



PROFILING STUDENT ENGAGEMENT AND LEARNING OUTCOMES IN GAMIFIED BASIC TECHNOLOGY: A DESCRIPTIVE SURVEY OF SCHOOL TYPES AND GENDER IN NIGERIAN JUNIOR SECONDARY SCHOOLS

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Abstract

There is a growing recognition of gamified learning as an effective approach to counter instructional stagnation in the technical education of developing countries. However, there is a scarcity of fundamental empirical information concerning variations in engagement and academic performance among school types and student demographic segments. This descriptive survey is a sample of 240 JS 2 students learning Basic Technology in private and public secondary schools in Oyo metropolis, Nigeria. The researchers collected data using the Gamified Learning Engagement Scale (GLES; $r=0.88$) and the Basic Technology Achievement Test (BTAT; $r=0.84$). Analysis included means, standard deviations, percentage distribution and cross tabulation. The study revealed that there is high level of engagement in gamified Basic Technology classes ($M = 3.24$, $SD = 0.52$). Students in private school show greater engagement ($M = 3.41$, $SD = 0.45$) and cognitive achievements ($M = 68.50\%$, $SD = 11.20$) than students in public school ($M = 3.07$, $SD = 0.54$; $M = 58.20\%$, $SD = 12.80$). Very small gender differences were found in engagement (male mean = 3.26; female mean = 3.22) and academic achievements (male mean = 63.80%; female mean =



62.90%). Gamification increases engagement across demographic factors, but infrastructural problems prevent additional gains in cognition.

Keywords: Gamification, student engagement, basic technology, demographic profiling, school types, gender

Introduction

Basic Technology is a vital aspect in the nine year basic education curriculum of Nigeria because it is the major platform through which junior secondary school students learn how to solve problems practically, how to draw, how to understand the basics of engineering and how to apply psychomotor skills to make technological and industrial advancements (Nwachukwu & Johnson, 2020). It is supposed to be an ideal platform for bridging theoretical knowledge and practical knowledge for enabling students to advance their studies in Science, Technology, Engineering and Mathematics (STEM) subjects as well as to foster the technical workforce needed for sustaining the economic growth of the nation. The instruction of Basic Technology in junior secondary schools in Nigeria is based on traditional lecture approach based on rote memorization regardless of the vital importance of the subject (Badmus et al., 2024).

This leads to some negative outcomes like lack of student's motivation, passivity in participation and poor academic achievement in Basic Technology in particular in parts that involve practical application and problem solving (Nguyen Viet et al., 2025). There is an existing incongruence in the purpose of the subject with actual instructions in Basic Technology and lack of instructional materials, assistive technologies and infrastructural facilities especially in the public secondary schools (Nwachukwu & Johnson, 2020). Such conditions offer a learning experience where students are exposed to technical concepts but do not have an opportunity to engage with them through standard feedback systems for building competence and confidence (Badmus et al., 2024). In this sense, gamified instruction appears to be an innovative pedagogy, capable of solving the existing problems related to Basic Technology (Okoro, 2023). Gamification refers to the application of game elements such as points badges leader boards progress and challenge systems in a non-game context to improve motivation and engagement. Gamification is consistent with the needs of contemporary digital youth and with psychological principles of Self-Determination Theory (Ryan & Deci, 2000) regarding the autonomy, competence, and relatedness of the learner. Empirical evidence has been found that shows that gamified instruction is effective in various educational environments (Oby, 2024; Ahmed et al., 2025; García-López et al., 2023; Gaurina et al., 2025; Hellín et al., 2023; Tsebe et al., 2023).

Student engagement is a multi-dimensional construct, and its mapping in different educational environments is the key empirical issue of the present-day research paradigm (UNESCO, 2025; Oby, 2024).



