The Effectiveness of Learning through Gamification with Artificial Intelligence on Mental Health (Anxiety) and Building Learning Habits for College Learners

Reham Mohamed Al-Ghoul[1,*], Ramy Samir Mohammed ALSeragy[2]

[1]Senior Instructional Designer, Lecturer in Educational Technology Center, Faculty of Education, Mansoura University, Egypt

[2]Assistant Professor of Educational Technology, Manager of Education Technology Center, Faculty of Education, Mansoura University, Egypt

Emails: drreham@mans.edu.eg; Ramy.ALSeragy@gamil.com

Abstract

Gamification is the process of incorporating game-like elements, such as scoring and competition, into non-game activities to increase engagement and motivation. Artificial intelligence (AI) refers to the simulation of human intelligence in machines that are programmed to think and learn like humans. When these two concepts are combined, they can help students overcome anxiety and develop effective learning habits, and the use of AI technology can provide personalized feedback and support, ultimately improving overall mental well-being and academic success. These innovative approaches to learning have the potential to revolutionize traditional education methods and create a more engaging and effective learning environment for students. This research used gamification with artificial intelligence in learning content in an eLearning environment. The participants were 60 learners enrolled in the vocational diploma program in educational technology specialization at the faculty of education at Mansoura University. The findings of research found that incorporating game-like elements and personalized learning experiences could help reduce stress and increase motivation among students. This innovative approach to education shows promise in improving student outcomes and overall academic performance.

Keywords: Gamification; Artificial Intelligence; Anxiety; Mental Health

1. Introduction

Gamification is defined as the process of enhancing a service with affordances for gameful experiences in order to support users' overall value creation. It emphasizes the experiential nature of gamification and highlights four important aspects: affordances, psychological mediators, the goals of gamification, and the context of gamification. There are four possible gamifying actors: the core service provider, a third-party service provider, the customer/user, and another customer/user. Gamification can be seen as a communicative staging of the service environment, where resources are used to support customers' processes. (Juho, 2017)

Gamification has been found to be a valuable tool to entice users to engage with educational systems and increase their interactivity and engagement over time. It can contribute to the uptake of e-learning technologies and support sustained teach (Nouzha et al., 2021)

However, gamification within mental health apps does not seem to affect depressive symptoms but may influence patients managing anxiety, stress, or other conditions where anhedonia is not present. Gamification may not be a

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promising feature for depressive symptoms, but it could hold promise for other mental health conditions. (Litvin et al., 2020)

Mental health for students is a growing concern globally, with studies showing that university students are experiencing increasing levels of mental illness. Factors contributing to this issue include widening participation in education and financial pressures on students. In the UK, there has been a significant increase in anxiety and depression among young people, but the actual incidence of mental disturbance in the student population is not well documented. University counseling services report dealing with an increasing number of students with severe mental health problems (Macaskill, 2013) (Sheila & Alastair, 2005)

Artificial intelligence is revolutionizing the way student's approach studying by providing personalized study recommendations, improved time management strategies, and enhanced study material accessibility. AI tools are changing the landscape of education by influencing study habits, helping students understand difficult concepts, and making learning more engaging. (*How Artificial Intelligence Influences Students Study Habits*, 2023)

A study by Varsha and Prakash, "An AI-based learning style prediction model for personalized and effective learning," presented an AI-based learning prediction model that effectively predicts learning styles based on various attributes, such as attention, meditation, and cognitive workload. The model aims to personalize the learning experience for students and help them understand their individual learning styles. (Lokare & Jadhav, 2024)

Researches explore the effectiveness of gamification on anxiety and learning satisfaction. Additional elements like personalization, motivational reminders, and learning habits.

2. Purpose of the research

The aim of this research is to train college learners on how to convert passive study to active study through gamification with artificial intelligence to reduce anxiety and build successful learning habits.

3. Research Questions

- Do learning through gamification with artificial intelligence affect mental health (anxiety) compared to traditional learning methods?
- To what extent can learning through gamification with artificial intelligence build learning habits?

