

Examining Test Anxiety and Its Alleviation: Assessing the Efficacy of Gamification in ESL Contexts

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ABSTRACT

Students are under more pressure now than ever before, which has caused a variety of anxieties. This study focuses on test anxiety, which encompasses emotional factors that impact students before, during, and after exams. Factors contributing to test anxiety include inadequate test-taking skills, unfamiliarity with content and formats, time constraints, and strict evaluation. Gamification, the integration of game elements into non-gaming contexts, offers significant psychological benefits, especially for ESL students. This research aims to evaluate the effectiveness of reducing test anxiety among ESL learners. To assess the impact of gamification, a survey comprising twelve statements related to test anxiety was administered to 30 first-year undergraduate ESL students. It was followed by a focused group interview that delved into gamification's effect on test anxiety. The study shows a reduction in anxiety levels of the students due to gamification. Ultimately, this study highlights the importance of innovative approaches, such as gamification, in addressing test anxiety within ESL education.

Keywords: *Test Anxiety, Gamification, ESL Learners, Motivation, Engagement.*

Introduction

The global education landscape underwent a seismic shift during the COVID-19 pandemic, and students and educators alike were grappling with the rapid transition to online learning. The COVID-19 pandemic has been profoundly altered creating both challenges and opportunities. Among challenges, the increase in anxiety levels among students is significant,

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exacerbated by abrupt transitions to online learning, isolation from peers, and lack of structured support systems. Consequently, educational institutions are directing the system to address problems related to students' anxieties. In these circumstances, language anxiety turned out to be a more distinct challenge in English as a Second Language (ESL) learners.

In language acquisition, language anxiety greatly affects the learners' academic performance. Gardner (1985) defined learner anxiety as "a construct of anxiety which is not general but instead is specific to the language acquisition context and is related to second language achievement." Test anxiety, a type of situation-specific anxiety, is particularly impactful, as it emerges from affective factors tied to evaluative situations (Ellis, 1994). Zeidner (2007, p. 166) and Joy (2013) described test anxiety as "the set of cognitive, physiological, and behavioural responses that accompany concern about possible negative consequences or failure on exams or similar evaluative situations." Such anxiety often leads to physical and psychological problems, reduced motivation, and performance errors (Aydin et al., 2020).

For ESL learners, these effects are magnified due to linguistic challenges, unfamiliar question formats, and time pressure. Pandemic-induced disruptions added another layer of complexity, and learners often struggled to adapt to remote learning environments where language barriers were more difficult to overcome. The post-COVID-19 era calls for targeted interventions, such as gamification, to address these compounded challenges and foster resilience in ESL learners. Therefore, the objective of the research study is to find the impact of gamification on ESL learners' test anxiety and the game elements that help to reduce learners' test anxiety.

Review of Literature

Research highlights several factors that influence test anxiety and its impact on language learning. El-Banna (1989) noted that higher anxiety levels were associated with poorer test performance. Demographics such as gender, school grade level (Hembree, 1988), and socioeconomic variables (Guida and Ludlow, 1989) significantly contribute to test anxiety. Putwain (2007) confirmed the predictive role of gender, ethnicity, and socioeconomic status in anxiety scores among secondary school students.

Poor study skills are another significant source of test anxiety. Wittmaier (1972) established a link between ineffective study habits and increased test anxiety. Culler and Holahn (1980) observed that high-anxious college students displayed less effective studying behaviours, resulting in lower academic performance. Cassady and Johnson (2002) further confirmed that

students with high anxiety about cognitive tests exhibited ineffective preparation and study behaviour.

The testing environment also plays a crucial role in exacerbating test anxiety (Bushnell, 1978; Shohamy, 1982). The findings of the research underscore the importance of creating a conducive testing environment to alleviate stress. Assessment methods and test instructions also directly affect test anxiety (Mandelson, 1973). Oh (1992) noted that specific assessment techniques, such as cloze and think-aloud methods, increased anxiety levels among students. These findings suggest a need for carefully designed assessment practices to mitigate anxiety.

