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GAMIFICATION'S IMPACT ON LEARNING OUTCOMES AND LEADERSHIP IN POST-GRADUATE ENTREPRENEURSHIP: A MIXED METHODS STUDY

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Abstract

This mixed-method study explores the impact of gamification on learning outcomes and leadership skills among post-graduate entrepreneurship students, considering different learning styles. Through observations, interviews with nine participants, and four structured questionnaires, the research found that gamification enhances learning by making it more engaging, collaborative, and practical, fostering leadership skills. The quantitative analysis confirmed the reliability and validity of the constructs and showed significant direct effects of gamification on learner engagement and motivation. While the moderating effect of gamification on sensory indicators and self-conformity was not significant, its direct impact on self-conformity highlighted its role in increasing engagement. The study underscores the importance of self-concordance in improving academic performance, self-efficacy, and creativity, facilitated through gamification and personalized learning approaches. Despite limitations, the study provides valuable insights into gamification's effectiveness. Future research should explore its impact in varied educational settings, use larger samples, investigate specific gamification elements, employ objective measures, conduct longitudinal studies, and examine psychological and motivational factors mediating the relationship between gamification and self-concordance.

Keywords: Gamification, Learning Outcomes, Leadership Skills, Engagement, Self-Concordance, Post-Graduate Students.

INTRODUCTION

Education is a fundamental effort to develop human potential to its fullest extent. As countries experience economic growth and development, they increasingly depend on the development of human capital to remain competitive and improve the quality of life for their citizens (Wilson & Briscoe, 2004). This involves providing guidance and facilitation to individuals throughout their learning process. Indonesia, in particular, is projected to have a workforce of 65 million young adults by 2035 and is therefore focusing on education to ensure its citizens are prepared for an increasingly competitive economy (The Report: Indonesia, 2018). According to the United Nations Development Program (2018) report, Indonesia currently has a Human Development Index (HDI) of 0.689, ranking 113th out of 188 countries and placing it in the medium development category. This highlights the importance of education in driving the country's progress.

The learning process in education occurs through interactions between educators and students. To be effective, educators must have knowledge of various learning theories that are relevant to current situations and conditions. It is widely accepted that aligning individual learning styles with appropriate instructional interventions has a significant impact on student performance and the achievement of learning outcomes (Becker, 2005; Cassidy, 2004). Guney & Al, (2012) identify six common learning theories: behaviorism, cognitivism, constructivism, experiential, humanistic, and social-

situational. Additionally, Surur, (2021) mentions another important learning theory, connectivism, which was introduced by Edward L. Thorndike in 1890. Understanding and applying these theories is crucial for educators to optimize the learning experience for their students.

To address the need for new pedagogical approaches, Michel et al., (2009) conducted an empirical study comparing gamification to traditional teaching methods. The results of the study concluded that gamification led to better learning outcomes than traditional lecture-based approaches. Gamification involves taking existing elements, such as websites, enterprise applications, or online communities, and integrating game mechanics to motivate participation, engagement, and loyalty. It applies the data-driven techniques used by game designers to engage players to non-game experiences, thereby motivating actions that add value to education. As a pedagogy, gamification has the potential to improve expected student outcomes by increasing engagement and motivation in the learning process.

The literature review highlights the growing body of evidence supporting the effectiveness of gamification in entrepreneurship education. Antonaci et al., (2015) found that gamified collaborative courses familiarize students with basic concepts of entrepreneurship and stimulate entrepreneurial attitudes. Grivokostopoulou et al., (2019) demonstrated that gamified learning activities increase motivation and assist in formulating entrepreneurship skills and competencies. Navarro-Mateos et al., (2024) showed that gamification-based programs can improve emotional intelligence, personal initiative, entrepreneurial attitude, resilience, and self-efficacy. Bellotti et al., (2013) found that gamified short courses engage and promote interest in entrepreneurship. Patrício et al., (2018) demonstrated that gamification enhances the quality of ideas and leads to the development of innovation and entrepreneurship capabilities. Aries et al., (2020) found that gamification positively impacts students' entrepreneurial intentions, while Wangi et al., (2018) observed that gamification is effective, interesting, and makes students more technology-literate. Takemoto & Oe, (2021) noted that gamification stimulates learning and deepens understanding of theories and models. Kusdiyanti et al., (2022) found that gamification-based learning media increased student interest and activeness in entrepreneurship education. Lyons et al., (2023) demonstrated that gamification significantly influences overall engagement and fosters higher-order learning in entrepreneurial education.

The importance of knowing how to teach students effectively is underscored by the changing characteristics of different generations. Generally, there are several categories of generations, including Generation X (baby boomers), Generation Y, and Generation Z (millennials), each with distinct characteristics that need to be considered in learning approaches. This research aims to investigate how individuals react differently to gamified educational contexts, particularly in the learning process, and to identify which gamification mechanisms are most appropriate based on individual learning styles. By understanding how students learn and which gamification mechanisms are most suitable for different types of students, educators can optimize learning outcomes and help students develop their full potential. Ultimately, this research highlights the importance of gamification as a pedagogy that can enhance the quality of education and prepare students for success in an increasingly competitive world.

The novelty and originality of this research lie in its exploration of the relationship between gamification and learning theories in the context of higher education, particularly in post-graduate education. While previous studies have investigated the effectiveness of gamification in various sectors, including education, few have focused on its application in post-graduate settings or examined its connection to learning theories. This research aims to fill this gap by measuring the impact of gamified learning mechanisms on students' leadership skills, taking into account the unique learning styles of individuals as described by learning theories. Furthermore, the use of complex models in gamification research is still relatively uncommon, and by employing sophisticated analytical methods, this study contributes to the advancement of gamification research and provides insights into the intricacies of its application in educational settings. The combination of focusing on post-graduate education, examining the relationship between gamification and learning theories, and utilizing complex models sets this research apart from previous studies in the field, aiming to provide novel insights and contribute to the growing body of knowledge on gamification in higher education.

