



How do you feel? Unmasking ambiguity tolerance, learning adaptability, self-management, and learning outcomes in gamification vs. ludicization in foreign language learning

Ehsan Namaziandost^{a,*}, Fidel Çakmak^b, Parisa Ashkani^c

^a PhD in Applied Linguistics (TEFL), Department of English, Ahvaz Branch, Islamic Azad University, Ahvaz, Iran

^b Associate Professor, Department of Foreign Language Education, Alanya Alaaddin Keykubat University, Antalya, Turkey

^c Assistant Professor, English Language and Literature Department, Lorestan University, Lorestan, Iran

ARTICLE INFO

Keywords:

Gamification
Ludicization
Ambiguity tolerance
Learning adaptability
Self-management
Learning outcomes

ABSTRACT

In recent years, the integration of gamification and ludicization into foreign language learning has gained increasing attention for its potential to enhance learner engagement and facilitate more effective learning outcomes. This study investigated the comparative effects of gamification and ludicization on ambiguity tolerance (AT), learning adaptability (LA), self-management, and learning outcomes (LOs) among foreign language learners in Turkey. A total of 256 students were assigned to one of three groups: the gamification group, the ludicization group, and the control group. Using a mixed-methods approach, quantitative data were collected via surveys assessing AT, LA, self-management, and LOs across the three groups. Qualitative data were gathered through semi-structured interviews to gain deeper insights into participants' perceptions of the effectiveness of gamification and ludicization in fostering the constructs under investigation in the study. Results indicated that both experimental groups outperformed the control groups in terms of gaining in AT, LA, self-management, and LOs on the post-tests. The qualitative data revealed that the participants both experimental groups expressed positive attitudes toward the effectiveness of the gamification and ludicization in promoting their AT, LA, self-management, and LOs. These findings provide valuable insights for educators and instructional designers, highlighting that integrating gamified elements and ludic learning methods into foreign language learning can foster critical learner attributes and improve academic performance. Through such integration, the study recommends customizing these strategies to align with learners' specific needs, thereby optimizing engagement and adaptability in language learning.

1. Introduction

Gamification plays an increasingly prominent role in language learning by incorporating game-like elements to engage and motivate learners. Gamification entails incorporating game design elements into non-game contexts to enhance engagement, motivation, and learning outcomes (LOs), particularly in language acquisition (Waluyo & Bucol, 2021). By integrating features like points, badges, leaderboards, and challenges, gamification transforms English learning into an enjoyable and interactive experience, boosting learner motivation and participation. Moreover, this approach is claimed to foster a sense of competition and achievement, encouraging students to practice language skills in a low-pressure environment, ultimately enhancing proficiency and

retention (Deterding et al., 2011; Kapp, 2012; Ratinho & Martins, 2023; Renacido & Biray, 2025; Werbach & Hunter, 2012; Zichermann & Cunningham, 2011).

Building on this, game design is composed of two main components: game mechanics and game elements. Game mechanics pertain to the interactive actions players engage in to accomplish objectives, while game elements encompass features such as goals, feedback, avatars, points, and rules (Samur, 2016; Schell, 2008). In particular, key elements in gamification research, like points, leaderboards, and achievements, and badges, serve multiple functions, including providing feedback and setting goals (Hamari et al., 2014; Werbach & Hunter, 2012). Furthermore, gamification influences learners in cognitive, emotional, and social dimensions (Rivera & Garden, 2021). Cognitively,

* Corresponding author.

E-mail addresses: e.namazi75@yahoo.com (E. Namaziandost), fidel.cakmak@yahoo.com, fidel.cakmak@alanya.edu.tr (F. Çakmak), ashkaniparisa@yahoo.com (P. Ashkani).

<https://doi.org/10.1016/j.chbr.2025.100651>

Received 12 December 2024; Received in revised form 19 February 2025; Accepted 13 March 2025

Available online 22 March 2025

2451-9588/© 2025 The Authors. Published by Elsevier Ltd. This is an open access article under the CC BY-NC-ND license (<http://creativecommons.org/licenses/by-nc-nd/4.0/>).

it can buttress problem-solving; emotionally, it can enrich the learning environment (Huang & Wang, 2025); and socially, it can motivate learners to engage with a group, fostering relationships and identities within the gamified context (Krath et al., 2021). However, a potential drawback is that learners may prioritize quantity over quality in their performance to improve their rankings (Zeybek & Saygi, 2024).

As regards gamification, a closely related concept is ludicization, which focuses on transforming original game contexts into playful experiences, rather than simply incorporating game elements as artefacts (Genvo, 2013). Ludicization transforms traditional settings or activities into playful environments, emphasizing engagement and interaction with the game (Sanchez & Emin, 2014). As a result, this process creates spaces where participants can experience playfulness through metaphorical or reflective activities rather than simply applying game elements (Kim et al., 2018). This approach encourages individuals to embrace playful experiences, thereby transforming current situations into idealized playful contexts (Sanchez et al., 2016). Both gamification and ludicization promote playful learning, yet they differ in their approaches. Gamification boosts engagement through the implementation of structured game mechanics such as points, rewards, and real-world context simulations, whereas ludicization cultivates playful experiences through analogies and transformative learning environments, focusing on metaphors and reflective spaces for interactive experiences (Frasca, 2022; Sanchez et al., 2016).

Building on these distinctions, the theoretical bases of the Cognitive Development, Social Constructivism, Self-Determination, Experiential, and Ludic Learning Theories provide further insights into how gamification and ludicization foster learner engagement, adaptation, and self-regulation. Piaget's (1972) Cognitive Development Theory highlights the significance of active engagement in constructing knowledge. Gamification and ludicization create interactive and dynamic learning environments, allowing learners to actively participate in their education process, leading to improved adaptability and self-management. Vygotsky's (1978) Social Constructivism also underscores the importance of social interaction and collaboration in learning. The supportive and engaging nature of gamification can enhance learners' AT by providing social contexts for exploration and experimentation, which are essential for navigating complex tasks. In addition, Self-Determination Theory (Ryan and Deci, 2000) posits that intrinsic motivation, as reflected in the use of rewards and a leader dashboard, can be fueled by the needs for autonomy, competence, and relatedness. Similarly, Kolb's (1984) Experiential Learning Theory emphasizes learning through experience and reflection. Also, Ludic Learning Theory, as a synthesis of several theories related to enjoyment and creativity, highlights the role of playfulness in learning. Play is viewed as a means of exploring and experimenting with the world, fostering curiosity and enhancing problem-solving skills. The ludic approach to learning, therefore, advocates creativity, engagement, and autonomy, underscoring the importance of playful elements within educational contexts (Selander, 2008). While gamification entails externally imposed rewards and provides a framework where the learners are driven and goal directed, ludicization provides a context for divergent, self-directed thinking, deeper exploration, and both social and cognitive interactions. However, both gamification and ludicization provide opportunities for active engagement and self-reflection, which are highly likely to lead to enhanced LOs and adaptability.

In the domain of foreign language learning, gamification and ludicization have been explored immensely (Zhang, 2022). These approaches are believed to strategies that can enhance student motivation and augment the learning experience by rendering the educational environment more enjoyable and participatory (Pujolà & Appel, 2020; Zhang, 2024a, 2024b). Moreover, from the psychological perspective, it is proposed that both gamification and ludicization can effectively affect participants' mindset (Yüksel, 2024) and increase EFL learners' ambiguity tolerance (AT) (Reinhardt, 2018). Adaptability to uncertainty (AT), the ability to remain comfortable and effective in uncertain or

unclear situations, is a critical psychological trait that affects learning and performance (McLain et al., 2015). Specifically, AT is a personality trait explored in modern psychology, closely linked to various pedagogical factors that educators can leverage to gain a better understanding of student characteristics (Li & He, 2016). More precisely, as a personality trait, it pertains to how individuals cope with ambiguous situations and respond to unclear or incomplete information (Chu et al., 2015). It involves embracing unpredictability, functioning without complete information, and acting without clear outcomes (Iannello et al., 2017). This trait encompasses how individuals process information in uncertain situations and respond with a range of cognitive, emotional, and behavioral reactions (Shaterian Mohammadi et al., 2014), while managing new, unclear cues without frustration or the need for immediate clarity (Ehrman et al., 2003).

Ambiguity in language learning, on the other hand, is typically characterized by situations where contextual cues or incentives are unclear, such as when learners encounter novel, complex, or conflicting scenarios during the learning process (Han, 2021; Nezhad et al., 2013). Scholars have also recognized AT as a fundamental personality trait (Li & He, 2016), enabling individuals to approach new and complex situations without frustration. In the context of language learning, the exposure to large amounts of new information or conflicting scenarios can trigger strong emotional responses, such as stress. Thus, AT can affect diverse dimensions of language learners' emotional and intellectual functioning, including cognitive style, belief systems, social roles, and problem-solving strategies, potentially shaping their perception of success (Furnham & Marks, 2013; Yu et al., 2022).

Language learners with a high AT can navigate through uncertain situations, such as unfamiliar concepts or complex tasks, without becoming overwhelmed. This enables them to refine their learning strategies, enhancing their adaptability to different challenges. By managing ambiguity, they develop greater flexibility, cope with stress more effectively, and engage in self-regulated learning, leading to improved academic performance (Alahdadi & Ghanizadeh, 2017). Learning adaptability (LA), based on cognitive-developmental theory, is a form of self-regulation in challenging contexts (Collie et al., 2017). It refers to learners' ability to adjust their strategies and behaviors to align with the changing educational environment, including curriculum, teachers, and teaching resources (Luo et al., 2018). Research has shown that LA has significant theoretical (Zhang, 2017) and practical (Raza et al., 2021; Wang et al., 2021) effects on students' learning outcomes (LOs), educational choices, and mental well-being (Luo et al., 2018). Therefore, understanding its role in learning can provide key insights for designing interventions that promote successful language learning in uncertain academic settings.

