Development of Game-Based Learning Teacher Toolkit in Technology and Livelihood Education to Enhance Student Engagement

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ABSTRACT

This study examined the extent of use of game-based learning (GBL) strategies and its relationship with students' engagement in Technology and Livelihood Education (TLE) in selected schools in the Schools Division of Tacloban City, Philippines. It addressed the need to support TLE teachers in using engaging instructional strategies while considering the challenges they experience in implementing GBL. Using a quantitative descriptive-correlational design, the study involved 365 Grade 8 students and 27 TLE teachers. The researchers gathered data through a validated, researcher-developed questionnaire and analyzed it using frequency, percentage, mean, Pearson r, t-test, and one-way ANOVA at the 0.05 level of significance. Findings showed that teachers often used GBL strategies, while students showed high to very high levels of behavioral, emotional, and cognitive engagement. Teachers reported moderate challenges, mainly time constraints, limited resources, and lack of training. Results also revealed a significant positive relationship between the extent of GBL use and students' engagement. However, teachers showed no significant differences in GBL strategy use when grouped according to profile variables. These findings suggest that greater GBL use is associated with higher student engagement in TLE, although the results do not establish direct causation. Based on these findings, the researchers developed a Game-Based Learning Teacher Toolkit to help teachers improve classroom strategies, address common implementation challenges, and promote more engaging TLE instruction.

Keywords: game-based learning, student engagement, teacher toolkit, Technology and Livelihood Education

INTRODUCTION

Improving student performance is a central goal of teaching and curriculum delivery. However, student performance should not be limited to test scores. It also includes mastery of essential competencies, the ability to apply learning to new situations, and the development of productive habits such as attention, persistence, collaboration, and reflective thinking. These outcomes can provide students with better opportunities for further education, meaningful employment, and active participation in their communities. At the classroom level, student performance may be improved through consistent participation, sufficient time on learning tasks, deeper processing of content, and timely feedback. Therefore, instructional approaches that strengthen daily participation and understanding deserve careful attention, particularly when they can be adapted across subjects, used under different information and communications technology (ICT) conditions, and sustained within teachers' available time and workload.

Student engagement is an important part of this concern because it reflects the degree to which students participate in and commit themselves to learning. It is commonly understood through behavioral, emotional, and cognitive dimensions. Behavioral engagement includes participation, effort, persistence, and observance of classroom expectations. Emotional engagement refers to students' interest, enjoyment, sense of belonging, and reactions to learning activities. Cognitive engagement involves the use of learning strategies, self-regulation,

and willingness to exert the mental effort needed to understand difficult concepts. These dimensions are related but distinct, suggesting that engagement should be studied as a multidimensional construct rather than as participation or motivation alone (Fredricks et al., 2004).

Engagement is important because it can connect classroom experiences with academic outcomes. In a study involving 554 students, Kassab et al. (2024) found that behavioral and cognitive engagement were positively related to academic achievement. These two dimensions also helped explain how students' perceptions of their learning environment were related to their academic performance. Although the study was conducted in health professions education, its findings provide recent evidence that students are more likely to perform well when they actively participate and invest cognitive effort in learning (Kassab et al., 2024). Thus, engagement is not merely an emotional response to enjoyable lessons; it is a practical condition that may support persistence, understanding, and achievement.

Teachers use various strategies to promote engagement, including clear learning goals, timely feedback, collaborative work, student choice, active learning, and meaningful classroom tasks. Game-based learning (GBL) and gamification have received growing attention because they can combine many of these features in one learning experience. Although the terms are sometimes used interchangeably, they have different meanings. GBL uses complete games or structured play to teach knowledge and skills, whereas gamification applies selected game elements, such as points, levels, badges, challenges, rewards, and leaderboards, to activities that are not originally games (Li et al., 2023). In actual classroom practice, teachers may combine these approaches through digital quizzes, team competitions, simulations, role-playing activities, rewards, immediate feedback, and reflection tasks. When these activities connect to clear learning objectives, they can encourage students to participate, work with others, respond to feedback, and keep working through difficult tasks.

International evidence generally supports the educational potential of gamified and game-based activities. Li et al. (2023) analyzed 41 studies with 49 independent samples and more than 5,071 participants. Their meta-analysis found a significant overall effect of gamification on learning outcomes. However, its effectiveness varied by educational level, subject area, design principles, intervention duration, and learning environment. Similarly, Zeng et al. (2024) reviewed 22 experimental studies conducted between 2008 and 2023 and found a moderately positive effect of gamification on academic performance. These findings indicate that game elements can support learning, but their success depends on how they are selected and integrated into instruction rather than on their presence alone (Li et al., 2023; Zeng et al., 2024).

A systematic review of 90 gamification interventions in primary and secondary education also showed that gamification has supported participation, motivation, self-regulation, and school engagement. However, many of the reviewed studies measured only one or two parts of engagement. The authors consequently recommended a broader assessment that considers the different ways students behave, feel, and think during learning (Ramírez Ruiz et al., 2024). This limitation matters because increased participation in a game does not automatically mean students are emotionally connected to the lesson or cognitively processing its content. A well-designed GBL study should therefore examine behavioral, emotional, and cognitive engagement together.

Studies in the Philippines further support the use of game-based and gamified activities. Barba (2021) used Quipper, Kahoot!, and Quizizz with selected Grade 7 students who showed low engagement in answering self-learning modules. After the intervention, the students reported more favorable learning experiences and demonstrated better participation, module completion, attendance, and grades. The study also showed that connectivity affected how the intervention was scheduled and implemented (Barba, 2021). Similarly, Biona et al. (2024) implemented the Games-Based Approaches to Motivate Engagement intervention among 43 Grade 9 students. Engagement increased significantly from the preintervention assessment to the postintervention assessment, while interviews showed improvements in participation, motivation, enjoyment, retention, and collaboration (Biona et al., 2024).

Local evidence also suggests that GBL may support subject-specific proficiency. Payot et al. (2025) compared game-based and conventional instruction among 61 Grade 8 students studying triangle congruence. The group that played the adapted hopscotch game scored significantly higher on the posttest than the comparison group,

suggesting that a simple, non-digital game can support mathematics learning (Payot et al., 2025). These Philippine studies similarly show positive outcomes, but they differ in platforms, subjects, measures, and learning settings. Moreover, most examined a single intervention in one school or class. Their findings are useful but do not provide a division-level picture of how frequently teachers use different GBL strategies in their regular instruction.

