

Exploring Students' Perception of Quizizz as a Learning Media in Higher Education

Explorer la perception des élèves de Quizizz en tant que média d'apprentissage dans l'enseignement supérieur

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Résumé de l'article

L'utilisation du jeu dans l'éducation a été mise en évidence pour améliorer l'engagement des élèves dans l'apprentissage. Cependant, de nombreuses recherches montrent que l'utilisation du jeu dans l'apprentissage n'est efficace que pour les élèves du secondaire, tandis que son utilisation pour les étudiants d'enseignement supérieur est très limitée. Les recherches sur le jeu dans l'éducation ont été principalement occupées par Kahoot! Alors que Quizizz a moins d'analyses. Cette recherche exploratoire vise à explorer la perception des étudiants de Quizizz en tant que média d'apprentissage et les obstacles connexes vécus dans le programme d'étude de la science des bibliothèques d'une université islamique d'État en Indonésie. La recherche utilise une combinaison de méthodes quantitatives et qualitatives, telles que l'enquête et la discussion de groupe ciblée, avec un échantillon de 204 étudiants. L'étude a révélé que l'utilisation de jeux dans l'apprentissage augmentait activement l'engagement des élèves et a conduit à une amélioration significative de l'indépendance et de la maîtrise de soi dans l'apprentissage, ce qui a amélioré la réalisation des objectifs d'apprentissage. Pendant l'activité d'apprentissage, les élèves soutiennent qu'ils acquièrent leur confiance en soi tout en profitant du jeu. La recherche suggère que pour augmenter les résultats de l'apprentissage, les éducateurs devraient utiliser diverses stratégies d'enseignement qui encouragent l'engagement mental et physique actif des élèves. En outre, il est prévu que cette expérience d'apprentissage et ce contenu améliorent la mémoire rétentue des élèves.

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Exploring Students' Perception of Quizizz as a Learning Media in Higher Education

Explorer la perception des élèves de Quizizz en tant que média d'apprentissage dans l'enseignement supérieur

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Abstract

The use of game in education has been evidenced to improve students' engagement in learning. However, much research shows that the use of game in learning is only effective for high school students, while its use for students of higher education is limited. Research on game in education has predominantly been occupied by Kahoot! while Quizizz has received less analysis. This research aims to explore student perception of Quizizz as a learning media and the related obstacles experienced in a library science study program of State Islamic University of North Sumatera in Indonesia. The research uses a combination of quantitative and qualitative methods, such as survey and focused group discussion, with a sample of 272 undergraduate students. The study found that the use of games in learning actively increased student engagement and led to a significant improvement in independence and self-control in learning. During the learning activity students maintain that they gain their self-confidence while enjoying the game. The research suggests that to increase learning achievement, educators should use various teaching strategies that encourage students' active mental and physical engagement. Additionally, it is expected that this learning experience and content will enhance students' retentive memory.

Keywords: educational technology; game-based learning; gamification; library and information science; Quizizz

Résumé

L'utilisation du jeu dans l'éducation a été mise en évidence pour améliorer l'engagement des élèves dans l'apprentissage. Cependant, de nombreuses recherches montrent que l'utilisation du jeu dans l'apprentissage n'est efficace que pour les élèves du secondaire, tandis que son utilisation pour les étudiants d'enseignement supérieur est très limitée. Les recherches sur le jeu dans l'éducation ont

été principalement occupées par Kahoot! Alors que Quizizz a moins d'analyses. Cette recherche exploratoire vise à explorer la perception des étudiants de Quizizz en tant que média d'apprentissage et les obstacles connexes vécus dans le programme d'étude de la science des bibliothèques d'une université islamique d'État en Indonésie. La recherche utilise une combinaison de méthodes quantitatives et qualitatives, telles que l'enquête et la discussion de groupe ciblée, avec un échantillon de 204 étudiants. L'étude a révélé que l'utilisation de jeux dans l'apprentissage augmentait activement l'engagement des élèves et a conduit à une amélioration significative de l'indépendance et de la maîtrise de soi dans l'apprentissage, ce qui a amélioré la réalisation des objectifs d'apprentissage. Pendant l'activité d'apprentissage, les élèves soutiennent qu'ils acquièrent leur confiance en soi tout en profitant du jeu. La recherche suggère que pour augmenter les résultats de l'apprentissage, les éducateurs devraient utiliser diverses stratégies d'enseignement qui encouragent l'engagement mental et physique actif des élèves. En outre, il est prévu que cette expérience d'apprentissage et ce contenu améliorent la mémoire rétentive des élèves.