LA can facilitate self-management by enabling students to adjust their strategies in response to changing environments. It can help learners regulate their emotions, thoughts, and behaviors, allowing them to remain focused and motivated in challenging academic settings. Through management strategies like goal setting, time management, and problem-solving, LA enhances their ability to navigate uncertainty and achieve academic success (She et al., 2023). Through self-management, learners cultivate self-discipline and regulate their emotions (Lee et al., 2014), enabling them to stay motivated in pursuing both academic and personal goals (Pinochet-Quiroz et al., 2022). Thus, students can better confront challenges in their learning journey (Zhu et al., 2020), thereby enhancing LOs. In language learning, Hauck and Hurd (2005) found that self-regulated learners experienced lower anxiety and demonstrated better language performance. It was reported that learners developed self-awareness, strategic learning, and coping mechanisms, all of which yielded positive LOs. Li et al. (2023) highlighted the crucial role of self-management skills in language learning through mobile technology, highlighting that enhancing these skills could further improve language acquisition.

In light of these, it has been well-noted that the relationship between gamification, ludicization, and cognitive flexibility needs to be further

explained. While gamification involves the structured use of game elements to enhance engagement and interest, ludicization is a marked shift towards both playful and motivation-driven learning (Zhang, 2023). Gamification enhances structured goal-setting and self-management by incorporating points and levels, enabling learners to track progress and make autonomous decisions based on earned rewards and achievements (Deterding et al., 2011). This structured approach fosters autonomy and flexibility, ultimately improving LOs (Azman Ong & Ibrahim, 2024). In contrast, ludicization promotes experiential learning, allowing learners to explore flexible rules and interactions, creating diverse and dynamic learning experiences. (Whitton, 2014). Through repeated attempts and experiences, learners can become more comfortable with uncertainty, enhancing their resilience and problem-solving abilities. By integrating both gamification and ludicization, learners can develop autonomy, flexibility, and adaptability in their learning environments. While these two strategies represent distinct approaches, they can complement each other to foster a more dynamic and self-directed foreign language learning experience.

2. Literature review

The growing integrating game elements into education has spurred researchers to assess its impact on LOs and motivation. Zhang and Yu (2022) conducted a study to assess the effectiveness of ludicization on online learning, specifically focusing on its potential negative impacts on learning achievement and intrinsic motivation. They reported that ludicization had minimal and counterproductive effects on subscales related to intrinsic motivation, including challenge, curiosity, and independent mastery. The study concluded that ludicization might yield insignificant or even detrimental effects on both learning achievement and intrinsic motivation. Despite these findings, there exist methodological concerns about the generalizability of the study. Relatively small sample size and lack of control for external variables like prior gaming exposure or personal learning styles might have influenced the results. Additionally, there could have been cultural bias in outcomes because motivation and gamified engagement vary according to educational background and readiness for such experiences. Building on this, Zhang (2023) compared the impacts of gamification and ludicization on learning achievement and motivation. The results revealed that both gamification and ludicization had minimal influence on motivation-related subscales, with ludicization exhibiting counterproductive effects on intrinsic orientation and learning beliefs. It can be stated that gamification, in contrast to ludicization, led to improved language LOs. Like Zhang and Yu (2022), the study had a small sample size, and individual differences might have accounted for the negative impact of ludicization on motivation-related subscales.

Delving into motivation-related factors, Zhang (2022) examined ludicization's efficacy, exploring its effects on learning achievement, intrinsic motivation, and extrinsic motivation. It was found that ludicization had counterproductive effects on extrinsic motivation, leading to poorly internalized this extrinsic motivation that inhibited intrinsic motivation and learning achievement. Despite these potential drawbacks, the study suggested that ludicization and game-related pedagogies could still yield beneficial outcomes if implemented effectively.

Resting on this discussion, Sadeghi et al. (2022) examined the effects of gamified versus non-gamified instruction on vocabulary development and motivation among students in an English language preparatory program at a Turkish university. Their study also explored participants' perceptions of learning vocabulary through gamification. The findings demonstrated that gamified instruction positively affected student motivation, although there was no significant difference in vocabulary development between the two groups, aside from a slight increase in the EG. Ultimately, students regarded gamified instruction as an effective method for learning and practicing vocabulary. This study aligned with the studies by Zhang (2022, 2023) in terms of motivation but provided controversial outcomes in terms of language learning. The language

learning was not intentional; therefore, it might not be noticed but enjoyed.

Rodríguez-Ferrer et al. (2023) further explored the effectiveness of educational gamification and game-based learning (GBL) methodologies compared to a traditional transmissive approach in enhancing reading processes and academic performance among Spanish high school students with dyslexia. Results indicated that the experimental group, which underwent gamification and GBL interventions across 15 1-h sessions, experienced significant improvements in reading skills and academic performance, although improvements in pseudoword speed were less significant compared to the control group. The intensity of the 15 sessions might have affected pseudoword processing and resulted in positive effects.

In another context, Jayanti et al. (2024) examined the influence of Classcraft, a gamified learning platform, on elementary school students' writing abilities. This research provided empirical support for Classcraft as an educational intervention that fosters a more engaging and enjoyable learning environment, ultimately improving young learners' writing outcomes, though generalizability could have been a consideration. Additionally, the age specification might have influenced the sense of joy experienced. Lastly, Shen et al. (2024) investigated how gamification integration influenced language learning achievement among Chinese students, focusing on the mediating role of learners' motivation and the moderating effect of digital literacy. Moreover, the study proposed a moderated mediation model, where learners' motivation served as a mediator and digital literacy as a moderator, underscoring the substantial role of this integrated approach in enhancing LOs.

While gamification has been widely studied, ludicization remains relatively underexplored in the context of foreign language learning. Empirical evidence on the relationship between these two approaches, specific personal factors, and LOs is still limited (Zhang, 2024a, 2024b). Few studies mentioned above directly compare the effects of these two methods on language learners' psychological traits such as AT, LA, self-management, and language learning LOs. A key issue that warrants further investigation is how different levels of structure in gamification and ludicization influence learning adjustment, the ability to cope with linguistic ambiguity, and self-regulated language learning. The distinction is crucial for the further development of the instructional design in traditional foreign language instruction, especially within digital and technology-enhanced environments. Further, as seen below, while research on gamification has primarily focused on learner motivation and engagement, its connection to linguistic outcomes remains less explored, especially in comparison to ludicization. There appears to be a dearth of research to assess whether the structured reinforcement of gamification yields better results in vocabulary and grammar learning or whether the exploratory nature of ludicization fosters more fluent and flexible language use. Further research is needed to demonstrate which method more effectively enhances language LOs and psychological traits, especially in combination with cognitive flexibility factors such as adaptability and self-management.

The search for connections among these constructs in language learning highlights the need to contribute to the existing body of research. Learning a foreign language encompasses a wide range of spheres, from fundamental aspects such as personal engagement and motivation to specific learning objectives that shape the assessment of instructional strategies. Although gamification and ludicization have been tested as motivational strategies, their direct impact on core linguistic abilities remains unclear. In this context, research should move beyond generalized psychological traits and focus on how these approaches align with language acquisition theories and influence practical language performance. Some researchers argue that game-based methods, particularly those incorporating student-driven goals, spaced repetition, or point systems, enhance short-term vocabulary recall (Azman Ong & Ibrahim, 2024). However, the immersive, context-driven play in ludicization may strengthen word retention and pragmatic

usage. A direct comparison of these approaches could provide clearer insights into their effectiveness for long-term lexical development. Furthermore, achievement systems incorporating structured tasks such as quizzes and gamification elements support an effective rule-based approach to grammar learning. In contrast, ludicization, through narrative interactions and experimentation, can foster implicit grammar learning and productivity in sentence construction. The question remains: does structured progression lead to better grammar comprehension and production than creative language use? Moreover, gamification has been shown to boost learners' confidence in controlled speaking activities through consistent practice, adaptive difficulty levels, and instructor feedback. However, the focus on open-ended speech, dialogue, and role-playing may be more effective in fostering natural interaction skills (Zhang, 2024a, 2024b). It is crucial to investigate how different methods enhance speech comprehension and production, pronunciation accuracy, and the speaker's ability to adapt to various linguistic contexts. Additionally, understanding how learners interpret foreign language input within a gamified environment remains an important area of research. Therefore, this study seeks to address this gap by examining the effects of gamification and ludicization on foreign language LOs and psychological traits. By doing so, it aims to establish a foundational understanding of how gamification can be effectively integrated into foreign language education. To fulfil this aim, the following research questions were formulated.

1. Does gamification significantly improve EFL learners' ambiguity tolerance, learning adaptability, self-management, and learning outcome?
2. Does ludicization significantly improve EFL learners' ambiguity tolerance, learning adaptability, self-management, and learning outcome?
3. In what ways do gamification influence EFL learners' ambiguity tolerance, learning adaptability, self-management, and learning outcome?
4. In what ways do ludicization affect EFL learners' ambiguity tolerance, learning adaptability, self-management, and learning outcome?

3. Participants

This study was conducted in southern Türkiye at two state universities offering English Language Teaching programs designed to equip students with essential 21st-century skills. These institutions, with their diverse student populations, provided an ideal environment for investigating the effects of innovative pedagogical approaches. Participants were selected from these programs, specifically targeting intermediate-level English as a Foreign Language (EFL) learners. The study included a total of 256 students, consisting of 112 males and 144 females, aged between 18 and 23. All participants were enrolled in the English Language Teaching programs at the two universities and were not taking any additional English language courses during the study period. For participant selection, a convenience sampling method was employed. Convenience sampling, in this context, refers to a non-probability sampling technique where participants are selected based on their accessibility and willingness to participate (Mackey & Gass, 2015). This approach was chosen due to its practicality within the research context, allowing for the recruitment of an adequate sample size within the available timeframe. Participants were randomly assigned to one of three groups: a gamification group ($n = 86$), a ludicization group ($n = 85$), and a control group ($n = 85$). Random assignment was employed to ensure an even distribution of participant characteristics, such as age, gender, and language proficiency, across the groups. This procedure aimed to minimize potential biases and enhance the internal validity of the study.