The Department of Education has also recognized GBL's potential contribution to classroom teaching. Through Memorandum No. DM-CT-2023-113, the Bureau of Learning Delivery, in collaboration with Microsoft Philippines, conducted professional development cohorts on Minecraft: Education Edition. The program aimed to build teachers' confidence in using the platform and creating localized, game-based lesson plans aligned with DepEd learning competencies. The memorandum identified potential benefits such as engagement, active learning, problem-solving, critical thinking, collaboration, immediate feedback, real-world application, adaptability, and enjoyment. At the same time, it acknowledged concerns involving student access to accounts and the possibility that students might focus more on the game than on the intended learning outcomes (Department of Education [DepEd], 2023). These concerns emphasize that GBL implementation must consider instructional design, available technology, teacher preparation, and students' learning needs.

Despite the encouraging evidence, important gaps remain in the junior high school context of Tacloban City. First, few local studies have measured the extent to which teachers regularly use specific groups of GBL strategies, including digital quizzes, team-based games, simulations, challenges, rewards, feedback, and reflection. Second, researchers seldom examine multidimensional student engagement alongside detailed information about teachers' GBL practices. Local studies often focus on general participation, motivation, proficiency, or short-term outcomes from a single intervention. Third, evidence remains limited regarding possible differences in GBL use and student engagement across subject areas, such as Mathematics, Science, and Araling Panlipunan, and under varying ICT conditions. Without such evidence, it is difficult to determine which strategies are practical, accessible, and suitable for the conditions teachers and students experience in the division.

Therefore, this study aims to determine the extent of teachers' use of game-based learning strategies and its relationship with students' behavioral, emotional, and cognitive engagement in selected junior high schools in the Schools Division of Tacloban City. It also examines differences in relevant variables by subject area and ICT conditions. The findings will serve as the basis for developing a context-appropriate GBL Teacher Toolkit containing practical strategies that teachers can adapt to their subjects, available technology, and classroom needs. By translating local evidence into realistic classroom practices, the study may help teachers create more engaging learning experiences and provide a practical pathway through which stronger student engagement can support improved learning outcomes.

Research Questions

Specifically, the study seeks to answer the following questions:

1. What is the profile of the student respondents in terms of age and sex?
2. What is the profile of the teacher respondents in terms of age, sex, years of teaching experience, and frequency of using game-based learning (GBL) strategies?
3. What is the level of student engagement as perceived by the respondents in terms of behavioral, emotional, and cognitive engagement?
4. What GBL strategies are commonly used by TLE teachers to promote student engagement?
5. What challenges do TLE teachers encounter when integrating GBL strategies into their teaching?
6. Is there a significant relationship between the extent of use of GBL strategies and the level of student engagement?
7. Are there significant differences in the extent of GBL strategy use when teachers are grouped according to their profile?
8. What GBL teacher toolkit may be developed based on the study's findings?

METHODOLOGY

Research Design

The study employed a **quantitative descriptive-correlational research design** ***to examine the use of*** **Game-Based Learning (GBL) strategies** and student engagement in Technology and Livelihood Education (TLE) among Grade 8 learners and teachers in selected public junior high schools in the Schools Division of Tacloban City.

The **descriptive component** of the study determined the respondents' profiles, the extent of teachers' use of GBL strategies, the level of student engagement in terms of behavioral, emotional, and cognitive dimensions, and the challenges encountered by teachers in implementing GBL. The **correlational component** examined the relationship between the extent of GBL use and student engagement. The study also examined whether the extent of GBL use differed when teachers were grouped according to selected profile variables.

The study was **nonexperimental**, as the researchers did not manipulate or control the variables. Instead, GBL use and student engagement were examined as they naturally occurred in the participating school settings. For purposes of this study, **Game-Based Learning (GBL)** refers to the intentional use of **games or structured game-based activities as part of the teaching-learning process to achieve specified curricular learning objectives**. In GBL, the game itself serves as the context or mechanism through which learners acquire, practice, apply, or demonstrate knowledge and skills. The game-based activities may involve clearly defined goals, rules, challenges, learner interaction, feedback, and opportunities for decision-making and problem-solving that are directly connected to the intended TLE learning outcomes.

In this study, GBL was operationalized through teachers' reported use of the following **game-based instructional strategies**: (a) digital or computer-based educational games; (b) board, card, or other structured classroom games; (c) role-playing and game-based problem-solving activities; (d) game-based simulations in which learners work within defined rules, goals, challenges, and feedback mechanisms; (e) collaborative game-based activities; and (f) immediate feedback and reinforcement embedded within game-based activities. These strategies were included only when they were intentionally used to support or assess specific TLE learning objectives.

GBL was distinguished from gamification in this study. GBL involves the use of an actual game or structured game-based activity as the medium or context for learning, whereas gamification refers to the incorporation of selected game elements—such as points, badges, leaderboards, or rewards—into a nongame instructional activity. Accordingly, the questionnaire did not treat the mere use of points, rewards, badges, or competitive features as evidence of GBL unless these elements were embedded within an actual game-based learning activity. This distinction guided the development, validation, and interpretation of the GBL questionnaire items.

This operational definition was also used as the basis for determining whether reported classroom practices were considered GBL strategies.

The study involved **365 Grade 8 students and 27 TLE teachers** from selected public junior high schools in the Schools Division of Tacloban City.

For the student participants, the researchers determined the required sample size using **Slovin's formula with a 5% margin of error,** resulting in a sample of 365 Grade 8 students. The researchers employed **stratified random sampling,** with each participating school treated as a stratum. The number of student respondents selected from each school was determined proportionately based on the school's Grade 8 student population. After proportional allocation was established, eligible students within each school were selected through random sampling.

Students were included if they: **(a)** were officially enrolled as Grade 8 learners during School Year 2025–2026; **(b)** were receiving TLE instruction in the participating schools; **(c)** had written parental or guardian consent;

and **(d)** provided learner assent. Students who did not meet any of these requirements were excluded from the study.

The teacher participants consisted of **27 TLE teachers handling Grade 8 classes** in the participating schools. Because the number of eligible teachers was relatively small, the researchers used **complete enumeration**. Thus, all Grade 8 TLE teachers who met the inclusion requirements and voluntarily agreed to participate were invited to take part in the study.

The researchers used **researcher-developed questionnaires**, prepared separately for student and teacher respondents. The instruments were developed based on the study's research questions, the operational definition of GBL, relevant literature on game-based learning and student engagement, and the specific learning context of TLE.