Language proficiency is another critical factor that influences anxiety about tests. Rotenberg (2002) identified a negative correlation between language proficiency and test anxiety, where less proficient learners exhibited higher anxiety levels. Similarly, Joy (2013) observed that test anxiety was most pronounced during the test stage, followed by the pre-test stage. Effective preparation strategies are vital to minimise the anxiety associated with language proficiency.

Test anxiety adversely affects the language learning process. Aydin et al. (2006) found that anxiety reduced motivation, concentration, and achievement while increasing errors. Schonwetter (1995) demonstrated that test anxiety hindered students from fully benefiting from structured instruction, reducing their motivation for future learning. In listening and speaking tasks, Haskin et al. (2003) and Arnold (2000) highlighted the detrimental effects on anxiety, with visualisation strategies that proved effective in reducing listening test anxiety.

Aydin et al. (2020) highlighted several strategies to deal with anxiety, such as breathing exercises, talking to friends, family members, and the school counsellor, praying and listening to music. Although these strategies helped students, the new atmosphere and test instructions created anxiety within the students. Gamification has shown positive results in increasing motivation and engagement in the domain of teaching, learning, and assessment (Zhang and Hasim, 2023; Ertan and Arkün, 2024). Incorporating gamification into the classroom can lead to a positive result in the area of test anxiety.

Gamification involves using game mechanics such as avatars, leaderboards, and rewards to create an engaging, competitive, and low-pressure environment. Research emphasises that incorporating gamification in educational settings positively impacts motivation, engagement, and language proficiency (Karl Kapp, 2012). Additionally, elements such as avatars or nicknames allow students to participate anonymously, which helps to reduce the pressure and

fosters a sense of security. By providing immediate feedback, gamified assessments increase self-confidence, and students recognise their mistakes and address their areas of improvement on time.

In addition, multimodal game elements, such as points and leaderboards, promote motivation and healthy competition among learners (Zichermann and Cunningham, 2011). With the assistance of these gamification features, the assessments become more enjoyable and also encourage the consistent participation of the students in classroom activities. While promoting active participation and positive learning outcomes, the dynamic nature of gamification introduces an assessment format into more effective and learner-centred experiences, to address the challenges of test anxiety.

Research Questions

This study attempts to find the answer to the following questions:

- Does gamification effectively reduce the test anxiety of ESL learners?
- What specific game elements help in reducing the test anxiety of ESL learners?

Research Design

The present study aims to investigate the level of test anxiety of students in ESL classrooms and the impact of gamification on test anxiety. A mixed-method approach is adopted with beads on the research questions. The level of test anxiety and the impact of gamification on students' test anxiety is identified through a quantitative method, and a qualitative method is used to investigate the game elements that are involved in reducing test anxiety.

A study was conducted in a Communicative English course at St. Joseph's College, Tiruchirappalli, India. 30 first-year ESL students from various departments were selected from a mandatory 80-hour Communicative English course, conducted from July to October 2023, in addition to their regular academic programme. Of the 30 students, 28 were male, and 2 were female with an average age of 18 years ranging from 17 to 19 years. Most of the students (N=21) who participated in the study received their instruction in English, while the remaining 30% of the students (N=9) had received instruction in Tamil during their school years. According to Raj and Singh (2023), Kahoot is considered one of the multimodal gamified applications chosen for the gamified assessment. Visual, auditory, and interactive gamified components are introduced in the classroom assessments.

To examine the level of students' anxiety level, a questionnaire was adopted from Joy (2013) for the survey. The questionnaire contains 12 statements with a four-point agreement scale. The questionnaire was modified to assess students' anxiety levels before (3), during (5), and after tests (1), as well as the influence of gamification on text anxiety (3). After completion of the final exams, the survey was conducted in the classroom. The questionnaire helps to understand the level of students' test anxiety at various times of the test.

A focus group interview was selected as a qualitative approach to explore the effectiveness of game elements on test anxiety. The results of final exam scores and responses from the survey help to categorise the students for the interview. Three groups of students were divided with equal members in each. The interview was recorded and further analysed to understand the game elements that help to reduce the anxiety about the test of the students.

To maintain ethical standards throughout the research process, the following issues were considered:

- Informed consent was secured and assured.
- Confidentiality was maintained.
- Trust was established to protect participants' well-being and ensure data reliability.