Ethical considerations were a key focus throughout the research process. Participants were initially contacted through their university

instructors, who introduced the study and invited students to participate. Those interested were then provided with detailed information about the study's purpose, procedures, as well as the potential risks and benefits involved. Prior to their involvement, all participants provided written informed consent, confirming their voluntary participation and understanding of their rights. The consent process highlighted their right to withdraw from the study at any time without any repercussions. Furthermore, all data collected, including survey responses and interview transcripts, were anonymized to ensure participant confidentiality. No personally identifiable information was collected or linked to the data. The study was monitored and approved by the Ethics Committee in Research at a state university, ensuring adherence to ethical guidelines for research involving human participants.

4. Instruments

4.1. General English test for learning outcomes

The General English Test for LOs was developed to measure the English proficiency of EFL learners across four key domains: reading comprehension, vocabulary knowledge, grammar usage, and listening skills. This 40-item multiple-choice test, with 10 items per domain, was designed to provide a thorough evaluation of learners' language abilities, challenging those at pre-intermediate to intermediate proficiency levels. Reading comprehension assesses the ability to understand and draw meaning from texts, while vocabulary knowledge focuses on word recognition and appropriate usage in context. Grammar usage evaluates sentence construction through fill-in-the-blank questions, and listening skills measure the ability to understand spoken English and identify important details from audio passages. To ensure validity, the test was reviewed by experienced EFL teachers and language assessment specialists, confirming its content validity through their feedback and its construct validity by aligning it with established English proficiency frameworks. The test was piloted with a smaller group of EFL learners, and its internal consistency was calculated using Cronbach's alpha, yielding a value of .89, indicating high reliability. The pilot testing confirmed that the items functioned cohesively, making the test a robust tool for assessing English LOs.

4.2. Self-management scale

The Self-Management Scale (SMS) was adapted to assess students' self-management skills across three domains: social management, knowledge time management, and mental health management. This 10-item scale, rated on a 5-point Likert scale (1 = Strongly disagree to 5 = Strongly agree), measures students' ability to organize social activities, manage their time effectively, and maintain mental well-being, all of which are critical for language learning success. The original scale demonstrated strong reliability ($\alpha = .89$), while the adapted version showed high reliability with a CR of .91. Confirmatory factor analysis (CFA) further validated the scale's construct validity, with adequate model fit indices ($\chi^2/df = 3.96$, CFI = .94, TLI = .93, RMSEA = .06, SRMR = .03). With its strong reliability and validity, the scale serves as an effective tool for assessing self-management skills in the context of language learning.

4.3. Learning adaptability scale

The Learning Adaptability Scale (LAS) was revised to measure students' ability to adapt to new learning environments and challenges, a crucial factor in language learning. Originally consisting of 44 items, the scale was modified to a 30-item version to better align with the research context. Each item is rated on a 5-point Likert scale, with higher scores indicating greater adaptability. The original scale demonstrated strong reliability, with a KMO value of .94 and a Cronbach's alpha of .86, reflecting good consistency and validity. The adapted scale retained the

same psychometric principles, ensuring proper scoring of reverse-coded items and accurately reflecting participants' overall academic adaptability. With its strong reliability and validity, the scale serves as a reliable tool for measuring LA in EFL learners.

4.4. Second language tolerance of Ambiguity Scale

The Second Language Tolerance of Ambiguity Scale (SLTAS) was employed to assess students' ability to tolerate ambiguity in language learning, a critical skill for navigating unfamiliar linguistic and cultural contexts. This 12-item scale, rated on a 5-point Likert scale (1 = Strongly disagree to 5 = Strongly agree), measures students' comfort with uncertain or ambiguous situations in language learning. The original scale demonstrated strong reliability, with a Cronbach's alpha of .84, indicating good internal consistency. Widely utilized in language learning research, the SLTAS has consistently demonstrated reliability and validity, making it a suitable tool for evaluating tolerance of ambiguity in EFL learners.

4.5. Semi-structured interviews

Semi-structured interviews were conducted to explore students' attitudes and perceptions regarding the role of gamification and ludification in English language learning. A total of 15 students participated, reaching data saturation, as no new themes emerged from additional interviews. The interviews lasted between 17 and 25 min and explored the impact of gamification and ludification on language learning. They examined how these strategies influenced students' learning experiences, engagement, and perceived effectiveness. All interviews were audio-recorded and transcribed verbatim to maintain participants' original language and expressions. The data were analyzed using thematic analysis, with the research team carefully reviewing the transcripts multiple times to identify significant themes and insights. By employing verbatim transcription and a structured thematic approach, the study enhances the reliability and validity of its qualitative findings, offering a nuanced understanding of students' views on gamification and ludification in language learning.

4.6. Data collection procedures

This study followed well-organized data collection procedures. The process began with a pre-test phase, during which all 256 participants completed surveys to evaluate their levels of AT, LA, self-management, and LOs. These surveys were administered consistently across the three groups to gather baseline data before any instructional interventions took place. Furthermore, all participants were given 12 General English lessons as part of their regular instruction during the treatment phase, ensuring that the core content remained consistent across all groups. The pre-test data served to identify any initial differences between the groups, providing a baseline for assessing the impact of the subsequent instructional methods.

In the treatment phase, each group participated in 12 General English lessons, with the instructional approach tailored to their assigned experimental conditions. The lesson content was consistent across all groups, focusing on key English language skills, such as reading comprehension, vocabulary development, grammar exercises, and listening activities. The teacher followed the intermediate-level coursebook [English File](#) (2019). This consistency in lesson content ensured that any differences in LOs could be attributed to the instructional methods rather than variations in the material.

The lessons for the gamification group were designed to include competitive, game-inspired elements aimed at enhancing motivation and engagement. For instance, students earned points for answering questions correctly, participating actively in class, and completing tasks on time. These points contributed to individual scores and team competitions, with incentives such as badges, leaderboards, and additional

privileges. Each lesson was structured with specific challenges or "missions" (goal-setting), encouraging students to collaborate or compete to achieve designated learning objectives in the language tasks assigned during class. Students could earn points by answering questions correctly, staying actively engaged, and completing tasks within the given deadlines. These game-like mechanics were set to create an immersive gamified environment, motivating learners to participate and improve their skills through individual or group ratings, while enjoying the competitive and engaging learning experience.

In contrast, the ludicization group received the same 12 English lessons but without the competitive elements of gamification. Instead, the emphasis was on playful, creative, and enjoyable activities that made the learning process more engaging without relying on scores or rewards. For example, role-playing exercises, storytelling, and collaborative problem-solving tasks were central to these lessons. The lessons were carefully crafted incorporating the playful activities to stimulate creativity and intrinsic motivation, encouraging learners to enjoy the learning process for its own sake rather than external rewards. For example, students developed their verbal and creative skills further when they participated in cooperative storytelling before a reading activity, and created a story together by building on each other's version of the story. Instead of rewards and ratings, the ludicization group focused on learning through enjoyment and freedom in learning tasks.

The CG received the same 12 English lessons through traditional instructional methods, which focused on teacher-centered approaches such as lectures, direct instruction, and individual exercises. These lessons followed conventional classroom practices, where students were expected to complete grammar drills, reading comprehension tasks, and listening activities with minimal emphasis on interactive or engaging elements such as GG and LG. The CG served as a baseline to evaluate the effectiveness of the more dynamic and interactive approaches used in the gamification and ludicization groups. By ensuring consistency in lesson content across all groups, any differences observed in the post-test results could be confidently attributed to the instructional methods, providing clear insights into the impact of gamification and ludicization on foreign language learning.

Following the treatment phase, a post-test identical to the pre-test was administered to measure changes in AT, LA, self-management, and LOs. The consistent use of metrics in both the pre- and post-test phases ensured reliable comparisons of LOs across the three groups. To complement the quantitative data, semi-structured interviews were conducted with a subset of participants from the gamification group and ludicization group. These interviews provided deeper insights into participants' experiences, highlighting their perceptions of engagement, motivation, and skill development under the two experimental approaches.

4.7. Data analysis

To analyze the collected data, both descriptive (e.g., M and SD) and inferential statistical methods were employed. Specifically, a one-way multivariate analysis of variance (MANOVA) was selected as the primary inferential statistical tool, as it enabled the simultaneous assessment of group differences across multiple dependent variables. All statistical analyses were conducted using SPSS version 25.

For the qualitative data analysis, the authors deployed the thematic analysis. Specifically, thematic analysis was selected as the framework for this qualitative inquiry, as it provides a flexible yet rigorous method for identifying, analyzing, and reporting patterns (themes) within the data ([Creswell et al., 2007](#)). The analysis proceeded through several distinct stages. First, all interviews were transcribed verbatim to ensure accuracy and enable a thorough examination. These transcripts then served as the primary data source. Next, a process of familiarization was undertaken, involving repeated readings of the transcripts to gain a holistic understanding of the participants' narratives. This immersive step allowed the researchers to deeply engage with the data before

proceeding to a more structured analysis. Following this, initial codes were generated. These codes represented key concepts, ideas, and observations emerging from the transcripts, acting as labels for meaningful segments of text. The coding process was iterative, with continuous refinement and adjustments as the researchers delved deeper into the data. Subsequently, the individual codes were grouped into broader, overarching themes. This involved identifying connections and relationships between codes, clustering them into categories that represented recurring patterns of meaning across the interviews. These themes captured the essence of the participants' experiences and perceptions regarding gamification and ludicization in their language learning. Finally, the identified themes were reviewed and refined. This stage involved revisiting the transcripts to ensure that the themes accurately reflected the data and that there was sufficient evidence to support their interpretation. This iterative process of theme development strengthened the analysis and ensured the credibility of the findings.

To ensure the trustworthiness of the qualitative results, multiple validation strategies were employed. First, member checking was implemented by sharing the preliminary results with participants to confirm the accuracy of interpretations and ensure alignment with their lived experiences. The participants confirmed that the findings represented their primary perceptions. Second, inter-coder reliability was established. Two code analysts independently coded a subset of the transcripts, and their coding was compared to ensure consistency and agreement in the application of codes. Discrepancies in coding were discussed and resolved collaboratively, strengthening the rigor of the coding process. Third, detailed audit trails were maintained. This involved documenting every step of the process, from transcription to theme development, allowing for transparency and enabling other researchers to trace the analytical steps taken. This meticulous record-keeping contributed to the dependability of the findings.

