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Diana Rzabayeva
Abai Kazakh National Pedagogical University,
Almaty city, Dostyk av., 13, Kazakhstan
E-mail: drzabayeva@gmail.com
ORCID ID: https://orcid.org/0009-0007-5775-0899

Gulzhaina K. Kassymova
Abai Kazakh National Pedagogical University,
Almaty city, Dostyk av., 13, Kazakhstan
E-mail: g.kassymova@abaiuniversity.edu.kz
ORCID ID: https://orcid.org/0000-0001-7004-3864

Hendri Pratama
Sultan Idris Education University,
35900 Tanjong Malim, Perak, Malaysia
Email: hendripratama.tvet@gmail.com
ORCID ID: https://orcid.org/0000-0002-0985-8156

The Role of Gamification in Promoting Digital Literacy: Bridging the Gap between Fun and Learning

Abstract: Educators are exploring innovative methods to teach digital literacy engagingly as it becomes an essential skill in the 21st century. A powerful tool for enhancing student motivation and participation is gamification, which involves the use of game elements in non-game contexts. This article examines the role of gamification in promoting digital literacy among school-aged learners, emphasizing its ability to bridge the gap between fun and education. Using points, rewards, levels, and challenges as part of digital literacy lessons can create a more dynamic and interactive learning environment. This study explores the role of gamification in enhancing digital literacy among 5th and 6th-grade students. Involving 60 students aged 10 to 12, the research divided participants into two groups: one engaged in a fully gamified learning environment and the other instructed through traditional methods supplemented with gamification elements. Through pre-test and post-test assessments, the effectiveness of gamification strategies in improving digital literacy skills was evaluated. A variety of gamified approaches are described in the article, along with the benefits of increased student engagement and possible challenges about the balance between entertainment and educational objectives. Finally, practical strategies for implementing gamification in digital literacy programs are provided, offering educators a roadmap for fostering critical digital skills enjoyably and effectively.

Keywords: Gamification in Education, Digital Literacy, Educational Technology, Game-Based Learning, Technology Integration

Introduction

In recent years, the integration of gamification into educational frameworks has emerged as a powerful tool for enhancing student engagement, fostering motivation, and promoting digital literacy. In today's rapidly evolving digital landscape, digital literacy is fundamental for success in personal, academic, and professional spheres. Digital literacy encompasses more than just the ability to operate technology; it includes critical thinking, data management, and the safe, responsible use of digital tools (Azman et al., 2024). Gamification has gained popularity in education because of its potential to make learning more interactive, enjoyable, and effective. Gamification taps into the psychological principles that make games appealing, such as achievement, progression, and reward, and applies them in educational contexts (Sailer et al., 2017). By transforming otherwise mundane tasks into engaging activities, gamification helps cultivate a natural interest in learning digital literacy skills. For instance, educational platforms incorporating gamified elements, such as Duolingo for language learning or Kahoot for quizzes, illustrate how students can acquire new skills in enjoyable, manageable formats that motivate continuous participation (Agung et al., 2023; Plump & LaRosa, 2017).

Kassymova et al. (2021) explore the upgrading of learning quality through e-learning systems, suggesting that the integration of interactive technologies, including gamification, plays a crucial role in enhancing the overall learning experience. By providing real-time feedback and adaptable learning pathways, gamified systems can address individual learning needs and foster critical digital skills (Kassymova, Nursultan, & Xu, 2024). This individualized approach not only improves engagement but also helps develop digital

literacy more dynamically and enjoyably. Gamification in education is not merely about incorporating game-like elements but about strategically aligning these elements with educational objectives to promote deeper engagement. According to Rohde et al. (2023), artificial intelligence can be leveraged in conjunction with gamification to further personalize e-learning programs, making them more responsive to the learner's progress and interests. Moreover, the role of mobile applications in promoting digital literacy has been explored in studies on interactive learning tools, such as the Android-based application for teaching manufacturing technology (Mutarah et al., 2024). These mobile platforms offer hands-on experiences that blend traditional content with innovative, game-inspired mechanics, thereby supporting both technical and cognitive skill development.