The researchers implemented rigorous measures to protect participants from potential harm or exploitation, ensuring the reliability of the data collected. Special attention was paid to the development of the interview questionnaire, ensuring its appropriateness and neutrality to prevent any potential bias. As the participants were young adults, interviews were conducted in a comfortable and non-threatening setting, fostering an atmosphere conducive to open and candid dialogue. This approach encouraged participants to freely express their opinions and experiences without any pressure or discomfort.

Results

The purpose of the present study was to investigate the effect of gamification on test anxiety among tertiary students. Communicative English was selected for the study. Students were divided into three classes based on their pre-test scores. The survey data were collected after the post-test from students who practised gamification strategies in the classroom. To have strong evidence and answer the research questions, a focus group interview was conducted on test anxiety and the influence of gamification.

Level of students' test anxiety

1. Before test

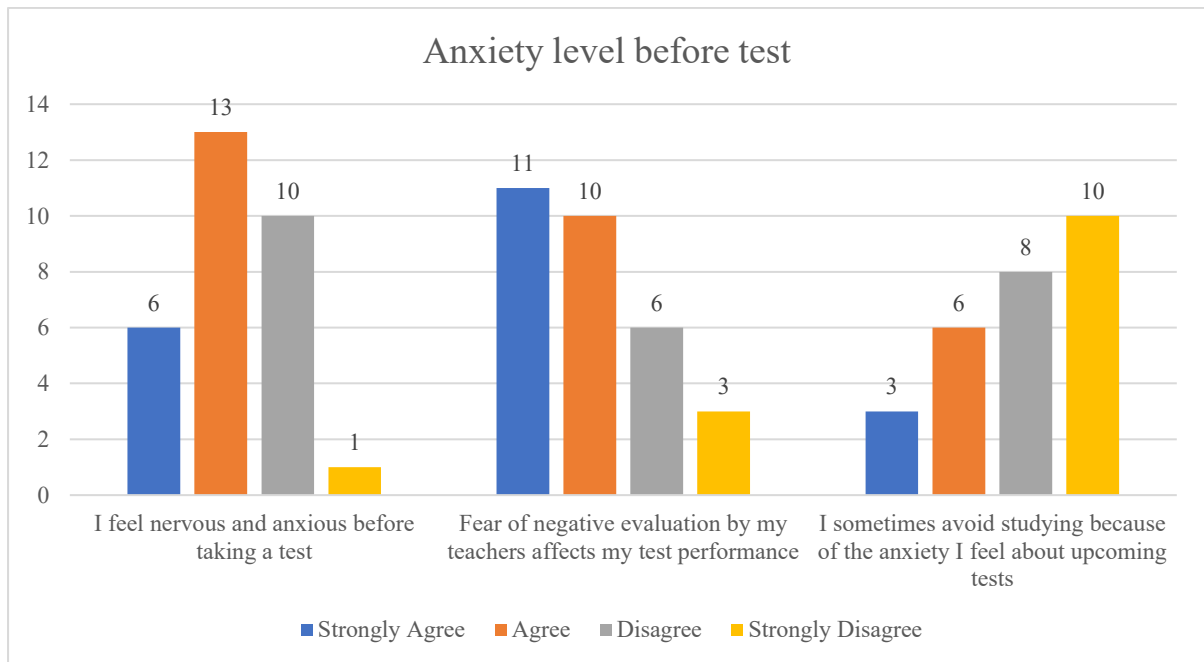


Figure 1: Anxiety level before the test

Figure 1 above shows the anxiety levels of the students before a test, revealing diverse responses to different anxiety-related factors. A significant number of students agreed or strongly agreed with feeling nervous and anxious before taking a test, highlighting the prevalence of pre-test anxiety. Fear of negative evaluation by teachers or peers was another prominent factor, with a majority indicating agreement. This suggests that external pressures and judgment can strongly influence stress. Remarkably, when considering the avoidance of studying due to anxiety about the upcoming tests, the responses were more varied. Although some students strongly disagreed with this statement, indicating resilience to anxiety-driven avoidance, a significant portion agreed, implying that anxiety can sometimes act as a deterrent to effective study habits. Overall, anxiety before tests is due to a combination of personal feelings of nervousness, fear of external evaluation, and impact on study behaviours.