4. Study of the context

– Definition and explanation of gamification

Gamification is the application of game design elements and principles in non-game contexts to motivate and engage users. It involves adding games or gamelike elements to tasks to encourage participation. Gamification can be used to increase productivity, boost company profitability, and improve engagement. It taps into people's natural desires for competition and achievement, making tasks more enjoyable. Gamification is not limited to digital experiences and can be applied in various domains to solve different challenges. (Cloke, 2024)

Gamification in education is an approach to incorporating game design elements into educational environments to increase learners' motivation and engagement. It aims to encourage students by using game principles in learning activities. (Dichev & Dicheva, 2017)

– Impact of gamification on student engagement

Gamification has positively affected student engagement by providing personalized feedback, challenges, and activities tailored to individual students' needs. By utilizing advanced gamification techniques, schools can increase student engagement through incentives, rewards, and an immersive learning environment. Gamified learning methods aim to improve individual student engagement by orienting new learning material, boosting socialization, and promoting positive relationships within the classroom. (*Impact of Gamification on Student's Learning and Engagement*, 2023) (Chen & Liang, 2022)

– Overview of mental health issues facing college students

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Mental health is about how people think, feel, and behave. It can affect a person's day-to-day life, relationships, and physical health. Factors like socioeconomic pressure, childhood adversity, and biological factors can contribute to mental health conditions. Mental health disorders include anxiety disorders, mood disorders, and schizophrenia. Promotion and prevention interventions aim to reduce risks and build resilience. (*Mental Health*, 2022)

Anxiety has been found to have a negative impact on academic performance. Students with high levels of anxiety tend to display a passive attitude towards studies, leading to poor performance in exams and assignments. Research among engineering students showed a significant correlation between high anxiety levels and low academic performance (Jamil et al., 2022)

Additionally, a meta-analysis reported that treating anxiety improved academic performance among anxious students, suggesting that anxiety caused poor performance. (*The Relationship between Study Anxiety and Academic Performance among Engineering Students*, 2010) (McCurdy et al., 2022)

- **anxiety symptoms between college students**

Anxiety is prevalent among college students due to the heavy workload, transition to adulthood, and academic stress. His symptoms can include:

- Nervousness or unease
- Inability to maintain focus
- Uncontrollable worry
- Sleep disturbances or insomnia
- Missing classes or assignments
- Isolation from family, friends, and classmates
- Changes in eating habits
- feeling scared
- indigestion or abdominal discomfort
- Cycles of negative thoughts (*Causes & Statistics of Anxiety in College Students | Duquesne University*, 2023)

- **Effects of gamification on anxiety among students**

There are several ways in which gamification can be helpful during anxiety. In many cases, as is true for other entertainment media:

- Gamification provide a temporary diversion from (real-world) adverse events or emotions.
- Gamification stimulates dopamine release; a neurotransmitter linked to sensations of pleasure and reward, and elicits positive emotions such as joy and surprise, with positive effects on the psychological well-being of the individual. (Chen et al., 2022)

- **Build learning habits steps**

To build learning habits you should do:

- Make learning a habit: ideally daily Set learning goals for yourself for a period, such as a quarter, six months, a year or even longer.
- Go for quality, not quantity: your goal is not to cram volumes of new information into your brain. Instead, you want to get strong insights, which neuroscientists consider the active ingredient in learning.
- Mix up your learning content: Alternate between learning a variety of technical and soft skills to strengthen your curiosity muscles as well as make you a more flexible learner and thinker.
- Experiment to find out what is best for your brain: Every person’s brain is unique, so one size does not fit all when it comes to learning.
- Take time to reflect: Set aside time to think about the benefits and value you are getting as you learn. (Guthridge, 2018)

- **Learning Habits with Artificial Intelligence**

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To build learning habits, students can engage in deeper learning activities that allow them to create and apply knowledge on topics that matter to them. Teachers and students can intentionally structure learning experiences to target habits of success that are strengths to build on or areas for improvement. Out-of-school activities also provide opportunities to develop and demonstrate habits of success. Extensive resources are available to support deeper learning activities, such as project-based learning, which can help build learning habits. (Janet, 2018)

Personal competencies like cognitive, metacognitive, motivational, and social/emotional skills converge to form learning habits, which can be intentionally established and strengthened through personalized instruction. Teachers play a critical role in helping students build and apply these learning habits in various situations. Learning habits are essential for personalized learning and can be developed through a teacher's skillful ordering of assignments and analysis of a student's competencies. (Levine, 2021)

Artificial intelligence and machine learning technologies are being used in education to build learning habits in students by providing biometric and neurologic data for personalized pedagogies. (P. et al., 2020)

- **Previous studies on gamification**

Previous studies have shown that gamification can have a positive impact on students' learning outcomes, motivation, and engagement. Gamified learning has been found to yield better academic performance compared to online learning and traditional learning. Students who participated in gamified learning showed higher success rates, excellence rates, and average grades. Gamification also reduced the withdrawal rate among students. Overall, gamified learning was considered the most effective approach, followed by traditional learning and online learning. Students had a positive attitude towards gamification and recommended its use in more courses in the future. Gamification was found to increase learning motivation, engagement, and productivity, creating interactive and student-centered environments. The integration of gamification in education can lead to improved learning outcomes, academic performance, and retention rates. (Lampropoulos & Sidiropoulos, 2024)

5. Methodology

This research addressed the effects of learning through gamification with artificial intelligence on mental health (anxiety) and building learning habits, according to college learners the research was guided by the following research questions:

- Do learning through gamification with artificial intelligence affect mental health (anxiety) compared to traditional learning methods?
- To what extent can learning through gamification with artificial intelligence build learning habits?