Digital literacy programs that incorporate gamification are particularly effective in bridging the gap between traditional instruction and experiential learning. Unlike conventional learning, which often follows a rigid, didactic format, gamified learning offers an immersive experience. Learners become active participants, exploring complex topics through challenges, points, badges, and levels that reward effort and achievement (Koravuna & Surepally, 2020). This interactive environment fosters intrinsic motivation, encouraging students to engage with material more deeply than they might in a traditional setting (Deterding et al., 2011). For digital literacy, this means learners are more likely to retain critical concepts, such as information evaluation, digital safety, and privacy, because they have actively engaged with these skills in a dynamic, game-based context.

The rapid digitalization of education has heightened the need for innovative approaches that effectively engage students and develop essential digital literacy skills. As technology becomes increasingly integral to all facets of life, digital literacy—encompassing competencies such as evaluating information, navigating online environments, and using digital tools responsibly—has become a core element of modern education (Mazlan et al., 2023). However, traditional teaching methods may struggle to fully engage digital-native students, who are accustomed to interactive, technology-enhanced experiences. Consequently, educators and researchers are exploring gamification as a promising strategy to foster digital literacy in a way that is both engaging and effective.

One of the most compelling aspects of gamification is its adaptability. Digital literacy programs vary in their scope and complexity, depending on learners' needs and proficiency levels. Gamification is flexible, offering a personalized learning experience that can adjust to diverse skill levels. For example, adaptive gamified digital literacy programs allow learners to progress at their own pace, ensuring they master foundational skills before advancing to more complex topics. Studies have shown that this adaptive learning approach not only improves digital literacy skills but also fosters greater learner satisfaction (Stylianou & Savva, 2022). Moreover, because gamified learning can occur across various devices and settings, it enhances accessibility, allowing more people to engage with digital literacy education in ways that fit their preferences and schedules.

Gamification, the integration of game-like elements (such as points, rewards, and challenges) into non-game environments, leverages motivational design principles to create learning experiences that captivate students' attention and drive their involvement. By turning routine educational tasks into dynamic, interactive activities, gamification encourages students to actively participate in their learning. This approach has shown considerable potential in enhancing digital literacy by encouraging students to explore digital tools, solve complex problems, and collaborate with their peers in a digital context. Foundational studies, such as that by Molumby (2016), highlight the effectiveness of structured gamified environments in fostering student engagement, motivation, and complex problem-solving abilities. Meanwhile, Sun & Hsieh (2018) and (García Cabot et al. (2017) demonstrate how points, leaderboards, and achievements in online courses can positively impact academic performance and prolong engagement.

Critics of gamification argue that it may dilute educational content by focusing too heavily on entertainment rather than knowledge acquisition. However, well-designed gamification strikes a balance between fun and learning, promoting both enjoyment and meaningful engagement with the material (Hamari et al., 2014). In a gamified environment, learners encounter structured challenges that enhance problem-solving skills, a vital aspect of digital literacy. These challenges can range from decoding complex information to navigating online safety scenarios, providing real-world relevance and practical application (Asigigan & Samur, 2022). Thus, gamification not only makes learning more enjoyable but also ensures that the lessons are both substantive and applicable in real digital environments.

Gamification also addresses the evolving expectations of digital-native learners who are accustomed to interactive multimedia content. Traditional instruction often fails to resonate with these learners, who find conventional learning methods disengaging. Gamified digital literacy programs, with their interactive design, appeal to this demographic by presenting information in formats that are familiar and engaging. This approach aligns with research suggesting that younger learners exhibit higher retention rates when educational content is visually stimulating and participatory (Kassymova et al., 2024). By incorporating gamified elements such as instant feedback, level progression, and collaborative tasks, educators can create a learning environment that resonates with students, keeping them motivated to engage in digital literacy education.

