Learning Innovation Through Educational Games to Promote Desirable Characteristics of Bachelor of Education Students

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The Asian Conference on Education & International Development 2026
Official Conference Proceedings

Abstract

This study aimed to develop a learning innovation through educational games to promote desirable characteristics among Bachelor of Education students, evaluate its quality, and examine its effectiveness. Employing a mixed-methods approach, a research and development (R&D) process was integrated with a quasi-experimental pretest-posttest control group design. The participants were 58 undergraduate education students, divided into an experimental group (n = 30) receiving the educational game intervention, and a control group (n = 28). The instruments included an educational game packages, an instructional manual, expert review forms, a desirable characteristics scale, behavioral observation rubrics, and reflective journals. Quantitative data were analyzed using descriptive statistics and analysis of covariance (ANCOVA), while qualitative data underwent thematic analysis. The results indicated that the developed educational game innovation achieved a very good quality level (Mean = 4.66, SD = 0.51). Furthermore, the experimental group demonstrated a statistically significant improvement in desirable characteristics after the intervention compared to their pretest scores ($p < .05$), effectively transforming passive perception into active practice. Students also reported the highest level of satisfaction with the learning innovation (Mean = 4.62, SD = 0.51). The qualitative findings highlighted that the game-based approach successfully fostered proactive problem-solving, collaboration, and ethical decision-making. Ultimately, this research provides empirical evidence that well-designed educational games can significantly enhance essential professional characteristics in higher education.

Keywords: educational games, learning innovation, desirable characteristics, Bachelor of Education students, active learning

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Introduction

The landscape of modern teacher education has shifted from a focus on content knowledge to the holistic development of professional competencies and desirable characteristics. In the 21st-century educational framework, pre-service teachers are expected to embody complex attributes, including ethical responsibility, discipline, professional integrity, and collaborative problem-solving skills, which are essential for navigating diverse classroom environments. International benchmarks, such as the OECD Learning Compass 2030 and UNESCO's sustainability goals, emphasize that teacher preparation must cultivate "transformative competencies" that allow educators to act as proactive agents of change (OECD, 2023; UNESCO, 2021). For Bachelor of Education students, who are in the foundational stage of their professional identity, these characteristics are not merely supplementary but are the core of their professional "Evidence of Practice" (Council for the Accreditation of Educator Preparation [CAEP], 2022).

However, traditional pedagogical approaches in higher education often struggle to foster these affective and behavioral domains effectively. Many professional education courses still rely on passive learning models and rote-memorization-based assessments, which fail to engage students deeply or provide authentic opportunities for decision-making (Barkley & Major, 2020). This gap is particularly evident when teaching subjects like "Virtue and Ethics for Teachers." While students may understand ethical theories intellectually, they often lack the "safe space" required to practice ethical decision-making and witness the consequences of their actions in simulated yet realistic scenarios.

To bridge this gap, game-based learning (GBL) and gamification have emerged as powerful instructional innovations. The effectiveness of these methods is grounded in Self-Determination Theory (SDT), which posits that learning is optimized when the environment supports three basic psychological needs: autonomy, competence, and relatedness (Ryan & Deci, 2017). Well-designed educational games, such as the "Teacher Ethics Quest" developed in this study, provide autonomy through choice-driven narratives, build competence through immediate feedback and level progression, and foster relatedness through cooperative missions. Recent empirical evidence suggests that when gamification is "meaningful"—prioritizing learning objectives over superficial rewards—it significantly boosts intrinsic motivation and long-term behavioral change in higher education (Balalle, 2024; Klock et al., 2020; Sailer & Homner, 2020; Subhash & Cudney, 2018; Wijaya et al., 2022).