5. Quantitative findings

5.1. Findings

To analyze the collected data, a one-way MANOVA was conducted. Before conducting the MANOVA, the necessary assumptions for this statistical test were thoroughly evaluated and confirmed. These assumptions included multivariate normality, homogeneity of variance-covariance matrices, and the absence of multicollinearity among the dependent variables. Multivariate normality was assessed using Mardia's test, which revealed that while some variables violated univariate normality, the key assumption of multivariate normality was met (Mardia's coefficient = 2.35, $p = .12$). This finding was further supported by a visual inspection of Q-Q plots for each dependent variable, which showed no significant deviations from normality. The homogeneity of variance-covariance matrices was evaluated using Box's M test. Although Box's M test is known to be sensitive to minor deviations, the results were non-significant (Box's M = 12.78, $F(10, 15123) = 1.25$, $p = .26$), indicating that this assumption was adequately met for the analysis. Finally, multicollinearity was assessed by examining the correlation matrix of the dependent variables. None of the correlations exceeded .80, with the highest correlation observed between self-management and LOs ($r = .72$). This evidenced that multicollinearity was not a significant issue in the dataset.

The results of the pre-tests administered to the three groups are presented in Table 1. By assessing these dimensions, the pre-tests provided a baseline understanding of the participants' initial capabilities and dispositions. This baseline is crucial for interpreting the subsequent findings of the study.

The pre-test results for the three groups are summarized in Table 1, which includes data on four key variables: LOs, self-management, AT, and LA. The gamification group had a mean LO score of 14.77 (SD = 2.80), showing moderate variability, while the ludicization group scored

Table 1
Outcomes of the Pretests.

	Groups	Mean	Std. Deviation	N
LOP Pre-test	Gamification Group	14.7674	2.79779	86
	Ludicization Group	14.2588	2.98868	85
	Control Group	15.2235	3.00149	85
	Total	14.7500	2.94525	256
SM Pre-test	Gamification Group	20.2907	4.28092	86
	Ludicization Group	21.3176	4.33483	85
	Control Group	20.0706	5.23220	85
	Total	20.5586	4.64890	256
AT Pre-test	Gamification Group	26.8605	6.00228	86
	Ludicization Group	26.0118	4.90018	85
	Control Group	27.3059	5.23273	85
	Total	26.7266	5.40619	256
LA Pre-test	Gamification Group	60.0000	8.76625	86
	Ludicization Group	59.3176	7.36014	85
	Control Group	59.5647	8.50413	85
	Total	59.6289	8.20754	256

slightly lower ($M = 14.26$, $SD = 2.99$). The control group had the highest mean LO score ($M = 15.22$, $SD = 3.00$), though with the greatest variability. Across all groups, the total mean LO score was 14.75 ($SD = 2.95$), reflecting moderate overall LOs. For self-management, the gamification group scored 20.29 ($SD = 4.28$), the ludicization group scored slightly higher ($M = 21.32$, $SD = 4.33$), and the control group had the highest variability ($M = 20.07$, $SD = 5.23$). The total mean SM score across all groups was 20.56 ($SD = 4.65$), indicating moderate self-management skills. In terms of AT, the gamification group scored 26.86 ($SD = 6.00$), the ludicization group scored 26.01 ($SD = 4.90$), and the control group had the highest mean score ($M = 27.31$, $SD = 5.23$). The total mean AT score was 26.73 ($SD = 5.41$), demonstrating relatively high AT across groups. Finally, for LA, the gamification group scored 60.00 ($SD = 8.77$), the ludicization group scored 59.32 ($SD = 7.36$), and the control group scored 59.56 ($SD = 8.50$). The total mean LA score was 59.63 ($SD = 8.21$), indicating high overall LA. These findings provide a baseline for understanding the initial differences and similarities among the groups, which will inform further analysis.

To assess whether the observed differences in pre-test outcomes were statistically significant, a one-way MANOVA was conducted. The findings are summarized in Table 2.

As shown in Table 2, the MANOVA results for the intercept revealed highly significant values across all four multivariate tests (Pillai's Trace, Wilks' Lambda, Hotelling's Trace, and Roy's Largest Root), with significance values (Sig.) of .000. This indicates that the intercept explained a substantial portion of the variance in the dependent variables. The partial eta squared value of .992 further underscored the strong relationship between the intercept and the combined dependent variables. In contrast, the multivariate tests examining the effect of the groups (gamification group, ludicization group, and control group) yielded mixed results. Pillai's Trace, Wilks' Lambda, and Hotelling's Trace showed no statistically significant differences among the groups (Sig. = .230, .226, and .223, respectively), with partial eta squared values of .021, indicating minimal group influence on the dependent variables. However, Roy's Largest Root showed a marginally significant effect (Sig. = .037, partial eta squared = .040), hinting at potential, albeit weak, differences among the groups. While this result approaches statistical significance, it does not provide strong evidence of meaningful group differences in the overall analysis. These findings uncovered that the groups had a limited impact on the dependent variables, with the intercept playing a far more substantial role.

A second one-way MANOVA was conducted following the interventions to assess whether there were statistically significant improvements in the measured constructs. The descriptive statistics for the post-test scores are presented in Table 3.

As reported in Table 3, post-intervention results indicated that the gamification group demonstrated notable improvements across all

Table 2

Outcomes of the MANOVA for the pre-tests.

Effect		Value	F	Hypothesis df	Error df	Sig.	Partial Eta Squared
Intercept	Pillai's Trace	.992	7922.476 ^a	4.000	250.000	.000	.992
	Wilks' Lambda	.008	7922.476 ^a	4.000	250.000	.000	.992
	Hotelling's Trace	126.760	7922.476 ^a	4.000	250.000	.000	.992
	Roy's Largest Root	126.760	7922.476 ^a	4.000	250.000	.000	.992
Groups	Pillai's Trace	.041	1.322	8.000	502.000	.230	.021
	Wilks' Lambda	.959	1.329 ^a	8.000	500.000	.226	.021
	Hotelling's Trace	.043	1.336	8.000	498.000	.223	.021
	Roy's Largest Root	.041	2.594 ^b	4.000	251.000	.037	.040

^a Design: Intercept + Groups.^a Exact statistic.^b The statistic is an upper bound on F that yields a lower bound on the significance level.**Table 3**

Outcomes of the post-tests.

	Groups	Mean	Std. Deviation	N
LO Posttest	Gamification Group	26.2791	8.53319	86
	Ludicization Group	22.6118	7.21456	85
	Control Group	18.0471	5.70277	85
	Total	22.3281	7.97064	256
SM Posttest	Gamification Group	36.9186	8.09388	86
	Ludicization Group	32.2235	8.77548	85
	Control Group	25.4824	8.15419	85
	Total	31.5625	9.55254	256
AT Posttest	Gamification Group	38.2558	8.42152	86
	Ludicization Group	35.2118	8.43193	85
	Control Group	29.3059	5.06628	85
	Total	34.2734	8.32969	256
LA Posttest	Gamification Group	75.1744	16.10421	86
	Ludicization Group	69.0118	16.20809	85
	Control Group	59.4588	13.42754	85
	Total	67.9102	16.56466	256

measured variables compared to their pre-test scores. This group achieved the highest mean scores for LOs ($M = 26.28$, $SD = 8.53$), Self-management ($M = 36.92$, $SD = 8.09$), AT ($M = 38.26$, $SD = 8.42$), and LA ($M = 75.17$, $SD = 16.10$), implying substantial gains and moderate to high variability. The ludicization group also showed improvements across all variables, though to a lesser extent than the gamification group. Their mean scores were LO ($M = 22.61$, $SD = 7.21$), SM ($M = 32.22$, $SD = 8.78$), AT ($M = 35.21$, $SD = 8.43$), and LA ($M = 69.01$, $SD = 16.21$). The control group, in contrast, exhibited the smallest improvements across all variables, with mean scores of LO ($M = 18.05$, $SD = 5.70$), SM ($M = 25.48$, $SD = 8.15$), AT ($M = 29.31$, $SD = 5.07$), and LA ($M = 59.46$, $SD = 13.43$). Overall, the mean scores across all groups post-intervention demonstrate a generally positive trend for all variables: LO ($M = 22.33$, $SD = 7.97$), SM ($M = 31.56$, $SD = 9.55$), AT ($M = 34.27$, $SD = 8.33$), and LA ($M = 67.91$, $SD = 16.56$).

To determine if these differences were statistically significant, a second one-way MANOVA was conducted. The results are presented in Table 4.

Table 4

Outcomes of the one-way MANOVA for the post-tests.

Effect		Value	F	Hypothesis df	Error df	Sig.	Partial Eta Squared
Intercept	Pillai's Trace	.334	30.801 ^a	4.000	246.000	.000	.334
	Wilks' Lambda	.666	30.801 ^a	4.000	246.000	.000	.334
	Hotelling's Trace	.501	30.801 ^a	4.000	246.000	.000	.334
	Roy's Largest Root	.501	30.801 ^a	4.000	246.000	.000	.334
Groups	Pillai's Trace	.533	22.421	8.000	494.000	.000	.266
	Wilks' Lambda	.469	28.344 ^b	8.000	492.000	.000	.315
	Hotelling's Trace	1.131	34.647	8.000	490.000	.000	.361
	Roy's Largest Root	1.129	69.706 ^b	4.000	247.000	.000	.530

^a Design: Intercept + LOPre + SMPre + ATPre + LAPre + Groups.^a Exact statistic.^b The statistic is an upper bound on F that yields a lower bound on the significance level.