- **Research Design**

The research used a quantitative method design that experimental design systematically manipulates one or more variables in order to evaluate how this manipulation influences outcomes. As described by Creswell and Creswell (2018). The researcher can determine if the treatment, rather than other factors, influences the outcomes when one group receive a manipulated variable and the other group does not. (Tashakkori & Creswell, 2008, p. 4). The researcher gathered quantitative data during the same research phase for an overall interpretation.

- **Participants and sample size**

The researcher recruited individuals to participate in the research. The researcher-recruited participants from the sample population of 60 learners enrolled in the vocational diploma program in educational technology specialization at the faculty of education at Mansoura University. All learners enrolled in the vocational diploma program in educational technology specialization had the opportunity to volunteer for participation in the research. The researcher randomly assigned all participants to either the control group that learned (design e-content modules by traditional method) or the experimental group that learned (design e-content modules through gamification and artificial intelligence).

- **Resources for the Learning Experience**

The researcher created the learning experience based on gamification, artificial intelligence, and learning modules in Moodle LMS.

- **Learning modules**

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The author used the Moodle LMS to teach design e-content modules through gamification with artificial intelligence or design e-content modules only for learners because it is easy to put learning resources on it and can do the activities, pre- and post-assignment, and pre- and post-test easily for learners, and the researcher-collected scores easily for analysis.

- **Anki App**

The author used the Anki app. A completely free flashcard app (no forced ads, paid models, etc.) helped learners to memorize with minimal efforts. They can add text, images, audio, and video to their cards. Anki utilizes spaced repetition, an evidence-based learning technique that optimizes memory retention and recall.

- **AI tool**

The author used Chat GBT 3 to create a chatbot for learners. Which learners can use to create flash cards and ideas to use it in the Anki App. The author embedded a chatbot in Moodle LMS so learners can use it.

– **Setting**

The researcher conducted all sessions on the Moodle LMS in two courses, first course was for the experimental group, and the second course was for the control group.

The first course (design e-content modules through gamification and artificial intelligence) consists of four modules about design e-content (e-content intro, create e-content by storyline articulate, create e-content activities by storyline articulate, create e-content quizzes by storyline articulate) and one lesson about how to use the Anki app.

The second course (design e-content modules without gamification and artificial intelligence) consists of four modules about design e-content (e-content intro, create e-content by storyline articulate, create e-content activities by storyline articulate, create e-content quizzes by storyline articulate).

In the first course (design e-content modules through gamification and artificial intelligence), the experimental group studied with the Anki app that permitted them to create cards, reviewing cards, customizing review settings, syncing decks, and backing up data. They also used an AI chatbot that was created based on Chat GBT 3.

– **Data Collection Instruments**

- **Scale of Learning Habits quality**

The author aimed to test the effects of gamification with artificial intelligence on building learning habits and to compare participant scores between two groups. So the author using the Learning Habits Quality Scale, which was created by the author. The scale is a 5-point Likert-type scale (0 = Never, 1 = Rarely affected, 2 = Sometimes, 3 = Often, 4 = Always) and includes five dimensions: Consistent Study Routine & Environment, Active Engagement with Content, Time Management & Organization, Communication & Help-Seeking, and Self-Discipline & Focus. Appendix A contains the full Learning Habits Quality Scale, which is designed to measure the quality and consistency of learners' engagement in academic practices, including the completion of assignments, participation in quizzes, and involvement in lesson-based activities.

- **Content Test**

In the present research, the author aimed to test the effects of gamification with artificial intelligence on mental health (anxiety) and building learning habits by comparing participant learning in two groups when engaging in Moodle LMS. The author used a pre- and post-test model to measure participant learning. The pre- and post-tests consisted of 30 questions each, drawn from existing assessments of student understanding of design e-content modules.

- **Scale of mental health Anxiety Symptoms for College Students**

The author aimed to test the effects of gamification with artificial intelligence on mental health (anxiety). The scale is a 5-point Likert-type scale (1= Not at all affected, 2= Slightly affected, 3= Moderately affected, 4= Severely affected, 5= Extremely affected) that measures the six dimensions (Feeling nervous, anxious, or on edge - Worrying too much - Feeling afraid of failure - Difficulty concentrating - Being easily annoyed or irritable - Feeling afraid of social situations). Overall, lower scores represented a greater response and a greater likelihood of using gamification with artificial intelligence on decrease anxiety for learners Appendix B.