LITERATURE REVIEW

Behaviorism Theory

Behaviorism is a learning theory that emphasizes the role of observable behavior and the environment in the learning process. According to behaviorists, learning occurs through a process of conditioning, where individuals respond to external stimuli and their behavior is shaped by the consequences of their actions (Akinsanmi, 2008; Harzem, 2004). The key figures in the development of behaviorism include Ivan Pavlov, Edward Thorndike, John B. Watson, and B.F. Skinner. Pavlov is known for his work on classical conditioning, demonstrating how a neutral stimulus can be paired with an unconditioned stimulus to elicit a conditioned response (Dembo, 2001). Thorndike's research focused on the formation of connections between stimuli and responses, leading to the development of his laws of effect, exercise, and readiness (Rizo, 1991; Roby, 1992). Watson, considered the founder of behaviorism, believed that all behavior is the result of conditioning and that emotional responses can be learned through stimulus-response associations (Henderson, 1981; Samelson, 1981). Skinner, on the other hand, studied operant conditioning, which involves voluntary behaviors that are shaped by their consequences through mechanisms such as positive reinforcement, negative reinforcement, extinction, and punishment (Brophy, 1990; Dembo, 2001). Skinner also introduced the concept of behavioral shaping, where successive approximations of a desired behavior are rewarded until the target behavior is achieved.

Cognitivism Theory

Cognitivism is a learning theory that emerged as a response to the limitations of behaviorism, focusing on the mental processes involved in learning (Akinsanmi, 2008; Gagné, 1984). The theory emphasizes the role of schema, which are symbolic mental constructions that organize and process information in the mind. Learning occurs when there is a change in the learner's schemata, and the learner is an active participant in the learning process. The origins of cognitive psychology can be traced back to the ancient Greeks, Plato and Aristotle, but the cognitive revolution became evident in American psychology during the 1950s (Rizo, 1991). Jean Piaget, one of

the major contributors to the development of cognitivism, developed the major aspects of his theory as early as the 1920s, but his ideas did not impact North America until the 1960s after Miller and Bruner founded the Harvard Center for Cognitive Studies.

Key concepts in cognitive theory include the three-stage information processing model, which consists of the sensory register, short-term memory, and long-term memory (Brophy, 1990). The sensory register receives input from the senses and holds it for a brief period, while short-term memory processes and retains information for up to 20 seconds or more if rehearsed repeatedly. Long-term memory stores information from short-term memory for long-term use and has unlimited capacity. Other important concepts include meaningful effects, serial position effects, practice effects, transfer effects, interference effects, organization effects, levels of processing effects, state-dependent effects, mnemonic effects, schema effects, and advance organizers (Brophy, 1990; Roby, 1992). These concepts help explain how information is perceived, processed, stored, and retrieved in the mind, and how various factors can influence the effectiveness of learning. For example, meaningful information is easier to learn and remember, and if a learner links relatively meaningless information with prior schema, it will be easier to retain. Practice and rehearsal improve retention, especially when distributed over time, while prior learning can interfere with the learning of new material. The depth at which information is processed also affects its retention, with deeper levels of processing leading to better memory. Overall, cognitivism provides a comprehensive framework for understanding the complex mental processes involved in learning and offers insights into how educators can design instruction to facilitate the acquisition, retention, and application of knowledge.

Experiential Theory

Experiential learning theory, as developed by Kolb et al., (2014) and later adapted by Felder & Silverman, (1998) is a holistic approach that emphasizes the central role of experience in the learning process. Kolb's theory identifies four types of learners: converger, diverger, assimilator, and accommodator, while Felder and Silverman's model categorizes learning styles into four main elements: perception (sensing-intuiting), input (visual/verbal), processing (active/reflective), and organization (sequential/global). The Felder-Silverman learning style model has been widely used in technology-enhanced learning systems and is considered to be generalizable, as it represents elements from most other learning style models (Arnold et al., 2013; Limongelli et al., 2012). The model's elements include sensing students who prefer concrete learning materials, intuitive students who prefer abstract materials, visual students who prefer pictures and diagrams, verbal students who prefer listening or reading, active students who learn by doing and enjoy discussion, reflective students who prefer to learn alone, sequential students who learn in a step-by-step manner, and global students who absorb learning materials randomly and understand the whole picture once they have learned enough (Graf, 2007; Sharda, 2007). The researcher believes that experiential learning is compatible with gamification, which uses technology as a tool for the education process of the new generation.

Gamification in Education

Gamification in education refers to the application of game mechanics in a non-game context to increase learner engagement and motivation. In an educational context, gamification is seen as a valuable tool to positively engage students and regulate their behaviour, particularly in the face of the challenges brought by millennials who often

have short attention spans and lack skills in critical reflection necessary for deep learning (Elam et al., 2007; Howe & Strauss, 2002). Studies by Domínguez et al., (2013), Lee & Hammer, (2011), and many others have explored the impact of gamification across different disciplines and levels of education, from primary to higher education. The results show that gamification can enhance skill development in areas such as financial literacy and information literacy (Buckley et al., 2017; deCos & Liliia, 2015). However, the literature also recognises that gamification is not always effective for everyone and requires further research to understand how the impact of gamification varies at an individual level (Hanus & Fox, 2015; Nicholson, 2014).

Additional research points to the importance of considering students' personal traits and learning preferences in the design of gamified learning interventions (Hamari et al., 2014; Miller et al., 2016). Studies by Hwang & Choi, (2020) and Huang et al., (2019) highlight the importance of aligning educational games with students' learning styles to improve their motivation and learning achievement. Overall, while gamification has shown potential to improve learning performance and achievement, a tailored approach based on students' individual traits and learning theories is considered essential to maximise its effectiveness. This underscores the need for a more nuanced approach and more in-depth research to optimise gamification in education.

METHODOLOGY

Research Design

This study uses a mixed-method design (Figure 1) to explore the impact of gamification in improving student skills in higher education institutions based on learning theory (Sugiyono, 2021). The research design includes several stages, starting with a qualitative approach, followed by a quantitative approach, and finally concluding with a synthesis of findings from both approaches. In the first stage, qualitative research was conducted to collect rich and in-depth data from the sample population through observations and interviews (Fadillah et al., 2024). The data collected was then analysed to identify emerging themes and patterns, which would be used to develop more specific hypotheses and research questions for the quantitative stage.

