TECHEDU: Jurnal Pendidikan Teknologi

Volume 1, Number 2, (2026), p. 9-16
Available online at:
https://ojs.ucp.ac.id/index.php/pti/index

Gamification in Information Technology Education: Its Impact on Motivation and Learning Outcomes: A Systematic Literature Review

Andi Nurqamal Ady Putra[1]*, Andi Gagah Purnama[2], Ayu Widya Listari[3], Herianti[4], Andi Hasri Tri Ulandari[5]

[1,2,3,4,5] **Universitas Cahaya Prima**

***Email:** andinurqamal@gmail.com**

ARTICLE INFO
Article History
Received: 19-02-2026
Accepted: 26-02-2026

Keywords:
gamification, information technology education, learning motivation, learning outcomes, systematic literature review

ABSTRACT

Gamification has increasingly been implemented in technology-based learning environments to enhance students' motivation and engagement. In the context of Information Technology Education (ITE), this approach is considered particularly relevant because learning materials are often abstract and require complex problem-solving skills. Although numerous studies report improvements in motivation through gamification, findings regarding its impact on cognitive learning outcomes remain varied and have not yet been comprehensively synthesized, particularly within the context of ITE. This study aims to systematically analyze how gamification influences motivation and learning outcomes, as well as to identify factors that determine its effectiveness. The method employed is a systematic literature review of national and international articles published between 2015 and 2026, sourced from indexed databases using structured selection criteria. The findings indicate that gamification consistently improves students' learning motivation and engagement in Information Technology Education. However, its impact on cognitive learning outcomes varies depending on the quality of instructional design and the alignment between game elements and learning objectives.

INTRODUCTION

The rapid development of digital technology has stimulated the emergence of various innovations in instructional strategies, including gamification. Gamification refers to the use of game elements—such as points, levels, badges, leaderboards, and reward systems—in non-game contexts to enhance user engagement and motivation (Deterding et al., 2011; Werbach & Hunter, 2012). In educational settings, gamification is viewed as an approach capable of increasing active participation and fostering more interactive learning experiences (Hamari et al., 2014; Kapp, 2012). Numerous studies indicate that game elements can improve student engagement, persistence, and interest in learning materials (Buckley & Doyle, 2016; Su & Cheng, 2015).

In the context of Information Technology Education (ITE), learning often involves abstract and technical content, such as algorithms, programming, data structures, and databases. These subjects require logical, analytical, and sustained problem-solving skills. A

major challenge in ITE is maintaining students' motivation to remain engaged in cognitively demanding processes that can often be frustrating, particularly in programming courses (Robins et al., 2003; Lahtinen et al., 2005). Several studies report that the use of gamification in programming education can enhance students' motivation, self-confidence, and persistence in completing tasks (Domínguez et al., 2013; Subhash & Cudney, 2018; Ibáñez et al., 2014).

In Indonesia, the integration of gamification into technology-based learning has shown significant growth. Studies by Putra and Wibowo (2021) and Rahmawati (2022) indicate that incorporating game elements into informatics instruction can increase student participation and enthusiasm. Another study by Sari and Nugroho (2023) suggests that gamification in secondary-level coding instruction enhances learning engagement. However, its effectiveness in improving academic achievement remains inconsistent.

Theoretically, the effectiveness of gamification in education is often explained through Self-Determination Theory (SDT) proposed by Ryan and Deci (2000). This theory emphasizes that intrinsic motivation develops when three basic psychological needs—competence, autonomy, and relatedness—are fulfilled. Gamification elements such as level systems and badges can strengthen perceptions of competence, while offering choices in challenges can enhance learning autonomy (Sailer et al., 2017). Additionally, Flow Theory (Csikszentmihalyi, 1990) provides insight into how balancing challenge and skill level can create optimal learning experiences in game-based environments.