To ensure construct alignment, the questionnaire items were organized according to the variables and dimensions measured in the study. Items measuring GBL were specifically written to reflect the operational definition of GBL rather than general technology use, gamification, or conventional classroom activities.

The student questionnaire consisted of three parts. **Part I** gathered the respondents' demographic information, specifically age and sex. **Part II** measured students' behavioral, emotional, and cognitive engagement during game-based learning activities. Behavioral engagement covered indicators such as participation, attention, effort, and persistence. Emotional engagement addressed learners' interest, enjoyment, sense of involvement, and positive or negative feelings toward learning activities. Cognitive engagement focused on mental effort, concentration, strategic thinking, problem-solving, and the use of learning strategies.**Part III** measured students' perceptions of teachers' use of GBL strategies. The items focused on the actual implementation of game-based activities, including digital and classroom games, structured game-based challenges, collaborative game-based activities, role-playing or game-based problem-solving, game-based simulations, feedback provided during games, and the alignment of game-based activities with lesson objectives. Items referring only to isolated game elements, such as points, badges, rewards, or leaderboards, were not considered evidence of GBL unless these elements formed part of an actual game-based learning activity.

The teacher questionnaire consisted of five parts. **Part I** gathered information on teachers' age, sex, years of teaching experience, and frequency of GBL use. **Part II** measured teachers' perceptions of students' behavioral, emotional, and cognitive engagement during GBL activities. **Part III** measured teachers' self-reported use of GBL strategies in TLE. The items corresponded directly to the operational definition of GBL and included digital games, structured classroom games, role-playing and game-based problem-solving, game-based simulations, collaborative game-based activities, feedback mechanisms within games, and alignment of game-based activities with TLE learning objectives. **Part IV** measured the challenges encountered in integrating GBL. These challenges were grouped into instructional, technological, learner-related, and professional concerns. **Part V** consisted of open-ended questions that allowed teachers to describe additional experiences, difficulties, and contextual factors associated with the use of GBL.

Closed-ended items were rated using a **five-point Likert-type scale**. For the extent of GBL use and challenges, the following interpretation was applied:

Mean Range	**Interpretation**
4.21–5.00	Very High
3.41–4.20	High
2.61–3.40	Moderate
1.81–2.60	Low
1.00–1.80	Very Low

For the student engagement scale, the same five-point response format was used, with the interpretation based

For the student engagement scale, the same five-point response format was used, with the interpretation based on the scale specified in the instrument. The direction of scoring was kept consistent across items, and negatively worded items, if any, were reverse-scored before computing the composite scores.

For each multi-item scale, the researchers computed the **mean score for the corresponding items**, with higher scores indicating greater reported GBL use, higher student engagement, or greater perceived challenges, as applicable. Composite scores were computed only after checking the completeness and appropriate coding of the responses.

Validation and Reliability of the Instruments

Before the main data collection, the researcher subjected the researcher-developed questionnaires to **expert validation** to establish their content validity. Five experts with relevant expertise in **research methodology, statistics, TLE, and the constructs measured in the study** evaluated the instruments. The validators assessed the questionnaire items in terms of **clarity, relevance, coherence, and alignment with the research objectives and operational definitions of the study variables**. The instruments obtained an overall **Content Validity Index (CVI) of 0.94,** indicating a high level of content validity. Particular attention was given to the GBL items to ensure that they represented **game-based learning rather than gamification or general instructional technology use**. Items that were unclear, repetitive, insufficiently aligned with GBL, or inappropriate for the target respondents were revised or removed based on the validators' recommendations.

Following expert validation, the revised questionnaires were **pilot-tested with 30 participants** who possessed characteristics similar to those of the target respondents but were not included in the main study. The pilot test was conducted to assess the clarity of the instructions and items and to establish the internal consistency of the scales.

Reliability analysis using **Cronbach's alpha** yielded coefficients ranging from **0.81 to 0.89 across the study scales**, indicating good to excellent internal consistency. These results supported the reliability of the instruments for the main data collection.

Data Gathering Procedure

Before data collection, the researchers secured the necessary administrative and ethical permissions to conduct the study. Formal permission was obtained from the **Schools Division Office of Tacloban City,** followed by coordination with the school heads and designated personnel of the participating schools.

The researchers explained the purpose of the study, participant selection procedures, data collection schedule, administration procedures, and responsibilities of the individuals involved in the research process.

After expert validation and pilot testing, the questionnaires were finalized for administration. Written informed consent was obtained from participating teachers. For students below 18 years of age, **written parental or guardian consent and learner assent** were obtained before participation.

Participants were informed about the purpose and procedures of the study, the voluntary nature of participation, the confidentiality of their responses, and their right to refuse participation or withdraw from the study without penalty or negative consequences.

Data collection was conducted from **December 10 to December 17, 2025**. The questionnaires were administered according to an agreed schedule to minimize disruption to regular classes. Standardized instructions were provided to all respondents to promote consistency in administration.

The researchers administered the questionnaires personally, with assistance from authorized school personnel when necessary. Completed questionnaires were collected immediately after administration and checked for completeness. Responses were then coded and entered into a data file for statistical analysis. The encoded data

were reviewed for missing responses, inconsistent entries, and possible encoding errors before statistical analysis.

To protect participants' privacy, the researchers did not use personally identifying information in the statistical data file. The collected information was treated confidentially and was used solely for the purposes of the study.

Data Analysis

The quantitative data were analyzed using **descriptive and inferential statistics. Frequencies and percentages** were used to summarize categorical profile variables, such as sex. Appropriate measures of central tendency and variability were used to summarize numerical profile variables, such as age and years of teaching experience. **Mean scores** were used to describe the extent of GBL strategy use, the behavioral, emotional, and cognitive dimensions of student engagement, and the challenges encountered by teachers in integrating GBL. To determine the relationship between the extent of GBL use and student engagement, the researchers used the **Pearson product-moment correlation coefficient (r)** when the assumptions for parametric correlation were satisfied.

The **independent-samples *t* test** was used to compare the mean extent of GBL use between two independent groups, while **one-way analysis of variance (ANOVA)** was used when comparisons involved three or more independent groups. When a significant overall difference was found through ANOVA, an appropriate **post hoc comparison** was conducted to determine which groups differed significantly.

Before conducting the inferential analyses, the researchers examined the relevant assumptions, including **normality, linearity, independence of observations, and homogeneity of variance,** as applicable. When the assumptions for parametric tests were not reasonably satisfied, appropriate **nonparametric alternatives** were used.