The second stage involved quantitative research where data was collected through questionnaires designed based on the findings from the qualitative stage. Statistical analyses were then used to test the relationship between the identified variables and the effectiveness of gamification in leadership skills development. By combining contextual insights from the qualitative exploration and empirical evidence from the quantitative analysis, the researcher was able to build a more thorough understanding of the key factors influencing the effectiveness of gamification.

In the final stage, a synthesis and integration of findings from both approaches was conducted to draw comprehensive conclusions. This research also includes a longitudinal study where data is collected repeatedly from the same subjects over a semester to see the development and changes that occur.

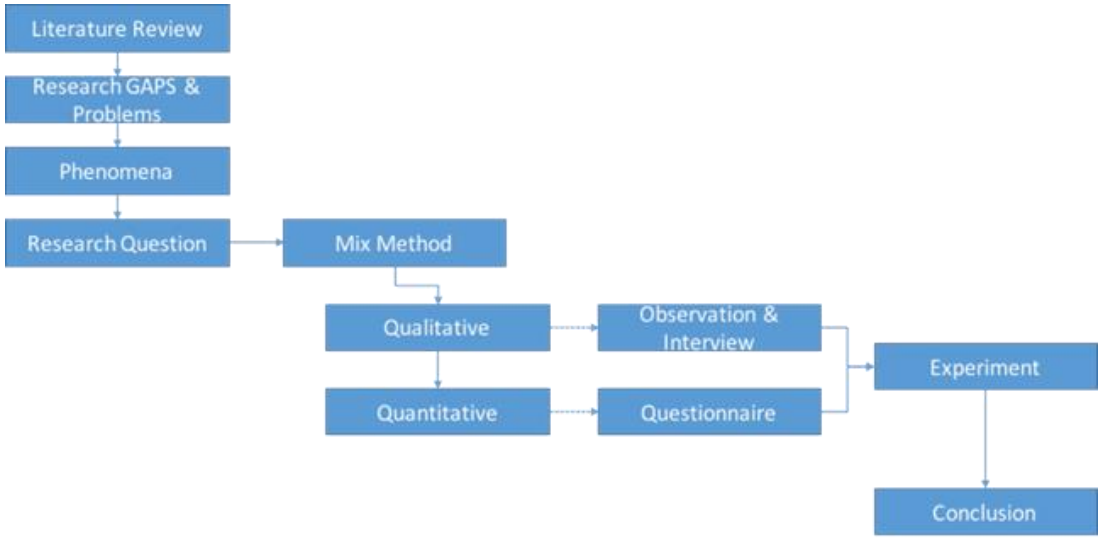

Figure 1: Research Design

The conclusion of this research is expected to significantly contribute to the development of gamification-based learning theory and practice as well as provide guidance for more effective implementation in the future. The time horizon of this study is longitudinal, where data is collected repeatedly from the same subject over a semester. This approach allows the researcher to observe developments and changes that occur over time, thus providing a deeper insight into the long-term effects of gamification in a learning context.

Data Collection

Qualitative

The qualitative method of data collection is a scientific approach used to collect non-numerical data through systematic observation and in-depth interviews. Observations in this study were conducted using the participatory method, where the researcher is directly involved in the respondents' activities, but still maintains a professional distance to ensure objective data. The focus of the observation is to identify students' readiness and willingness to learn using gamification. The data collected from these observations will be verified with data obtained from interviews and other quantitative methods.

Interviews were conducted to gain a deeper understanding of how and why postgraduate students in entrepreneurship learn better through gamification compared to traditional learning methods. The interviews were semi-structured, starting with general questions about current learning methods, knowledge of gamification, expectations of gamification, and their experience of learning using gamification. Through these interviews, the researcher was able to collect data rich in insights from respondents' personal experiences that could provide a clearer picture of the effectiveness of gamification in improving leadership skills.

The sample size for the interviews was determined based on recommendations from Adler & Adler, (2011) who suggested between six and twelve participants to gain a deep understanding of the structure, operations and experiences of each sample. In this study, the researcher set a minimum of four respondents from each class to be interviewed. To ensure the credibility of the interview process, the researcher prepared a well-structured interview framework. This semi-structured interview framework

includes three main parts: first, about the current learning method, which includes questions regarding the subject and the ongoing learning process; second, about gamification, which includes knowledge about gamification and expectations towards the application of gamification in learning; and third, about experiences with gamification, which includes how the learning process with gamification takes place and the differences compared to traditional learning methods.

All interviews were conducted face-to-face to allow the researcher to read and respond to the respondents' body language, which can improve the efficiency of dialogue and provide a more comprehensive understanding. These interviews were audio-recorded to ensure the accuracy of the conversations, as well as brief notes to complete the overall picture of the interviews.

Quantitative

Quantitative methods of data collection were used to understand the relationships between the various variables in this study. One of the most commonly used methods was a structured questionnaire, designed to explore how gamification elements influence learning outcomes and leadership development. The questionnaire used in this study was divided into four different sections to address different aspects of the learning and leadership development process. The first questionnaire aimed to determine each student's learning style based on the Felder and Silverman model. The second questionnaire was used to measure students' responses and reactions to the gamification process, using a questionnaire from the Kirkpatrick model. The third questionnaire was designed to measure student learning using the revised self-leadership assessment by Houghton & Neck, (2002). Finally, the fourth questionnaire was used to measure student behaviour change through a 360-degree feedback tool.

In this study, the dependent variable is experiential learning, which is measured using Kolb et al., (2014) Learning Style Inventory and Felder & Silverman, (1998) Learning Style Model. The experiential learning assessment includes dimensions such as Sensing-Intuiting, Visual/Verbal, Active/Reflective, and Sequential/Global. The moderating variable is gamification, which is hypothesised to enhance the learning process by making it more engaging and interactive. Indicators of gamification include achievements, avatars, badges, boss battles, collectibles, battles, content unlocking, gifting, leaderboards, levels, points, quests, social graphs, teams, and virtual goods (Buckley et al., 2017).

