

Enhancing TLE Learning of 7th Grade Students Through the Assessment of Pedagogical Participation in Technology-Driven (PPT) Invented Educational Games

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Abstract

Gamification has increasingly been used as an instructional strategy to promote learner engagement and improve learning outcomes. However, its application in Technology and Livelihood Education (TLE), where learners are expected to acquire both conceptual knowledge and practical competencies, remains relatively limited. This study developed and evaluated a PowerPoint-based TLE Educational Learning Game and examined its effectiveness in improving Grade 7 learners' academic performance, retention of learning, and satisfaction. A quasi-experimental pretest-posttest non-equivalent groups design was employed among 80 Grade 7 learners from General Santos City National Secondary School of Arts and Trades. Two intact classes, 7-Cerna ($n = 40$) and 7-Gordo ($n = 40$), were assigned through a draw-lots procedure as the experimental and control groups, respectively. The experimental group received instruction through custom-made PowerPoint-based educational games, while the control group received conventional lecture-discussion instruction. A 25-item TLE pretest/posttest, retention test, expert evaluation questionnaire, and student satisfaction questionnaire were used. Data were analyzed using descriptive statistics, Effectiveness Index, and t-tests. The gamified group increased its mean score from 11.18 ($SD = 1.82$) in the pretest to 20.38 ($SD = 0.74$) in the posttest, yielding an Effectiveness Index of 81.50%. The control group increased from 11.18 ($SD = 2.21$) to 15.33 ($SD = 0.69$), with an Effectiveness Index of 30.02%. The developed game obtained an overall expert evaluation mean of 4.49 ($SD = 0.33$). Two weeks after the posttest, the experimental group obtained a retention mean of 19.00 ($SD = 0.91$). Student satisfaction was very high, with an overall mean of 4.66 ($SD = 0.62$). The findings indicate that the PowerPoint-based TLE Educational Learning Game was associated with substantial learning gains and favorable learner experiences. The results support the use of carefully designed gamified instructional materials as an additional strategy for teaching TLE.

Keywords: Gamification, Educational Game, Technology and Livelihood Education, PowerPoint, Learning Retention

1. INTRODUCTION

Technology and Livelihood Education (TLE) requires learners to acquire knowledge and develop competencies that can be applied in practical and real-world contexts. Because of this dual emphasis, instructional approaches need to provide opportunities for learners to understand concepts while actively participating in meaningful learning activities. The integration of technology into instruction has created opportunities for teachers to supplement conventional teaching approaches with interactive and learner-centered strategies.

Gamification refers to the incorporation of game elements, mechanics, and game-based thinking into non-game contexts to promote engagement, motivation, and learning (Deterding et al., 2011). Previous studies have documented the use of gamification in educational settings, particularly in improving learner engagement, motivation, and learning outcomes (Hamari et al., 2014; Dicheva et al., 2015; Majuri et al., 2018). Game-based learning may also provide learners with opportunities for repeated practice, immediate feedback, challenge, and active participation.

Despite the growing literature on gamification, its application in TLE remains less explored than its use in subjects such as mathematics, science, and English. This is particularly relevant because TLE involves practical competencies that may be difficult to demonstrate when learners have limited access to appropriate tools and equipment. The present study therefore explored a resource-efficient instructional approach through the development of a PowerPoint-based educational game.

The study was conducted at General Santos City National Secondary School of Arts and Trades, where the researcher identified challenges associated with TLE instruction, including language barriers and limitations in the availability of equipment for performance-related activities. The developed game incorporated interactive components such as quizzes, challenges, simulations, images, icons, animations, and feedback mechanisms. The game was designed around the learning competencies prescribed for Grade 7 TLE under the curriculum used in the study.

The instructional approach was theoretically informed by Constructivist Learning Theory, Cognitive Load Theory, and Self-Determination Theory. Constructivism emphasizes active and meaningful knowledge construction, while Cognitive Load Theory highlights the importance of organizing instructional materials in ways that support learners' processing of information. Self-Determination Theory, meanwhile, emphasizes competence, autonomy, and relatedness as important factors in motivation. These perspectives provide a theoretical basis for using interactive and structured game elements in classroom instruction.