Despite its promising potential, the success of gamification in education heavily depends on context-specific factors, such as students' age, learning preferences, and cultural backgrounds. For example, while leaderboards may motivate some students, others might find them intimidating or discouraging (Dicheva et al., 2015). Similarly, the level of technological access and support available within schools can significantly influence how gamification is implemented and received. Recent studies, such as those by Carlos Fernández-Zamora & Arias-Aranda (2017) and Muangsrinoon & Boonbrahm (2019), emphasize the importance of aligning gamified designs with theoretical frameworks like Self-Determination Theory to address both intrinsic and extrinsic motivations, ultimately supporting students' sustained engagement and digital skill development.

Given the growing body of research and practical applications, this article explores the role of gamification in promoting digital literacy. It aims to bridge the gap between fun and learning by examining how gamified environments not only enhance motivation but also foster critical digital competencies. Through a review of existing literature, theoretical frameworks, and specific case studies, this article sheds light on the potential of gamification to transform digital literacy education and offers insights into designing effective gamified learning environments that balance engagement with skill acquisition.

Literature review

As the digital landscape continues to evolve, digital literacy has emerged as an essential skill set, encompassing a wide range of competencies from basic technological skills to more advanced information analysis and problem-solving abilities (List, 2019). However, traditional methods of teaching digital literacy often struggle to fully engage learners, particularly younger, digitally native audiences. In response to this challenge, educators and researchers have explored gamification—the integration of game-like elements into non-game contexts — as a method for enhancing digital literacy education by making it more accessible, interactive, and appealing (Turan & Meral, 2018). This section reviews existing literature on the role of gamification in promoting digital literacy, focusing on its impact on learner engagement, motivational outcomes, adaptability to different learning levels, and criticisms of its implementation.

The exploration of gamification in educational contexts has become increasingly prominent in recent years, reflecting a growing recognition of its potential to enhance student motivation and engagement. The foundational work by Molumby (2016) highlights the critical role that gamified learning environments play in fostering student competencies. By establishing clear instructions and well-defined purposes, educators can significantly boost engagement levels, thereby supporting the development of complex problem-solving skills. This study underscores the necessity for empirically validated gamified designs, advocating for the integration of specific gamification principles—such as visual status, social engagement, and rapid feedback—within educational frameworks.

Building on this foundation, García Cabot et al. (2017) expand the discussion by examining the integration of gamification elements within MOOCs. Their research modifies the Elgg social platform, demonstrating how points, achievements, and leaderboards can enhance academic performance and prolong engagement in e-learning environments. This work emphasizes that while gamification can effectively drive user behavior, its success heavily relies on the context and characteristics of the users involved (Kassymova et al., 2021).

Furthering this conversation, Carlos Fernández-Zamora & Arias-Aranda (2017) explore the implementation of gamification in a master's program, aiming to combat distractions inherent in the digital age. They argue that gamification not only fosters motivation and active participation but also cultivates a sense of flow and self-directed learning among students. Their findings align with the notion that

gamification, characterized by game elements such as goals, rules, and feedback, can create engaging educational experiences that enhance student involvement.

Liivak (2018) contributes to the discourse by investigating gamification within an English as a Foreign Language (EFL) textbook set. This study illustrates how gamification can transform traditional educational paradigms, fostering greater emotional connections and social positioning among students. By addressing both intrinsic and extrinsic motivations, gamification emerges as a powerful tool for enhancing student engagement and learning outcomes, particularly in language acquisition contexts (Utaminingsih et al., 2024).

Muangsrinoon & Boonbrahm (2019) provide a systematic review that identifies a variety of game elements applicable across different fields, including education and healthcare. Their analysis reveals the relationship between gamification and Self-Determination Theory, suggesting that elements such as feedback, competition, and cooperation can significantly motivate learners. This broad applicability of gamification underscores its potential as a versatile framework for enhancing educational practices.