All hypothesis tests were evaluated at a **0.05 level of significance**. Statistical analyses were conducted using **IBM SPSS Statistics Version 27.0.**

The responses to the open-ended teacher questions were reviewed and organized according to recurring ideas concerning teachers' experiences and challenges in using GBL. Related responses were grouped into common themes and summarized descriptively. These responses were used **only to provide contextual support for the quantitative findings** and were not treated as an independent qualitative research component.

Ethical Considerations

The study followed accepted ethical principles for research involving human participants. Before data collection, the researcher obtained administrative permission to conduct the study from the Schools Division Office of Tacloban City and the heads of the participating schools. Participation was voluntary. Adult participants provided informed consent, while students under 18 participated only after written parental or guardian consent and learner assent were obtained. Participants were informed of the study purpose, procedures, expected duration, possible risks and benefits, confidentiality measures, and their right to refuse participation or withdraw without penalty. No names were recorded in the dataset, and identification codes were used where necessary. The report did not identify individual participants or schools. Research records were stored securely and were accessible only to authorized persons. Electronic data were protected using appropriate security measures, while printed materials were stored in a secure location. These procedures were intended to protect participants' privacy, confidentiality, autonomy, and welfare throughout the study.

RESULTS AND DISCUSSION

Profile of Respondent Groups

The study involved two respondent groups—Grade 8 students and their TLE teachers. A total of 365 students

and 27 teachers participated.

Table 1 *Demographic Profile of the Students*

Variables	Frequency	Percentage
Age		
12 years old	23	6.30
13 years old	198	54.2
14 years old	125	34.2
15 years old	15	4.10
16 years old	4	1.10
Sex		
Male	133	36.4
Female	232	63.6
Total		**100.0**

Profile of Students. Table 1 shows that most student respondents were 13 years old (54.2%) or 14 years old (34.2%), representing 88.4% of the sample and indicating that the participants were predominantly in early adolescence. This stage involves rapid cognitive, physical, and psychosocial development that can influence how learners think, make decisions, interact with others, and participate in learning activities (World Health Organization [WHO], n.d.). Similarly, de Carvalho et al. (2025) found that psychosocial development and the cognitive, affective, behavioral, and agentic dimensions of school engagement varied according to age, with engagement generally declining from early to late adolescence. These findings suggest that game-based learning (GBL) activities in Technology and Livelihood Education (TLE) should match learners' developmental level and incorporate meaningful challenges, social interaction, practical problem-solving, choices, and timely feedback. By sex, female students (63.6%) outnumbered male students (36.4%), suggesting that the overall engagement results may reflect female respondents' experiences more strongly; however, this demographic difference alone does not establish that one sex is more engaged than the other. Previous research found that female students demonstrated higher behavioral engagement than male students, while autonomy support was especially important to male students' engagement (Lietaert et al., 2015). Moreover, Tsai (2017) observed differences in students' gaming attitudes and mode preferences but found that both female and male learners participated actively when individual and multiplayer options were available. In the Philippine junior high school context, Quiblat and Ubayubay (2025) also found that teaching styles significantly influenced students' affective and cognitive engagement. Therefore, the proposed GBL toolkit should be developmentally appropriate, gender-sensitive, and inclusive by providing individual and group activities, cooperative and competitive options, clear instructions, learner choice, and equal opportunities for participation rather than relying on fixed assumptions about male and female preferences.

Table 2 *Demographic Profile of the Teachers*

Variables	Frequency	Percentage
Age		
21 – 30	5	18.5
31 – 40	16	59.3
41 – 50	6	22.2
Sex		
Male	5	18.5
Female	22	81.5
Years of Teaching Experience		
Less than 5 years	15	55.6
5 – 9 years	8	29.6
10 – 14 years	1	3.70
15 – 19 years	2	7.40

20 years – above	1	3.70
Total	**27**	**100.0**

Profile of Teachers. Table 2 shows that most teacher respondents were 31–40 years old (59.3%), female (81.5%), and relatively new to the profession, with 55.6% having less than 5 years of experience and another 29.6% having 5–9 years, meaning that 85.2% had taught for fewer than 10 years. The concentration of teachers within the 31–40 age group is comparable to the findings of Remo and Marcia (2025), who found that most teachers in their Philippine sample were 31–40 years old, female, and had fewer than 10 years of service. This age profile may indicate a workforce that has already developed practical classroom experience while continuing to strengthen its instructional competence; however, age alone should not be interpreted as evidence of readiness to adopt GBL. Research indicates that teachers' acceptance of educational technology depends more strongly on its perceived usefulness, ease of use, and compatibility with their teaching practices than on demographic characteristics alone (Scherer et al., 2019). The predominance of female teachers also aligns with Sebastian et al. (2022), who described elementary teaching in the Philippines as a female-dominated profession. Nevertheless, sex should not be used to assume particular instructional abilities or teaching styles because both female and male teachers can effectively implement collaborative, competitive, technology-based, and learner-centered strategies. More importantly, the large proportion of teachers with fewer than 10 years of experience highlights the need for structured professional support. The UNESCO and International Task Force on Teachers for Education 2030 (2024) emphasized that induction, mentoring, collaboration, and continuous professional development are essential in supporting beginning and early-career teachers. Therefore, the proposed GBL toolkit should be practical, user-friendly, and inclusive, with clear implementation procedures, sample TLE lesson integrations, ready-to-use activities, assessment guides, low-technology and digital alternatives, and mentoring or peer-support mechanisms, while also providing adaptable and advanced options for more experienced teachers.