Table 4 presents the MANOVA results, showing that the intercept was highly significant across all four multivariate tests (Pillai's Trace, Wilks' Lambda, Hotelling's Trace, and Roy's Largest Root), with $p < .001$ for each. This indicates that the intercept explained a substantial portion of the variance in the combined dependent variables, as further supported by a partial eta squared of .334. The multivariate tests for the groups (gamification, ludicization, and control) also revealed high statistical significance ($p < .001$) across all four tests. The partial eta squared values for the group effect were .266 (Pillai's Trace), .315 (Wilks' Lambda), .361 (Hotelling's Trace), and .530 (Roy's Largest Root), demonstrating that group membership (i.e., intervention type) contributed significantly to the variance in the combined dependent variables. These findings evidence that the interventions, particularly gamification and ludicization, had a significant positive impact on the combined dependent variables post-intervention.

Table 5 presents the results of the between-subjects MANOVA, revealing significant effects for both the intercept and group differences across all four dependent variables at the post-test stage. Specifically, the group effect was statistically significant ($p < .001$) for all variables. The intercept effect was also significant, although less so for LOs ($p = .028$), while remaining highly significant ($p < .001$) for the other three variables. The partial eta squared values for the group effect ranged from .150 (LA) to .249 (Self-management), indicating moderate to large effect sizes. These values revealed that the group interventions explained 15 % of the variance in LA, 20.1 % in LOs, 20.9 % in AT, and 24.1 % in Self-management. Although the intercept effects were also statistically significant, their partial eta squared values were smaller, ranging from .019 (LO) to .149 (AT). This pattern of results reveals that while initial levels of the dependent variables contributed to post-test scores, the group interventions were the primary sources of the observed differences.

Table 6 reports the results of pairwise comparisons between the three groups. For LOs, the gamification group scored significantly higher than both the ludicization group (Mean Difference (MD) = 3.35, $p = .007$) and the control group (MD = 8.48, $p < .001$). The ludicization group also outperformed the control group (MD = 5.12, $p < .001$). This pattern indicates that both interventions improved learning outcomes compared to the control condition, with gamification demonstrating a greater

Table 5

Outcomes of MANOVA tests of between-subjects effects for the post-tests.

Source	Dependent Variable	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Corrected Model	LO Posttest	3945.705 ^a	6	657.618	13.362	.000	.244
	SM Posttest	5788.611 ^b	6	964.768	13.743	.000	.249
	AT Posttest	3757.466 ^c	6	626.244	11.190	.000	.212
	LA Posttest	10951.833 ^d	6	1825.306	7.701	.000	.157
Intercept	LO Posttest	240.805	1	240.805	4.893	.028	.019
	SM Posttest	1362.048	1	1362.048	19.402	.000	.072
	AT Posttest	2434.793	1	2434.793	43.505	.000	.149
	LA Posttest	9642.851	1	9642.851	40.684	.000	.140
Groups	LO Posttest	3082.747	2	1541.374	31.319	.000	.201
	SM Posttest	5538.878	2	2769.439	39.449	.000	.241
	AT Posttest	3674.342	2	1837.171	32.827	.000	.209
	LA Posttest	10403.533	2	5201.766	21.947	.000	.150
Error	LO Posttest	12254.732	249	49.216			
	SM Posttest	17480.389	249	70.202			
	AT Posttest	13935.394	249	55.965			
	LA Posttest	59017.100	249	237.016			
Total	LO Posttest	143828.000	256				
	SM Posttest	278294.000	256				
	AT Posttest	318408.000	256				
	LA Posttest	1250587.000	256				
Corrected Total	LO Posttest	16200.438	255				
	SM Posttest	23269.000	255				
	AT Posttest	17692.859	255				
	LA Posttest	69968.934	255				

^a R Squared = .244 (Adjusted R Squared = .225).^b R Squared = .249 (Adjusted R Squared = .231).^c R Squared = .212 (Adjusted R Squared = .193).^d R Squared = .157 (Adjusted R Squared = .136).**Table 6**

Outcomes of the pairwise comparison groups.

Dependent Variable	(I) Groups	(J) Groups	Mean Difference (I-J)	Std. Error	Sig. ^b	95 % Confidence Interval for Difference ^b	
						Lower Bound	Upper Bound
LO Posttest	Gamification Group	Ludicization Group	3.353 ^a	1.083	.007	.744	5.962
		Control Group	8.475 ^a	1.076	.000	5.880	11.069
	Ludicization Group	Gamification Group	-3.353 ^a	1.083	.007	-5.962	-.744
		Control Group	5.122 ^a	1.098	.000	2.476	7.767
SM Posttest	Control Group	Gamification Group	-8.475 ^a	1.076	.000	-11.069	-5.880
		Ludicization Group	-5.122 ^a	1.098	.000	-7.767	-2.476
	Gamification Group	Ludicization Group	4.829 ^a	1.293	.001	1.713	7.945
		Control Group	11.391 ^a	1.286	.000	8.292	14.490
AT Posttest	Ludicization Group	Gamification Group	-4.829 ^a	1.293	.001	-7.945	-1.713
		Control Group	6.562 ^a	1.311	.000	3.403	9.721
	Control Group	Gamification Group	-11.391 ^a	1.286	.000	-14.490	-8.292
		Ludicization Group	-6.562 ^a	1.311	.000	-9.721	-3.403
LA Posttest	Gamification Group	Ludicization Group	2.815 ^a	1.154	.046	.033	5.598
		Control Group	9.118 ^a	1.148	.000	6.351	11.885
	Ludicization Group	Gamification Group	-2.815 ^a	1.154	.046	-5.598	-.033
		Control Group	6.303 ^a	1.170	.000	3.482	9.124
LA Posttest	Control Group	Gamification Group	-9.118 ^a	1.148	.000	-11.885	-6.351
		Ludicization Group	-6.303 ^a	1.170	.000	-9.124	-3.482
	Gamification Group	Ludicization Group	6.209 ^a	2.376	.028	.484	11.935
		Control Group	15.574 ^a	2.362	.000	9.880	21.267
LA Posttest	Ludicization Group	Gamification Group	-6.209 ^a	2.376	.028	-11.935	-.484
		Control Group	9.365 ^a	2.409	.000	3.559	15.170
	Control Group	Gamification Group	-15.574 ^a	2.362	.000	-21.267	-9.880
		Ludicization Group	-9.365 ^a	2.409	.000	-15.170	-3.559

Based on estimated marginal means.

^a The mean difference is significant at the .05 level.^b Adjustment for multiple comparisons: Bonferroni.

effect. A similar trend was observed for self-management (SM). The gamification group's scores were significantly higher than both the ludicization group (MD = 4.83, $p = .001$) and the control group (MD = 11.39, $p < .001$), and the ludicization group's scores were higher than the control group's (MD = 6.56, $p < .001$). These results highlight positive influences of both interventions on self-management, with a stronger effect from gamification. Regarding AT, the gamification group scored significantly higher than both the ludicization group (MD = 2.82,

$p = .046$) and the control group (MD = 9.12, $p < .001$), and the ludicization group outperformed the control group (MD = 6.30, $p < .001$). Again, both interventions enhanced AT, with a larger effect from gamification. Finally, for LA, the gamification group scored significantly higher than both the ludicization group (MD = 6.21, $p = .028$) and the control group (MD = 15.57, $p < .001$). The ludicization group also scored higher than the control group (MD = 9.37, $p < .001$). These results demonstrate that both interventions improved LA, with

gamification showing a greater positive impact.

5.2. Qualitative findings

The qualitative data provided valuable insights that reinforced the quantitative findings, illuminating the learners' perceptions of gamification's impact on their learning experience. Four key themes emerged from the gamification group's responses: engagement and motivation, self-management, cognitive flexibility, and collaborative learning. These themes aligned with the positive quantitative results, offering a deeper understanding of how gamification influenced the targeted constructs. For instance, regarding engagement and motivation, one student noted, *"The points and badges made learning feel like a game, and I was actually excited to study. I found myself looking forward to the next task because I wanted to earn more rewards and see my progress on the leaderboard"*. This perspective reflects the broader theme of enjoyment, a subcategory within engagement, and supports the quantitative data showing improved LOs by suggesting a link between increased motivation and enhanced learning. Another participant explained, *"The competition with classmates pushed me to try harder, and I was surprised at how much I learned. It wasn't just about winning; it was about feeling a sense of accomplishment and seeing my efforts pay off in real-time"*. This comment highlights the role of competition as a motivational driver, further substantiating the quantitative findings. Additionally, a third participant shared, *"The game elements made the lessons less intimidating and more fun. I didn't feel like I was studying in the traditional sense, but I was still learning effectively"*. This perspective underscores how gamification can transform the learning experience into something more enjoyable and less stressful, which likely contributed to the observed improvements in engagement and motivation.

The theme of self-management also resonated strongly with the quantitative results. Learners reported that gamification facilitated better time management and self-regulation. One participant articulated, *"Having deadlines within the game helped me organize my study time better. I knew I had to complete certain tasks by specific dates, and this structure kept me on track"*. This statement illustrates how the structured nature of gamified learning environments can promote time management skills, directly correlating with the quantitative data that indicated improvements in this area. Furthermore, another student commented, *"Tracking my progress in the game made me more aware of my learning journey and helped me identify areas where I needed to focus more. Seeing my achievements visually motivated me to keep going and set new goals for myself"*. This perception aligns with the subcategory of progress tracking and emphasizes the role of gamification in fostering self-awareness in learning, a crucial aspect of self-management. A third participant added, *"The game gave me a clear sense of direction. I knew what I needed to do next, and this clarity helped me stay focused and avoid procrastination"*. This insight further highlights how gamification can provide learners with a sense of purpose and direction, which are essential for effective self-management.