2. After Test

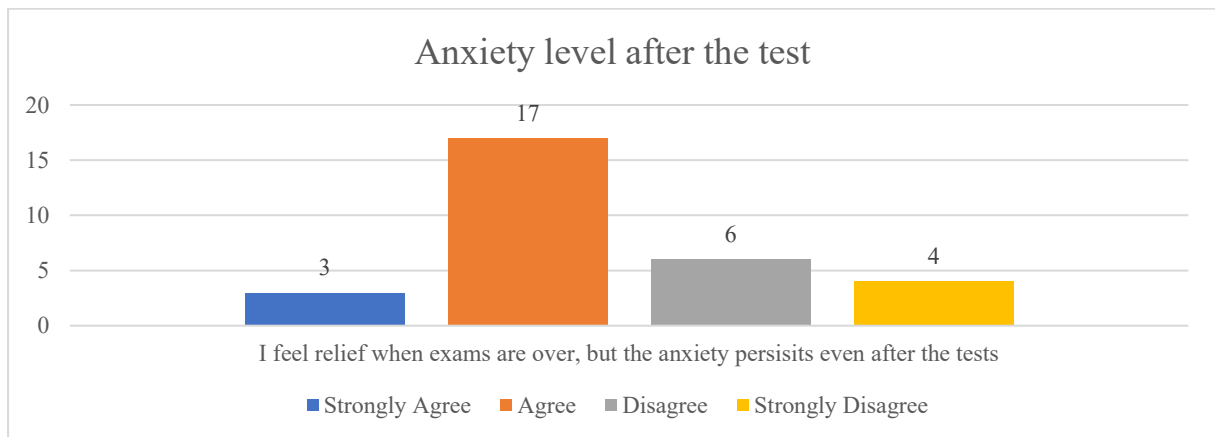


Figure 2: Anxiety level after test

Figure 2 shows the level of anxiety after tests, revealing the enduring effects of stress related to tests. A majority of respondents (20) agreed that, while they experienced relief once the exams were over, anxiety persisted even after completing the tests. This lingering stress is indicative of the cumulative pressure exerted by the testing process, suggesting that the resolution of the immediate stressor (the test) does not fully alleviate the psychological impact. A smaller number of respondents (10) strongly agreed with this sentiment, further highlighting the prevalence of post-test anxiety. In contrast, only two respondents disagreed and none strongly disagreed, emphasising the widespread acknowledgement of persistent anxiety among students. The figure underscores the need for interventions that address not only pre-test and in-test anxiety but also the aftermath of the testing experience. Persistent anxiety after exams can reflect concerns about performance, fear of judgement, or regret for mistakes. Strategies such as gamification, which foster a more enjoyable and less pressurised learning environment, could play a vital role in mitigating these lingering effects. By shifting the focus from purely evaluative metrics to interactive and engaging assessments, educators can help students manage immediate and residual test-related stress, ultimately enhancing emotional well-being and academic performance.