Contemporary approaches differentiate behavioral, emotional and cognitive components in the phenomenon of engagement, which have specific roles in learning process and learning outcomes (Falade et al., 2026). Behavioral engagement includes persistence, attentiveness and commitment to instruction-related activities. Emotional engagement refers to affective responses like interest, enjoyment, and enthusiasm, and feeling safe from anxiety (Chans & Portuguese Castro, 2021). Cognitive engagement refers to the commitment to learning strategies, self-regulation, and mental effort to master technical concepts (García-López et al., 2023). Taking all the three dimensions into account will give an in-depth comprehension of the phenomenon of students' experience in gamified instruction and will highlight possible gaps in instructional support needed (Gaurina et al., 2025).

A number of studies (Oby, 2024; Ahmed et al., 2025; Okoro, 2023; have emerged in the Nigerian education system to explore the possibilities of gamification in different subjects and levels of education. Previous studies have investigated teachers' attitude and self-efficacy toward the implementation of gamification in Kwara State and found mostly positive dispositions but several hindrances such as lack of internet connectivity, inadequate training and dearth of technological resources (Adedapo, 2021). Research has demonstrated the effectiveness of gamification in altering students' perception (Hellín et al., 2023; Olowu, 2025; Aliyu et al., 2025; Caballero et al., 2022). There were findings on the positive influence of gamification on academic performance, participation and knowledge acquisition (Holguin et al., 2020; Ofosu-Ampong, 2020; Rao, 2022; Alsadoon et al., 2022). Badges and points were the most common game elements used by the researchers. However, the growing body of research on the use of gamification in Nigeria is mainly focused on such disciplines as Social Studies, mathematics, and English; Basic Technology is not empirically explored enough, despite its importance (Adedapo, 2021; Badmus et al., 2024).

The institutional background of Nigerian secondary education adds some complexity to gamification issues not reflected in existing research (Olowu, 2025; Aliyu et al., 2025; Ofosu-Ampong, 2020). The level of technological infrastructure, teacher to student ratio and the quality of instructional support systems in private schools and public schools differ significantly (Salawu & Adedapo, 2001). There is research on differences in students' achievements related to the choice between public and private schools and differences between cognitive skills of students of Northern Nigeria's private and public schools. This brings up the issue of possible differences in profiles of student engagement and academic achievement in gamified instruction in private vs. public schools (Ahmed et al., 2025).

A key dimension to explore is the gender dynamics within technology-enhanced learning environments. Some scholars argue that competition-oriented mechanics such as leaderboards induce



stereotype threat and thus have a negative effect on female performance (African Centre for the Study of the United States, 2022). Collaborative and mastery designs, in contrast, can be useful across the board. A systematic review of studies on gamification associated with women's experience in learning environment indicates that females show greater engagement when there is choice, collaboration and feedback with emphasis on autonomy, mastery and relatedness components rather than competition (Nguyen Viet et al., 2025). Given gender stereotypes and norms in the Nigerian society that influence students' attitudes toward technology and technical subjects (Adedapo, 2020), the issue of the ability of gamification to guaranty equal engagement and academic performance among different genders becomes a relevant topic to be empirically examined.

There is no systematic evidence in Nigeria on the profiles of engagement in Basic Technology across the behavioral, emotional and cognitive dimensions and on the variation of such engagement and achievement among students in public and private schools and between males and females. The absence of descriptive baseline data makes it difficult for educational planners to design a proper intervention in the field and to understand whether gamified instruction needs a differential approach in different institutional settings and among different student samples. These gaps are particularly critical, given the challenges of Nigerian schools such as overpopulated classrooms, uneven access to technology and heterogeneous student demographics.

Otherwise, Nigerian students in the junior secondary schools will continue to do badly in Basic Technology lessons. This would hamper their preparation for further technical studies and undermine the country's effort to build its technically skilled labor force. The study is aimed at profiling engagement and academic achievement of students of public and private schools and across gender in gamified Basic Technology lessons in Oyo metropolis.

Statement of the Problem

Underperformance of junior secondary school students in Basic Technology has emerged as an important educational and developmental issue in Nigeria. Even though Basic Technology plays a key role in equipping learners for technical vocations and in providing learners the requisite preparation for future courses in science and engineering fields, there is heavy dependence on traditional lecture-based methods that do not motivate students or equip them with the practical problem-solving skills required by the curriculum. Gamified instruction has emerged as one of the innovative methods that could be used to overcome these limitations, but the knowledge base in Nigeria as far as the efficacy of gamified instruction in Basic Technology is concerned, is still under-developed. Most research conducted in Nigeria on gamification has dealt with mathematics, English and Social Studies but has ignored the subject area Basic Technology which requires a unique blend of cognitive understanding and psychomotor skills.