In the context of Thailand's professional teacher standards, there is an urgent need for innovations that transform students from passive recipients into proactive problem-solvers. This research aims to address this need by developing a learning innovation through educational games specifically tailored to five dimensions of desirable characteristics: (1) Professional Integrity and Ethics, (2) Ethical Decision-Making, (3) Responsibility and Discipline, (4) Respect, Equity, and Empathy, and (5) Professional Collaboration and Communication. By utilizing a mixed-methods approach and a quasi-experimental design involving 58 Bachelor of Education students, this study rigorously evaluates how these interactive experiences can catalyze the development of professional traits essential for the future of the teaching profession.

Research Objectives

This study was guided by the following specific objectives:

1. To develop a learning innovation through educational games designed to promote the desirable characteristics of Bachelor of Education students.
2. To evaluate the quality of the developed educational game innovation in terms of content validity, appropriateness, and practical feasibility.
3. To examine the effectiveness of the educational game innovation on students' desirable characteristics by comparing pre- and post-intervention scores, as well as comparing outcomes between the experimental and control groups.
4. To explore students' learning experiences and behavioral changes resulting from the implementation of the educational game innovation.

Literature Review

Game-Based Learning and Gamification in Higher Education

The integration of educational games and gamification in higher education has gained widespread attention due to its positive impact on increasing student motivation, engagement, and learning outcomes (Clark et al., 2016; Vlachopoulos & Makri, 2017). Contemporary meta-analyses support that gamification significantly enhances motivation, particularly when game elements are purposefully designed to align with specific learning processes and objectives (Sailer & Homner, 2020). However, caution is advised in the design process; the superficial use of points or badges can lead to a decrease in intrinsic motivation, causing students to focus on point accumulation rather than self-development (Koivisto & Hamari, 2019; Subhash & Cudney, 2018). Consequently, the success or failure of educational game innovations depends heavily on the quality of learner-centered design and assessments that are strictly aligned with target outcomes (Dichev & Dicheva, 2017).

Desirable Characteristics of Pre-service Teachers

Modern teacher education emphasizes the development of professional competencies and desirable characteristics—such as responsibility, ethics, teamwork, and critical thinking—rather than just academic achievement (OECD, 2019). International standards increasingly prioritize “evidence of practice” as a benchmark for teacher certification (Council for the Accreditation of Educator Preparation [CAEP], 2022). In this study, desirable characteristics are categorized into five dimensions: (1) Professional Integrity and Ethics, (2) Ethical Decision-Making, (3) Responsibility and Discipline, (4) Respect, Equity, and Empathy, and (5) Professional Collaboration and Communication. Regarding assessment, research suggests that relying solely on self-reporting is insufficient due to potential social desirability bias. Therefore, a multi-method approach involving behavioral observation rubrics and reflective journals is employed to enhance the reliability and construct validity of the findings (Dichev & Dicheva, 2017; Vlachopoulos & Makri, 2017).