3. During the test

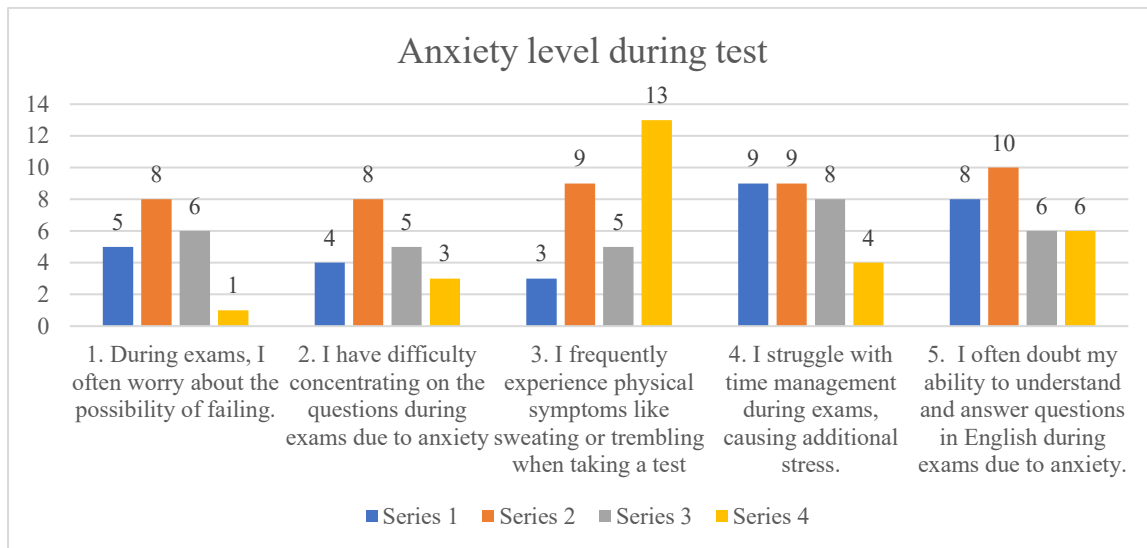


Figure 3: Anxiety level during test

Figure 3 highlights various dimensions of the anxiety experienced by students during exams. The first statement reveals that a significant number of students worry about failing during exams, with more respondents agreeing than disagreeing. Similarly, the second statement indicates that anxiety hinders students' concentration during exams, showing a similar pattern in responses, where agreement is more prevalent. The third statement focuses on the physical symptoms of anxiety, such as sweating or trembling, experienced by many students. Therefore, a significant number strongly agree with this observation, emphasising the tangible impact of stress related to tests. Regarding time management struggles, as indicated in the fourth statement, the responses show a balanced distribution, and many acknowledge this challenge as a stressor during exams. Lastly, the fifth statement reveals doubts about the ability of the student to understand and answer questions in English due to anxiety. The response pattern aligns with previous observations, highlighting the widespread effects of test anxiety on academic performance and self-confidence.

Influence of Gamification

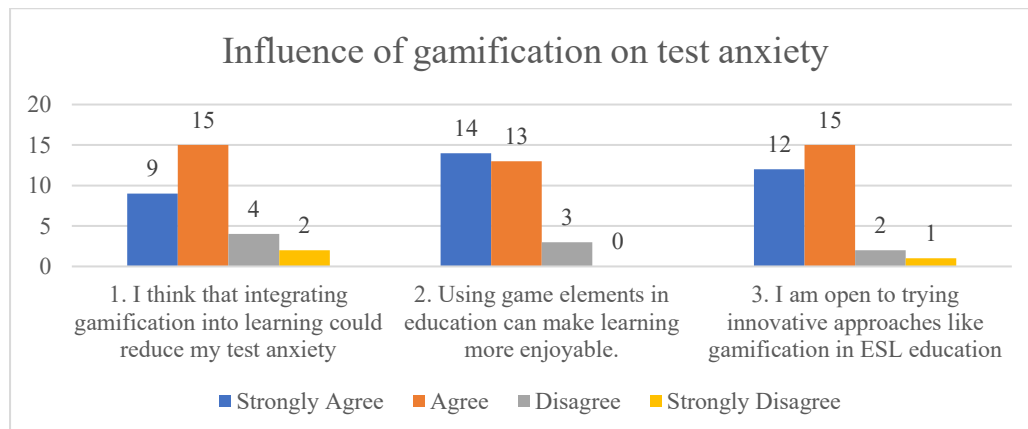


Figure 4: Influence of gamification on test anxiety

Figure 4 shows the responses to three statements regarding the impact of gamification in education. The graph highlights a positive perception towards gamification in education, with the majority of respondents agreeing or strongly agreeing that gamification can reduce test anxiety and make learning more enjoyable. Furthermore, there is a strong openness towards trying gamification in ESL education, suggesting a favourable attitude towards incorporating game elements in educational settings to enhance learning experiences.

An analysis of anxiety levels before, during, and after tests highlights the multifaceted nature of test-related stress among students. The analysis of the present study reveals that most of the students feel nervous and anxious before the test and fear of negative evaluation by the teacher or peers is another key factor for the anxiety before the tests. Some students feel anxious about the test, which results in avoidance of studying for the test. These per-test anxieties also continued during the examination process. As shown in the data (Figure 3), anxiety presents in various forms. An extensive number of students worry about failing, struggle to concentrate, and experience physical symptoms such as sweating or trembling.