In addition to this gap in the literature, some critical issues relating to the profiles of student engagement and achievement in gamified instructions based on the nature of school ownerships and genders have yet to be explored. There is little evidence available about the possible differences between students from public and private secondary schools in respect of their engagement levels and achievement in the process of gamified instruction even though there are both theoretical and empirical basis for thinking that institutional resource differences could make a difference to the outcome of gamification. There is also no evidence about any differences between male and female students in their profiles of engagement and achievement in the process of gamification of Basic Technology even though there is some international evidence showing that motivational patterns by gender could influence student response to gamification.

Without such empirical data about the profiles of students in gamification, educational policymakers would not be able to know whether gamification interventions would have to be tailored to fit different types of schools or whether they could promote equity among different student populations. There would be no way of knowing which engagement dimensions may need additional help for certain student groups because of the lack of data about student engagement profiles. If the above gaps in the knowledge base continue to exist, then Nigerian junior secondary schools will continue to implement instructional methods that cannot provide adequate preparation of students for technical education. The implications for Nigeria include poor competitiveness in technical fields, reduced capacity for industrial innovation and continuation of educational inequalities. Hence, this study addresses the above gaps by profiling student engagement in gamification of Basic Technology instruction through behavioral, emotional and cognitive dimensions and comparing engagement and achievement profiles based on school ownerships and genders.

Objectives of the Study

The objective of this study is to investigate the student engagement and academic performance profile of gamification of Basic Technology lessons among Junior Secondary School students in Oyo State, Nigeria. This will entail:

1. general multidimensional profile of student engagement in gamification of Basic Technology lessons along behavioral, emotional and cognitive dimensions.
2. Comparing the profile of student engagement and academic performance in gamification of Basic Technology lessons among public and private owned secondary schools.
3. Comparison of student engagement profile and academic performance in gamification of basic technology lessons between males and females.



Research Questions

Research questions guiding the study are as follows:

1. What defines the full profile of student engagement, incorporating behavioral, emotional, and cognitive aspects in gamified Basic Technology teaching?
2. How do the profiles of student engagement and academic performance compare in public and private secondary schools in gamified Basic Technology teaching?
3. How do the profiles of student engagement and academic performance compare in gamified Basic Technology teaching among male and female students?

Theoretical Justification

This study is theoretically grounded in a combination of the constructs of Self-Determination Theory and the tripartite approach to student engagement. According to Self-Determination Theory, when three basic psychological needs are satisfied—namely autonomy, competence, and relatedness—intrinsic motivation and engagement result (Ryan & Deci, 2000). In the setting of technical subject areas like Basic Technology, gamification helps to satisfy these needs through providing clear instructional directions, immediate progress feedback through point and badge system and provision of challenges in collaboration. Engagement has been defined as a high-level construct with three different dimensions according to the tripartite approach to engagement (Rivera et al., 2021; Ahmed et al., 2025;). Behavioral engagement is the process of persistence, attention, and commitment to instructional tasks. Emotional engagement is defined as affective reactions such as interest, enjoyment, enthusiasm, and lack of anxiety. Cognitive engagement is the involvement in learning techniques and efforts of mastering difficult technical concepts. The tripartite model supplies the conceptual frame for the profiling of student engagement in the present study.

The theoretical orientation is in line with the known tenets of educational technology in Nigeria. Early research on the use of instructional media in education through design models highlighted the significance of aligning media tools with learners' needs to enhance cognitive and behavioral engagement (Adedapo & Opoola, 2021). The use of interactive and media-based methods of instruction, make passive learners to become active learners (Adedapo et al., 2004).