– **Data Analysis**

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The particular data collection process used by the researcher qualifies as convergent parallel strategy, collecting quantitative data simultaneously during the research phase.

- **Research Question 1**

Research Question 1 was the following:

Do learning through gamification with artificial intelligence affect mental health (anxiety) compared to traditional learning methods?

The independent variables were gamification with artificial intelligence. The dependent variable for Research Question 1 was mental health (anxiety). The researcher used a scale of mental health anxiety symptoms Appendix B for college students administered to the groups of research. To analyze the scale, the researcher utilized Multivariate Tests. In addition, the researcher collected post-test scores on the content test. Those scores were analyzed using utilized independent T-Test.

- **Research Question 2**

Research Question 2 was the following:

To what extent can learning through gamification with artificial intelligence build learning habits?

The data for Research Question 2 were collected through scores on the Learning Habits Quality Scale, which was designed to measure the quality and consistency of learners' engagement in academic practices, including the completion of assignments, participation in quizzes, and involvement in lesson-based activities. These activities were integrated into the instructional modules delivered through the Moodle Learning Management System (LMS) for both the experimental and control groups. The scores were analyzed using Multivariate Tests to examine differences between the groups.

6. Results

The research was designed to determine the effects of gamification with artificial intelligence on mental health (anxiety) compared to traditional learning methods. The specific focus was on comparing results between two groups of learners. The first group of learners studying with utilized gamification with artificial intelligence method (experimental group), whereas the second group of learners studying with utilized traditional learning method (control group).

- **Research Question 1**

Do learning through gamification with artificial intelligence affect mental health (anxiety) compared to traditional learning methods?

The data for Research Question 1 were collected through two main sources: the scores obtained from the Mental Health Anxiety Symptoms Scale and the scores from the post-test administered to both the experimental group and the control group. The Mental Health Anxiety Symptoms Scale was specifically designed to measure levels of anxiety-related symptoms among the learners, providing quantitative data that reflect their mental health status during the course of the intervention. These anxiety scale scores were analyzed using multivariate statistical techniques, specifically Multivariate Tests, which allowed for an in-depth comparison of differences between the two groups with respect to the measured indicators of mental health anxiety. The results of this analysis are detailed and presented in Table 1 and Table 2, highlighting any statistically significant variations that may exist between the groups.

Table 1: Summary of general Linear Model (GLM) Multivariate Tests: Descriptive Statistics for the differences between the average scores in the Psychological Measures

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variable	Control Group (Mean ± SD)	Experimental Group (Mean ± SD)	p-value
Feeling Nervous/Anxious	26.40 ± 0.16	22.83 ± 0.75	< .001
Worrying Too Much	27.57 ± 0.20	23.83 ± 1.23	< .001
Feeling Afraid of Failure	26.77 ± 0.31	22.93 ± 2.81	< .001
Difficulty Concentrating	27.77 ± 0.26	24.97 ± 1.97	< .001
Being Easily Annoyed	27.67 ± 0.20	23.87 ± 1.24	< .001
Fear of Social Situations	25.97 ± 0.19	23.57 ± 1.11	< .001
Total	162.13 ± 0.97	142.00 ± 5.32	< .001

The table shows that the control group scored significantly higher than the experimental group across all psychological variables ($p < .001$), including anxiety, worry, fear of failure, concentration issues, irritability, and social fear. The largest difference was seen in the total score, with the control group scoring 20.13 points higher. These results suggest the control group experienced greater psychological distress, with consistent and statistically significant differences across all measures.

Table 2: Univariate Tests (Effect of Group on Each Variable)

Dependent Variable		Sum of Squares	DF	Mean Square	F	Sig.
Feeling nervous anxious	Contrast	190.817	1	190.817	255.20	.000
	Error	43.367	58	.748		
Worrying too much	Contrast	209.067	1	209.067	169.51	.000
	Error	71.533	58	1.233		
Feeling afraid of failure	Contrast	220.417	1	220.417	78.318	.000
	Error	163.233	58	2.814		
Difficulty concentrating	Contrast	117.600	1	117.600	59.657	.000
	Error	114.333	58	1.971		
Being easily annoyed	Contrast	216.600	1	216.600	174.16	.000
	Error	72.133	58	1.244		
Feeling afraid of social situations	Contrast	86.400	1	86.400	77.894	.000
	Error	64.333	58	1.109		

It is clear from the table 2 that:

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- Feeling Nervous/Anxious (F = 255.204, p < .001) → Control group significantly higher.
- Worrying Too Much (F = 169.514, p < .001) → Control group significantly higher.
- Feeling Afraid of Failure (F = 78.318, p < .001) → Control group significantly higher.
- Difficulty Concentrating (F = 59.657, p < .001) → Control group significantly higher.
- Being Easily Annoyed (F = 174.161, p < .001) → Control group significantly higher.
- Feeling Afraid of Social Situations (F = 77.894, p < .001) → Control group significantly higher.