The study specifically aimed to: (1) develop a PowerPoint-based TLE Educational Learning Game; (2) assess the quality of the game through expert evaluation; (3) determine the effectiveness of the intervention based on students' academic gains; (4) investigate learning retention after the intervention; and (5) evaluate students' satisfaction with the game and their learning experience.

The study was conducted during the fourth quarter of School Year 2024–2025, from February to March 2025. It focused on two Grade 7 intact classes at General Santos City National Secondary School of Arts and Trades. The experimental group received the gamified intervention, whereas the control group received conventional lecture-discussion instruction.

2. MATERIALS AND METHODS

2.1 Research Design

The study employed a **quasi-experimental pretest-posttest non-equivalent groups design**. Two intact Grade 7 classes participated in the study. Both groups were administered pretests and posttests, while the experimental group received the PowerPoint-based gamified intervention.

The design was represented as:

Group	Pretest	Intervention	Posttest
Experimental	O ₁	X	O ₂
Control	O ₃	—	O ₄

where X represented the gamified instructional intervention.

2.2 Participants

The participants were 80 Grade 7 learners from two intact classes at General Santos City National Secondary School of Arts and Trades, Tiongson Street, Lagao, General Santos City. Section 7-Cerna consisted of 40 learners and served as the experimental group, while Section 7-Gordo consisted of 40 learners and served as the control group. Assignment of the treatment was determined through a draw-lots procedure.

The study was conducted during the fourth quarter of School Year 2024–2025. The instructional content was based on the Grade 7 TLE competencies identified in the curriculum used by the study.

2.3 Research Instruments

Four principal instruments were used.

First, a 25-item TLE pretest/posttest was developed based on a table of specifications and the learning competencies identified in the curriculum. The test was evaluated by the research adviser and TLE experts for accuracy, suitability, and practicality.

Second, a retention test was administered to the experimental group following the intervention to determine the extent to which learning was maintained.

Third, an expert evaluation questionnaire was used to assess the developed educational game. The instrument examined six dimensions: content quality, instructional design, usability and accessibility, aesthetic appeal, pedagogical effectiveness, and overall evaluation.

Fourth, a Student Satisfaction and Learning Experience Questionnaire, adapted from previous instruments and modified for the TLE Educational Learning Game, was administered to the experimental group. It assessed satisfaction, content, usability, engagement, and learning impact using a five-point Likert scale.

2.4 Development of the Educational Game

The PowerPoint-based educational game was developed through an iterative process. The researcher first identified the instructional goals and learning content, then organized the material into game levels or modules. Interactive components such as quizzes, challenges, and simulations were incorporated to support participation and learning.

Visual elements, including images, icons, and animations, were integrated into the PowerPoint presentation. The prototype was subsequently reviewed and refined based on feedback from educators and other experts to improve its content accuracy, instructional quality, functionality, and user experience.

The expert evaluation covered six dimensions: content quality, instructional design, usability and accessibility, aesthetic appeal, pedagogical effectiveness, and overall evaluation.

2.5 Research Procedure

Prior to implementation, the researcher secured the necessary permissions and informed consent. Both groups completed the pretest before the intervention.

The experimental group, composed of 40 learners from Section 7-Cerna, received instruction using the custom-made PowerPoint educational games. The control group, composed of 40 learners from Section 7-Gordo, received conventional lecture-discussion instruction. Both groups were taught according to the learning competencies included in the study.

After the instructional period, both groups completed the posttest. A retention test was subsequently administered to the experimental group two weeks after the posttest to assess the persistence of learning.

2.6 Data Analysis

Descriptive statistics, including means and standard deviations, were used to summarize students' performance and satisfaction ratings. The Effectiveness Index (EI) was calculated to determine the extent of improvement from pretest to posttest.

The Effectiveness Index was calculated as:

$$EI = (\text{Sum of Posttest Scores} - \text{Sum of Pretest Scores}) / [(\text{Number of Students} \times \text{Full Test Score}) - \text{Sum of Pretest Scores}] \times 100$$

The study used an alpha level of **0.05** for statistical testing. Paired-samples t-tests were used to examine differences between relevant pretest and posttest scores and between posttest and retention scores. Satisfaction data were analyzed using weighted means and standard deviations.

Retention was assessed using the ratio of the average retention-test score to the average posttest score:

$$\text{Retention Percentage} = (\text{Average Retention-Test Score} / \text{Average Posttest Score}) \times 100$$

3. RESULTS

3.1 Expert Evaluation of the TLE Educational Learning Game

The developed PowerPoint-based TLE Educational Learning Game received favorable evaluations from the expert panel across all six dimensions.