Mots-clés: apprentissage basé sur le jeu ; bibliothèque et science de l'information ; gamification ; Quizizz ; technologie éducative

Introduction

Learning is a multifaceted process that encompasses cognitive, attitudinal, and psychomotor aspects, involving intentional, active engagement in reciprocal activities of intention-action-reflection to achieve understanding and behavioural changes (Anderson, Krathwohl, & Bloom, 2001; Bloom, 1956; Glover, 2013; Sataloff et al., 2000). Furthermore, it is an intentional process to achieve both understanding and behavioural change goals. To improve student motivation in learning and maintain the sustainability of academic activities, educators need to use various strategies and media that encourage both mental and physical engagement, such as games (Bond et al., 2020; Mak et al., 2021; Whiter, 2020).

Previous research has consistently shown that the use of games in learning environments substantially enhances the achievement of learning objectives, with studies across various fields highlighting its effectiveness (Glover, 2013; Jääskä et al., 2022; Lin, 2022; Yang & Chen, 2021). This body of work suggests that the implementation of games in educational settings should not merely be for entertainment but must constitute a sequence of meaningful activities that support educational objectives (Nachimuthu & Vijayakumari, 2011). Building on these insights and the foundational work of prominent researchers such as Ortega et al. (2022) in history education, Moon & Ke (2019) in the domain of mathematics, Basuki and Hidayati (2019) in English language learning, Candel et al. (2021) in music learning, and Tavares (2022) in nursing, this study aims to delve deeper into the nuanced impact of game-based learning strategies. By investigating the efficacy of these strategies within a Library Science Program, this research not only aims to validate the versatility and potential of game-based approaches across varying disciplines but also seeks to enrich the current academic discourse on educational games. Through this investigation, we aspire to contribute to a more comprehensive understanding of how game-based learning can be optimally designed and implemented to achieve desired educational outcomes, thereby offering meaningful activities that align with learning objectives.

The games intended to encourage learning in students should include focused activities, reward mechanisms, and progress tracking of the learning process (Glover, 2013). According to Nachimuthu and Vijayakumari (2011), to truly be effective, learning games must also incorporate elements that are enjoyable and intrinsically motivating for students. This approach is underpinned by the crucial role of engagement in the educational process. Engagement is a pivotal component in education for several reasons, as outlined by recent research. It is directly linked to increased student achievement, boosting satisfaction, aiding in retention strategies and learning outcomes, particularly notable in higher education settings (Candel et al., 2021; Delialioğlu, 2012; Gao et al., 2018; Hamari et al., 2016; Wang & Degol, 2014; Webber et al., 2013).

In this era of rapid information technology development, diverse technology-based games, including Kahoot, Popplet, Padlet, Quizizz, Google Street View, Screencast-O-Matic, and Adobe Spark, have risen in popularity for enhancing student engagement in learning (Trust, 2017). A comparative study of the effectiveness of Kahoot! and Quizizz on academic achievement found both platforms to be equally effective, demonstrating no significant difference in enhancing learning outcomes (Janković & Lambić, 2022), but students prefer Quizizz over Kahoot! (Basuki & Hidayati, 2019). This finding supports the premise that when educational games are thoughtfully designed with engaging elements, they can significantly impact learning, regardless of the specific platform used (El-Masri & Tarhini, 2015; Gao et al., 2018).

Given the critical role of student engagement in academic achievement, satisfaction, and retention, alongside the necessity for a nuanced and comprehensive approach to engagement research, the use of gamified learning tools becomes increasingly important. As such, our evolving exploration into the effectiveness of technology-based games in education serves not only to expand upon the existing body of work but also to underscore the compelling need for game-based learning strategies that are intricately designed to enhance engagement across diverse student demographics and learning environments.

Gamification as an approach to the learning process is based on the social learning theory developed by Bandura (1977) and Vygotsky (1977). According to Bandura, an individual's learning behaviour is influenced by encouragement from the social environment, referred to as incentives. These incentives are indicated by an individual's interest and motivation in the learning process (Bandura, 1977, p. 101). Bandura posited that learning occurs within a social context and is significantly influenced by observation, imitation, and modeling. This framework suggests that social incentives and intrinsic motivations play a crucial role in shaping an individual's learning behaviour (Bandura, 1977). Gamification leverages these principles by incorporating elements like leaderboards, badges, and points—external incentives that mirror the social reinforcements Bandura describes. These elements not only motivate learners but also foster a sense of community and belonging, reinforcing learning through social engagement and recognition.