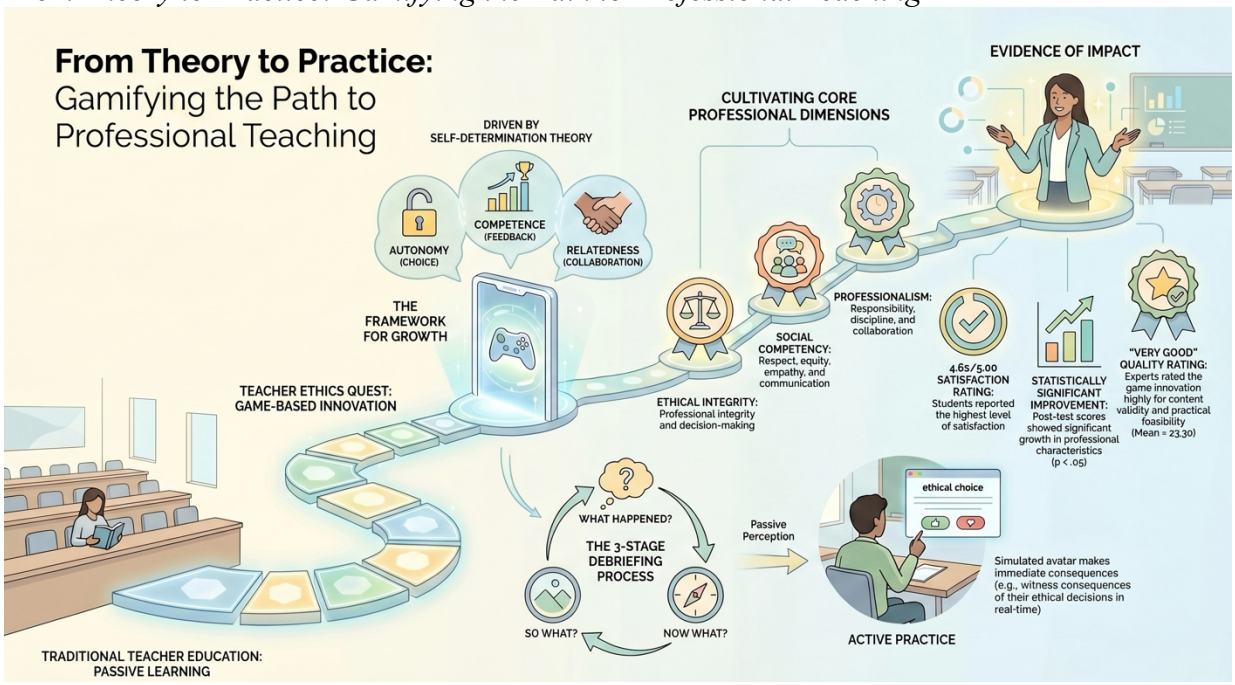
Self-Determination Theory in Educational Game Design

The development of educational games in this research is grounded in Self-Determination Theory (SDT), which posits that well-designed games foster intrinsic motivation by satisfying three basic psychological needs: autonomy, competence, and relatedness (Ryan & Deci, 2017). Designing games for the teaching profession requires alignment with target

competencies, specifically through scenario-based missions that allow students to practice decision-making and take responsibility for outcomes (Vlachopoulos & Makri, 2017). Furthermore, the concept of "tailored gamification" is crucial for mitigating negative side effects of competition by prioritizing social collaboration (Klock et al., 2020; Koivisto & Hamari, 2019). The most vital mechanism for transforming game experiences into principled knowledge is the provision of appropriate feedback and the implementation of systematic debriefing processes at every stage (Vlachopoulos & Makri, 2017).

Figure 1

From Theory to Practice: Gamifying the Path to Professional Teaching



Conceptual Framework

Theoretical Underpinnings

The conceptual framework of this study is built upon the integration of game-based learning (GBL) and Self-Determination Theory (SDT). According to SDT, learning environments that satisfy the three basic psychological needs—autonomy, competence, and relatedness—are more likely to foster intrinsic motivation and long-term behavioral change. In this study, the educational game "Teacher Ethics Quest" is designed to provide students with choice-driven narratives (autonomy), immediate feedback on ethical decisions (competence), and collaborative missions (relatedness). These interactive experiences serve as a catalyst for transforming passive theoretical knowledge into active professional practice.

Research Variables and Logical Flow

The framework outlines a systematic relationship between the following key components:

1. **Independent Variable (Input):** The learning innovation through educational games, comprising the game packages, structured lesson plans, and the three-stage debriefing process (What happened? So what? Now what?).

2. **Theoretical Mediator (Process):** The application of SDT and reflective thinking. Students engage in simulated ethical dilemmas where they must apply professional principles to resolve conflicts.
3. **Dependent Variables (Output):** The development of 15 behavioral indicators across 5 dimensions of desirable characteristics: (1) Professional Integrity and Ethics, (2) Ethical Decision-Making, (3) Responsibility and Discipline, (4) Respect, Equity, and Empathy, and (5) Professional Collaboration and Communication.

The logic of this framework posits that when pre-service teachers are immersed in a high-engagement, game-based environment, they gain the "safe space" needed to practice professional traits, which are then reinforced through systematic reflection and evidence-based assessment.