Frequency of Use of Game-Based Learning Strategies

Table 3 *Frequency of Use of Game-Based Learning Strategies*

Strategy Type	**Examples**	***M***	**Interpretation**
Digital quiz games	Kahoot, Quizizz, Blooket	2.44	Rarely
Gamification elements	Points, badges, levels	2.67	Sometimes
Team-based games	Group quests, competitions	2.85	Sometimes
Simulations/role-play	Case scenarios, VR	2.78	Sometimes
Puzzles/problem-solving	Escape rooms, logic puzzles	2.63	Sometimes
Assessment games	Final boss challenges	2.63	Sometimes
Narrative/story games	Quest-based learning	3.15	Sometimes
Analog/physical games	Board games, bingo	2.59	Rarely
Competitive games	Tournaments, relays	2.52	Rarely
Creativity games	LEGO tasks, build missions	2.37	Rarely
Reflective games	Game journals, debriefs	2.93	Sometimes
Overall Mean		**2.69**	**Sometimes**
Note. 4.21-5.00=Always; 3.41-4.20=Often; 2.61-3.40=Sometimes; 1.81-2.60=Rarely; 1.00-1.80=Never			

Table 3 shows that TLE teachers used game-based learning (GBL) strategies at a moderate level overall (M = 2.69, "Sometimes"), indicating that GBL was already present in their instructional practices but had not yet become a consistent feature of classroom teaching. Narrative/story-based games (M = 3.15) and reflective games (M = 2.93) received the highest ratings, suggesting that teachers were more likely to use strategies that contextualized TLE concepts through stories and encouraged learners to examine their experiences and decisions. This finding is supported by Breien and Wasson (2021), whose review showed that well-designed narratives in digital games can strengthen engagement, motivation, and learning, although their effectiveness depends on how narratives are integrated with instructional content. Similarly, Alf et al. (2023) found that structured reflection during simulation games produced small to moderate improvements in students'

engagement, teamwork, understanding, and perceived learning. Team-based games (*M* = 2.85), simulations or role-play (*M* = 2.78), and gamification elements (*M* = 2.67) were used only sometimes, indicating that these potentially valuable approaches had not yet been fully developed. Qian and Clark (2016) reported that GBL can help develop collaboration, communication, problem-solving, critical thinking, and creativity, while Sailer and Homner (2020) found significant positive effects of gamification on cognitive, motivational, and behavioral learning outcomes, particularly when competition was combined with collaboration.

In contrast, creativity-based games (*M* = 2.37), digital quiz games (*M* = 2.44), and competitive games (*M* = 2.52) were rarely used, revealing limited integration of digital, creative, and competition-oriented activities. Although Table 3 does not directly identify the reasons for their limited use, possible explanations include inadequate access to devices and internet connectivity, insufficient training, limited preparation time, and teachers' unfamiliarity with available games. In a study of K–12 teachers, Hébert et al. (2021) found that access to technology, limited knowledge of digital games, inadequate technical support, and lack of professional development hindered the integration of digital GBL. Therefore, the proposed GBL teacher toolkit should provide curriculum-aligned, ready-to-use TLE activities; detailed implementation procedures; low-technology and digital alternatives; collaborative and competitive formats; creativity-based tasks; reflection and debriefing guides; and assessment tools to improve both the frequency and quality of GBL implementation.

Student Engagement as Perceived by Teachers and Students

Table 4 *Behavioral Engagement as Perceived by Teachers and Students*

Indicators	**Learners (n=365)**		**Teachers (n=27)**	
	M	**Interpretation**	***M***	**Interpretation**
1. Students participate actively when game activities are used.	3.73	High	4.93	Very High
2. Students remain on task during game-based activities.	3.94	High	4.56	Very High
3. Students volunteer answers more often during game rounds.	3.45	High	4.41	Very High
4. Students collaborate well with their group during team games.	3.87	High	4.33	Very High
5. Students exert effort to improve their performance each round.	3.94	High	4.56	Very High
6. Students willingly volunteer to participate in class games.	3.41	High	4.07	High
Mean	**3.72**	**High**	**4.48**	**Very High**

Note. M=mean. Scores were interpreted as follows: Legend:4.21-5.00=Very High; 3.41-4.20=High; 2.61-3.40=Moderate; 1.81-2.60=Low; 1.00-1.80=Very Low

Behavioral Engagement. Table 4 shows that students' behavioral engagement during game-based learning (GBL) activities was perceived as high by learners (*M* = 3.72) and very high by teachers (*M* = 4.48), indicating strong reported participation, attention, persistence, and effort in GBL-enhanced TLE classes. Behavioral engagement refers to students' observable involvement in learning, including participation, on-task behavior, effort, persistence, and compliance with classroom expectations (Fredricks et al., 2004). The high ratings for remaining on task and exerting effort to improve performance are consistent with Hamari et al. (2016), who found that appropriately challenging games increased engagement and that engagement was positively associated with learning. Likewise, Sailer and Homner's (2020) meta-analysis found significant positive effects of gamification on behavioral, motivational, and cognitive learning outcomes, although the effects depended on the design and context of implementation. Learners (*M* = 3.87) and teachers (*M* = 4.33) also rated collaboration during team games highly, suggesting that GBL activities provided opportunities for peer interaction, shared responsibility, and collective problem-solving. This finding is supported by Qian and Clark (2016), who concluded that well-designed GBL can promote collaboration, communication, problem-solving, critical thinking, and creativity.

However, teachers consistently rated themselves higher than learners, particularly for active participation and volunteering responses. This descriptive gap may indicate that teachers focused on visible classroom behaviors, whereas students assessed their engagement based on their personal effort and experiences; however, the difference should not be interpreted as statistically significant unless an appropriate inferential test supports it. Fredricks and McColskey (2012) explained that teacher reports and student self-reports capture different aspects of engagement and should therefore be used together to obtain a more complete understanding of learners' experiences. Thus, the findings provide strong descriptive evidence that students were behaviorally engaged during GBL activities, but they do not independently establish that GBL caused this engagement. The proposed GBL toolkit should therefore include collaborative tasks, appropriately challenging activities, immediate feedback, participation monitoring tools, student reflection forms, and regular feedback mechanisms to sustain on-task behavior while ensuring students' perspectives are considered when evaluating engagement.

Table 5 *Emotional Engagement as Perceived by Teachers and Students*

Indicators	**Learners (n=365)**		**Teachers (n=27)**	
	M	**Interpretation**	***M***	**Interpretation**
1. Students show increased interest when teacher uses games in class.	3.88	High	4.52	Very High
2. Students enjoy learning more during game-based activities.	3.94	High	4.41	Very High
3. Students appear more confident when participating in class games	3.47	High	4.44	Very High
4. Students look forward to lessons where educational games are used.	3.77	High	4.59	Very High
5. Students display a sense of belonging during class game activities.	3.68	High	4.74	Very High
6. Students show enthusiasm and positive emotions when games are used.	3.87	High	4.59	Very High
Mean	**3.72**	**High**	**4.48**	**Very High**
Note. M=mean. Scores were interpreted as follows: Legend:4.21-5.00=Very High; 3.41-4.20=High; 2.61-3.40=Moderate; 1.81-2.60=Low; 1.00-1.80=Very Low				