Chong (2019) further examines the diverse applications of gamification in higher education, noting its effectiveness in improving student motivation and performance across various disciplines. However, the study also highlights the criticisms surrounding measurement and the need for a deeper understanding of gamification's design and implementation processes. This call for more robust conceptual frameworks suggests that while gamification shows promise, further research is necessary to optimize its application in educational settings.

Prados Sánchez et al. (2023) shifts the focus to the specific domain of reading instruction, illustrating how gamification can positively influence students' attitudes and motivation toward reading. The findings indicate that platforms like Read Theory can serve as effective alternatives to traditional methods, fostering independent reading habits among students. This study emphasizes the importance of integrating gamification into curriculum design to enhance language development and learner autonomy.

Finally, Jack et al. (2024) explore gamification within flipped classroom environments, reinforcing the idea that gamified elements can significantly enhance student engagement and learning outcomes. Their recommendations for educators aim to leverage gamification strategies to foster active participation and motivation, suggesting a promising avenue for future research in this dynamic field.

Table 1. Summary of Key Studies on Gamification in Educational Contexts

Authors	Focus	Key findings	Gamification elements
Molumby (2016)	Role of gamified environments in fostering competencies	Gamified learning boosts engagement and problem-solving skills through clear	Visual status, social engagement, rapid feedback
García Cabot et al. (2017)	Gamification in MOOCs	Integration of points, achievements, and leaderboards in e-learning enhances academic performance and engagement. Context and user characteristics impact effectiveness	Points, achievements, leaderboards
Carlos Fernández-Zamora & Arias-Aranda (2017)	Gamification in a master's program	Gamification promotes motivation, participation, flow, and self-directed learning, fostering engaging educational experiences	Goals, rules, feedback
Liivak (2018)	Gamification in EFL education	Gamification in EFL settings boosts emotional connections, social positioning, and engagement. Addresses both intrinsic and extrinsic motivations	Various motivational elements

Prados Sánchez et al. (2023)	Gamification in reading instruction	Gamification positively impacts reading motivation and attitudes. Tools like ReadTheory support independent reading and language development	Points, levels, progress tracking
Jack et al. (2024)	Gamification in flipped classroom environments	Gamification significantly enhances engagement and learning in flipped classrooms. Recommends gamification strategies for improved student motivation	Points, challenges, progress feedback

Overall, the literature collectively underscores the transformative potential of gamification in education, highlighting its ability to bridge the gap between engagement and learning. Through a critical evaluation of the various studies, it becomes evident that while gamification presents numerous benefits, its effectiveness is contingent upon thoughtful implementation tailored to specific educational contexts and learner needs.

Methodology

Participants

The study involved 60 students from four 5th and 6th-grade classes in a private school, aged between 10 and 12 years old. The students were divided into two experimental groups and two control groups, each consisting of 15 students. The students were chosen to represent typical digital literacy levels and engagement behaviors among early adolescent learners, a demographic particularly responsive to interactive and gamified learning environments.

The approach used in this study was quasi-experimental design that compared two groups: one group received a gamified digital literacy program, while the other group followed a traditional, non-gamified curriculum. This allowed the researchers to assess differences in learning outcomes and engagement that were directly attributable to the gamification elements. It also used pre- and post-assessment tests to measure improvements in digital literacy competencies, such as information processing and digital ethics, between the gamified and non-gamified groups. This design helped isolate the effects of gamification, providing a controlled basis for comparing how different teaching methods impact digital literacy.

Results and discussion

This study employed a quasi-experimental design with a pre-test/post-test structure to assess the impact of gamification on digital literacy skills. Digital literacy was evaluated across specific sections, each focusing on a distinct area (e.g., online information evaluation, digital communication, and online safety). The study spanned three weeks, during which one group of students engaged in gamified digital literacy activities, while the other followed a traditional instructional approach supplemented with limited gamified elements.