Finally, the themes of cognitive flexibility and collaborative learning provided further support for the quantitative findings. Students felt that gamification enhanced their problem-solving abilities and critical thinking. One participant stated, *"The challenges in the game required me to think creatively and find solutions, which helped me improve my problem-solving skills. I had to approach problems from different angles, and this made me more confident in tackling difficult tasks"*. This comment demonstrates how the game-like challenges contributed to cognitive flexibility, echoing the quantitative results that showed improvements in AT. Another participant elaborated, *"The game encouraged me to think outside the box. It wasn't just about memorizing information; it was about applying what I learned in new and creative ways"*. This perspective underscores how gamification can foster a deeper level of cognitive engagement, which is critical for developing cognitive flexibility. Moreover, the collaborative aspects of some gamified activities were appreciated by the students. As one participant explained, *"Working with my classmates*

on the game challenges made learning more fun and helped me learn from different perspectives. We could share ideas and strategies, which made the tasks easier and more enjoyable". This statement highlights the importance of peer interaction and shared experience within gamified learning, reinforcing the quantitative data indicating positive effects on LA. Another participant added, *"The group tasks in the game taught me how to communicate better with others and how to work as a team. It wasn't just about individual success; it was about achieving something together"*. This insight further emphasizes the social and collaborative benefits of gamification, which can enhance both LOs and interpersonal skills. These qualitative insights, taken together, offer a compelling narrative that complements and enriches the quantitative findings, providing a more holistic understanding of the impact of gamification on EFL learners.

The qualitative data collected from the ludicization group provided valuable insights into the learners' experiences and perceptions, reinforcing the quantitative findings that demonstrated significant improvements in AT, LA, self-management, and LOs. Four prominent themes emerged from the analysis of the learners' responses: exploration, autonomy, relaxed learning, and real-world dimension. These themes offer a nuanced understanding of how ludicization fostered the development of these crucial skills. For example, concerning exploration, one participant commented, *"I felt like I could really experiment with the language and try different things without fear of making mistakes. It was liberating to know that I didn't have to follow strict rules or worry about being judged. This freedom allowed me to take risks and explore new ways of expressing myself in English"*. This quote encapsulates the essence of free expression, a subcategory within exploration, and supports the quantitative data by highlighting how ludicization encourages a playful approach to language learning, which can contribute to greater AT. Another participant shared, *"I discovered so many new resources online that I didn't even know existed, and I was able to use them in my learning. For example, I found interactive language games, podcasts, and even virtual language exchange partners. These resources made learning more dynamic and fun, and I felt like I was in control of my own learning journey"*. This comment reflects the subcategory of alternative sourcing and illustrates how ludicization can empower learners to become more resourceful and independent in their language acquisition. A third participant added, *"The activities encouraged me to think outside the box and explore different ways of solving problems. It wasn't just about memorizing vocabulary or grammar rules; it was about using the language creatively and discovering what worked best for me"*. This perspective further emphasizes how ludicization fosters a sense of curiosity and experimentation, which are essential for developing AT and adaptability.

The theme of autonomy also resonated strongly with the quantitative results, with learners expressing a greater sense of ownership over their learning process. One student explained, *"I liked being able to choose what I wanted to work on and how I wanted to learn it. For example, if I was interested in a particular topic, I could dive deeper into it and explore related materials. This made the learning process more personal and meaningful to me"*. This statement exemplifies the subcategory of learner ownership and demonstrates how ludicization can foster self-directed learning, a key aspect of self-management, which was also reflected in the quantitative data. Another participant added, *"Being able to learn at my own pace was really helpful, and I felt less pressured. I didn't have to rush through topics just to keep up with others. Instead, I could take my time to fully understand a concept before moving on to the next one"*. This comment highlights the subcategory of self-regulated patterns and underscores the positive impact of ludicization on learners' ability to manage their own learning. A third participant noted, *"The flexibility of the ludicization approach allowed me to tailor my learning experience to my own needs and preferences. I could focus on areas where I needed more practice and skip over things I already knew well. This made the whole process more efficient and enjoyable"*. This insight further illustrates how ludicization promotes autonomy and self-regulation, which are critical for effective self-management.

Finally, the themes of relaxed learning and real-world dimension offered further support for the quantitative findings. Learners reported feeling less stressed and more satisfied with the learning process. One participant noted, *"The atmosphere was much more relaxed, and I felt more comfortable participating. I didn't feel the usual anxiety I associate with language classes, and this made it easier for me to engage with the material and with my classmates"*. This sentiment aligns with the subcategory of low stress and suggests that ludicization can create a more conducive learning environment, potentially contributing to improved LOs. Another participant shared, *"The playful nature of the activities made learning feel less like a chore and more like something I looked forward to. I didn't feel overwhelmed or pressured, which allowed me to enjoy the process and stay motivated"*. This comment further highlights how ludicization can reduce stress and increase learner satisfaction, which are important factors in achieving positive LOs. Moreover, learners appreciated the connection to real-world contexts. One student commented, *"I could see how what I was learning could be applied in real-life situations, which made it more meaningful. For example, we practiced ordering food in a restaurant or asking for directions, and I could immediately use these skills outside the classroom"*. This comment reflects the subcategory of real-world context and emphasizes the importance of making learning relevant and applicable, which can enhance motivation and engagement, ultimately leading to better LOs, as indicated by the quantitative data. Another participant added, *"The activities often simulated real-world scenarios, which helped me feel more confident about using English in everyday situations. It wasn't just about learning the language; it was about learning how to use it in practical ways"*. This perspective underscores the value of integrating real-world relevance into the learning process, which can make the experience more engaging and impactful. Collectively, these qualitative insights provide a rich and nuanced understanding of the ways in which ludicization can positively influence EFL learners' experiences.

6. Discussion of the findings

The findings of this study shed light on the comparative effects of gamification and ludicization on key psychological and educational outcomes among foreign language learners in Türkiye. Both strategies demonstrated significant benefits, contributing positively to learners' AT, LA, self-management, and overall LOs. However, the results revealed notable distinctions between the two approaches. The gamification group exhibited substantial improvements across all measured variables, indicating its efficacy in creating an engaging and supportive learning environment. In contrast, while the ludification group also outperformed the CG, its impact was more specific to enhancing creativity and fostering a sense of autonomy among participants. Qualitative feedback further highlighted the immersive and enjoyable nature of the gamification experience, implying that it not only facilitated skill development but also enriched learners' engagement with the material, which was in alignment with existing studies by Zhang (2023, 2024a).

In line with Zhang and Yu (2022), who found that ludicization led to lower post-test scores and minimal positive effects on intrinsic motivation, our study indicated that while ludicization does enhance certain outcomes, its effectiveness is limited. Unlike Zhang and Yu's findings that reported that ludicization might have detrimental impacts on learning achievement and motivation, our results showed that ludicized tasks such as collaborative storytelling and role-playing likely created a new student-centered learner experience that promotes autonomy and greater creative thinking. Further, the classroom conditions, such as peer collaboration, task flexibility, and low-stakes playful activities, may have also enhanced the effectiveness of ludicization by lowering performance anxiety and increasing willingness to take risks in language use. Expanding on Zhang (2023), who reported significant improvements in learning achievement with gamification but minimal influence on motivation-related subscales, our findings resonate with the notion that gamification effectively enhances LOs across various dimensions.

The substantial improvements observed in the gamification group

indicate its efficacy in creating an engaging and supportive learning environment. This aligns with Sadeghi et al. (2022), who noted the positive effects of gamified instruction on student motivation, although they found no significant difference in vocabulary development. Our study extends this by demonstrating that gamification influences not only motivation but also psychological attributes such as self-management and adaptability. In addition, Jayanti et al. (2024) provided empirical support for the effectiveness of a gamified learning platform in improving writing abilities, reinforcing the idea that gamification fosters a more engaging and enjoyable learning experience. Our qualitative feedback echoes this sentiment, emphasizing the immersive nature of gamification and its role in enriching learners' engagement with the material. Our results also support the findings of Shen et al. (2024) by affirming that gamification significantly enhances learning achievement, highlighting the interconnectedness of motivation and effective educational practices.

Moreover, our findings are supported by several educational theories such as Cognitive Development, Social Constructivism, Self-Determination, Experiential, and Ludic Learning Theories, which emphasize the benefits of gamification and ludicization in enhancing learners' experiences and learning objectives (LOs). The increased sense of autonomy reported by the ludicization group markedly supports the theory of self-determination, while the gamification group's improvements in self-management and adaptability advocate that both approaches effectively foster a supportive learning environment that nurtures intrinsic motivation.

Overall, the findings of our study can be justified through six key reasons. First, engagement and motivation play a crucial role in learning effectiveness (Sanchez et al., 2020). Gamification incorporates elements such as points, badges, and leaderboards, fostering motivation through competition and rewards. This approach likely contributed to improvements in adaptability, learning achievement, and self-management by encouraging learners to take risks, navigate uncertainties, and refine their learning strategies. While ludicization also promotes engagement, it emphasizes enjoyment and playfulness rather than competition. This approach fosters creativity and autonomy, allowing learners to explore and experiment freely, leading to enhanced learning experiences. Additionally, both approaches promote active learning, as learners interact directly with content rather than passively receiving information. The structured challenges and feedback mechanisms in gamification provide a clear pathway for improving navigation skills and LOs, while ludicization encourages self-directed learning through experiential engagement.

Social interaction and collaboration further explain the positive impact of both approaches. Gamification often encourages peer interaction by fostering shared strategies and collective problem-solving (Sanchez et al., 2016), thereby enhancing adaptability and AT. In contrast, ludicization facilitates collaboration in a more playful manner, enabling learners to express ideas and take creative risks in a supportive environment. The presence of constructive feedback is another key factor, as gamification provides immediate feedback, helping learners adjust their strategies and build self-management skills. Although feedback in ludicization may be less structured, it remains valuable by reframing failure as a learning opportunity, fostering intrinsic motivation and autonomy (Liu et al., 2024). Moreover, both approaches create a psychologically safe environment, allowing learners to take risks without fear of failure. In particular, ludicization, by promoting a playful atmosphere, further persuades experimentation and creative exploration.

Eventually, the differentiated learning experiences between the two approaches justify the variations in our findings. Gamification, with its structured learning paths and measurable outcomes, is well-suited for enhancing adaptability and self-management. In contrast, ludicization emphasizes personal expression and creativity, leading to greater autonomy among learners. These distinctions highlight how each approach caters to different aspects of learning, reinforcing the effectiveness of

both strategies while shedding light on their unique contributions to learner development.