Emotional Engagement. Table 5 shows that students' emotional engagement during game-based learning (GBL) activities was perceived as high by learners ($M = 3.77$) and very high by teachers ($M = 4.55$), indicating generally positive feelings of enjoyment, interest, enthusiasm, confidence, and belonging during GBL-enhanced TLE lessons. Emotional engagement includes learners' affective responses to classroom activities, such as interest, enjoyment, belonging, and the absence of negative feelings toward learning (Fredricks et al., 2004). These favorable ratings align with Plass et al. (2015), who explained that effective GBL draws on affective, motivational, cognitive, and sociocultural processes to create meaningful learning experiences. Likewise, Zainuddin et al. (2020) found that gamified instruction often increased learners' motivation, enjoyment, participation, and social interaction, although its effectiveness depended on activity design and alignment with learning objectives. Teachers gave particularly high ratings to students' sense of belonging ($M = 4.74$) and their tendency to look forward to lessons involving games ($M = 4.59$), suggesting that teachers observed a positive, socially connected classroom atmosphere. This result is important because Korpershoek et al. (2020) found that school belonging was positively associated with students' motivational, social-emotional, behavioral, and academic outcomes.

However, learners reported comparatively lower confidence in participating ($M = 3.47$) and sense of belonging ($M = 3.68$), indicating that some students may still experience hesitation, discomfort, or limited inclusion during game-based activities. Because emotions and feelings of belonging are not always directly observable, teachers may interpret visible enthusiasm as stronger emotional engagement than students personally experience. Fredricks and McColskey (2012) explained that teacher reports and student self-reports capture different aspects of engagement and should be considered together; moreover, the observed difference between

the group means should not be treated as statistically significant without an appropriate inferential test. Thus, the findings provide strong descriptive evidence of positive emotional engagement during GBL activities but do not independently prove that GBL caused these responses. The proposed toolkit should therefore include psychologically safe, non-eliminating games; flexible individual and group participation; balanced teams; opportunities to choose roles; low-risk practice rounds; supportive feedback; and student reflection or emotional check-ins to ensure all learners experience enjoyment, confidence, and belonging.

Table 6 *Cognitive Engagement as Perceived by Teachers and Students*

Indicators	**Learners (n=365)**		**Teachers (n=27)**	
	M	**Interpretation**	***M***	**Interpretation**
1. Students think strategically when answering game questions.	3.99	High	4.52	Very High
2. Students apply prior learning to improve their performance in games.	3.90	High	4.33	Very High
3. Students reflect on their mistakes during games to do better next time.	4.02	High	4.33	Very High
4. Students set personal goals during game-based activities.	3.79	High	4.44	Very High
5. Students connect game tasks with real-life contexts or lesson concepts.	3.96	High	4.59	Very High
6. Students think carefully before responding during game rounds.	4.24	Very High	4.52	Very High
Mean	**3.98**	**High**	**4.46**	**Very High**
Note. M=mean. Scores were interpreted as follows: Legend:4.21-5.00=Very High; 3.41-4.20=High; 2.61-3.40=Moderate; 1.81-2.60=Low; 1.00-1.80=Very Low				

Cognitive Engagement. Table 6 shows that students' cognitive engagement during game-based learning (GBL) activities was perceived as high by learners ($M = 3.98$) and very high by teachers ($M = 4.46$), indicating that students reportedly invested considerable mental effort, reflection, and strategic thinking in GBL-enhanced TLE lessons. Cognitive engagement involves learners' willingness to exert mental effort, use learning strategies, regulate their thinking, and understand complex ideas rather than merely complete assigned tasks (Fredricks et al., 2004). Learners rated thinking carefully before responding as very high ($M = 4.24$), while the remaining indicators were rated high, suggesting deliberate reasoning and thoughtful decision-making. This pattern is consistent with Qian and Clark (2016), who found that well-designed GBL can support problem-solving, critical thinking, collaboration, and knowledge construction. Similarly, Sailer and Homner's (2020) meta-analysis found a significant positive effect of gamification on cognitive learning outcomes. The high to very high ratings for reflecting on mistakes, applying prior learning, and relating activities to real-life situations further suggest that students engaged in metacognitive thinking and knowledge transfer, which are particularly important in TLE because learners must apply concepts and procedures to authentic tasks. Plass et al. (2015) explained that games can promote meaningful learning when challenges, feedback, reflection, and instructional content are carefully integrated, while Alf et al. (2023) found that structured reflection during simulation games improved learners' understanding, engagement, teamwork, and perceived learning.

However, teachers provided consistently higher ratings, particularly for connecting lessons to real-life contexts ($M = 4.59$) and strategic thinking ($M = 4.52$). Because cognitive engagement involves internal mental processes that are not directly observable, teachers may infer deep thinking from students' visible performance, whereas learners assess the effort and strategies they personally use. Fredricks and McColskey (2012) emphasized that teacher reports and student self-reports provide different but complementary information about engagement; moreover, the difference between the reported means should not be described as statistically significant unless supported by an appropriate inferential test. Therefore, the findings provide strong descriptive evidence of cognitive engagement during GBL activities but do not independently establish that GBL caused higher-order thinking. The proposed toolkit should include authentic TLE scenarios, progressively challenging problems, decision-making tasks, explanations of answers, error-analysis activities,

metacognitive prompts, self-assessment forms, structured debriefing, and transfer tasks that require students to apply learning to new situations.