Leadership, as an independent variable, was measured using Roennfeldt, (2012) five levels of leadership, consisting of rights, relationships, results, reproduction, and respect. The assessment was conducted through a questionnaire based on Maxwell's leadership model.

This structured approach ensured comprehensive data collection, facilitating in-depth analyses of how each sensory in gamification influenced leadership learning outcomes. The integration of gamification into the learning environment aims to make the process more engaging and cater to various learning styles, thus increasing the overall effectiveness of leadership training. Visual and auditory elements are essential to make the material engaging and improve memory retention, while kinesthetic and tactile activities provide hands-on learning experiences that make abstract leadership principles more tangible. Group and individual activities within gamification are designed to encourage collaboration and personal reflection, ensuring the development of well-rounded leadership skills. Table 1. Shows the questionnaire

statements used to measure the impact of gamification on various variables related to leadership learning.

Table 1: Questionnaire Statements

Variable	Statements
Visual	- Visual materials in gamification improve my understanding of leadership concepts - I am more interested in learning leadership with visual elements in gamification - Visual elements in gamification help me remember leadership lessons better.
Auditory	- I understand leadership materials better with the use of audio in gamification - Narration and music in gamification make me more focused on the material - Audio discussions and instructions in gamification enhance my leadership communication skills
Kinesthetic	- Physical activities in gamification engage me more in learning leadership - Through gamification, I can practice leadership skills kinesthetically - Kinesthetic activities in gamification enhance my understanding of practical applications of leadership
Tactile	- Tactile interaction in gamification reinforces my learning experience about leadership - Using physical objects in gamification helps me learn leadership concepts - Tactile experiences in gamification add an additional dimension to my leadership learning
Group	- Team collaboration in gamification deepens my understanding of leadership dynamics - Through group activities in gamification, I learn the value of cooperation in leadership - Group discussions in gamification enrich my learning experience with various leadership perspectives
Individual	- Individual gamification activities allow me to reflect on my personal leadership approach - I feel more accountable for my leadership learning process when engaging in gamification alone - Setting my own learning pace in gamification enhances the effectiveness of my leadership learning

Data Analysis

Qualitative

Data analysis for qualitative methods involves a systematic approach to understanding non-numerical data, such as text or visual data, through detailed descriptions, themes and patterns. For this research, qualitative data was collected using observation and semi-structured interviews. Observations were conducted using participant observation techniques, which involve the researcher immersing themselves in the respondents' activities while maintaining a professional distance (Adler & Adler, 2011). Interviews were designed to gather in-depth insights into participants' experiences with gamification in learning and its impact on their leadership skills.

Data from observations and interviews were transcribed and analysed using thematic analysis. Thematic analysis involves identifying, analysing and reporting patterns (themes) in the data (Braun & Clarke, 2006). This process included familiarisation with the data, initial coding, searching for themes, reviewing themes, defining and naming themes, and producing a report. The aim was to develop a comprehensive understanding of how gamification influences learning and leadership development. Validity in qualitative research, often referred to as credibility, is enhanced through methods such as data saturation, triangulation, and member checking. Data saturation ensures that no new information or themes emerge from additional data collection,

thus ensuring that the data adequately represents the phenomenon under study (Saunders et al., 2008). Triangulation involves using multiple data sources or methods to cross-verify findings, thereby increasing the robustness and reliability of the research results (Welch & Patton, 1992).

For qualitative methods, validity (credibility) and reliability (dependability) are addressed through data saturation, triangulation, and member checking. Data saturation is achieved by continuing data collection until no new information or themes emerge, to ensure comprehensive coverage of the research topic (Saunders et al., 2008). Triangulation was performed by using multiple data sources (observations and interviews) to verify the findings, thereby increasing the robustness and trustworthiness of the results (Welch & Patton, 1992). Member checking involves participants reviewing the findings to ensure accuracy and authenticity, thereby strengthening the validity of the research.

Quantitative

Data analysis for quantitative methods involves applying statistical techniques to test hypotheses and examine relationships between variables. In this study, quantitative data was collected using four structured questionnaires: Felder and Silverman's learning style inventory to determine students' learning styles, Kirkpatrick's model to measure students' reactions to gamification, Houghton & Neck, (2002) leadership self-assessment to measure student learning, and a 360-degree feedback tool to assess changes in student behaviour.

These instruments allow for a comprehensive exploration of the impact of gamification on experiential learning and leadership development. The quantitative data collected will be analysed using various statistical techniques, including descriptive statistics, correlation analysis, regression modelling, and structural equation modelling.

Validity and reliability of the quantitative data are critical to the integrity of the research findings. Content validity will be established through expert judgement, with calculation of the content validity ratio (CVR) or content validity index (CVI). Construct validity will be evaluated through exploratory factor analysis (EFA) and confirmatory factor analysis (CFA), with KMO values ≥ 0.6 and significant Bartlett's test ($p < 0.05$) for EFA, as well as fit indices such as CFI ≥ 0.9, TLI ≥ 0.9, RMSEA ≤ 0.08, and SRMR ≤ 0.08 for CFA.

Reliability will be assessed through internal consistency testing using Cronbach's alpha, with values ≥ 0.7 considered acceptable and ≥ 0.8 indicating good reliability. In addition, stability reliability will be assessed through the test-retest method, and equivalence reliability will be tested by using two parallel forms of the instrument and calculating the correlation between scores.

Conducting these validity and reliability tests requires an adequate sample size, with a minimum of 100 participants recommended for EFA and at least 200 participants for CFA. It is important to ensure that the sample is representative of the target population and take into account any cultural or linguistic factors that may influence responses. By fulfilling these criteria, researchers can ensure that the instrument accurately measures the intended construct and provides reliable and meaningful results, allowing valid conclusions to be drawn and contributing to the overall quality and trustworthiness of the research findings.