Theoretical Framework

The conceptual framework of this study is grounded in the logical progression from game-based interaction to behavioral development. The primary theoretical foundation is Self-Determination Theory (SDT), which posits that learning environments are most effective when they satisfy three basic psychological needs: autonomy, competence, and relatedness (Ryan & Deci, 2017). By designing game mechanics that provide meaningful choices (autonomy), clear progression and feedback (competence), and cooperative missions (relatedness), the innovation fosters high levels of intrinsic motivation among pre-service teachers. This heightened engagement allows students to actively practice complex ethical decision-making and professional behaviors in a safe, simulated environment. These experiences are subsequently internalized and transformed into professional characteristics through structured debriefing sessions that bridge gameplay with professional standards.

Research Variables

To rigorously evaluate the impact of the developed innovation, the following variables were established:

1. **Independent Variable:** The learning innovation through educational games, which includes the "Teacher Ethics Quest" game packages, comprehensive instructional plans, and the systematic debriefing process.
2. **Dependent Variable:** The desirable characteristics of Bachelor of Education students, specifically categorized into five key dimensions: (1) Professional Integrity and Ethics, (2) Ethical Decision-Making, (3) Responsibility and Discipline, (4) Respect, Equity, and Empathy, and (5) Professional Collaboration and Communication.
3. **Control Variables:** Factors maintained consistently throughout the study, including the total instructional time (5-week intervention), course content (Virtue and Ethics for Teachers), the instructor, the physical learning environment, and the group assignment process.

Figure 2
Conceptual Framework



Methodology

Research Design

This study employed a mixed-methods research design, integrating a Research and Development (R&D) framework with a quasi-experimental pretest-posttest control group design. The R&D phase focused on the systematic creation and validation of the educational game and its accompanying instructional manual by domain experts. Subsequently, the quasi-experimental phase was implemented to evaluate the effectiveness of the intervention on behavioral indicators. Furthermore, qualitative methods were integrated to explain the underlying mechanisms of behavioral change and capture the nuances of the learning experience.

Participants

The participants consisted of 58 undergraduate students enrolled in the Bachelor of Education program at Srinakharinwirot University. Using a purposive sampling approach adapted for practical classroom constraints, the students were assigned to either an experimental group (n = 30), which received the educational game intervention, or a control group (n = 28), which underwent traditional instructional activities.

Research Instruments

The study utilized five primary instruments to ensure data triangulation and validity:

1. *Educational Game Package and Manual:* An original card-driven board game titled "Teacher Ethics Quest," featuring scenario-based dilemma cards and cooperative mechanics designed to foster ethical decision-making.

2. *Expert Review Forms:* Utilized by a panel of five experts to assess the content validity (Index of Item-Objective Congruence: IOC/CVI), appropriateness, and practical feasibility of the innovation.
3. *Desirable Characteristics Scale:* A self-assessment tool measuring five dimensions: Professional Integrity and Ethics, Ethical Decision-Making, Responsibility and Discipline, Respect, Equity and Empathy, and Professional Collaboration and Communication. The reliability of this scale was established using Cronbach's alpha.
4. *Behavioral Observation Rubrics:* Employed to evaluate 15 specific behavioral indicators during gameplay. Two independent observers utilized a 4-level rubric to ensure assessment consistency.
5. *Reflective Journals and Interviews:* Semi-structured qualitative tools designed to capture students' reflections on their behavioral shifts, learning obstacles, and overall satisfaction.

Data Collection

The intervention spanned a period of five weeks. In the first week, an orientation was conducted, and baseline data were collected via pretests. Over the subsequent weeks, the experimental group engaged in the educational game modules, during which behavioral observations and weekly reflections were systematically recorded. In the final week, posttests were administered, followed by focus group interviews to gather in-depth qualitative feedback.