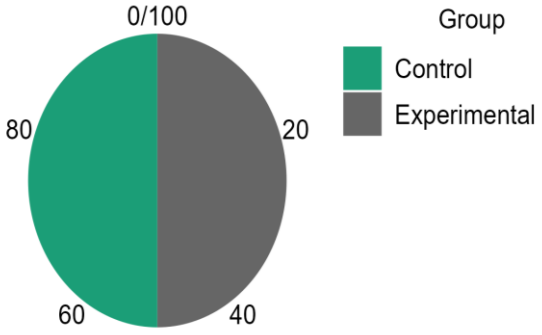

Figure 1. Proportion of Students in Control and Experimental Groups

- *Experimental Group (Gamified Format):* Two classes participated in a digital literacy program heavily incorporating gamification elements, such as points, badges, challenges, and immediate feedback mechanisms. Activities were designed to encourage students' engagement and reinforce digital skills in a fun, interactive way.
- *Control Group (Traditional Format with Limited Gamification):* The other two classes followed a traditional instructional approach with limited gamification features, using standard teaching methods supplemented by only a few game-like elements (e.g., occasional points or quizzes but without the comprehensive gamified structure of the experimental group).

All students completed a digital literacy pre-test, divided by sections, to assess their baseline skills and knowledge. This test was structured to capture performance across the same digital literacy competencies targeted in the program.

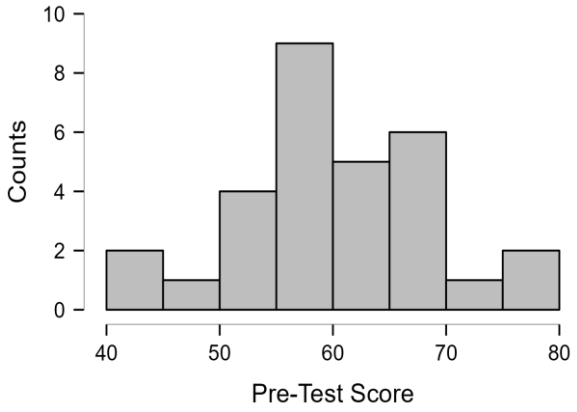

Figure 2. Distribution of Pre-Test Scores Among Students

Intervention

- *Experimental Group:* The two experimental classes engaged in a fully gamified curriculum, incorporating various game design elements such as levels, points, feedback loops, and collaborative tasks, to foster engagement and reinforce learning outcomes. This intervention was conducted over three weeks, with daily sessions designed to be interactive and responsive to students' progress.
- *Control Group:* The two control classes received instruction on the same digital literacy topics but through a traditional teaching format. They participated in teacher-led instruction, with periodic quizzes and discussions but minimal interactive elements.

At the end of the three-week intervention, all students took a post-test structured identically to the pre-test, divided by sections. This allowed for a direct comparison of pre- and post-intervention results to evaluate changes in digital literacy skills and the potential influence of gamification elements on student engagement and performance.

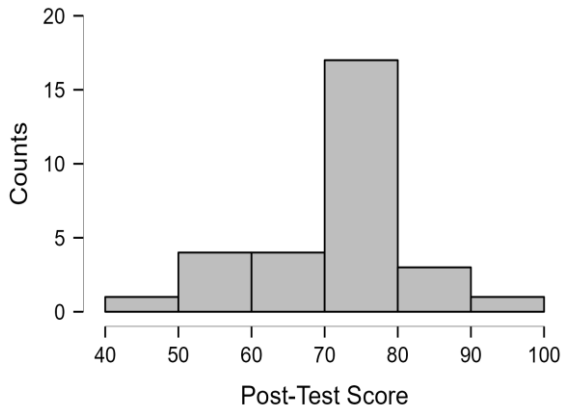

Figure 3. Distribution of Post-Test Scores Among Students

After three weeks of engaging in gamification elements, post-test scores ranged from 44.65 to 90.43, with a mean score of approximately 73.76. The distribution plot in of post-test scores illustrated the effectiveness of the intervention in the Fig. 3.