Methods

Research Design



In this study, a descriptive survey design was used under a quantitative research framework. With this type of methodology, variations in the engagement and achievements of the participants can be observed, quantified and described through natural means without any form of experimental manipulation within the period of assessment. For this study, the target population is all Junior Secondary School Year 2 students in Oyo Educational Zone, Oyo Metropolis, Oyo State, Nigeria. Oyo Educational Zone comprised all the four local government areas in Oyo, Oyo State. Through multistage sampling technique, 240 participants were chosen to constitute the sample. To begin with, stratifying the population based on ownership type, both 120 public and 120 private secondary schools were selected. Random selections of four public and four private secondary schools were made with simple balloting techniques. From each selected school, one class of JS 2 offering Basic Technology was identified, with 30 participants sampled in each class. Altogether, there were 120 male and 120 female participants (N = 240).

Instrumentation

Gamified Learning Engagement Scale comprised of 15 items, adapted from recent standardised engagement scales (UNESCO. 2025; Oby, 2024; Ahmed et al., 2025; Gaurina et al., 2025), on a 4-point Likert scale that had values from 1 (Strongly Disagree) to 4 (Strongly Agree). It comprised of three subscales which include Behavioral Engagement (5 items), Emotional Engagement (5 items), and Cognitive Engagement (5 items). Content validity of the instrument was determined through three educational technology and psychometricians. The internal consistency reliability resulted in a value of 0.88 (Behavioral: 0.87; Emotional: 0.88; Cognitive: 0.89). Mean, median (Mdn), standard deviation, interquartile range (IQR), skewness, kurtosis, and percentage were used for the data analysis using SPSS version 26.

Results

Research Question 1: What makes up the profile of student engagement in terms of the various dimensions of behavioural, affective, and cognitive in gamified Basic Technology teaching?

Table 1: Overall Multidimensional Engagement Profile (N = 240)



Engagement Dimension	Items	M	SD	Mdn	IQR	Skewness	Kurtosis	Interpretation
Behavioural Engagement	5	3.32	0.48	3.40	0.60	0.62	0.14	Very High
Emotional Engagement	5	3.28	0.55	3.30	0.80	0.51	0.22	Very High
Cognitive Engagement	5	3.12	0.53	3.10	0.70	0.28	0.11	Moderate High
Composite GLES Index	15	3.24	0.52	3.27	0.65	0.48	0.08	High

Note: GLES = Gamified Learning Engagement Scale. Benchmark Scores: 1.00-1.75: Very Low; 1.76-2.50: Low; 2.51-3.25: Moderately High; 3.26-4.00: Very High.

As depicted in Table 1 above, the overall engagement level of the students in gamified learning lessons was very high ($M = 3.24$, $SD = 0.52$). Behavior engagement received the highest mean score ($M = 3.32$, $SD = 0.48$). The results show that the students had high physical engagement, were highly persistent in the tasks assigned to them, and did not display off-task behaviors. There was also high emotional engagement ($M = 3.28$, $SD = 0.55$), which denotes that the students had enthusiasm about participating in gamified activities. Cognitive engagement was also high ($M = 3.12$, $SD = 0.53$) but lower than behavior and emotional engagements.

Table 2: Distributional Profile of Student Engagement Categories (N = 240)

Engagement Tier	Score Range	Frequency	%	Cumulative %
Very High Engagement	3.26–4.00	128	53.33	53.33
Moderate High Engagement	2.51–3.25	94	39.17	92.50
Low Engagement	1.76–2.50	15	6.25	98.75
Very Low Engagement	1.00–1.75	3	1.25	100.00

**Total****240****100.0**

Table 2 shows the distribution in terms of categories shows that above 92% of the surveyed students fall into the category of being Moderately High to Very High in engagement, while only 7.5% of them were observed to be low in engagement.

Research Question 2: How does the profile of student engagement and academic performance differ in gamified Basic Technology in public schools from those in private schools?