RESULTS AND DISCUSSION

Qualitative

To understand and identify how and why entrepreneurship graduate students learn better through gamification than traditional learning, interviews were conducted with key figures from various roles within the organisation. The respondents shared their personal experiences with gamification in their learning, providing insights into how gamification enhanced their learning process and ultimately improved their leadership skills.

The nine interview participants were selected based on their job function, expertise and experience in the relevant field. Their involvement provided specialised knowledge and perspectives that were critical to a thorough assessment of the impact of gamification compared to traditional learning methods. By focusing on their daily roles and personal experiences, the interviews aimed to uncover the practical benefits of gamification in improving educational outcomes and leadership skills.

To understand and identify how and why entrepreneurship graduate students learn better through gamification compared to traditional learning methods, interviews were conducted. The interviews delved into the personal experiences of nine respondents who used gamification in their learning process, providing deeper insights into its impact on their leadership skills. Results from the interviews showed that conventional teaching methods often fail to sustain student engagement due to their standardised and often monotonous nature. One participant described traditional methods as "very conventional" and noted the challenge of maintaining concentration, saying, *"The challenge is to maintain concentration so that it is not boring"* (P1). Another participant echoed this sentiment, explaining that the traditional way of learning during the COVID-19 pandemic was "monotonous, lacking variety, and not very creative in delivering the material" (P2). In addition, P5 said, *"Usually, it's still the same with all campuses. Yes, come, then the lecturer talks, then explains,"* highlighting the lack of innovation in traditional teaching methods. Similarly, P6 mentioned, *"In the end it's less effective because the material is too heavy,"* indicating the limitations of traditional methods in engaging students.

In contrast, gamification was praised for making learning more fun and engaging. Participants highlighted that gamification introduces fun into the learning process, which helps maintain interest and motivation. P1 said, *"Because games are fun. So, you're using a fun method and it's also more fun."* P2 also said, *"By incorporating games, but also being able to learn, it's fun for us."* This fun gamification element helps in understanding and remembering the material better, as P2 further explained, *"It's more fun. And from your experience, with the method, do you feel like you understand the topic better? Oh, of course. For me, it was very helpful in understanding the material taught."* P4 added, *"But there are new experiences like playing games, but on the other hand, it's actually part of learning. It's just the way the material is delivered through games."* P8 also shared, *"Gamification has actually been implemented every year in face-to-face classes,"* emphasising its continuous integration into the educational environment.

Gamification also fosters a dynamic and collaborative learning environment, which is crucial for developing leadership skills. Participants emphasised the importance of interaction and teamwork facilitated by gamification. P1 stated, *"Because there are many parts where we can't work alone,"* and P3 added, *"The competitive nature of*

gamification fosters a sense of ambition and teamwork, thus enhancing the overall learning and understanding of leadership concepts." The interactive nature of gamification helps bridge the gap between theory and practice, making the learning experience more practical and applicable to real-world scenarios. P5 highlighted, *"Maybe it can, sir. Usually there is a video given, there is a gamification model introduced, but before the class starts, we are told to watch an introductory video, so it's not empty in class."* P7 supported this by stating, *"Gamification is just a tool to differentiate learning methods so that we don't get bored, there is an element of fun."*

The motivational aspect of gamification was also highlighted, with participants stating that gamification made them more active and engaged in class. P2 mentioned, *"Personally, I like the rewards... For me personally, it makes me more active in class."* P3 added, *"Gamification makes the learning experience more fun, so people become motivated."* This motivation is crucial to maintaining engagement and ensuring that students actively participate in the learning process. P4 supported this by stating, *"It should be able to contribute to training leadership skills. So, in the game, we are sometimes divided into teams. And there are always members. And it's not possible for everyone to just be a member. There will be someone who organises the team to make sure the team work is effective and efficient, fast. So, this person brings together the minds of the members in the team to make it effective."* P9 also mentioned, *"Gamification, especially in entrepreneurship, has to be very practical. Theoretical knowledge alone is not enough."*

In addition, the importance of feedback in gamification was underlined. The participants appreciated the personalised feedback they received, which helped them understand and improve their learning outcomes. P1 said, *"So sometimes that's what keeps our mindset the same. Because there is no feedback."* P8 added, *"Every week we go to class... give progress updates, then get feedback from the lecturer."* This continuous feedback is essential for personal and professional growth, allowing students to identify areas for improvement and track their progress. P9 commented, *"There is a reward system. But more interesting is the reflection part, like realising certain aspects about oneself."*

The participants also discussed the practical application of gamification in real-world scenarios. P4 stated, *"So decision-making skills are highly trained, and also communication."* P8 shared, *"For me personally, it's very impactful. Because in gamification, there are decision choices... So, we can also learn risk management directly there."* This practical aspect of gamification helps students apply theoretical knowledge in real-life situations, improving their decision-making and risk management skills.

Overall, the interview results show that integrating gamification into the curriculum significantly enhances the learning experience and leadership development of entrepreneurship graduate students. Traditional learning methods, although necessary for theoretical knowledge, are often considered less engaging compared to the interactive and fun nature of gamified learning. Gamification makes learning practical, improves information retention, and fosters a dynamic and collaborative environment, ultimately bridging the gap between theory and practice. Participants' personal experiences and insights clearly show that gamification positively influences leadership skills through elements of competition, teamwork, and decision-making. P6 emphasised, *"Ultimately, gamification turns the concept of education into a game."* P7

stated, *"Gamification is just a tool to differentiate learning methods to avoid boredom, there is an element of fun in it."* The results of this study suggest that a blended approach that combines theoretical learning and gamification would be highly beneficial for students.

Framework for Gamification in Enhancing Learning and Leadership Skills

The conceptual framework developed from the thematic analysis of the interviews explores the impact of gamification on different learning styles and its influence on self-match, self-efficacy, task/job performance, and creative performance, as depicted in Figure x. The framework identifies several different learning styles such as Visual, Auditory, Kinesthetic, Tactile, Group, and Individual. These learning styles represent the various sensory channels and social preferences that learners use to absorb and process information effectively (Davis et al., 2018; Oxford, 2017; Reid, 1987).