Furthermore, the students doubted their ability to understand and answer the questions, which resulted in overthinking. Adding to their stress, students struggle to manage their stipulated time. Therefore, students find it difficult to allocate the time to all the questions. These findings highlight the immediate impact on cognitive and physical performance during tests. A difference is observed and evident in the nature of anxiety after the tests. Most of the students report feeling relieved that the exams are over. However, some students continue to have

anxiety. The lingering anxiety signifies the persistent concern about the performance and evaluation that affect future participation in similar assessments.

The influence of anxiety is prevalent in comparing the stages of the testing process. Anticipation and fear of failure are the major causes of before-test anxiety, while during-test anxiety revolves around performance challenges and physiological responses. Although the anxiety level is reduced in post-test anxiety, an indication of the enduring psychological impact of the assessments presents in the students. To address these issues, a systematic approach is required that includes strategies to reduce fear of evaluation, improve time management skills, and foster confidence in language proficiency. Such an approach could alleviate anxiety at all stages of the test process and allow students to achieve their full potential.

The analysis of the present study proposes that gamification is widely viewed as a promising strategy to address test-related anxiety. Most of the students recognise its potential to reduce anxiety, and also enhance engagement and enjoyment in the learning process. Furthermore, the willingness to integrate gamification in ESL contexts demonstrates an openness to innovative strategies that balance learning outcomes and student well-being. These results highlight that students support gamification as a strategy to mitigate test anxiety.

The qualitative analysis of the study highlighted key patterns in students' experiences with test anxiety across different stages of assessment. These patterns mostly aligned with the survey responses. Anxiety from overthinking, inadequate preparation, and unfamiliar test formats are commonly experienced by students before tests. Mismanagement of time, unfamiliar vocabulary, and question patterns are common factors that exacerbate stress levels during tests. Participants expressed feeling uneasy when managing the time for the final questions and concerned about determining the appropriate length of their answers, which underscores the cognitive and emotional challenges faced during assessments. After tests, students tend to discuss the question paper with peers which often causes self-doubt and nervousness. The following statements are example responses from the students.

'I overthink that the questions will be tough, which leads me to anxiety.'

'I was lethargic and did not prepare well. When I entered the exam hall, I wished I could study more which creates stress and anxiety.'

'When I read any unfamiliar vocabulary in the question paper that confuses me and leads me to overthink and stress.'

‘I used to discuss the questions with friends after the exam which made me nervous about my answers in the test.’

These sample responses reveal the predominant nature of test anxiety before, during, and after the tests. The students expressed positive attitudes toward gamified assessments, while another shared, stating that they did not feel the usual stress associated with traditional tests. Responses from the students suggest the significant impact of gamification on alleviating test anxiety. The students also highlighted the enjoyable and engaging nature of gamification.

The following statements are sample responses from the students.

‘It is fun and enjoyable, not like usual tests.’

‘I don’t feel like being in a test when gamification is introduced in the classroom,’

‘In the gamified assessment, I am confident to answer the questions.’

During the interview, students also mentioned major game elements that contributed to reducing test anxiety including avatars or nicknames, leaderboards, rewards, points, automated feedback, and multimodality. These game elements created a more relaxed and enjoyable learning environment and also increased students’ confidence and motivation. The sample of students’ responses is as follows,

‘I like the nicknames and cool avatars. I used funny names while participating in the tests. So that if I get good marks, my name will be displayed on the leaderboard. If I fail, no one knows about me. So, I answered confidently.’

‘I like being first on the leaderboard. So, whenever the test comes, I try to score first. Even if I made a mistake in one question, I can perform well in the next question.’

‘I like competitions with my friends and I like to get good marks. So, I try my best to get good scores.’

‘I like to explore more, so, I scored good marks in some tests and got poor performance in some. After experiencing it, I liked the different feedback on the screen and it made me curious about its function.’

By comparing and analysing all the responses, the findings emphasise the potential of gamification to transform assessments into a less intimidating and more effective experience for students.