Table 3: Disaggregated Profile of School Ownership Type

Metrics	Public Schools (N = 120)	Private Schools (N = 120)	Disparity
Behavioural Engagement	3.18 (SD = 0.50)	3.46 (SD = 0.42)	+0.28
Emotional Engagement	3.10 (SD = 0.58)	3.46 (SD = 0.48)	+0.36
Cognitive Engagement	2.93 (SD = 0.52)	3.31 (SD = 0.48)	+0.38
Overall GLES Index	3.07 (SD = 0.54)	3.41 (SD = 0.45)	+0.34
BTAT Performance	58.20% (SD = 12.80)	68.50% (SD = 11.20)	+10.30%

Table 4: Cross Tabulation: School Ownership versus BTAT Achievement Performance Tiers

School Ownership	Low Achievement (<50%)	Moderate Achievement (50–69%)	High Achievement (≥70%)	Total
Public Schools	32 (26.67%)	62 (51.67%)	26 (21.66%)	120 (100%)
Private Schools	8 (6.67%)	51 (42.50%)	61 (50.83%)	120 (100%)
Total Sample	40 (16.67%)	113 (47.08%)	87 (36.25%)	240 (100%)



School ownership profiling shows marked differences between public and private secondary schools. In particular, learners from private institutions scored higher engagement in all aspects ($M = 3.41$, $SD = 0.45$) compared to their public school peers ($M = 3.07$, $SD = 0.54$). The largest difference occurred with respect to cognitive engagement (+0.38 difference).

The achievement profile of learners showed similar results. Private institution learners had a mean BTAT of 68.50% ($SD = 11.20$) compared to the average of 58.20% ($SD = 12.80$) for the learners from public institutions. From the cross-tabulation, 50.83% of the learners from private schools attained the high achievement level as opposed to 21.66% from the public schools.

Research Question 3: How do the profiles of engagement and academic performance for gamified Basic Technology vary according to learner gender?

Table 5: Disaggregated Profile by Learner Gender

Metrics	Male Students (N = 120)	Female Students (N = 120)	Disparity
Behavioural Engagement	3.35 (SD = 0.46)	3.29 (SD = 0.50)	+0.06
Emotional Engagement	3.25 (SD = 0.56)	3.31 (SD = 0.54)	0.06
Cognitive Engagement	3.18 (SD = 0.51)	3.06 (SD = 0.54)	+0.12
Overall GLES Index	3.26 (SD = 0.51)	3.22 (SD = 0.53)	+0.04
BTAT Performance	63.80% (SD = 12.40)	62.90% (SD = 12.10)	+0.90%

Table 6: Gender Cross-tabulation by BTAT Success Levels

Gender	Low Achievement (<50%)	Moderate Achievement (50–69%)	High Achievement (≥70%)	Total
Male Students	19 (15.83%)	57 (47.50%)	44 (36.67%)	120 (100%)
Female Students	21 (17.50%)	56 (46.67%)	43 (35.83%)	120 (100%)
Total Sample	40 (16.67%)	113 (47.08%)	87 (36.25%)	240 (100%)

Unlike the school ownership inequalities described above, there are no apparent inequalities in engagement and performance from the results related to gender profiling. There are virtually no differences between overall engagement scores of male students ($M = 3.26$, $SD = 0.51$) and those of female students ($M = 3.22$, $SD = 0.53$), the overall difference being of just +0.04. The scores of male students are higher in terms of behavioral (+0.06) and cognitive (+0.12) engagement, while those of female students are somewhat higher in relation to emotional engagement (+0.06). In terms of academic performance on the BTAT test,



the scores of male and female students are equally close, male students receiving the score of 63.80% (SD = 12.40), and female students, 62.90% (SD = 12.10); the difference is +0.90%.

Discussion of Findings

Overall Multidimensional Engagement Profile

The general engagement of students in gamified Basic Technology lessons was high. Behavioral engagement had the highest average score, followed by emotional engagement, and cognitive engagement scored slightly lower. Almost nine-tenth of the participants belonged to the moderately high and highly engaged groups. This result shows that gamification promotes behavioral and emotional engagement in technical tasks and concepts. The high behavioral engagement indicates that the game mechanics, including points, badges, and reviewing of the leaderboard, motivate students to participate actively, persist in tasks, and refrain from doing anything outside their academic activity. Emotional engagement demonstrates students' enjoyment and enthusiasm in their learning processes and indicates the absence of fear – emotions crucial to learning complex technical concepts. Lower cognitive engagement means that while students engage behaviorally and emotionally, deeper cognitive processing and regulation strategies require more attention from teachers.