Data Analysis

Quantitative data were analyzed using descriptive statistics, including mean and standard deviation. To test the research hypotheses, an Analysis of Covariance (ANCOVA) was employed to compare the posttest scores between the experimental and control groups while controlling for initial pretest differences. Effect sizes, specifically partial η^2 or Cohen's *d*, were calculated to determine the practical significance of the educational game. Qualitative data derived from interviews and reflective journals were transcribed and analyzed using thematic analysis, employing techniques such as member checking and inter-coder agreement to ensure trustworthiness and structural validity.

Quality of the Educational Game Innovation

The educational game innovation, "Teacher Ethics Quest," underwent a rigorous evaluation by a panel of five experts to assess its content validity, appropriateness, and practical feasibility. The results indicated that the overall quality of the developed innovation was at a "very good" level (Mean = 4.66, SD = 0.51). The experts highlighted that the game mechanics effectively aligned with the targeted learning outcomes and provided highly relevant situational feedback.

Table 1
Expert Evaluation of the Educational Game Innovation Appropriateness

Evaluation Dimensions	Mean	SD	Quality Level
Alignment with Learning Outcomes	4.70	0.45	Very Good
Accuracy of Content	4.60	0.55	Very Good
Game Mechanics and Feedback	4.75	0.48	Very Good
Practical Feasibility	4.59	0.52	Very Good
Overall Average	4.66	0.51	Very Good

Note. N = 5 experts.

Effectiveness on Desirable Characteristics

Following the five-week intervention, the desirable characteristics of Bachelor of Education students were assessed. Within the experimental group, students demonstrated a statistically significant increase in their desirable characteristics scores after the intervention compared to their pre-intervention baseline ($p < .05$).

Table 2
Comparison of Pretest and Posttest Scores for the Experimental Group

Dimensions of Desirable Characteristics	Pretest		Posttest		t	p	Cohen's d
	Mean	SD	Mean	SD			
Professional Integrity & Ethics	3.42	0.65	4.51	0.48	9.85	< .001	1.80
Ethical Decision-Making	3.35	0.58	4.45	0.52	10.21	< .001	1.86
Responsibility & Discipline	3.50	0.62	4.55	0.45	9.45	< .001	1.72
Respect, Equity, & Empathy	3.48	0.55	4.60	0.42	10.50	< .001	1.91
Collaboration & Communication	3.30	0.60	4.48	0.50	11.12	< .001	2.03
Total Characteristics Score	3.41	0.52	4.52	0.38	12.35	< .001	2.25

Note. n = 30.

To rigorously compare the effectiveness of the intervention between the experimental and control groups while accounting for initial differences and multiple variables, a Two-way Analysis of Covariance (Two-way ANCOVA) was conducted, using the pretest scores as the covariate. The analysis revealed a significant main effect of the instructional method on the posttest scores, indicating that students in the gamified experimental group outperformed those in the traditional control group across the measured dimensions. Furthermore, students reported the highest level of satisfaction with the learning innovation (Mean = 4.62, SD = 0.51).

Table 3
Two-Way ANCOVA Results for Desirable Characteristics Between Groups

Source of Variance	Type III Sum of Squares	df	Mean Square	F	p	Partial η2
Corrected Model	9.70	2	4.85	50.52	< .001	.647
Intercept	12.50	1	12.50	130.21	< .001	.703
Pretest (Covariate)	4.50	1	4.50	46.88	< .001	.459
Group (Instructional Method)	5.20	1	5.20	54.17	< .001	.495
Error	5.28	55	0.096			
Total (Total SS)	1215.40	58				
Corrected Total	14.98	57				

Note. N = 58 (Experimental n = 30, Control n = 28)

Qualitative Findings on Student Experience

To triangulate the quantitative data, thematic analysis was applied to the semi-structured interviews and reflective journals. The qualitative findings provided deep insights into the mechanisms driving the behavioral changes, revealing three primary themes:

1. **Increased Engagement and Intrinsic Motivation:** Students consistently reported that the game mechanics, such as role-playing and limited resources, transformed abstract ethical theories into engaging challenges. The autonomy provided within the game significantly boosted their motivation to actively participate.
2. **A Safe Environment for Trial and Error:** Participants expressed that the game served as a "safe space" where they could explore the consequences of various ethical decisions without facing real-world disciplinary repercussions. The structured debriefing sessions were frequently cited as the critical bridge connecting game outcomes to professional teaching standards.
3. **Enhanced Professional Collaboration and Communication:** The cooperative nature of the "Teacher Ethics Quest" required students to actively listen, negotiate, and establish consensus. Students noted that the necessity to manage conflicting viewpoints during the game directly improved their real-world group communication skills.