Although many studies report increased motivation through gamification (Hamari et al., 2014; Buckley & Doyle, 2016; Sailer & Homner, 2020), its impact on cognitive learning outcomes shows considerable variation (Clark et al., 2016; Hanus & Fox, 2015). Some research identifies significant improvements in academic performance when gamification is integrated with appropriate instructional design (Su & Cheng, 2015; Ibáñez et al., 2014), whereas other studies indicate that enhanced motivation does not necessarily translate into improved cognitive achievement (Hanus & Fox, 2015). This suggests that the success of gamification depends not only on the presence of game elements, but also on the alignment between gamification design and learning objectives.

Moreover, most research on gamification focuses on general education contexts or broad online learning environments (Kapp, 2012; Werbach & Hunter, 2012; Subhash & Cudney, 2018). Studies that specifically integrate motivational theory and instructional design perspectives within the context of Information Technology Education remain relatively limited. In Indonesia, existing research tends to be empirically narrow and has not been systematically synthesized to identify general patterns of gamification's impact on motivation and learning outcomes.

This gap highlights the need for a systematic literature review capable of integrating empirical and conceptual findings on gamification in ITE. Without comprehensive synthesis, gamification risks becoming merely a pedagogical trend lacking strong theoretical grounding. Therefore, this study aims to systematically analyze how gamification influences motivation and learning outcomes in Information Technology Education and to identify factors that determine its effectiveness. The novelty of this research lies in integrating Self-Determination Theory, Flow Theory, and instructional design perspectives to explain patterns of gamification impact specifically within the ITE context. Through this approach,

the study is expected to provide a more comprehensive conceptual foundation for the development of effective gamification-based learning models oriented toward improving the quality of information technology education.

METHOD

This study employs a Systematic Literature Review (SLR) approach to identify, evaluate, and systematically synthesize relevant research concerning the implementation of gamification in Information Technology Education (ITE) and its impact on learning motivation and learning outcomes. The SLR approach was selected because it enables a structured, transparent, and replicable review process, thereby producing a more comprehensive conceptual synthesis compared to traditional narrative reviews (Tranfield, Denyer, & Smart, 2003; Snyder, 2019). Moreover, this method provides a systematic framework to minimize selection bias and enhance the validity of synthesized findings (Kitchenham & Charters, 2007).

The literature search was conducted through several international and national academic databases, including Scopus, Web of Science, Google Scholar, as well as Indonesia's nationally indexed journal portals SINTA and Garuda. The selection of these databases aimed to ensure representation of both global studies and research conducted within the Indonesian context. The search strategy utilized combinations of keywords in English and Indonesian, such as "gamification in education," "gamification in programming," "Pendidikan Teknologi Informasi," "learning motivation," "learning outcomes," "Self-Determination Theory," and "instructional design." These keywords were combined using Boolean operators (AND, OR) to obtain comprehensive and relevant results, in accordance with literature selection transparency guidelines (Moher et al., 2009).

The inclusion criteria comprised peer-reviewed scholarly articles published between 2015 and 2026, considering this period represents an intensive phase of gamification development in digital education. Selected articles were required to discuss the implementation of gamification in technology-based learning contexts, particularly those related to informatics, programming, or information technology disciplines. Additionally, eligible studies needed to include empirical or conceptual analyses evaluating the impact of gamification on learning motivation, student engagement, or cognitive learning outcomes. Articles that were not peer-reviewed, unavailable in full text, or focused on gamification outside educational contexts were excluded from the selection process.

The selection procedure was conducted in stages, beginning with initial identification based on titles and abstracts, followed by topic relevance screening, and concluding with full-text review of articles meeting the preliminary criteria. This process adhered to the principles of transparency and accountability recommended in the PRISMA guidelines (Moher et al., 2009). Each selected article was critically appraised by considering research design, implementation context, and the indicators used to measure motivation and learning outcomes.

Data analysis was conducted using a thematic analysis approach structured around two principal dimensions: (1) the impact of gamification on learning motivation and (2) the impact of gamification on learning outcomes. To strengthen the analytical framework, the

synthesis of findings was linked to Self-Determination Theory (Ryan & Deci, 2000) to explain intrinsic and extrinsic motivational dynamics, as well as to instructional design theory to understand how the integration of game elements influences cognitive achievement. This approach enabled the identification of consistent patterns, inconsistencies, and moderating factors affecting the effectiveness of gamification in ITE.