Meanwhile, Vygotsky (1997, p. xxii) stated that the educational process should be based on individual activities and teaching guides to monitor these activities. Vygotsky emphasized that the best way to understand the mind is by looking at how it changes, and the highest mental functions come from social activities which are mediated by tools and symbols. Moreover, the role of the educator is to create a supportive social environment for learning (Hausfather, 1996). Vygotsky emphasized the importance of social interaction and cultural tools in the development of cognitive

abilities. He argued that learning is a socially mediated process and that the educational environment should facilitate individual activities within a cooperative framework, guided by more knowledgeable others (1997). This perspective underlines the significance of creating learning environments that are responsive to individual needs while enabling social collaboration through shared activities. Gamification in education can be viewed as a direct application of Vygotsky's theory, providing a structured yet flexible framework where individual efforts are acknowledged within a collective context, and learning is mediated by digital tools and symbols that facilitate educational objectives.

In gamification-based learning, there are several components and features, such as scores, badges, rankings, and trophies, that allow for immediate and real-time feedback (Hassan et al., 2021). These features are incentives created to stimulate student motivation to participate in a learning environment that makes them feel happy and compete with peers. Before presenting the game, educators should determine the objectives and expected achievement by playing the game first. According to Pařová & Vejačka (2022), one principle in game-based learning is that failure in playing is not tantamount to negative consequences of learning achievement, but only defeat. Gamification approaches in the learning process provide opportunities for students to act independently, demonstrate competence, and learn to work with others (Giang, 2013; Glover, 2013; Guthrie, 2014). Games can enhance immersive, flexible, tiered, diverse, and interactive learning experiences that increase student motivation and active engagement as well as support collaboration and real-world experiences (Díaz, 2020; Moon & Ke, 2019).

Quizizz is one of the effective and widely used technology-based learning media by educators in various subjects. Its use stirs student curiosity, enhances creativity, and supports learning with peers. This is in line with Black and Allen's (2018) suggestion that learning is a social activity. The use of Quizizz in learning creates a sense of enjoyment for students and increases focus on the learning content. The ease of learning, enjoyment, and meaningful knowledge has a positive impact on learning attitudes (Lin, 2022).

Research on the utilization of games in educational contexts has predominantly focused on primary and secondary education levels, leaving a noticeable void in understanding their impact and implementation at the tertiary or higher-education level. The scarcity of gamification in higher education is a notable issue (Montenegro-Rueda et al., 2023; O'Connor & Cardona, 2019). This gap is particularly pronounced when it comes to investigating students' perceptions of games as viable learning media within these more advanced educational settings. Our research endeavors to bridge this gap by exploring the application of games, specifically through the use of Quizizz in higher education. By concentrating on Quizizz as a learning media, this study aims to delve into students' perceptions and evaluate how games can influence learning motivation, engagement, and the overall effectiveness of the learning process. The body of academic work dedicated to examining Quizizz as a learning medium remains scant and needs further exploration (Muji et al., 2021; Pratama, 2021), underscoring the novelty and significance of our investigation in this area. Therefore, the present study aims to answer the following questions: What is students' perception of Quizizz as a learning media? What are the obstacles experienced by students when learning to use Quizizz?

Method

Participants and Context

This research was conducted within the Library and Information Science study program, Faculty of Social Sciences, Universitas Islam Negeri Sumatera Utara, Indonesia, in December 2022. Quizizz as a learning media was given to several classes, which include Learning Theory, Media and Curriculum, Digital Library, and Library Management classes.

The study included university students enrolled in four distinct courses, spread across eight classes in the third, fifth, and seventh semesters of 2022 (Table 1).

Table 1

Characteristic of Study Participants

Class	Courses	Semester	Number of students		Total number of students
			Male	Female	
1	Learning theory, media and curriculum	7	4	34	38
2	Learning theory, media and curriculum	7	14	39	53
3	Digital library	5	9	21	30
4	Digital library	5	9	30	39
5	Digital library	5	6	24	30
6	Library management	3	5	21	26
7	Library management	3	6	21	27
8	Library management	3	6	23	29
Total number of students			59	213	272

For most students, this was their first exposure to Quizizz. This research aims to explore students' perception of Quizizz as a learning media and the related obstacles experienced in a library science study program at the Universitas Islam Negeri Sumatera Utara in Indonesia. By focusing on student experiences and feedback, the study intends to assess the effectiveness of Quizizz in enhancing learning outcomes and to identify the specific challenges students face while adapting to this digital tool. Insights gained could offer valuable guidance on integrating technological aids more effectively within educational frameworks, especially tailored to the needs of the library science curriculum at this university.