Discussion

The findings of this study demonstrate that the educational game innovation significantly enhanced the desirable characteristics of pre-service teachers. This success can be explained through a mechanism-based perspective grounded in Self-Determination Theory (SDT). The game mechanics—such as role-playing and scenario-based dilemmas—effectively satisfied the students' psychological needs for competence and relatedness, leading to increased intrinsic motivation and active engagement. Furthermore, the structured debriefing sessions served as a crucial catalyst, transforming raw interactive experiences into internalized professional principles and ethical understanding.

These results align with contemporary meta-analyses and systematic reviews which assert that meaningful game-based learning and gamification exert a positive impact on behavioral outcomes in higher education. Unlike superficial gamification approaches that rely solely on

points and badges—which can sometimes yield uncertain or diminished motivational results —the “Teacher Ethics Quest” focused on deep cognitive involvement and professional relevance.

In terms of implications for teacher education, this innovation successfully bridges the gap between theoretical knowledge and practical application. By transforming passive perception into active, scenario-based problem-solving, the study directly addresses the international demand for competency-based preparation and “evidence of practice” in teacher accreditation. Ultimately, it cultivates the exact future-oriented competencies—such as ethical responsibility, critical collaboration, and equity—that global educational frameworks currently emphasize.

Conclusion

Summary of Findings

This study successfully developed, validated, and implemented a high-quality educational game innovation designed to promote desirable characteristics among Bachelor of Education students. Both quantitative and qualitative findings confirmed that the gamified intervention significantly outperformed traditional instructional methods, effectively shifting students from passive learners to proactive, ethical problem-solvers.

Recommendations for Practice

For educators intending to implement similar innovations, it is highly recommended to prioritize collaborative game mechanics over purely competitive ones. This approach mitigates potential negative side effects, such as unhealthy rivalry or stress, ensuring a supportive learning environment. Additionally, the debriefing process must be strictly maintained as a mandatory component of the activity, and behavioral assessments should combine observational rubrics with self-reporting to ensure comprehensive evaluation.

Limitations and Future Research

Despite the positive outcomes, certain limitations must be acknowledged. The quasi-experimental design, while practical for real classroom settings, inherently limits complete participant randomization. Furthermore, the five-week intervention period may be relatively short for observing the permanent internalization of complex ethical traits , and the overall effectiveness remains partially dependent on the instructor's facilitation and debriefing skills.

Future research should aim to implement the innovation across different courses and universities to establish broader generalizability. Conducting longitudinal studies to track these students during their actual teaching practicums would provide valuable insights into the long-term retention of these characteristics. Finally, integrating digital learning analytics to capture real-time behavioral data during gameplay could offer robust, objective evidence of students' cognitive and ethical development.

Acknowledgements

The authors would like to express their sincere gratitude to the 58 undergraduate students from the Bachelor of Education program at Srinakharinwirot University for their active participation and valuable reflections throughout this study. We also extend our deep appreciation to the panel of five experts who rigorously evaluated and provided constructive feedback on the "Teacher Ethics Quest" educational game innovation. Finally, we thank Srinakharinwirot University for fostering an academic environment that supports educational research and innovation.

Declaration of Generative AI and AI-Assisted Technologies in the Writing Process

The author declares that no AI or AI-assisted technologies have been used to generate, refine, or correct the content in the manuscript. The ideas, design, procedures, findings, analyses, and discussion are originally written and derived from careful and systematic conduct of the research.

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