact successful gamification implementation in educational environments.

Conclusion

The study concluded that gamification has become an innovative approach to improving the sustainable ET of the digital natives in PHM. According to the results, many technology educators have adopted the use of gamification in their classroom instruction, including the use of points and scoring systems, leader boards, level/progression systems,

simulation games, and immediate feedback systems. The study also found that digital natives are highly exposed to gamification in their technology studies and that both students and lecturers have positive perceptions about the effectiveness of gamification in improving their motivation, engagement, collaboration, and understanding of technology-related concepts.

The study also revealed that there was no noteworthy difference between the perceptions of students and lecturers regarding the use of gamification strategies, suggesting that both groups hold a positive view of the educational value of gamification strategies. But several challenges were pointed out as obstacles to good implementation, such as a lack of digital infrastructure, a lack of lecturers' training, large class sizes, time limits, high costs of gamification tools, unstable power supply, and a negative attitude of some students. Moreover, challenges of gamification implementation were correlated with positive exposure to gamification, which means that the more the respondents were exposed to gamification, the more challenges were raised. Thus, integrating gamification into ET is dependent on the continuous support of the institutions, enhancement of technological infrastructure, and continuous capacity building of the teachers.

Recommendations

1. ET tutors need to explore a broader set of gamification tools and techniques, such as simulations, digital quizzes, badges, and storytelling, to improve learning experiences.
2. Provide students with more opportunities for gamified learning in lectures by using an interactive digital platform and game-based activity more frequently.
3. Policy support and lecturer training on gamification in ET should be supported by administrators of the school and the Ministry of Education.
4. Adequate infrastructure, stable power supply, and technological resources should be provided by governments and educational stakeholders to overcome challenges in the implementation of gamification.

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