Table 1

Expert Evaluation of the TLE Educational Learning Game

Dimension	M	SD
Content Quality	4.56	0.58
Instructional Design	4.44	0.58
Usability and Accessibility	4.44	0.19
Aesthetic Appeal	4.67	0.29
Pedagogical Effectiveness	4.33	0.38
Overall Evaluation	4.50	0.58
Overall Mean	4.49	0.33

The overall evaluation mean was **4.49 (SD = 0.33)**. Content Quality obtained a mean of 4.56, Instructional Design 4.44, Usability and Accessibility 4.44, Aesthetic Appeal 4.67, Pedagogical Effectiveness 4.33, and Overall Evaluation 4.50. These results indicate consistently favorable expert assessments of the instructional and technical characteristics of the game.

3.2 Academic Performance and Effectiveness Index

The experimental and control groups both obtained a pretest mean of **11.18**, indicating comparable starting scores in the reported results. The experimental group subsequently obtained a posttest mean of **20.38 (SD = 0.74)**, whereas the control group obtained a posttest mean of **15.33 (SD = 0.69)**.

Table 2

Comparison of Pretest and Posttest Means and Effectiveness Index

Group	Pretest M	Posttest M	Effectiveness Index
Experimental	11.18	20.38	81.50%
Control	11.18	15.33	30.02%

The experimental group demonstrated a larger increase in mean score than the control group. Its Effectiveness Index was **81.50%**, compared with **30.02%** for the control group. The study's interpretation scale classified the experimental-group EI as highly effective and the control-group EI as not effective.

The statistical analysis yielded a t-statistic of 0.000, indicating no significant difference between the pretest scores of the experimental and control groups. This result suggests that both groups started at the same level of knowledge prior to the intervention.

3.3 Retention of Learning

The experimental group completed a retention test two weeks after the posttest. The mean posttest score was **20.38 (SD = 0.74)**, while the retention-test mean was **19.00 (SD = 0.91)**.

Table 3

Posttest and Retention-Test Scores of the Experimental Group

Measure	Mean	SD
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Measure	Mean	SD
Posttest	20.38	0.74
Retention test	19.00	0.91
Difference	1.38	—

The difference between the posttest and retention-test means was 1.38 points. The retention score therefore remained close to the posttest score after the two-week interval.

The thesis reports a paired t-test of $t = 17.74$, $p = .000$, indicating a statistically significant difference between the posttest and retention-test scores. Although the retention score decreased from the posttest, the retention mean remained relatively high.

Using the retention formula specified in the methodology, the reported means correspond to approximately 93.23% retention ($19.00 \div 20.38 \times 100$).

3.4 Student Satisfaction and Learning Experience

The experimental group completed a satisfaction questionnaire covering five dimensions: Satisfaction, Content, Usability, Engagement, and Learning Impact.

Table 4

Student Satisfaction with the TLE Educational Learning Game

Dimension	M	SD
Satisfaction	4.68	0.61
Content	4.60	0.66
Usability	4.63	0.65
Engagement	4.65	0.64
Learning Impact	4.73	0.55
Overall	4.66	0.62

The overall satisfaction mean was **4.66 (SD = 0.62)**. Learning Impact obtained the highest dimension mean at **4.73**, followed by Satisfaction at 4.68, Engagement at 4.65, Usability at 4.63, and Content at 4.60. All dimensions were interpreted in the thesis as very satisfactory.

The findings indicate that learners reported favorable experiences with the game's accessibility, instructional content, interactive elements, engagement, and perceived contribution to learning.

4. DISCUSSION

The findings provide evidence that the PowerPoint-based TLE Educational Learning Game was associated with substantial improvement in the academic performance of the experimental group. The experimental group increased from a pretest mean of 11.18 to a posttest mean of 20.38, while the control group increased from 11.18 to 15.33. The resulting Effectiveness Index was 81.50% for the experimental group and 30.02% for the control group.

The comparable pretest means provide an important context for interpreting the subsequent difference in posttest performance. The thesis also reports no significant baseline difference between the groups. Within the limits of the quasi-experimental design, the larger gain observed in the gamified group is consistent with the possibility that the intervention contributed to improved learning outcomes.