7. Conclusions and implications

The study's findings unveiled that both gamification and ludicization served as effective pedagogical strategies for enhancing LOs among EFL learners. However, they exhibited distinct advantages: gamification significantly boosted AT, LA, self-management, and overall learning achievements, while ludicization fostered creativity and a sense of autonomy. These outcomes demonstrate that integrating these approaches into language instruction can create more engaging and supportive learning environments that cater to diverse learner needs (Zhang, 2024a, 2024b). Based on these results, it can be concluded that a blended approach incorporating both gamification and ludicization can maximize the benefits for EFL learners. By leveraging gamification, language educators can cultivate a robust framework that enhances learners' psychological resilience and adaptability, essential for navigating the challenges of language learning. Simultaneously, the creative and autonomous elements offered by ludicization can empower learners to take ownership of their learning journey, encouraging them to explore through language learning experiences. Not only can this dual strategy address various aspects of learner engagement, but it can also promote a more holistic educational experience that aligns with contemporary educational theories. Consequently, adopting both pedagogical strategies in EFL contexts can lead to improved motivation, engagement, and overall language proficiency among learners.

The study suggests implications for EFL learners, teachers, and material developers in language education. To start with, EFL learners can benefit from gamification's engaging elements, which not only make learning enjoyable but also promote critical skills such as AT and self-management. Ludicization offers opportunities for creativity and autonomy, further enriching the learning experience. Understanding the unique benefits of both strategies allows learners to select or be guided toward the approach that best suits their individual learning styles and preferences, fostering a more personalized educational journey. The enjoyable and immersive aspects of both gamification and ludicization can help sustain learners' motivation and engagement, crucial for long-term language acquisition. As for EFL teachers, the study pinpoints the importance of considering incorporating gamification and ludicization into their curricula, adapting instructional strategies to harness the strengths of both approaches. This could involve integrating game elements into lessons while also creating opportunities for playful, exploratory learning experiences. Teachers can also facilitate environments that encourage student autonomy and creativity through ludic learning activities, including digital storytelling, role-plays, simulations, puzzle solving, or collaborative tasks that allow learners to explore language in meaningful contexts. For instance, in EFL writing classes, instructors could develop a collective digital storytelling activity in which students add new parts of the story based on prompts. This can enable students to promote imagination, creativity, linguistic diversity, and spontaneous speech. At the same time, it may be possible to create a game in which teams receive points for correct grammar, well-developed creativity, and storylines. This will establish serious work conditions, but in a lively, fun environment. Material developers need to ensure that gamified systems have specific and effective tracking features, while self-guided motivation is supported through ludicized components, allowing for structured engagement and free exploration to coexist. Furthermore, materials should align with the particular LOs of EFL programs, which include, but are not limited to, language self-management, self-adaptation, AT, and creativity. To achieve this, developers can create motivational designed materials that give credence to gamification integrated with the learning model of ludicization. In so doing, the pedagogical rigor of the material can activate learner-oriented spaces where students are able to build independence, perseverance, and high proficiencies in the language in a gamified context.

Research limitations and recommendations for future studies

While the findings of this study are promising, there are several limitations that should be noted. Firstly, the use of a convenience sampling method may restrict the generalizability of the results, as the sample might not accurately reflect the larger population of EFL learners in Turkey or other settings. The participants' age range (18–23 years) may also limit the applicability of the findings to both younger and older learners. Secondly, although participants were randomly assigned to groups, there may still be uncontrolled variables influencing LOs, such as previous exposure to gamification or ludicization in other courses. Moreover, the study concentrated solely on intermediate EFL learners, which may overlook the impact of these strategies on learners at different proficiency levels. Lastly, the relatively brief duration of the intervention (12 general English lessons) may not provide enough time to observe the long-term effects on learners' language skills and psychological attributes. Longitudinal research could shed light on the sustained effects of gamification and ludicization on engagement, motivation, and skill development over time. Researchers could observe the effectiveness of gamification in providing structured reinforcement for retention skills and whether the flexibility of ludicization for learning fosters over the long term fluent and adaptable cognition in future studies.

To enhance the findings of this research, several recommendations can be made for future studies. First, researchers should consider utilizing more diverse sampling methods, such as stratified random sampling, to achieve a more representative sample that encompasses various age groups, proficiency levels, and backgrounds. This approach could improve the generalizability of the findings. Second, longitudinal studies extending the intervention beyond ten lessons could offer insights into the lasting effects of gamification and ludicization on language Learning Objectives, and psychological characteristics. Additionally, future research could investigate the impact of these pedagogical strategies in different educational settings, such as primary or secondary education, to evaluate their effectiveness across diverse age groups and learning environments. Finally, subsequent studies could compare the effects of gamification and ludicization on the core English skills and sub-skills of EFL learners.

CRedit authorship contribution statement

Ehsan Namaziandost: Formal analysis, Writing – review & editing. **Fidel Çakmak:** Writing – review & editing, Writing – original draft, Conceptualization. **Parisa Ashkani:** Formal analysis, Writing – review & editing.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Data availability

Data will be made available on request.

References

- Alahdadi, S., & Ghanizadeh, A. (2017). The dynamic interplay among EFL learners' ambiguity tolerance, adaptability, cultural intelligence, learning approach, and language achievement. *Iranian Journal of Language Teaching Research*, 5, 37–50. <https://doi.org/10.30466/ijltr.2017.20341>
- Azman Ong, M. H., & Ibrahim, N. S. (2024). Towards the formation of we-intention to continue playing mobile multiplayer games: Importance of gamification design elements and social play habit roles. *Information Technology & People*, 0(0), 1–24. <https://doi.org/10.1108/ITP-11-2022-0904>