Table 2. Descriptive Statistics

	Student	Gender	Group	Pre-Test Score	Post-Test Score
Valid	30	30	30	30	30
Mode	1.000 [a]	1.000	1.000	57.660 [a]	44.650 [a]
Median	15.500			58.140	74.500
Mean	15.500			59.897	72.105
Std. Error of Mean	1.607			1.556	1.872
Std. Deviation	8.803			8.522	10.255
Coefficient of variation	0.568			0.142	0.142
Variance	77.500			72.625	105.159
Range	29.000			34.920	45.780
Minimum	1.000			40.870	44.650
Maximum	30.000			75.790	90.430
25th percentile	8.250			55.318	65.578
50th percentile	15.500			58.140	74.500
75th percentile	22.750			65.948	77.487

Note. Not all values are available for *Nominal Text* variables

Education serves as a fundamental driver of social progress, and for educational institutions to adapt their pedagogical approaches effectively, it is crucial to assess students' learning outcomes. In this analysis (Table 2), we examine the performance data of 60 students, focusing on their pre- and post-test scores while considering various demographic factors. The sample consists of students aged 10 to 12, with a balanced representation of male and female participants. This equitable distribution helps minimize age and gender biases in our study, allowing for a more nuanced examination of student performance.

An analysis of performance by gender reveals interesting trends. Pre-test averages for male and female students are similar, yet post-test results indicate that female students have a slight advantage in digital literacy skills following the intervention. This phenomenon suggests the need for further investigation into the factors influencing learning outcomes that may be specific to gender in the context of gamified learning environments.

Age also plays a significant role in academic performance, as older students may exhibit greater cognitive maturity and academic preparedness. However, our data indicates no significant correlation between test scores and age within the 10-12 age range. Both 10-year-old and 11-year-old students demonstrate comparable levels of achievement, implying that factors beyond age may contribute to variations in learning outcomes.

A closer look at individual student data reveals a spectrum of performance outcomes. Some students show marked improvement between the pre- and post-tests, while others either progress minimally or even regress. This variability underscores the importance of employing personalized teaching strategies tailored to the diverse needs of individual learners, particularly in gamified educational settings. Such tailored

approaches are essential to ensure that all students benefit from the engaging learning experiences gamification offers, aligning with the objectives of this study.