Overall, the control group scored significantly higher than the experimental group across all emotional and cognitive variables measured. These results suggest that the intervention had a substantial impact on decreasing levels of anxiety-related emotions and cognitive difficulties, indicating a heightened emotional response in the experimental group compared to the control group.

In addition to the anxiety symptoms data, post-test scores were also collected for both the experimental and control groups to assess academic performance outcomes following the learning intervention. These post-test scores were analyzed separately using an independent t-test, a statistical method appropriate for comparing the means of two independent groups. This analysis was conducted to determine whether there were significant differences in learning outcomes between the two instructional methods employed in the study. The findings from the t-test analysis are comprehensively displayed in Table 3.

Table 3: Independent Samples Test

	Levene's Test for Equality of Variances			**t-test for Equality of Means**					
Post Test	**N**	**F**	**sig**	**Std. Error Difference**	**95% Confidence Interval of the Difference**		**T**	**DF**	**sig**
					Lower	**Upper**			
assumed	30	7.329	.009	0.2499	3.23310	4.23357	14.9	58	.000
not assumed	30			.24990	3.23159	4.23508	14.9	50.8	.000

Table 3 presents the independent samples t-test results comparing post-test scores between the experimental group (gamification with AI) and the control group (traditional learning). Levene's Test shows a significance of .009, indicating unequal variances, so results under "equal variances not assumed" should be used. The t-value of 14.9 with a significance of .000 indicates a significant difference, with the experimental group outperforming the control group. The 95% confidence interval for the difference ranges from 3.23 to 4.24, supporting the effectiveness of the gamified AI-based approach in improving academic performance.

- **Research Question 2**

To what extent can learning through gamification with artificial intelligence build learning habits?

The data for Research Question 2 were collected through the scores obtained from the Learning Habits Quality Scale. This scale is designed to measure the quality and consistency of learners' engagement in academic practices, including the completion of assignments, participation in quizzes, and involvement in lesson-based activities. These activities were integrated into the instructional modules delivered through the Moodle Learning Management System (LMS) for both the experimental and control groups. The collected scores provided insight into how each group engaged with the course materials and fulfilled academic tasks within the structured learning environment. To analyze the differences in learning habits between the two groups, the data were subjected to multivariate statistical analysis using Multivariate Tests. This method allowed for the examination of potential group-based variations in learning habits quality across the measured components, as shown in Table 4.

Table 4: Summary of general Linear Model (GLM) Multivariate Tests: Descriptive Statistics for the differences between the average scores in the learning habits quality

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variable	Control Group (Mean ± SD)	Experimental Group (Mean ± SD)	p-value
Consistent Study Routine	28.27 ± 0.17	31.20 ± 0.17	< .001
Active Engagement with Content	29.60 ± 0.14	32.33 ± 0.14	< .001
Time Management & Organization	28.87 ± 0.19	30.93 ± 0.19	< .001
Communication & Help-Seeking	28.87 ± 0.19	32.23 ± 0.19	< .001
Self-Discipline & Focus	28.67 ± 0.13	32.03 ± 0.13	< .001
Total	144.27 ± 0.57	158.73 ± 0.57	< .001

The experimental group significantly outperformed the control group across all measured-on learning habits quality scale variables, including consistent study routine, active engagement with content, time management, communication help seeking, and self-discipline. The experimental group showed higher mean scores in every category, with all differences being statistically significant ($p < .001$). These results suggest that the Learning through Gamification with Artificial Intelligence had a positive effect on the experimental group's academic strategies and behaviors.

Table 5: *Univariate Tests (Effect of Group on Each Variable)*

Dependent Variable		Sum of Squares	DF	Mean Square	F	Sig.
Consistent Study Routine	Contrast	129.067	1	129.067	147.74	.000
	Error	50.667	58	.874		
Active Engagement with Content	Contrast	112.067	1	112.067	181.22	.000
	Error	35.867	58	.618		
Time Management Organization	Contrast	64.067	1	64.067	62.627	.000
	Error	59.333	58	1.023		
Communication Help-Seeking	Contrast	170.017	1	170.017	152.09	.000
	Error	64.833	58	1.118		
Self-Discipline Focus	Contrast	170.017	1	170.017	356.85	.000
	Error	27.633	58	.476		
total	Contrast	3139.267	1	3139.267	320.70	.000
	Error	567.733	58	9.789		

It is clear from the table 5 that:

- Consistent Study Routine ($F = 147.74$, $p < .001$) → Experimental group significantly higher.
- Active Engagement with Content ($F = 181.22$, $p < .001$) → Experimental group significantly higher.
- Time Management & Organization ($F = 62.627$, $p < .001$) → Experimental group significantly higher.
- Communication & Help-Seeking ($F = 152.09$, $p < .001$) → Experimental group significantly higher.