Data Collection and Instruments

Observations were conducted in classrooms to gather real-time data on participant behaviour and interactions with Quizizz. An observational checklist was used to ensure consistent data collection, focusing on student expressions and activities while using Quizizz. Observations took place over 90 minutes, capturing both the initiation and progression of students' behaviour while answering the questions on Quizizz, thus yielding insights into tool engagement. These sessions were video-recorded with participants' consent for later analysis.

To gain a deeper understanding of participant experiences and perspectives, focus group discussions were employed as one methodological approach in our research. These discussions involved a total of 24 undergraduate students, evenly distributed across 8 classes, ensuring a diverse representation by selecting 3 students at random from each class within the broader study cohort. Utilizing a semi-structured discussion format enabled us to thoroughly explore students' experiences with Quizizz as a learning tool. This format facilitated an open environment where participants could freely share their thoughts and emotions regarding their engagement with Quizizz, thereby enriching the observational data with qualitative nuances.

Furthermore, to corroborate observations and discussions with tangible evidence of student behaviour, the use of Quizizz in class was documented using a smartphone device. This recording served as a pivotal tool, validating the insights gathered through both observations and focus group discussions. Finally, data accrued from surveys underwent tabulation and detailed analysis, forming a comprehensive overview of our findings. This multifaceted approach—integrating focus group discussions, observational recordings, and survey analysis—offered a holistic perspective on the educational impact of Quizizz, illuminating both its benefits and the challenges perceived by students.

The quantitative approach was used to collect data on students' perceptions, and the data was collected using a questionnaire with the help of Google Forms. Furthermore, the data collection instrument applied a four-point Likert scale where each question was given a weight of 1 to 4 points. Point 1 represents disagree, 2 for slightly disagree, 3 for agree, and 4 for strongly agree with the statement. The questionnaire was developed to explore data on students' experiences when using Quizizz, the feelings experienced, and views on Quizizz as a learning media. Additionally, the instruments were developed based on the framework of EGAMEDU, developed by Gonzalez et al. (2022).

Gonzalez et al. (2022) proved the validity of EGAMEDU as a tool for measuring learning experiences using games. This tool was developed based on Bandura's Social Learning theory (1977) which consists of components of fun, attention, creative thinking, active, no negative effects, control, socialization, and learning. The fun component (questions 1-2) was used to measure student interest in using Quizizz. Attention (questions 3-4) measured the level of attention given by students in learning using Quizizz. Creative thinking (questions 5-6) measured the level of imagination, creativity, or effort made by students when using Quizizz. Activeness (questions 7-8) ascertained the emotional involvement of students and the nervousness experienced. Meanwhile, the absence of negative effects (questions 9-11) highlighted the level of frustration, difficulty, or pressure when using Quizizz. Control (questions 12-13) measured the level of student independence and self-confidence developed when running the game. Socialization (questions 14-15) determined the level

of cooperation between students and their interaction with peers. Finally, learning (questions 16-17) observed students' experience when learning something new.

The number of instruments totaled 17 question items, which were analyzed using the JASP application version 0.16.4 to determine the validity of each question. This open-source application was also used to measure students' perceptions based on the EGAMEDU category.

The research sample group totaled 272 undergraduate students in the Library and Information Science program, separated into eight classes in three different course types. However, only 204 students filled out the questionnaire, of which 171 (83.8%) were female and 33 (16.2%) male. The majority of participants were between the ages of 18 - 23 years. Table 2 shows the number of research participants by course in the program.

Table 2

Number of Research Subjects (n=204)

Courses	Students	%
Learning theory, media, and curriculum	67	33%
Library management	64	31%
Digital library	73	36%

Quizizz

Quizizz (<https://quizizz.com/>) is a web-based application designed for learning and learning assessment. This application was used as a media to test understanding of the learning material in the form of multiple-choice questions. The Quizizz questions were written in Indonesian on the subjects of learning theory, media, and curriculum, digital libraries, and library management. The educator instructed the students to answer the 17 questions using their smartphones. The educator displayed Quizizz on a large projector screen to show the quiz code used by the students to join. Finally, when the students were logged into the application with their devices and ready, the educator started the quiz.

During the quiz, each question was allotted a brief 30-second duration for students to respond, with each correct answer carrying a weight of one point. As students interacted with the quiz, the system dynamically projected a live rank order showcasing those who answered correctly and their corresponding scores. Following the quiz's conclusion, the system promptly displayed the scores and ranking order achieved by students, highlighting the top performers at the pinnacle of the leaderboard. Additionally, Quizizz provides educators the valuable functionality to review and download student learning achievement reports in Excel format, facilitating comprehensive assessment and analysis of individual and collective progress.