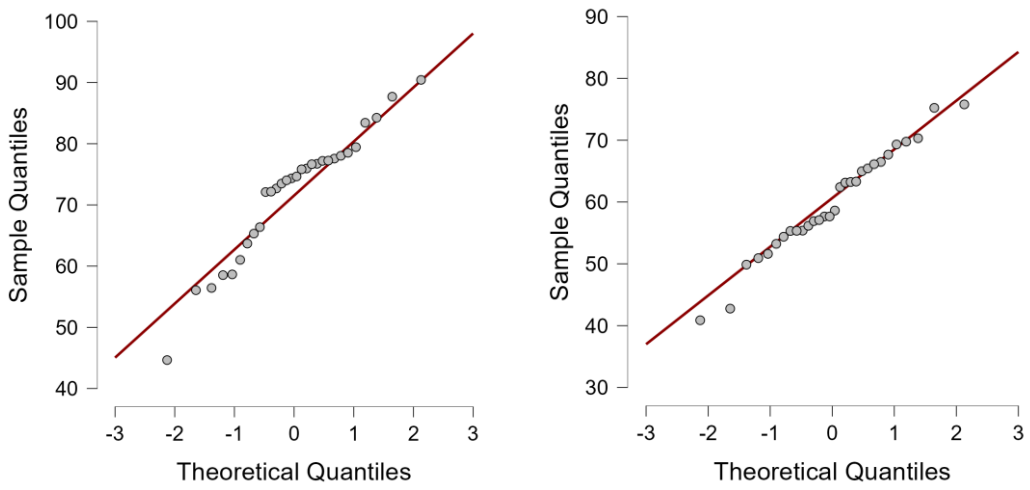

Figure 4. Comparing Pre-test and Post-test t Scores to Normal Distribution

Fig. 4 shows the post-test scores, ranging from 44.65 to 90.43, which should ideally show a shift towards a normal distribution. If the plot indicates a more centralized distribution compared to the pre-test, it signifies that gamification has effectively engaged students, improving their overall digital literacy skills. This shift reinforces the article's argument that fun and engaging educational methods can lead to better outcomes (Sadera et al., 2014). A marked difference in the shapes and central tendencies of the two plots provides empirical evidence to support the argument for the effectiveness of gamified learning. The comparison of the post-test distribution to the pre-test plot revealed shifts in the central tendency and shape, indicating the impact of gamification on students' learning outcomes.

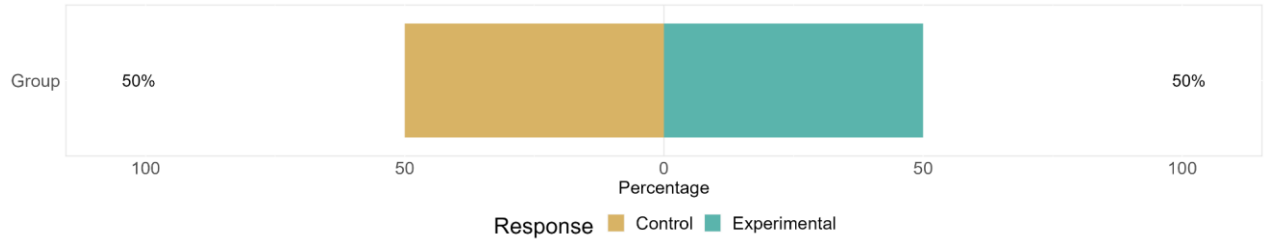

Figure 5. Likert plots of students' post-scores

Statistical analysis was conducted to evaluate the significance of the differences in performance across groups. The data from this study will provide insights into the effectiveness of gamification in enhancing digital literacy and offer practical recommendations for integrating gamification into early adolescent education. This study demonstrates the significant potential of gamification in enhancing digital literacy among 5th and 6th-grade students (Saxena & Mishra, 2021). By comparing pre-test and post-test scores, we observed substantial improvements in digital literacy skills among students exposed to a gamified learning environment, with female students showing particularly notable gains. These findings underscore the effectiveness of engaging, interactive educational strategies that foster motivation and participation, ultimately bridging the gap between traditional learning and modern educational needs.

Despite the positive outcomes, the analysis revealed complexities in student performance that highlight the importance of personalized teaching approaches. The absence of a strong correlation between age and academic achievement suggests that factors beyond mere age, including individual learning styles and prior knowledge, significantly influence educational outcomes. This variability calls for educators to

implement differentiated instruction tailored to the diverse needs of students, ensuring that all learners benefit from gamified strategies.

Conclusions

In conclusion, integrating gamification into educational practices presents a promising avenue for improving digital literacy and overall engagement in learning. As educational institutions strive to adapt to the demands of the digital age, embracing gamified methodologies can create dynamic and inclusive learning environments that cater to the varied needs of students. The convergence of gamification and e-learning represents a transformative approach to education. By aligning fun with learning objectives, gamified systems not only make digital literacy more accessible but also cultivate a generation of learners who are better equipped to thrive in the increasingly digital world. Future research should explore the long-term effects of gamification on learning outcomes and investigate specific elements that contribute to its effectiveness, further refining strategies to maximize its benefits in diverse educational contexts.

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