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- Self-Discipline & Focus ($F = 356.85$, $p < .001$) → Experimental group significantly higher.
- Total Academic Strategies Score ($F = 320.70$, $p < .001$) → Experimental group significantly higher.

Overall, the experimental group demonstrated significantly stronger academic habits and self-regulation strategies across all domains. These findings suggest the intervention had a robust positive impact on improving students' study behaviors and academic self-management.

7. Discussion

– Research Question 1

Do learning through gamification with artificial intelligence affect mental health (anxiety) compared to traditional learning methods?

All groups did show improvement from the pre- to post-test. The potential reasons behind that are the design e-content modules that they learned via Moodle LMS, which helped them to increase their scores. However, the experimental group is more improved than the control group in the post-test. The potential reasons behind that are gamification with artificial intelligence in an integrated way that enhanced their remembering and helped them to effectively reduce their anxiety. That was clear from the results of the scale of mental health anxiety symptoms for college students into two groups, where the experimental group showed fewer anxiety symptoms than the control group.

– Research Question 2

To what extent can learning through gamification with artificial intelligence build learning habits?

The experimental group showed more interaction than the control group in the Learning Habits Quality Scale. Which measures the quality and consistency of learners' engagement in academic practices, including the completion of assignments, participation in quizzes, and involvement in lesson-based activities on learning modules at Moodle LMS. The experimental group scored higher in post-assignment and activities than the control group, and the experimental group did all post-assignment and activities in its time before time ended with better accuracy than the control group.

– Limitations of the research

The limitations of the research include the small sample size and the lack of long-term follow-up data on learner performance. Future research should aim to address these limitations by conducting larger-scale research with longer follow-up periods to determine the lasting effects of gamification with artificial intelligence to reduce anxiety between learners. Additionally, exploring the role of individual differences in response to gamification with artificial intelligence could provide valuable insights for educators looking to implement this technique to cure other mental health problems.

8. Conclusion

The use of gamification in educational settings has been shown to have a positive impact on reducing anxiety among learners. By providing a temporary escape from stressors and triggering feelings of pleasure and reward, gamification can help students manage their anxiety levels and improve their overall well-being. Further research is needed to fully understand the extent of gamification's effects on anxiety, but the current evidence suggests that it can be a valuable tool in promoting mental health in learners.

Based on the findings of this research, it is clear that incorporating gamified elements into educational settings can have a significant impact on student success. By enhancing motivation and engagement, learners are more likely to actively participate in their learning and retain information more effectively. In addition, the ability of chatbots to provide instant feedback and support can help students stay motivated and on track with their learning goals. This kind of personalized assistance can also cater to individual learning styles and preferences, making the learning experience more tailored and effective. With the integration of technology tools like Anki and AI chatbots, educators can create a more dynamic and interactive learning environment that fosters deeper understanding and retention of key concepts. Ultimately, the use of these tools in education has the potential to revolutionize the way students learn and engage with course material.

References

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[1] "Causes & statistics of anxiety in college students," Duquesne Univ. School Nurs., Jan. 3, 2023. [Online]. Available: https://onlinenursing.duq.edu/doctor-nursing-practice/anxiety-in-college-students-causes-statistics-how-universities-can-help/. [Accessed: May 2, 2024].

[2] J. Chen and M. Liang, "Play hard, study hard? The influence of gamification on students' study engagement," Front. Psychol., vol. 13, Sep. 2022, doi: 10.3389/fpsyg.2022.994700.

[3] H. Cloke, "The definitive definition of gamification (+ 8 real-world examples)," Growth Eng., Mar. 6, 2024. [Online]. Available: https://www.growthengineering.co.uk/definition-of-gamification/. [Accessed: May 2, 2024].

[4] J. W. Creswell and J. D. Creswell, Research Design: Qualitative, Quantitative, and Mixed Methods Approaches, 5th ed. Thousand Oaks, CA: SAGE, 2018.

[5] C. Dichev and D. Dicheva, "Gamifying education: What is known, what is believed and what remains uncertain: A critical review," Int. J. Educ. Technol. High. Educ., vol. 14, no. 1, Feb. 2017, doi: 10.1186/s41239-017-0042-5.