This result fits the Self-Determination Theory (Ryan & Deci, 2000) which claims that gamification meets the fundamental psychological needs of students: autonomy, competence, and relatedness. In turn, such needs satisfaction leads to the development of intrinsic motivation. High behavioral and emotional engagement obtained in this study confirm the statement of Oby (2024), Ahmed et al. (2025), and Gaurina et al. (2025), that game mechanics provide feedback and make users feel successful and keep them motivated. Similarly, Hamari et al. (2016) claim that gamification tends to increase the level of engagement but this effect depends on context and implementation of games. The lower cognitive engagement agrees with the view expressed by Dichev and Dicheva (2017) that poor design of gamification systems may lead to focus on rewards instead of cognitive processes. The cognitive engagement is the hardest dimension to activate because of the special requirements it imposes to students' abilities.

From the practical perspective, this result means that gamification effectively increases behavioral and emotional engagement in Basic Technology. However, to facilitate deep cognitive engagement, teachers have to use metacognitive scaffolding along with game mechanics. Without such scaffolding, gamification will promote only enthusiastic participation and no deep learning. Theoretically, this result supports Self-Determination Theory and illustrates that gamified systems satisfy students' needs for competence (challenges) and relatedness (group quests). This result adds to the theory showing that different engagement dimensions can be affected by gamification differently, with behavioral and emotional engagement responding easier than cognitive engagement. In addition, this result disconfirms the idea that gamification always provides deep learning (Hellín et al., 2023; Tsebee et al., 2023).



Research Question 2: Differences Across School Ownership Models

Private school students showed significantly higher overall engagement and cognitive performance compared to public school students. The highest difference was recorded in the dimension of cognitive engagement. Cross-tabulation shows that almost half of the students from private schools reached the High Achievement level while only one fifth of public school students achieved the same level. This result means that there are serious structural differences between public and private secondary schools in Nigeria. High engagement and achievement scores in private schools indicate better access to digital tools, smaller teacher-to-student ratio, and better support. Public school teachers often face lack of assistive technologies and bigger classes. Such structural differences limit interaction of students with gamified tasks and lead to lower scores in cognitive processing. Particularly, the difference in cognitive engagement is worrying since it means that public school students are less able to engage in deep self-regulated learning – precisely the skill that is needed for technical problem solving.

This result confirms the finding of Ahmed et al. (2025) who found disparities in teaching facilities between public and private schools. Badmus et al. (2024) state that presence and structured application of resources is key factor that determines learning outcomes in Basic Technology. This result means that gamification cannot solve structural problems on its own. While gamified instruction positively affects the students in both public and private schools, cognitive achievements are limited in public schools because of resource limitations. Policymakers have to solve the problem of basic resources shortage and not just introduce gamification to reach equal learning outcomes. Educators from public schools may use low-tech (offline) gamification techniques: leaderboards, paper badges, and unplugged tasks to compensate for limitations in digital resources. This result supports the tri-partite model of engagement by showing that cognitive engagement is most sensitive to the context. It extends the Self-Determination Theory by showing that psychological needs satisfaction depends on institutional resources. Thus, students studying in under-resourced schools may not feel themselves competent and autonomous enough in gamified environment. The result disconfirms the idea that gamification is panacea that works in any situation.

Research Question 3: Differences between Male and Female Students

The gender analysis shows only minor differences in engagement and performance. Male students have higher behavioral and cognitive engagement, while females have higher emotional engagement. Cross-tabulation reveals almost identical distribution of students in performance tiers, with almost one third of males and females achieving high achievement.

This result means that gamified instruction is a gender-neutral pedagogic strategy. Similar engagement and achievement scores suggest that balanced gamification does not benefit one gender over another. Minor differences are insignificant and may appear as a consequence of natural variety rather than



of systematic gender effects. This finding is important for the Nigerian context where gender expectations and norms can influence students' attitude to technology and technical subjects.