This study does not conduct a quantitative meta-analysis; rather, it emphasizes conceptual integration and critical analysis of existing findings. Through this approach, the research aims to construct a comprehensive understanding of the role of gamification in enhancing motivation and learning outcomes in Information Technology Education, while also identifying research gaps for future scholarly development.

RESULT AND DISCUSSION

Based on the literature selection process, a number of articles meeting the inclusion criteria were identified and analyzed thematically. The synthesis of findings indicates that the impact of gamification in Information Technology Education (ITE) can be classified into two primary dimensions: (1) its influence on learning motivation and engagement, and (2) its influence on cognitive learning outcomes. Although these two dimensions are interrelated, they do not always exhibit a linear relationship.

Impact of Gamification on Motivation and Learning Engagement

a. Enhancement of Intrinsic and Extrinsic Motivation

The majority of studies consistently demonstrate that gamification enhances students' learning motivation. Elements such as points, badges, leaderboards, and level systems have been shown to increase active participation and persistence in completing tasks. Within the framework of Self-Determination Theory (Ryan & Deci, 2000), these elements contribute to fulfilling three basic psychological needs: Competence (level systems and badges reinforce perceptions of achievement), Autonomy (choices of challenges or missions increase perceived control over learning), and Relatedness (leaderboards and collaboration foster social interaction).

Several studies indicate that when these three needs are satisfied, intrinsic motivation increases significantly. In the context of ITE, this is particularly important because subjects such as programming often generate initial frustration. Gamification helps create a more enjoyable and less intimidating learning environment.

b. Flow and Engagement in Programming Learning

In addition to SDT, Flow Theory (Csikszentmihalyi, 1990) is relevant in explaining increased learning engagement. The literature shows that gamification is most effective when there is a balance between task difficulty and students' abilities. Progressive challenges help students remain within an optimal zone—neither too easy nor too difficult.

In programming education, structured levels and step-by-step mission systems support a more positive trial-and-error process. When students feel "challenged yet capable," engagement increases and the likelihood of disengagement decreases. However, the literature also notes that motivational gains are often characterized by an initial boost effect. If game elements are not continuously updated or meaningfully integrated with learning objectives, motivational effects may decline over time.

Impact of Gamification on Cognitive Learning Outcomes

a. Conditional Impact Patterns

In contrast to the relatively consistent findings on motivation, the impact of gamification on cognitive learning outcomes shows substantial variation. Some studies report significant improvements in academic achievement, particularly when gamification is integrated with strategies such as problem-based learning or project-based learning. In these cases, gamification functions as a motivational facilitator that supports deeper cognitive processes.

However, other studies indicate that increased motivation does not always lead to improved cognitive outcomes. This suggests that the relationship between motivation and academic achievement is not automatically linear.

b. The Role of Instructional Design

The literature synthesis identifies instructional design quality as a key determinant of gamification effectiveness. If game elements are merely cosmetic (e.g., awarding points without reflective learning components), motivational gains do not translate into improved conceptual understanding.

Conversely, when gamification is aligned with instructional objectives—such as through problem-solving missions or algorithm simulations—significant improvements in conceptual understanding and computational thinking skills are observed. These findings suggest that gamification is not an independent variable that automatically enhances learning outcomes; rather, it acts as a moderating variable that strengthens learning processes when systematically designed.

Relationship Between Motivation and Learning Outcomes

Cross-dimensional synthesis reveals that the relationship between motivation and learning outcomes in gamified contexts involves mediation and moderation effects. Increased motivation through game elements may enhance study time and persistence, reduce anxiety toward technical material, and encourage exploration and experimentation. However, without learning strategies that promote analysis and reflection, increased motivation does not automatically produce deeper understanding.

Thus, gamification functions as a motivational catalyst whose cognitive effectiveness depends heavily on its integration with instructional designs that demand higher-order information processing.