[6] L. Guthridge, "How to make learning a habit you enjoy," Forbes, Nov. 21, 2018. [Online]. Available: https://www.forbes.com/sites/forbescoachescouncil/2018/11/21/how-to-make-learning-a-habit-you-enjoy/. [Accessed: May 2, 2023].

[7] "How artificial intelligence influences students study habits," StartQuestion, Feb. 17, 2023. [Online]. Available: https://www.startquestion.com/survey-ideas/how-artificial-intelligence-influences-students-study-habits/. [Accessed: May 2, 2024].

[8] "Impact of gamification on student's learning and engagement," Acadecraft, Mar. 27, 2023. [Online]. Available: https://www.acadecraft.com/blog/gamifications-impact-on-students-learning/. [Accessed: May 2, 2024].

[9] H. Jamil et al., "The impact of anxiety and depression on academic performance: A cross-sectional study among medical students in Syria," PMC, Jul. 14, 2022, doi: 10.1055/s-0042-1755181.

[10] Janet, "Learning habits," ERIC Inst. Educ. Sci., 2018. [Online]. Available: https://eric.ed.gov/?id=ED607633.

[11] Juho, "Electronic markets," vol. 27, 2017, doi: 10.1007/s12525-015-0212-z.

[12] G. Lampropoulos and A. Sidiropoulos, "Impact of gamification on students' learning outcomes and academic performance: A longitudinal study comparing online, traditional, and gamified learning," Educ. Sci., vol. 14, no. 4, Apr. 2024, doi: 10.3390/educsci14040367.

[13] Levine, "Habits of success helping students develop essential skills for learning work and life," ERIC Inst. Educ. Sci., 2021. [Online]. Available: https://eric.ed.gov/?id=ED618110.

[14] S. Litvin et al., "Gamification as an approach to improve resilience and reduce attrition in mobile mental health interventions: A randomized controlled trial," PLOS ONE, Sep. 2020, doi: 10.1371/journal.pone.0237220.

[15] V. T. Lokare and P. M. Jadhav, "An AI-based learning style prediction model for . . . thinking skills and creativity," Think. Skills Creat., vol. 48, Mar. 2024, doi: 10.1016/j.tsc.2023.101421.

[16] Macaskill, "British journal of guidance counselling," vol. 41, 2013, doi: 10.1080/03069885.2012.743110.

[17] B. H. McCurdy et al., "Impact of anxiety and depression on academic achievement among underserved school children: Evidence of suppressor effects," PMC, Sep. 20, 2022, doi: 10.1007/s12144-022-03801-9.

[18] "Mental health," World Health Org., Jun. 17, 2022. [Online]. Available: https://www.who.int/news-room/fact-sheets/detail/mental-health-strengthening-our-response. [Accessed: May 2, 2024].

[19] Nouzha, Vanissa, and Gary, "Interactive learning environments," vol. 29, 2021, doi: 10.1080/10494820.2019.1623267.

[20] P., Sam, Kalervo, and ries, "Learning media and technology," vol. 45, 2020, doi: 10.1080/17439884.2020.1686015.

DOI: https://doi.org/10.54216/IJAIET.030102
Received: January 01, 2024 Revised: March 03, 2024 Accepted: May 31, 2024

[21] QuillBot, "QuillBot Flow," (May 2024 version) [Large Language Model], 2024. [Online]. Available: https://quillbot.com/flow. [Accessed: May 2, 2024].

[22] "The relationship between study anxiety and academic performance among engineering students," Sci. Direct, Dec. 23, 2010, doi: 10.1016/j.sbspro.2010.12.067.

[23] Sheila and Alastair, "British journal of guidance counselling," vol. 33, 2005, doi: 10.1080/03069880500327496.

Appendices

Appendix A: Learning Habits quality scale

The scale of Learning Habits quality: (0= Never - 1 = Rarely affected - 2 = Sometimes - 3= Often - 4 = Always).

Element	Indicators	0	1	2	3	4
Consistent Study Routine & Environment	Student studies at the same time each day.					
	Student has a designated space for online learning.					
	Student follows a weekly schedule for courses.					
	Student avoids distractions while studying online.					
	Student prepares materials before each study session.					
	Student logs into the LMS regularly without reminders.					
	Student reviews course announcements daily.					
	Student keeps the study environment clean and organized.					
	Student plans ahead for assignments and exams.					
	Student takes regular breaks to maintain focus.					
Active Engagement with Content	Student takes notes while watching lectures or reading materials.					
	Student asks questions when concepts are unclear.					
	Student participates actively in discussion forums.					
	Student relates new information to prior knowledge.					
	Student summarizes key concepts after study sessions.					
	Student completes optional learning activities or practice exercises.					
	Student revisits challenging content to improve understanding.					