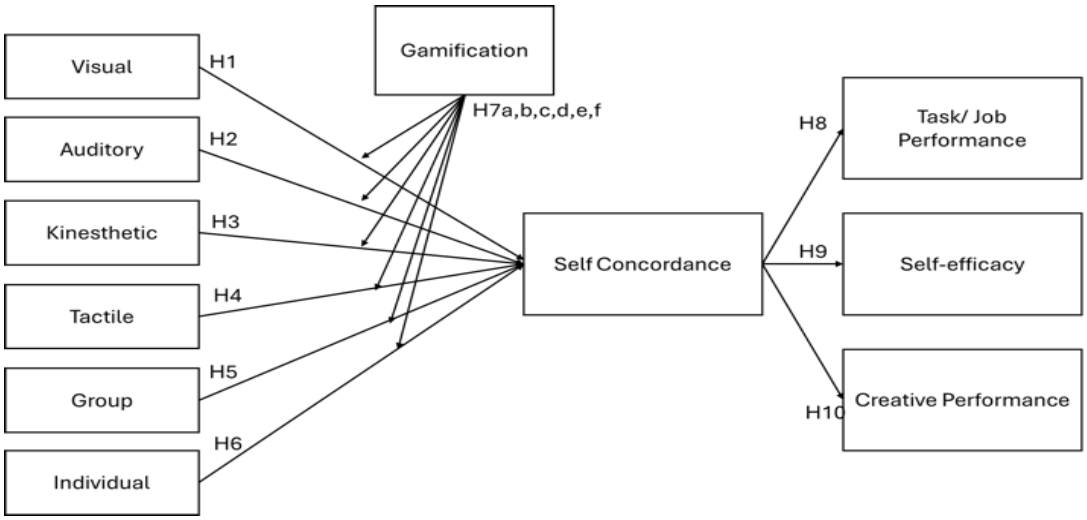

Figure 2: Framework for Gamification in Enhancing Learning and Leadership Skills

Gamification, as an innovative pedagogical approach, adapts to these different learning styles to make educational experiences more inclusive and effective. This method incorporates game design elements into non-game settings to increase engagement and motivation across a range of learning tasks (De Sousa Borges et al., 2014). This analysis highlights the importance of self-concordance in learning, which involves aligning educational tasks with learners' identities and values, increasing engagement and improving educational outcomes (Unsworth & Mason, 2016). This self-concordance is linked to increased self-efficacy, better task and job performance, and improved creative outcomes (Greguras & Diefendorff, 2010; Judge et al., 2017).

Quantitative

Descriptive Analysis

Descriptive analyses of the survey data used measures such as mean, standard deviation, and response frequency range to assess participants' responses, focusing on their perceptions across different sensory and interaction categories. All indicators showed favourable perceptions with mean values above 3.5, and most standard deviations below 1.25, indicating homogeneous responses with minimal variability. In particular, the visual and kinesthetic categories showed strong positive responses with averages above 4 and low variability, indicating consistent appreciation of these types

of stimuli. Auditory responses were also positive but showed slightly more variability, indicating diverse preferences among participants.

The tactile category in the survey analysis showed generally positive responses, with mean scores hovering around 4.0, indicating that participants responded well to tactile interactions. Group-orientated activities received the highest ratings with very low variability, indicating a strong preference for collaborative settings. In contrast, individual-orientated responses, although generally positive, showed higher variability, reflecting mixed feelings about solo activities. The gamification and self-concordance categories had slightly lower average scores (around 3.7 to 3.9) with higher variability, indicating different experiences with the role of gamification in learning and alignment of tasks with personal values.

Performance indicators, including job performance, self-efficacy, and creative performance, varied significantly more, with mean values ranging from 3.6 to 4.0 and higher standard deviations, indicating potential for improvement based on participants' varying levels of satisfaction and perceived effectiveness. This analysis highlights areas of strength in visual and group interaction, as well as opportunities to increase individual engagement and refine the implementation of gamification strategies.

Assessment of Measurement Model

The evaluation of the measurement model involved several assessments such as indicator reliability, multicollinearity, construct reliability, and validity to ensure the robustness of the survey analysis. Indicator reliability was generally high, with many indicators such as I.KIN3, I.TAC3, and I.AUD3 showing strong loadings above 0.8, while some such as ME.SC1 to ME.SC3 displayed lower loadings but still within the acceptable range of above 0.7. Multicollinearity is well controlled across indicators, with VIF values below the critical threshold of 5, indicating little concern regarding overlapping variables (Table 2).

Table 2: Outer Model Testing Result

Indicators	Outer loadings	VIF
D.CP1	0.762	1.258
D.CP2	0.778	1.306
D.CP3	0.744	1.208
D.JP1	0.76	1.314
D.JP2	0.83	1.521
D.JP3	0.81	1.468
D.SE1	0.78	1.299
D.SE2	0.752	1.162
D.SE3	0.729	1.282
I.AUD1	0.853	1.695
I.AUD2	0.798	1.604
I.AUD3	0.877	1.894
I.GRO1	0.874	2.096
I.GRO2	0.853	1.965
I.GRO3	0.878	1.867
I.IND1	0.804	1.601
I.IND2	0.871	2.014
I.IND3	0.87	1.799
I.KIN1	0.839	1.913
I.KIN2	0.896	2.227
I.KIN3	0.906	2.445

Indicators	Outer loadings	VIF
I.TAC1	0.861	2.071
I.TAC2	0.886	2.25
I.TAC3	0.913	2.484
I.VIS1	0.868	1.861
I.VIS2	0.831	1.813
I.VIS3	0.886	2.027
ME.SC1	0.735	1.181
ME.SC2	0.744	1.196
ME.SC3	0.747	1.195
MO.GAM1	0.801	1.485
MO.GAM2	0.742	1.232
MO.GAM3	0.776	1.32

Construct reliability results were very strong (Table 3), as evidenced by high composite reliability scores for constructs such as I.KIN and I.TAC, indicating strong internal consistency. In addition, these constructs, along with I.VIS and I.GRO, also demonstrated strong convergent validity with AVE values well above the minimum threshold of 0.5. However, constructs such as D.CP and D.SE, despite meeting the minimum threshold, show room for improvement in convergent validity with relatively lower AVE values.