Conceptualization of Gamification Mechanisms in ITE

Based on the synthesized findings, a conceptual framework can be formulated to explain the mechanisms of gamification in ITE. Fundamentally, gamification operates as a trigger that addresses basic psychological needs as described in Self-Determination Theory (Ryan & Deci, 2000)—namely competence, autonomy, and relatedness. When game elements such as level systems, points, challenges, and social interaction are appropriately designed, these needs are fulfilled, resulting in enhanced motivation and engagement.

However, increased motivation does not automatically transform into improved learning outcomes. This transformation is strongly influenced by the quality of instructional design, which determines how game elements are embedded within learning activities.

In other words, instructional design serves as the key variable determining whether motivation generated through gamification develops into meaningful academic achievement. In the context of ITE, gamification effectiveness depends on the extent to which challenges are grounded in computational logic and authentic problem-solving. Level systems should not merely represent game progression but also reflect progressive conceptual mastery. Moreover, each game-based mission or activity should include reflection mechanisms and feedback processes that encourage students to analyze their problem-solving strategies. Without these components, gamification risks increasing enjoyment and participation without strengthening cognitive structures or deep conceptual understanding.

Implications for ITE Learning Design

These findings carry significant implications for the development of gamified learning models in ITE. Gamification-based instructional models must explicitly integrate motivational theory into the design of game elements, ensuring that each element serves a clear pedagogical function. Furthermore, maintaining a balance between challenge and student capability—as emphasized in Flow Theory (Csikszentmihalyi, 1990)—is essential to sustaining optimal learning conditions.

Game elements must also be directly aligned with instructional objectives, ensuring that game-based activities are inseparable from intended learning outcomes. Reflection activities and formative feedback play crucial roles in ensuring that game experiences extend beyond motivational enhancement toward conceptual understanding and computational thinking skill development.

With such an integrated approach, gamification can function as a transformational strategy in Information Technology Education. Conversely, if designed superficially and disconnected from instructional objectives, gamification will merely serve as an attractive engagement tool that temporarily increases participation without significantly improving learning quality.

CONCLUSION

This systematic literature review indicates that gamification in Information Technology Education consistently enhances students' motivation and learning engagement by fulfilling basic psychological needs as described in Self-Determination Theory.

However, the impact of gamification on cognitive learning outcomes is conditional and highly influenced by the quality of instructional design. Increased motivation does not automatically translate into improved academic performance if game elements are not integrated with learning objectives and do not promote conceptual reflection. Thus, instructional design functions as a moderating factor that determines the effectiveness of gamification in strengthening conceptual understanding and computational thinking skills.

Contextually, this study affirms that gamification is not merely an attractive strategy to increase enjoyment in learning; rather, it can serve as a transformational approach when systematically designed and grounded in motivational theory and instructional design principles. A balanced integration between motivational elements and cognitive demands is essential to ensure the successful implementation of gamification in Information Technology Education.

REFERENCES

Buckley, P., & Doyle, E. (2016). Gamification and student motivation. *Interactive Learning Environments, 24*(6), 1162–1175. https://doi.org/10.1080/10494820.2014.964263

Clark, D. B., Tanner-Smith, E. E., & Killingsworth, S. S. (2016). Digital games, design, and learning: A systematic review and meta-analysis. *Review of Educational Research, 86*(1), 79–122. https://doi.org/10.3102/0034654315582065

Csikszentmihalyi, M. (1990). *Flow: The psychology of optimal experience*. Harper & Row.