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Element	Indicators	0	1	2	3	4
	Student applies course concepts to real-world situations.					
	Student uses diverse resources (e.g., videos, articles) to deepen understanding.					
	Student uses self-quizzing to reinforce learning.					
Time Management & Organization	Student sets weekly academic goals.					
	Student checks assignment deadlines early in the week.					
	Student uses a planner or app to organize tasks.					
	Student breaks larger assignments into manageable steps.					
	Student prioritizes tasks based on urgency and importance.					
	Student balances coursework with other responsibilities effectively.					
	Student completes assignments ahead of deadlines when possible.					
	Student monitors academic progress consistently.					
	Student avoids last-minute preparation or cramming.					
	Student reviews a calendar or task list regularly.					
Communication & Help-Seeking	Student contacts instructors for help when needed.					
	Student attends virtual office hours.					
	Student engages in study groups or peer discussions.					
	Student seeks clarification on unclear assignments.					
	Student responds to classmates' posts or questions.					
	Student communicates when falling behind or overwhelmed.					
	Student participates in giving and receiving feedback.					
	Student introduces themselves in class forums or group chats.					
	Student utilizes academic support services (e.g., tutoring, advising).					

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Element	Indicators	0	1	2	3	4
	Student contacts technical support when necessary.					
Self-Discipline & Focus	Student avoids social media and unrelated websites during study sessions.					
	Student completes tasks despite lack of motivation.					
	Student rewards themselves after achieving academic goals.					
	Student maintains focus when learning material is difficult.					
	Student reflects on their learning strategies and makes improvements.					
	Student follows a daily or weekly study plan without needing reminders.					
	Student avoids multitasking while attending online classes or studying.					
	Student maintains a consistent sleep schedule to support academic performance.					
	Student sets specific time limits for academic tasks to stay productive.					
	Student resists procrastination and begins tasks promptly.					

Appendix B: Scale of mental health Anxiety Symptoms for College Students

The scale of mental health Anxiety Symptoms for College Students: (1= Not at all affected - 2 = Slightly affected - 3 = Moderately affected - 4= Severely affected - 5 = Extremely affected).

Element	Indicators	1	2	3	4	5
Feeling nervous, anxious, or on edge	Frequently feeling tense before starting academic tasks					
	Feeling physically restless while trying to study					
	Anticipating worst-case outcomes in academic situations					
	Having trouble calming down during academic stress					
	Feeling nervous when deadlines approach					
	Experiencing physical symptoms (e.g., racing heart, sweating) while studying					
	Feeling a sense of dread before attending classes					

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Element	Indicators	1	2	3	4	5
	Becoming easily startled or jumpy while doing schoolwork					
Worrying too much	Overthinking past academic mistakes					
	Constantly worrying about not meeting expectations					
	Spending excessive time planning to avoid failure					
	Getting stuck in loops of "what if" scenarios					
	Ruminating about grades or feedback long after the fact					
	Worrying about being judged for academic performance.					
	Worrying even when things are going well academically.					
	Losing sleep due to academic worries.					
Feeling afraid of failure	Avoiding new academic challenges due to fear of failing.					
	Feeling paralyzed when facing high-stakes assignments.					
	Hesitating to ask for help for fear of appearing incompetent.					
	Viewing mistakes as personal failures.					
	Believing that failure defines your self-worth.					
	Not taking academic risks because of fear of not succeeding.					
	Comparing yourself negatively to others academically.					
	Experiencing shame after academic setbacks.					
Difficulty concentrating	Getting easily distracted during studying.					
	Struggling to follow instructions or lectures.					
	Needing to reread information multiple times to understand it.					
	Forgetting what you just studied shortly after.					
	Finding it hard to stay mentally present in class.					
	Getting mentally stuck on minor issues.					

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Element	Indicators	1	2	3	4	5
	Difficulty transitioning between academic tasks.					
	Losing track of time while working on academic tasks.					
Being easily annoyed or irritable	Feeling easily frustrated with academic tasks.					
	Snapping at others when feeling academically overwhelmed.					
	Becoming angry at yourself when struggling to understand material.					
	Feeling annoyed by group work or class participation.					
	Taking out stress on others due to academic anxiety.					
	Having difficulty managing mood during schoolwork.					
	Feeling emotionally exhausted from trying to focus.					
	Becoming defensive when receiving academic feedback.					
Feeling afraid of social situations	Avoiding participating in class discussions due to fear of judgment.					
	Skipping group work or presentations to avoid social interaction.					
	Feeling anxious when called on in class.					
	Dreading group projects or peer collaboration.					
	Avoiding office hours or talking to instructors.					
	Feeling nervous about asking questions in class.					
	Worrying about sounding “dumb” in front of classmates.					
	Struggling to network or form academic relationships.					

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