Table 3: Construct Reliability and Validity Result

Construct	Composite reliability (rho_c)	Average variance extracted (AVE)
D.CP	0.805	0.58
D.JP	0.843	0.641
D.SE	0.798	0.569
I.AUD	0.881	0.711
I.GRO	0.902	0.754
I.IND	0.885	0.721
I.KIN	0.912	0.776
I.TAC	0.917	0.787
I.VIS	0.897	0.743
ME.SC	0.786	0.55
MO.GAM	0.817	0.598

Furthermore, discriminant validity (Table 4), assessed through the HTMT ratio, was largely confirmed as most values were below the conservative threshold of 0.85, indicating sufficient clarity between constructs. However, some values, such as between I.AUD and I.GRO, approached this threshold very closely, indicating the need for further investigation to ensure adequate separation between these highly related constructs.

Table 4: HTMT Result

Construct	D.CP	D.JP	D.SE	I.AUD	I.GRO	I.IND	I.KIN	I.TAC	I.VIS	ME.SC	MO.GAM
D.CP	0.761										
D.JP	0.604	0.801									
D.SE	0.602	0.652	0.754								
I.AUD	0.467	0.392	0.418	0.843							
I.GRO	0.553	0.438	0.412	0.588	0.868						
I.IND	0.439	0.521	0.501	0.512	0.508	0.849					
I.KIN	0.525	0.504	0.461	0.564	0.687	0.522	0.881				
I.TAC	0.49	0.487	0.48	0.592	0.572	0.669	0.618	0.887			
I.VIS	0.489	0.419	0.383	0.576	0.603	0.585	0.56	0.648	0.862		
ME.SC	0.552	0.636	0.61	0.499	0.498	0.554	0.507	0.507	0.424	0.742	
MO.GAM	0.645	0.601	0.585	0.538	0.502	0.55	0.532	0.534	0.477	0.559	0.773

Overall, the measurement model successfully demonstrated the reliability and validity of the constructs used in the survey, with some areas identified for potential refinement.

Inner Model Testing

The results of the internal model test (Table 5), which analyses the explanatory power of the model on the dependent variables D.CP, D.JP, D.SE, and ME.SC, show that the model has substantial explanatory power for these variables.

The ME.SC construct shows the highest R-square value of 0.475, which means that the model can explain 47.5% of the variation in mediation self-conformity.

The adjusted R-square value, which is more conservative, was 0.449, indicating a small but significant adjustment when considering the number of predictors. For D.JP, the R-square of 0.405 indicates that 40.5% of the variation in job performance can be explained by the model, with the adjusted R-square value very close at 0.403, confirming the stability of the model.

Table 5: Inner Model Testing

Variable	R-square	R-square adjusted
D.CP	0.304	0.302
D.JP	0.405	0.403
D.SE	0.372	0.37
ME.SC	0.475	0.449

D.SE has an R-square value of 0.372, meaning the model can explain 37.2% of the variation in self-efficacy, with the adjusted R-square value showing 0.37, indicating the reliability of this model in explaining such variation. For D.CP, an R-square of 0.304 and an adjusted R-square of 0.302 confirms that the model is sufficient to explain about 30.4% of the variation in creative performance.

The overall R-square and adjusted R-square values indicate that the model is effective in explaining variation in the dependent variables, especially strong in explaining variation in ME.SC and D.JP, and still provides a good explanation for D.SE and D.CP.

Hypothesis Testing

The analysed bootstrapping results (Table 6) provide a detailed picture of the path coefficients and statistical significance of the relationship between different sensory and mediated self-congruence (ME.SC), as well as the subsequent impact of ME.SC on various performance dimensions.

A bootstrapping method with 10,000 sub-samples was used to ensure robustness and accuracy in testing the significance of the model paths. The analysis showed that most of the direct paths from sensory (I.AUD, I.GRO, I.KIN, I.TAC, I.VIS) to ME.SC did not exhibit significant path coefficients, as all p values were above the conventional threshold of 0.05.

However, the direct path from individual indicators (I.IND) to ME.SC showed significance, with a path coefficient of 0.23 and a p value of 0.002, signalling a strong positive relationship.

Table 6: Bootstraping Result

Path	Path Coef	T statistics	P values
I.AUD -> ME.SC	0,121	1,6	0,11
I.GRO -> ME.SC	0,104	1,188	0,235
I.IND -> ME.SC	0,23	3,109	0,002
I.KIN -> ME.SC	0,102	1,074	0,283
I.TAC -> ME.SC	0,05	0,489	0,625
I.VIS -> ME.SC	-0,062	0,77	0,441
ME.SC -> D.CP	0,552	10,402	0
ME.SC -> D.JP	0,636	11,583	0
ME.SC -> D.SE	0,61	14,581	0
MO.GAM -> ME.SC	0,27	3,855	0
MO.GAM x I.IND -> ME.SC	0,001	0,013	0,99
MO.GAM x I.VIS -> ME.SC	-0,059	0,837	0,403
MO.GAM x I.TAC -> ME.SC	0,204	1,798	0,072
MO.GAM x I.GRO -> ME.SC	-0,067	0,686	0,492
MO.GAM x I.AUD -> ME.SC	0,058	0,931	0,352
MO.GAM x I.KIN -> ME.SC	0,022	0,207	0,836

Meanwhile, the relationships from ME.SC to dependent variables such as creative performance (D.CP), work performance (D.JP), and self-efficacy (D.SE) were all statistically significant, with a p value of 0.000 and a high path coefficient, indicating the significant influence of self-congruence on these performance dimensions. Regarding the moderating effect of gamification (MO.GAM), most interactions did not yield significant results. However, the direct path from MO.GAM to ME.SC was significant, with a path coefficient of 0.27 and a p-value of 0.000, indicating that gamification has a positive and significant direct effect in mediating self-congruence. Overall, the relationships proposed by the model mostly lacked statistical significance, particularly on the direct path from sensory to ME.SC and the moderating effect of gamification, however the significant path from ME.SC to performance outcomes and the direct effect of gamification on ME.SC stood out as key areas of influence. These insights suggest the need for further investigation into model structure, variable operationalisation, or contextual factors that might influence these relationships differently.