- Chu, W. H., Lin, D. Y., Chen, T. Y., Tsai, P. S., & Wang, C. H. (2015). The relationships between ambiguity tolerance, learning strategies, and learning Chinese as a second language. *System*, 49, 1–16. <https://doi.org/10.1016/j.system.2014.10.015>
- Collie, R. J., Holliman, A. J., & Martin, A. J. (2017). Adaptability, engagement, and academic achievement at university. *Educational Psychology*, 37(6), 632–647. <https://doi.org/10.1080/01443410.2016.1231296>
- Creswell, J. W., Hanson, W. E., & Plano Clark, V. L. (2007). Qualitative research designs: Selection and implementation. *The Counseling Psychologist*, 35, 236. <https://doi.org/10.1177/0011000006287390>
- Deterding, S., Sicart, M., Nacke, L., O'Hara, K., & Dixon, D. (2011). Gamification: Using game-design elements in non-gaming contexts. In *CHI '11 extended abstracts on human factors in computing systems* (pp. 2425–2428). ACM. <https://doi.org/10.1145/1979742.1979755>
- Ehrman, M. E., Leaver, B. L., & Oxford, R. L. (2003). A brief overview of individual differences in second language learning. *System*, 31(3), 313–330. [https://doi.org/10.1016/S0346-251X\(03\)00045-9](https://doi.org/10.1016/S0346-251X(03)00045-9)
- English File (4th ed.). OUP.
- Frasca, G. (2022). Juego, videojuego y creación de sentido. Una introducción. *COMUNICACIÓN. Revista Internacional De Comunicación Audiovisual, Publicidad Y Estudios Culturales*, 1(7), 37–44. <https://doi.org/10.12795/comunicacion.2009.v01.i07.03>
- Furnham, A., & Marks, J. (2013). Tolerance of ambiguity: A review of the recent literature. *Psychology*, 4(9), 717–728. <https://doi.org/10.4236/psych.2013.49102>
- Genov, S. (2013). Penser les phénomènes de ludicisation à partir de Jacques Henriot. *30 ans de Sciences du jeu à Villeteuse. Hommage à Jacques Henriot*, 1, 1–19. <https://doi.org/10.4000/sdj.251>
- Hamari, J., Koivisto, J., & Sarsa, H. (2014). Does gamification work? A literature review of empirical studies on gamification. In *2014 47th Hawaii international conference on system sciences* (pp. 3025–3034). IEEE. <https://doi.org/10.1109/HICSS.2014.377>
- Han, K. (2021). Students' well-being: The mediating roles of grit and school connectedness. *Frontiers in Psychology*, 12, Article 787861. <https://doi.org/10.3389/fpsyg.2021.787861>
- Hauck, M., & Hurd, S. (2005). Exploring the link between language anxiety and learner self-management in open language learning contexts. *European Journal of Open, Distance and E-Learning*, 2, 1–21. <https://oro.open.ac.uk/3542/>
- Huang, Y. T., & Wang, T. H. (2025). Effect of integrating gamified teaching activities on learning emotions of design students with different learning styles. *Interactive Learning Environments*, 1–21. <https://doi.org/10.1080/10494820.2024.2446538>
- Iannello, P., Mottini, A., Tirelli, S., Riva, S., & Antonietti, A. (2017). Ambiguity and uncertainty tolerance, need for cognition, and their association with stress: A study among Italian practicing physicians. *Medical Education Online*, 22(1), Article 1270009. <https://doi.org/10.1080/10872981.2016.1270009>
- Jayanti, W. M., Firdaus, M. Y., & Arochman, T. (2024). The effectiveness of integrating classcraft: A gamified learning platform on enhancing writing skills among elementary school learners. *English Learning Innovation*, 5(2), 277–286. <https://doi.org/10.22219/englie.v5i2.35022>
- Kapp, K. M. (2012). *The gamification of learning and instruction: Game-based methods and strategies for training and education*. John Wiley & Sons.
- Kim, S., Song, K., Locke, B., & Burton, J. (2018). *Gamification in learning and education: Enjoy learning like gaming*. Springer International Publishing. <https://doi.org/10.1007/978-3-319-47283-6>
- Kolb, D. A. (1984). *Experiential learning: Experience as the source of learning and development*. Prentice Hall.
- Krath, J., Schürmann, L., & Von Korfflesch, H. F. (2021). Revealing the theoretical basis of gamification: A systematic review and analysis of theory in research on gamification, serious games and game-based learning. *Computers in Human Behavior*, 125, Article 106963. <https://doi.org/10.1016/j.chb.2021.106963>
- Lee, Y. H., Cheng, C. Y., & Lin, S. S. (2014). A latent profile analysis of self-control and self-esteem and the grouping effect on adolescent quality of life across two consecutive years. *Social Indicators Research*, 117(2), 523–539. <https://doi.org/10.1007/s11205-013-0364-6>
- Li, H., & He, Q. (2016). Ambiguity tolerance and perceptual learning styles of Chinese EFL learners. *English Language Teaching*, 9(6), 213–222. <https://doi.org/10.5539/elt.v9n6p213>
- Liu, G. Z., Fathi, J., & Rahimi, M. (2024). Using digital gamification to improve language achievement, foreign language enjoyment, and ideal L2 self: A case of English as a foreign language learner. *Journal of Computer Assisted Learning*. <https://doi.org/10.1111/jcal.12954>
- Luo, Z., Jia, Q. L., She, Y., & Lu, W. (2018). The relationship between students' learning adaptation and mental health in an information-based teaching environment based on potential profile analysis. *China Dis. Edu.*, 2, 37–43. <https://doi.org/10.13541/j.cnki.chinade.20180125.005>
- McLain, D. L., Kefallonitis, E., & Armani, K. (2015). Ambiguity tolerance in organizations: Definitional clarification and perspectives on future research. *Frontiers in Psychology*, 6. <https://doi.org/10.3389/fpsyg.2015.00344>. Article 344.
- Nezhad, H. Y., Atarodi, I., & Khalili, M. (2013). Why on earth is learners' patience wearing thin: The interplay between ambiguity tolerance and reading comprehension valence of Iranian intermediate level students. *Theory and Practice in Language Studies*, 3(8), 1490–1495.
- Piaget, J. (1972). *The psychology of intelligence*. Routledge.
- Pinochet-Quiroz, P., Lepe-Martínez, N., Gálvez-Gamboa, F., Ramos-Galarza, C., del Valle-Tapia, M., & Acosta-Rodas, P. (2022). Relationship between cold executive functions and self-regulated learning management in college students. *Estudios Sobre Educación*, 43, 93–113. <https://doi.org/10.15581/004.43.93-113>
- Pujolà, J., & Appel, C. (2020). Gamification for technology-enhanced language teaching and learning. In M. Kruk, & M. Peterson (Eds.), *New technological applications for foreign and second language learning and teaching* (pp. 93–111). IGI Global Scientific Publishing. <https://doi.org/10.4018/978-1-7998-2591-3.ch005>
- Ratinho, E., & Martins, C. (2023). The role of gamified learning strategies in student's motivation in high school and higher education: A systematic review. *Helyon*, 9. <https://doi.org/10.1016/j.heliyon.2023.e19033>
- Raza, S. A., Qazi, W., & Yousufi, S. Q. (2021). The influence of psychological, motivational, and behavioral factors on university students' achievements: The mediating effect of academic adjustment. *Journal of Applied Research in Higher Education*, 13(4), 849–870. <https://doi.org/10.1108/JARHE-03-2020-0065>
- Reinhardt, J. (2018). *Gameful second and foreign language teaching and learning: Theory, research, and practice*. Springer.
- Renacido, J. M. D., & Biray, E. T. (2025). Enhancing peer engagement and student motivation through AI-gamified interactive learning tools. In F. D. Mobo (Ed.), *Advancing sustainable development goals with educational technology* (pp. 277–342). IGI Global. <https://doi.org/10.4018/979-8-3693-8242-4.ch009>
- Rivera, E. S., & Garden, C. L. P. (2021). Gamification for student engagement: A framework. *Journal of Further and Higher Education*, 45(7), 999–1012. <https://doi.org/10.1080/0309877X.2021.1875201>
- Rodríguez-Ferrer, J. M., Manzano-León, A., Aguilar-Parra, J. M., & Cangas, A. (2023). Effectiveness of gamification and game-based learning in Spanish adolescents with dyslexia: A longitudinal quasi-experimental research. *Research in Developmental Disabilities*, 141, Article 104603. <https://doi.org/10.1016/j.ridd.2023.104603>
- Ryan, R. M., & Deci, E. L. (2000). Self-determination theory and the facilitation of intrinsic motivation, social development, and well-being. *American Psychologist*, 55(1), 68–78. <https://doi.org/10.1037/0003-066X.55.1.68>
- Sadeghi, K., Sağlık, E., Mede, E., Samur, Y., & Comert, Z. (2022). The effects of implementing gamified instruction on vocabulary gain and motivation among language learners. *Helyon*, 8(11), Article e11811. <https://doi.org/10.1016/j.heliyon.2022.e11811>
- Samur, Y. (2016). *Dijital oyun tasarımı*. Pusula.
- Sanchez, E., & Emin, V. (2014). Toward a model of play: An empirical study. In C. Busch (Ed.), *The 8th European Conference on games based learning*, 2 (pp. 503–512). Academic Conferences and Publishing International Limited.
- Sanchez, E., van Oostendorp, H., Fijnheer, J. D., & Lavoué, E. (2020). Gamification. In A. Tatnall (Ed.), *Encyclopedia of education and information technologies*. Springer. https://doi.org/10.1007/978-3-030-10576-1_38
- Sanchez, E., Young, S., & Jouneau-Sion, C. (2016). Classcraft: From gamification to ludicization of classroom management. *Education and Information Technologies*, 22, 497–513. <https://doi.org/10.1007/s10639-016-9489-6>
- Schell, J. (2008). *The art of game design: A book of lenses*. CRC Press.
- Selander, S. (2008). Designs for learning and ludic engagement. *Digital Creativity*, 19(3), 145–152. <https://doi.org/10.1080/14626260802312673>
- Shaterian Mohammadi, F., Alizadeh, F., & Nikokar, A. (2014). The efficiency of tolerance of ambiguity on meta-cognition beliefs and academic engagement among college students. *Biquarterly J Cogn Strategies Learn*, 1(1), 31–47.
- She, C., Liang, Q., Jiang, W., & Xing, Q. (2023). Learning adaptability facilitates self-regulated learning at school: The chain mediating roles of academic motivation and self-management. *Frontiers in Psychology*, 14, Article 1162072. <https://doi.org/10.3389/fpsyg.2023.1162072>
- Shen, Z., Lai, M., & Wang, F. (2024). Investigating the influence of gamification on motivation and learning outcomes in online language learning. *Frontiers in Psychology*, 15. <https://doi.org/10.3389/fpsyg.2024.1295709>
- Vygotsky, L. S. (1978). *Mind in society: The development of higher psychological processes*. Harvard University Press.
- Waluyo, B., & Bucol, J. L. (2021). The impact of gamified vocabulary learning using Quizlet on low-proficiency students. *Computer Assisted Language Learning Electronic Journal (CALL-EJ)*, 22(1), 158–179. <https://www.callej.org/journal/22-1/Waluyo-Bucol2021.pdf>
- Wang, X., Liu, Y. L., Ying, B., & Lin, J. (2021). The effect of learning adaptability on Chinese middle school students' English academic engagement: The chain mediating roles of foreign language anxiety and English learning self-efficacy. *Current Psychology*, 42, 6682–6692. <https://doi.org/10.1007/s12144-021-02008-8>
- Werbach, K., & Hunter, D. (2012). *For the win: How game thinking can revolutionize your business*. Wharton Digital Press.
- Whitton, N. (2014). *Digital games and learning*. Routledge.
- Yu, M., Wang, H., & Xia, G. (2022). The review on the role of ambiguity of tolerance and resilience on students' engagement. *Frontiers in Psychology*, 12, Article 828894. <https://doi.org/10.3389/fpsyg.2021.828894>
- Yüksel, M. (2024). Serious online games for engaged learning through flow. In N. Lee (Ed.), *Encyclopedia of computer graphics and games*. Springer. https://doi.org/10.1007/978-3-031-23161-2_227
- Zeybek, N., & Saygi, E. (2024). Gamification in education: Why, where, when, and how? A systematic review. *Games and Culture*, 19(2), 237–264. <https://doi.org/10.1177/15554120231158625>
- Zhang, M. (2017). Research on the problems and countermeasures of freshmen's learning adaptability: From the perspective of self-identity theory. *Journal of Henan University of Technology (Natural Science Edition)*, 2, 100–104. <https://doi.org/10.16433/j.cnki.cn41-1379.2017.02.015>
- Zhang, Q. (2022). The potentially counterproductive effects on learning achievement, intrinsic motivation, and extrinsic motivation for ludicization employing Habitica. *Educ. Inf. Technol.*, 27, 12399–12419. <https://doi.org/10.1007/s10639-022-11130-4>
- Zhang, Q. (2023). Investigating the effects of gamification and ludicization on learning achievement and motivation. *Int. J. Technol. Enhanc. Learn.*, 2(1), 1–19. <https://doi.org/10.4018/ijtee.326127>
- Zhang, Q. (2024a). Mixed effects of cooperative/competitive gamification on language learning regarding engagement, foreign language enjoyment, and classroom social

- climate. *Int. J. Inf. Technol.*, 16, 3437–3448. <https://doi.org/10.1007/s41870-024-01976-x>
- Zhang, Q. (2024b). Different efficiencies in foreign language learning for gamification and ludicization regarding learning outcome, readiness, engagement, and academic buoyancy. *Educ. Inf. Technol.*. <https://doi.org/10.1007/s10639-024-12968-6>
- Zhang, Q., & Yu, Z. (2022). The counterproductive effects on learning achievement and intrinsic motivation for ludicization as an online learning pedagogy involving game elements. *International Journal of Online Pedagogy and Course Design*, 12(1), 1–18. <https://doi.org/10.4018/ijopcd.309080>
- Zhu, M., Bonk, C. J., & Doo, M. Y. (2020). Self-directed learning in MOOCs: Exploring the relationships among motivation, self-monitoring, and self-management. *Educational Technology Research & Development*, 68(5), 2073–2093. <https://doi.org/10.1007/s11423-020-09747-8>
- Zichermann, G., & Cunningham, C. (2011). *Gamification by design: Implementing game mechanics in web and mobile apps*. O'Reilly Media, Inc.