Game-Based Learning (GBL) Strategies Commonly Used by TLE Teachers

Table 7 *Game-Based Learning Strategies Commonly Used by the Teachers*

Indicators	**Learners (n=365)**	**Teachers (n=27)**	**Learners (n=365)**	**Teachers (n=27)**
	M	**Interpretation**	***M***	**Interpretation**
1. Teacher uses digital quiz platforms (e.g., Kahoot, Quizizz) during lessons.	3.33	Sometimes	3.48	Often
2. Teacher gives students quick-response or timed quiz games.	3.67	Often	3.67	Often
3. Teacher shows leaderboards or rankings after game sessions.	3.70	Often	3.96	Often
4. Teacher gives points for correct answers or completed tasks.	4.16	Often	4.70	Always
5. Teacher gives badges, stars, or tokens when students perform well.	3.44	Often	3.19	Sometimes
6. Teacher uses levels or progress indicators to show students learning progress.	3.55	Often	4.26	Always
7. Teacher organizes team-based competitions or group game challenges.	3.97	Often	4.11	Often
8. Teacher assigns group roles (leader, scorer, strategist) during games.	3.99	Often	4.56	Always
9. Teacher gives students puzzles or problem-solving games that require teamwork.	3.95	Often	3.67	Often
10. Teacher uses simulations (digital or not) to help students explore real-world scenarios.	3.50	Often	4.11	Often
11. My teacher uses role-playing or scenario activities to help students understand lessons.	3.93	Often	3.93	Often
12. Teacher gives mission-based tasks with goals, rules, and challenges.	3.91	Often	4.00	Often
13. Teacher gives students immediate feedback after game tasks or questions.	3.85	Often	4.52	Always
14. Teacher uses students' game results to help them review topics they need to improve on.	3.93	Often	3.56	Often
15. Teacher asks for students' suggestions to improve future game activities.	3.75	Often	4.00	Often
16. Teacher makes sure everyone participates in game activities.	4.18	Often	4.59	Always
17. Teacher adjusts game rules or tasks for students who need extra help.	4.15	Often	3.70	Often
18. Teacher makes sure games are safe, fair, and not embarrassing for anyone.	4.20	Often	4.59	Always
19. Teacher uses games regularly in different lessons or topics.	3.75	Often	4.00	Often
21. Teacher uses different kinds of games to keep students interested.	4.08	Often	4.19	Often
22. Teacher connects game activities to lesson objectives and competencies.	3.40	Sometimes	4.63	Always
23. Teacher uses games as a way to check	3.86	Often	3.48	Often

students' understanding (formative assessment).				
24. Teacher uses games not only for review but also to introduce new topics.	4.01	Often	4.81	Always
25.Teacher asks students to reflect on what they learned after game activities.	3.95	Often	5.00	Always
Overall Mean	**3.87**	**Often**	**4.11**	
Note. M=mean. Scores were interpreted as follows: Legend: 4.21-5.00=Always; 3.41-4.20=Often; 2.61-3.40=Sometimes; 1.81-2.60=Rarely; 1.00-1.80=Never.				

Table 7 shows that GBL strategies were perceived as frequently used in TLE classes, with both learners (M = 3.87) and teachers (M = 4.11) providing an "Often" rating; however, these ratings describe frequency rather than the instructional quality or effectiveness of implementation. Teachers reported always awarding points for correct answers (M = 4.70), ensuring student participation (M = 4.59), and providing immediate feedback (M = 4.52), indicating that teachers regularly incorporated basic motivational and feedback mechanisms into instruction. Zainuddin et al. (2020) found that points, rewards, feedback, leaderboards, and participation structures can enhance motivation, engagement, and social interaction, while Bai et al. (2020) reported a significant moderate effect of gamification on academic performance. Nevertheless, these elements are most beneficial when they are connected to meaningful tasks and learning competencies rather than used only as external rewards. Team-based competitions, role-playing, simulations, and mission-based activities were also common, suggesting that teachers used collaborative and experiential formats. This is consistent with Qian and Clark (2016), who found that well-designed GBL can support collaboration, communication, creativity, problem-solving, and critical thinking.

A notable descriptive gap occurred in connecting game activities to lesson objectives, which learners rated as sometimes practiced (M = 3.40) but teachers rated as always practiced (M = 4.63). This may indicate that teachers intended to align games with their objectives, but the instructional purpose was not always apparent to students. Learners also rated the use of digital quiz platforms as sometimes practiced (M = 3.33), whereas teachers rated it as often practiced (M = 3.48). Fredricks and McColskey (2012) explained that teacher and student reports capture different perspectives and should be interpreted together; moreover, these differences should not be described as statistically significant without an appropriate inferential test. Teachers' ratings for reflection activities (M = 5.00) and using games to introduce new topics (M = 4.81) further suggest that games were reportedly incorporated beyond review exercises. Plass et al. (2015) emphasized that effective GBL requires the careful alignment of game mechanics, instructional content, feedback, and learning objectives, while Alf et al. (2023) demonstrated the value of structured reflection and debriefing in strengthening learning from games. Therefore, the proposed toolkit should retain commonly used strategies while providing explicit learning objectives, curriculum alignment guides, ready-to-use activities, immediate feedback procedures, reflection prompts, structured debriefing, and assessment tools to introduce, practice, apply, and evaluate TLE competencies.

Challenges in Game-Based Learning (GBL) Integration Experienced by TLE Teachers

Table 8 *Challenges Encountered by the Teachers in Integrating Game-Based Learning Strategies*

Indicators	***M***	**Interpretation**
1. I find it challenging to look for GBL activities suitable for TLE competencies.	4.41	Strongly Agree
2. There are limited ready-made digital or non-digital GBL materials for TLE.	4.19	Agree
3. I struggle to design games that match the technical content of TLE.	4.11	Agree
4. Integrating games takes more time than traditional TLE teaching methods.	4.15	Agree
5. I face difficulty balancing hands-on TLE tasks with game-based activities.	3.74	Agree
6. Lack of ICT tools or devices makes it hard to implement digital GBL.	4.19	Agree
7. Poor internet connectivity limits the use of online game-based platforms.	4.00	Agree

8. Some learners are not familiar with digital game platforms used in class.	3.89	Agree
9. Some students become overly competitive, affecting classroom harmony.	3.67	Agree
10. Students lose focus on the lesson because they are too focused on the "game."	3.30	Undecided
11. Not all students actively participate in game-based activities.	3.33	Undecided
12. Students have diverse learning paces, making it hard to manage game rounds.	3.67	Agree
13. Limited classroom space affects the implementation of physical or team games.	3.63	Agree
14. I lack sufficient training on how to integrate GBL effectively in TLE.	3.59	Agree
15. I am unsure which GBL strategies are appropriate for specific TLE topics.	3.48	Agree
16. Preparing game materials requires additional time and effort.	3.78	Agree
17. I find it difficult to assess learning outcomes through game-based activities.	3.19	Agree
18. Admin or school policies sometimes restrict the use of certain GBL tools.	2.22	Disagree
19. The cost of materials for some GBL activities is a constraint.	2.44	Disagree
20. I feel uncertain about classroom management when implementing competitive games.	1.85	Disagree
Overall Mean	**3.54**	**Agree**
Note. M=mean. Scores were interpreted as follows: Legend: 4.21-5.00=Strongly agree; 3.41-4.20=Agree; 2.61-3.40=Undecided; 1.81-2.60=Disagree; 1.00-1.80=Strongly disagree.		