The findings coincide with the results of Adedapo (2020) who found no gender differences in achievement of postgraduates in distance learning courses using standardized media-rich instruction platforms. These findings also support Zainuddin et al. (2020) who stressed the importance of gender balanced design in gamification. On the contrary, the findings contradict some international studies which report gender differences in reaction to gamification. For example, Nguyen Viet et al. (2025) observed that male students react better to competition and leaderboards, while females prefer collaboration and social rewards. The found gender equality may be explained by the balance in the design of gamification strategy used in this study.

This result means that gamification can serve as gender-neutral pedagogic strategy that positively affects both genders (African Centre for the Study of the United States, 2022). Educators and curriculum designers have to design gender-neutral game mechanics in order to avoid emphasis on competition (which may advantage males) or collaboration (which may advantage females) to keep equal engagement and achievement of both genders. Teachers should control group dynamics to ensure equal domination in gamified activities.

This finding confirms the statement made by Self-Determination Theory that basic psychological needs are universal and can be satisfied using different methods and in diverse groups of people. The finding extends the theory by showing how gender-neutral design of gamification allows meeting psychological needs of students in an equal way; African Centre for the Study of the United States, 2022). This result disconfirms deficit theories that depict female students as incapable or unwilling to learn technical subjects.

Implications of the Findings

The state ministries of education need to give priority to providing foundational learning tools and low-technology media kits to public secondary schools in efforts to close the gap in achievement between public and private institutions. The policy needs to define minimum requirements for the provision of Basic Technology resources. There is a need for investment in classroom facilities such as the provision of electricity, seating and display boards for gamified learning activities as failure to do so may hamper the efforts to provide gamified learning activities. The policy needs to mandate the training of teachers on gamification techniques with emphasis on low-cost offline gamification techniques applicable to public schools. The Nigerian Educational Research and Development Council needs to include gamification



principles in the teaching of Basic Technology and equip teachers with ready-made lesson and assessment plans.

The principals and head teachers need to create an environment which will enable gamified learning by allocating time, space and other resources required for gamified learning activities. There is need for the recognition and reward of teachers who have successfully introduced gamification in their classes. Schools should institute Professional Learning Communities whereby the Basic Technology teachers are able to exchange information regarding gamification techniques, resources and difficulties in doing so. Through peer observation and mentoring process gamification will be quickly adopted. Schools should diversify methods of assessments by focusing not only on scores but also on other aspects of engagement such as emotional and behavioral engagement. Portfolio assessments, project based assessments and peer assessment can be considered along with examinations. Schools need to adopt creative ways of mobilizing resources needed for gamification such as seeking help from the private sector, NGOs and even alumni association in financing gamification resources. Schools need to ensure that the gamified learning activities are made accessible to all students through provision of multiple modes of engagement, representation and expression.

There is need for state education boards to create a robust accountability framework for resource allocation to ensure that all the money which is supposed to be used in the procurement of instructional materials is allocated to the schools. The planning in education policies should be driven by data and hence it is necessary to carry out school based survey which could generate engagement and achievement profiles such as the ones generated in this study. There is need for the government to facilitate partnerships between public institutions of education and private institutions to benefit from the resources and expertise of the private companies. There should be creation of school based management committee that involves parents and other members of the community in the promotion of gamified learning activities.

Conclusion

Gamified learning strategies prove their effectiveness in increasing engagement and academic success of students studying Basic Technology. However, the implementation of gamification in public schools is limited by the absence of infrastructure. Importantly, gamification proves to produce equal gender results in technical learning.



Recommendations

The ministry of education in each state should take care of providing basic learning resources and low-tech media kits in order to diminish the performance gap between public and private schools.

1. Teacher training programs need to provide Basic Technology teachers with inexpensive gamification techniques like unplugged games and physical leaderboards that require no hi-tech facilities.
2. Curriculum developers and educational technologies should utilize neutral game mechanisms to ensure equal participation of male and female students in the learning process of technical subjects.
3. Further studies should employ an experimental design in order to prove cause-and-effect relationships and study different game mechanisms and retention rates of learning outcomes.

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