Discussion

The findings of the study highlight that exams are a primary source of stress for students while presenting peak anxiety levels before and during tests. Inadequate preparation, unfamiliar test structures, the intense atmosphere of the examination setting, and a pervasive fear of failure are the major triggers of students’ test anxiety. This awareness of their sources of anxiety

highlights the complex emotional and psychological pressures that students face during assessments.

Although traditional assessments provide the data for acquired learning, gamified assessments provide an enjoyable and engaging approach. Game elements such as avatars and nicknames promote anonymity which reduces social pressure and empowers students to participate confidently. Additionally, automated feedback offers immediate constructive responses, further enhancing students' confidence in their performance by correcting their mistakes. In addition, game elements such as points and leaderboards foster healthy competition among students. Accurate and assured responses encourage students while creating a dynamic and positive learning environment.

The supplementary findings of the study are that gamification describes the shifting focus of key psychological barriers from evaluation to enjoyment that reduce the cognitive load associated with fear of failure. Repeated exposure to gamified tasks builds students' self-efficacy is induced in the students through the repeated exposure of gamified tasks, promoting a sense of competence and confidence. Moreover, through collaborative learning in gamification, the feeling of isolation is reduced in high-pressure exam situations. Intrinsic and extrinsic motivators are effectively combined in this approach to create a balanced and supportive assessment environment.

To utilise the benefits of gamification, teachers are encouraged to integrate game elements into their assessment designs. Visual, auditory, and interactive components are presented in gamification which promotes multimodal engagement to enhance inclusivity by addressing diverse learning styles. Social and peer pressures can be reduced through anonymity in the form of avatars or nicknames and foster greater participation. Lastly, immediate and constructive insights are implemented through automated feedback, which can build students' confidence and reinforce learning outcomes.

Conclusion

After the COVID pandemic, education has undergone a drastic change and students face many challenges to cope with exams and studies. Traditional testing methods, often hinder students' ability to perform optimally due to stress and fear of failure. Addressing these psychological barriers, the gamification approach transforms the focus from evaluation to active engagement

and enjoyment. The present study suggests the profound impact of gamification on reducing test anxiety and enhancing the overall assessment experience. Introducing game elements such as avatars, nicknames, leaderboards, and automated feedback in an educational environment can make students more confident, motivated, and less pressured.

Furthermore, the impact of gamification not only alleviates test anxiety but also fosters intrinsic and extrinsic motivation. Rather than judgment, students find gamified assessment as opportunities for growth because of collaborative learning and immediate feedback. The gamified approach also aligns with diverse learning styles because of its multimodality, making education more inclusive and supportive.

To conclude, systematic integration of gamification in the classroom and assessment can gain more benefits. Gamification can evidently reduce the cognitive and emotional challenges associated with testing, paving the way for more effective and meaningful learning experiences. Additionally, gamification has immense potential to transform the educational landscape, ensuring that assessments contribute positively to both academic achievement and students' emotional well-being. Applying various gamified approaches and applications in ESL classrooms to improve language skills and ESL context and finding its impacts can be experimented with in future studies.

Works Cited:

- Arnold, Jane. "Seeing through Listening Comprehension Exam Anxiety." *TESOL Quarterly*, vol. 34, no. 4, 2000, pp. 777–86. JSTOR, <https://doi.org/10.2307/3587791>.
- Aydın, Selami, et al. "Test Anxiety among Foreign Language Learners: A Qualitative Study." *The Qualitative Report*, vol. 25, no. 12, 2020, pp. 4289–4309. <https://doi.org/10.46743/2160-3715/2020.4686>.
- Aydın, Selami, et al. "Test Anxiety in Foreign Language Learning." *Journal of Graduate School of Social Sciences of Balıkesir University*, vol. 9, no. 16, 2006, pp. 145–60.
- Bushnell, David D. *Altering Test Environments for Reducing Test Anxiety and for Improving Academic Performance*. US Department of Health, Education, and Welfare, National Institute of Education, 1978.