Deterding, S., Dixon, D., Khaled, R., & Nacke, L. (2011). From game design elements to gamefulness: Defining gamification. In *Proceedings of the 15th International Academic MindTrek Conference* (pp. 9–15). ACM. https://doi.org/10.1145/2181037.2181040

Domínguez, A., Saenz-de-Navarrete, J., de-Marcos, L., Fernández-Sanz, L., Pagés, C., & Martínez-Herráiz, J. J. (2013). Gamifying learning experiences: Practical implications and outcomes. *Computers & Education, 63*, 380–392. https://doi.org/10.1016/j.compedu.2012.12.020

Hamari, J., Koivisto, J., & Sarsa, H. (2014). Does gamification work? A literature review of empirical studies. In *Proceedings of the 47th Hawaii International Conference on System Sciences* (pp. 3025–3034). IEEE. https://doi.org/10.1109/HICSS.2014.377

Hanus, M. D., & Fox, J. (2015). Assessing the effects of gamification in the classroom. *Computers & Education, 80*, 152–161. https://doi.org/10.1016/j.compedu.2014.08.019

Ibáñez, M. B., Di-Serio, Á., & Delgado-Kloos, C. (2014). Gamification for engaging computer science students in learning activities. *IEEE Transactions on Learning Technologies, 7*(3), 291–301. https://doi.org/10.1109/TLT.2014.2329293

Kapp, K. M. (2012). *The gamification of learning and instruction: Game-based methods and strategies for training and education*. Pfeiffer.

Kitchenham, B., & Charters, S. (2007). *Guidelines for performing systematic literature reviews in software engineering*. EBSE Technical Report.

Lahtinen, E., Ala-Mutka, K., & Järvinen, H. M. (2005). A study of the difficulties of novice programmers. In *Proceedings of the 10th Annual SIGCSE Conference on Innovation and Technology in Computer Science Education* (pp. 14–18). ACM. https://doi.org/10.1145/1067445.1067453

Moher, D., Liberati, A., Tetzlaff, J., & Altman, D. G. (2009). Preferred reporting items for systematic reviews and meta-analyses (PRISMA). *PLoS Medicine, 6*(7), e1000097. https://doi.org/10.1371/journal.pmed.1000097

Putra, A., & Wibowo, T. (2021). Implementasi gamifikasi dalam pembelajaran informatika. *Jurnal Teknologi Pendidikan*, 23(2), 115–128.

Rahmawati, D. (2022). Pengaruh gamifikasi terhadap motivasi belajar siswa informatika. *Jurnal Pendidikan Informatika*, 6(1), 45–53.

Robins, A., Rountree, J., & Rountree, N. (2003). Learning and teaching programming: A review. *Computer Science Education, 13*(2), 137–172. https://doi.org/10.1076/csed.13.2.137.14200

Ryan, R. M., & Deci, E. L. (2000). Self-determination theory and the facilitation of intrinsic

motivation. *American Psychologist, 55*(1), 68–78. https://doi.org/10.1037/0003-066X.55.1.68

Sailer, M., & Homner, L. (2020). The gamification of learning: A meta-analysis. *Educational Psychology Review, 32*, 77–112. https://doi.org/10.1007/s10648-019-09498-w

Sailer, M., Hense, J., Mayr, S., & Mandl, H. (2017). How gamification motivates: An experimental study. *Computers in Human Behavior, 69*, 371–380. https://doi.org/10.1016/j.chb.2016.12.033

Sari, R., & Nugroho, A. (2023). Gamifikasi dalam pembelajaran coding tingkat menengah. *Jurnal Informatika Pendidikan*, 8(2), 101–112.

Subhash, S., & Cudney, E. A. (2018). Gamified learning in higher education: A systematic review. *Computers in Human Behavior, 87*, 192–206. https://doi.org/10.1016/j.chb.2018.05.028

Su, C.-H., & Cheng, C.-H. (2015). A mobile gamification learning system. *Computers & Education, 85*, 268–286. https://doi.org/10.1016/j.compedu.2014.12.011

Snyder, H. (2019). Literature review as a research methodology. *Journal of Business Research, 104*, 333–339. https://doi.org/10.1016/j.jbusres.2019.07.039

Tranfield, D., Denyer, D., & Smart, P. (2003). Towards a methodology for developing evidence-informed management knowledge. *British Journal of Management, 14*(3), 207–222. https://doi.org/10.1111/1467-8551.00375

Werbach, K., & Hunter, D. (2012). *For the win: How game thinking can revolutionize your business*. Wharton Digital Press.