Table 8 shows that teachers generally agreed they encountered challenges in integrating game-based learning (GBL) into TLE instruction (M = 3.54), indicating instructional, technical, and resource-related constraints. The greatest challenge was finding suitable GBL activities aligned with TLE competencies (M = 4.41), followed by the limited availability of materials (M = 4.19) and difficulty designing games for technical content (M = 4.11). These findings suggest a shortage of curriculum-aligned and subject-specific resources that teachers can readily use in skills-based TLE lessons. This pattern aligns with Hébert et al. (2021), who found that teachers had difficulty locating games connected to curriculum objectives and accessing the resources needed for classroom implementation. Moreover, effective game-based pedagogy requires pedagogical, technological, collaborative, and creative competencies, which can make designing games for specialized content challenging without adequate training and support (Nousiainen et al., 2018). Time was also a substantial concern, as teachers agreed that GBL requires more instructional time than conventional approaches (M = 4.15) and that preparing game materials demands additional effort (M = 3.78). Similar barriers involving lesson preparation, classroom schedules, and technology access have been documented in K–12 GBL research (Dan et al., 2025; Hébert et al., 2021). Therefore, the findings support developing a practical, competency-aligned TLE GBL toolkit with ready-to-use activities, adaptable game templates, clear implementation guides, low-resource alternatives, and assessment materials to reduce teachers' preparation demands and promote more consistent classroom integration.

Relationship between Teachers' Use of Game-Based Learning Strategies and Students' Engagement

Table 9 *Correlation between Teachers' Use of Game-Based Learning Strategies and Students' Engagement*

Variables		**r**	**p**	**Decision**	**Interpretation**
Extent of Use of GBL Strategies	Behavioral Engagement	0.48	<.001	Reject H_0	Significant
	Emotional Engagement	0.56	<.001	Reject H_0	Significant
	Cognitive Engagement	0.55	<.001	Reject H_0	Significant
	Overall Students' Engagement	0.59	<.001	Reject H_0	Significant

Table 9 shows statistically significant positive relationships between the extent of teachers' use of game-based learning (GBL) strategies and students' behavioral (r = .427, p < .001), emotional (r = .556, p < .001), cognitive (r = .545, p < .001), and overall engagement (r = .592, p < .001). These moderate-to-strong

correlations indicate that more frequent use of GBL strategies is associated with greater student participation, interest, motivation, and mental investment in learning. The strongest relationship was observed for overall engagement, followed by emotional engagement, suggesting that GBL is particularly associated with students' enjoyment, enthusiasm, and positive involvement in TLE lessons. This pattern aligns with Sailer and Homner (2020), whose meta-analysis found positive effects of gamification on behavioral, motivational, and cognitive learning outcomes, and Zainuddin et al. (2020), who found that gamified instruction was commonly associated with increased engagement, motivation, and social interaction. The significant relationships across the three dimensions further support the view that engagement is a multidimensional construct involving how students behave, feel, and think during learning (Fredricks et al., 2004). Game elements such as meaningful challenges, immediate feedback, clear goals, collaboration, and opportunities for problem-solving may help explain these positive associations (Plass et al., 2015). However, because the findings are correlational, they do not establish that GBL directly causes higher engagement; other factors, including teacher competence, classroom climate, learner characteristics, and resource availability, may also contribute. Nevertheless, the results support the pedagogical relevance of developing a structured, competency-aligned, and context-responsive GBL teacher toolkit to promote more consistent and meaningful student engagement in TLE classrooms.

Differences in Teachers' Use of Game-Based Learning Strategies by Profile Characteristics

Table 10 *Differences in Teachers' Use of Game-Based Learning Strategies by Profile Characteristics*

Profile characteristic	Statistical test	Test statistic	*p*	Result
Age	One-way ANOVA	$F = 0.144$	.866	Not significant
Sex	Independent-samples *t* test	$t = -1.161$	.257	Not significant
Years of teaching experience	One-way ANOVA	$F = 1.896$	.147	Not significant
Note. Statistical significance was evaluated at $\alpha = .05$.				

Table 10 shows that the extent of teachers' use of game-based learning (GBL) strategies did not differ significantly according to age ($F = 0.144$, $p = .866$), sex ($t = -1.161$, $p = .257$), or years of teaching experience ($F = 1.896$, $p = .147$); therefore, the null hypotheses for the three profile variables were not rejected. These findings indicate that the observed use of GBL strategies was relatively similar across the demographic groups in this sample and suggest that age, sex, and teaching experience alone may not adequately explain teachers' adoption of GBL in TLE. Instead, more immediate professional and contextual factors—such as perceived usefulness, ease of implementation, self-efficacy, training, access to resources, and institutional support—may be more relevant. This interpretation is supported by Bourgonjon et al. (2013), who found that teachers' acceptance of GBL was shaped by a complex set of beliefs and perceptions, and by Scherer et al. (2019), whose meta-analysis identified perceived usefulness, perceived ease of use, attitudes, self-efficacy, and facilitating conditions as important factors in teachers' technology adoption. Moreover, professional development can improve teachers' attitudes, confidence, and intentions to use digital games (An, 2018), while limited technology, curriculum connections, and instructional support can restrict classroom implementation (Hébert et al., 2021). However, the absence of statistically significant differences should not be interpreted as proof that the groups are completely equivalent; examine effect sizes and confidence intervals, particularly when groups are small or unequal. Nevertheless, the results support inclusive capacity-building, sustained instructional assistance, and a practical GBL teacher toolkit that teachers across different ages, sexes, and experience levels can use.

CONCLUSION

The study concludes that game-based learning (GBL) is a promising instructional approach for promoting student engagement in Technology and Livelihood Education (TLE). Learners demonstrated high behavioral, emotional, and cognitive engagement, while teachers frequently used strategies involving rewards, feedback, collaboration, and interactive activities. The significant positive relationship between the extent of GBL use and student engagement indicates that greater, more strategic GBL use is associated with stronger learner participation, positive learning experiences, and deeper cognitive involvement. However, because the study employed a correlational design, this relationship should not be interpreted as direct evidence of causation.

Despite these favorable findings, insufficient resources, time constraints, inadequate training, and difficulty developing activities aligned with learning competencies still limit the full integration of GBL. Technology-based strategies and explicit alignment between games and curricular objectives were also not consistently maximized. Because the extent of GBL use did not significantly differ by teachers' demographic characteristics, implementation appears to depend more on institutional support, access to resources, and professional development than on age, sex, or teaching experience. These findings establish the need for a structured, competency-aligned, and context-responsive GBL teacher toolkit to strengthen instructional practices and sustain meaningful student engagement in TLE.

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