- Cassady, Jerrell C., and Ronald E. Johnson. "Cognitive Test Anxiety and Academic Performance." *Contemporary Educational Psychology*, vol. 27, no. 2, 2002, pp. 270–95. <https://doi.org/10.1006/ceps.2001.1094>.
- Culler, Ralph E., and Charles J. Holahan. "Test Anxiety and Academic Performance: The Effects of Study-Related Behaviors." *Journal of Educational Psychology*, vol. 72, no. 1, 1980, pp. 16–20. <https://doi.org/10.1037/0022-0663.72.1.16>.
- El-Banna, Ahmed I. *Language Anxiety and Language Proficiency among EFL/ESL Learners at University Level: An Exploratory Investigation*. ERIC Database, ED308698, 1989, <https://eric.ed.gov/?id=ED308698>.
- Ertan, K., and Sibel Arkün Kocadere. "Investigating Achievement, Motivation and Attitude in a Gamified English Course." *International Journal of Technology Enhanced Learning*, vol. 16, no. 2, 2024, pp. 134–56.
- Guida, F. Vincent, and Larry H. Ludlow. "A Cross-Cultural Study of Test Anxiety." *Journal of Cross-Cultural Psychology*, vol. 20, no. 2, 1989, pp. 178–90. <https://doi.org/10.1177/0022022189202004>.
- Haskin, Janet, et al. *Decreasing Anxiety and Frustration in the Spanish Language Classroom*. ERIC Database, ED474368, 2003, <https://eric.ed.gov/?id=ED474368>.
- Hembree, Ray. "Correlates, Causes, Effects, and Treatment of Test Anxiety." *Review of Educational Research*, vol. 58, no. 1, 1988, pp. 47–77. <https://doi.org/10.3102/00346543058001047>.
- Joy, James L. "The Altitude of Test Anxiety among Second Language Learners." *Language Testing in Asia*, vol. 3, 2013, pp. 1–10.
- Kapp, Karl M. *The Gamification of Learning and Instruction: Case-Based Methods and Strategies for Training and Education*. Pfeiffer, 2012.
- Mandelson, Larry R. "Test Performance on Verbal Learning Task as a Function of Anxiety Arousing Testing Instructions." *Journal of Educational Research*, vol. 67, no. 1, 1973, pp. 37–40. <https://doi.org/10.1080/00220671.1974.10884551>.
- Oh, Jong-Bok. "The Effects of L2 Reading Assessment Methods on Anxiety Level." *TESOL Quarterly*, vol. 26, no. 1, 1992, pp. 172–76.
- Putwain, David W. "Test Anxiety in UK Schoolchildren: Prevalence and Demographic Patterns." *British Journal of Educational Psychology*, vol. 77, no. 3, 2007, pp. 579–93. <https://doi.org/10.1348/000709906X161704>.

- Raj, H. Daniel, and M. S. Xavier Pradheep Singh. "Gamified Student Response Systems for ESL Classrooms: An Analysis." *Journal of English Language Teaching*, vol. 65, no. 6, 2023, pp. 25–34. <https://journals.eltai.in/index.php/jelt/article/view/JELT650606>.
- Rotenberg, Adam M. A Classroom Research Project: The Psychological Effects of Standardized Testing on Young English Language Learners at Different Language Proficiency Levels. *ERIC Database*, ED472651, 2002, <https://files.eric.ed.gov/fulltext/ED472651.pdf>.
- Schonwetter, Dieter J. "An Empirical Investigation of Effective College Teaching Behaviors and Student Differences: Lecture Organization and Test Anxiety." *Annual Meeting of the American Educational Research Association*, San Francisco, 1995.
- Shohamy, Elana. "Affective Considerations in Language Teaching." *Modern Language Journal*, vol. 66, no. 1, 1982, pp. 13–17.
- Wittmaier, Bayard C. "Test Anxiety and Study Habits." *The Journal of Educational Research*, vol. 65, no. 8, 1972, pp. 352–54. <https://doi.org/10.1080/00220671.1972.10884344>.
- Zeidner, Moshe. *Test Anxiety: The State of the Art*. Kluwer Academic Publishers, 1998.
- Zhang, S., and Z. Hasim. "Gamification in EFL/ESL Instruction: A Systematic Review of Empirical Research." *Frontiers in Psychology*, vol. 13, 2023. <https://doi.org/10.3389/fpsyg.2022.1030790>.
- Zichermann, Gabe, and Christopher Cunningham. *Gamification by Design: Implementing Game Mechanics in Web and Mobile Apps*. O'Reilly Media, 2011.