The findings are consistent with the literature reviewed in the thesis. Hamari et al. (2014) identified motivational and engagement-related effects associated with gamification, while Dicheva et al. (2015) documented the growing use of gamification in education. The present study extends this body of work to a TLE context using a PowerPoint-based instructional game.

The expert evaluation further supports the instructional quality of the developed material. The overall mean of 4.49 indicates that experts viewed the game favorably across content, instructional design, usability, aesthetics, pedagogy, and overall quality. The highest dimension was Aesthetic Appeal ($M = 4.67$), while Pedagogical Effectiveness obtained a mean of 4.33.

These results are relevant because gamified instruction requires more than simply adding game mechanics to existing instructional materials. The game must remain aligned with learning objectives, provide understandable navigation and feedback, and support meaningful interaction with the content. The developed game incorporated quizzes, challenges, simulations, visual elements, and interactive features as part of its instructional design.

The retention findings provide additional evidence regarding learning after the intervention. The experimental group's retention mean of 19.00 was only 1.38 points lower than its posttest mean of 20.38. Although the reported paired t-test indicated a statistically significant difference, the relatively small numerical decline suggests that a substantial portion of the post-intervention performance was maintained after two weeks.

The finding is consistent with the theoretical perspective that repeated retrieval, immediate feedback, and active participation may support the consolidation of learning. The game's interactive format provided learners with opportunities to repeatedly encounter and retrieve concepts during the instructional activities.

Student satisfaction was also consistently high. The overall mean of 4.66 indicates favorable perceptions of the learning experience. Learning Impact obtained the highest mean (4.73), suggesting that students particularly perceived the game as contributing to their understanding of TLE concepts. Usability ($M = 4.63$) and Engagement ($M = 4.65$) were also highly rated.

The satisfaction results are consistent with Self-Determination Theory, which emphasizes the importance of competence, autonomy, and relatedness in learner motivation. The game's challenges, feedback, and interactive components may have contributed to learners' positive perceptions of the instructional experience. The findings also correspond with the Technology Acceptance Model in that learners reported favorable perceptions regarding the usability and usefulness of the digital learning tool.

Nevertheless, the results should be interpreted within the limitations of the study. The research involved only 80 learners from two intact classes in one school. The quasi-experimental design did not involve random assignment of individual learners, although treatment assignment between the two intact groups was conducted through a draw-lots procedure. The intervention was also limited to a specific TLE context and a particular period of instruction. Consequently, the findings should not be generalized automatically to other grade levels, schools, subjects, or learner populations.

Another limitation is that the retention assessment was conducted only with the experimental group. Thus, the study provides information about retention following the gamified intervention but does not provide a direct experimental-group-versus-control-group comparison of long-term retention.

5. CONCLUSION

The study developed and evaluated a PowerPoint-based Educational Learning Game for Grade 7 TLE learners. Expert evaluation produced an overall mean of 4.49 (SD = 0.33) across content quality, instructional design, usability and accessibility, aesthetic appeal, pedagogical effectiveness, and overall evaluation.

The experimental group demonstrated an increase in mean academic performance from 11.18 in the pretest to 20.38 in the posttest, corresponding to an Effectiveness Index of 81.50%. The control group increased from 11.18 to 15.33, with an Effectiveness Index of 30.02%.

After two weeks, the experimental group's retention-test mean was 19.00, compared with a posttest mean of 20.38. The findings indicate that learning performance remained relatively high following the intervention, although the reported t-test showed a statistically significant difference between the two assessments.

Students also reported favorable learning experiences, with an overall satisfaction mean of 4.66 (SD = 0.62) across satisfaction, content, usability, engagement, and learning impact.

Taken together, the results indicate that the PowerPoint-based TLE Educational Learning Game can serve as an additional instructional strategy for supporting academic learning and positive classroom experiences in TLE. Future studies may examine the intervention using larger and more diverse samples, longer retention intervals, additional TLE competencies, and randomized or more rigorous experimental designs.



Recommendations

Future development of the educational game may extend its content to other TLE strands and grade levels. Developers should continue to consider curriculum alignment, instructional design, usability, accessibility, aesthetics, and pedagogical effectiveness when refining the material. Further research should also include larger samples and comparison groups for retention testing to strengthen evidence regarding the long-term effects of gamified TLE instruction.

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