The study examines the effect of gamification on academic performance and self-learning level in a gamified online learning environment, and explores the relationship between learners' self-learning level and their learning experience in gamification. The results showed that sensory such as visual, auditory, kinesthetic, tactile, and group did not have a significant effect on self-congruence, although gamification significantly increased self-congruence, which in turn affected learners' academic performance, self-efficacy, and creative performance.

Research by Olsson et al., (2015) and Bagunaid et al., (2022) found that visualisations such as progress bars and digital badges improved learning comprehension and motivation but did not directly affect self-congruence. In addition, Moo et al., (2018) and Sulistyanto et al., (2019) showed that auditory is effective for knowledge retention but does not sufficiently influence conformity. In the kinesthetic context, W. Y. Hwang et al., (2020) and Rahmah & Siti Aishah, (2019) showed that kinesthetic learning is effective in collaborative and practical contexts but requires gamification to improve conformity.

For tactile, research by Harris et al., (2017) and Yang et al., (2022) indicate that tactile sensors improve motion perception and stability but do not sufficiently influence conformity without additional gamification elements. In addition, Warburton & Volet, (2013) and Boateng et al., (2022) found that group tasks enhanced self-directed learning but were not strong enough to improve conformity without gamification intervention. However, individualisation had a significant effect on conformity, supporting the finding that individualised learning, when combined with gamification strategies, can be effective in improving conformity. This is supported by the research of Mohd Saiboon et al., (2021) and Chen & Fan, (2023), which showed that self-directed learning strategies geared towards the development of individualised skills and knowledge can significantly improve performance and self-efficacy.

The effect of gamification on self-concordance highlights its important role in increasing learner engagement and motivation, which has a direct impact on improving self-concordance. The study found that gamification has a significant direct effect in mediating self-concordance, with strong path coefficients, suggesting that gamification elements effectively strengthen the link between learning activities and learners' personal goals and values. Research by Li et al., (2023) and Han, (2018) support these findings, suggesting that gamification can help students develop better self-learning strategies and reduce fear of difficult material, thereby increasing their interest and engagement in learning. Gamification, through elements such as points, badges and leaderboards, not only increases motivation and engagement but also helps learners feel more aligned with their learning goals, which in turn improves academic performance, self-efficacy and creativity. An additional study by Saleem et al., (2022) found that gamification elements are highly effective in increasing student engagement in online learning environments. This suggests that gamification can be a highly effective tool for improving learning outcomes and student motivation. However, the results also showed that the moderating effect of gamification on the relationship between sensory and self-congruence was not significant, which suggests that while gamification has a strong direct influence on self-congruence, the effect may not be the same across all sensory.

Furthermore, the relationships between self-congruence (ME.SC) with task/job performance (D.JP), self-efficacy (D.SE), and creative performance (D.CP) all showed statistical significance, highlighting the profound impact of self-concordance on performance outcomes. Allan et al., (2018) and Bartimote-Aufflick et al., (2016) confirm that when daily tasks align with one's intrinsic goals and values, this increases motivation and performance. In addition, Unsworth & Mason, (2016) emphasise that self-congruity facilitates an environment that is more conducive to creativity.

Thus, these findings suggest that gamification has a significant influence on self-congruence which in turn improves academic performance, self-efficacy, and creative performance. This confirms the importance of using gamification and individualised learning approaches in educational institutions and organisations to maximise self-concordance and improve overall performance.

CONCLUSION

This mixed-method research highlights the effectiveness of gamification in enhancing learning outcomes and leadership skills among post-graduate entrepreneurship students, taking into account different learning styles and theories.

The qualitative findings revealed that gamification makes learning more fun, engaging, and collaborative, fostering a dynamic learning environment crucial for developing leadership skills. The quantitative analysis supported these findings, demonstrating the reliability and validity of the constructs used in the survey, and showing substantial explanatory power for the dependent variables, especially for mediation self-conformity and job performance.

Although the moderating effect of gamification on the relationship between sensory indicators and mediation self-conformity was not significant, the direct effect of gamification on mediation self-conformity was significant, indicating its important role in increasing learner engagement and motivation.

Overall, the study emphasises the importance of self-concordance in improving academic performance, self-efficacy, and creative performance, which can be facilitated through gamification and individualised learning approaches, suggesting that educators and institutions should consider integrating gamification into their curricula to create a more engaging and effective learning environment.

LIMITATION AND FUTURE RESEARCH

Despite the valuable insights provided by this mixed-method study on the effectiveness of gamification in enhancing learning outcomes and leadership skills among post-graduate entrepreneurship students, it is important to acknowledge its limitations and identify areas for future research.

The study's focus on a specific context, relatively small sample size for qualitative interviews, lack of significant moderating effects of gamification on the relationship between sensory indicators and mediation self-conformity, reliance on self-reported measures, cross-sectional nature, and limited exploration of the underlying mechanisms through which gamification facilitates self-concordance are all limitations that should be addressed in future research.

Future studies could explore the impact of gamification in different educational settings, employ larger sample sizes, investigate the specific gamification elements most effective for each sensory modality, use more objective measures, conduct longitudinal studies, extend the investigation to team dynamics and collaboration, and delve deeper into the psychological processes and motivational factors mediating the relationship between gamification and self-concordance.

By addressing these limitations and exploring the suggested avenues for future research, researchers can continue to advance our understanding of how gamification can be leveraged to optimize learning experiences and develop essential leadership skills in various educational contexts.

Conflict of Interest

The authors declare no conflict of interest.

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