Results

Students' Perceptions of Quizizz as a Learning Media

To explore data about students' perceptions of Quizizz as a learning media, a Google Forms questionnaire was used. The scope of the data collected is shown in Table 3.

Table 3

List of Questions in the Questionnaire on Students' Perceptions of Quizizz

Question	Aspects measured
1. I feel happy when using Quizizz in learning	Fun
2. I think Quizizz increases my learning motivation	
3. I think Quizizz makes learning more interesting	Attention
4. By using Quizizz I am more focused on the content of the learning material	
5. The use of Quizizz makes me more concentrated on learning	Creative thinking
6. I think Quizizz makes me think more creatively	
7. I feel actively involved when using Quizizz	Activation
8. I don't feel nervous when using Quizizz	
9. I don't feel bored in learning when I use Quizizz	Absence of negative effect
10. I don't find it difficult to understand Quizizz	
11. I don't feel pressured (stressed) in using Quizizz	
12. I can do the questions in Quizizz independently	Control
13. I can operate Quizizz without the help of friends	
14. I have confidence that I can use Quizizz	Socialization
15. Quizizz allows me to cooperate with friends	
16. I feel that I can learn better using Quizizz	Learning
17. Based on my experience, learning using Quizizz makes me remember the subject matter longer	

Table 3 encapsulates the various aspects measured in the study about students' perceptions of using Quizizz as a learning tool. It categorizes student responses into distinct domains, such as Fun, Attention, Creative Thinking, Activation, Absence of Negative Effect, Control, Socialization, and Learning as per Bandura (1977). Each aspect is explored through specific questions, aimed at uncovering nuanced insights into how Quizizz impacts student engagement, involvement, emotional responses, self-efficacy, social interactions, and overall learning effectiveness. The questions range from evaluating emotional responses and engagement to assessing the platform's role in fostering independence, creativity, and collaborative opportunities among learners.

Quantitative Result

To present a concise description of the data sample in quantitative terms, Table 4 shows the descriptive statistics outlining the mean and standard deviation distribution values of each instrument as well as the data distribution for the students' perception instrument of Quizizz. The distribution shows the total minimum value is 17.0 and the total maximum is 68.0, with a total average of 57.333 and a total standard deviation of 8.155.

Table 4

Descriptive Statistics, Mean, and Standard Deviation of Instruments

	Valid	Mean	Std. Deviation	Minimum	Maximum
Q1	204	3.593	0.549	1.000	4.000
Q2	204	3.500	0.616	1.000	4.000
Q3	204	3.681	0.588	1.000	4.000
Q4	204	3.412	0.727	1.000	4.000
Q5	204	3.319	0.737	1.000	4.000
Q6	204	3.505	0.639	1.000	4.000
Q7	204	3.510	0.624	1.000	4.000
Q8	204	2.926	0.865	1.000	4.000
Q9	204	3.461	0.668	1.000	4.000
Q10	204	3.240	0.804	1.000	4.000
Q11	204	3.201	0.833	1.000	4.000
Q12	204	3.627	0.524	1.000	4.000
Q13	204	3.426	0.680	1.000	4.000

	Valid	Mean	Std. Deviation	Minimum	Maximum
Q14	204	3.377	0.643	1.000	4.000
Q15	204	2.784	1.004	1.000	4.000
Q16	204	3.417	0.649	1.000	4.000
Q17	204	3.377	0.695	1.000	4.000
TOTAL	204	57.333	8.155	17.000	68.000

The data collection instrument was further measured for validity using Cronbach's alpha (Cronbach α) which yielded a value of 0.927, as shown in Table 5. The recommended value of Cronbach's alpha was > 0.7 , signifying that the instrument is reliable. Furthermore, Table 6 shows the reliability test results per item of the instrument, indicating that each instrument has a value of ≥ 0.4 . Therefore, all instruments were concluded to be reliable.

Table 5

Frequentist Scale Reliability Statistics

Estimate	Cronbach's α
Point estimate	0.927
95% CI lower bound	0.912
95% CI upper bound	0.941

Table 6

Frequentist Individual Item Reliability Statistics

Item	If Item Dropped	
	Cronbach's α	Item-rest Correlation
Q1	0.928	0.696
Q2	0.927	0.727
Q3	0.928	0.661
Q4	0.926	0.740
Q5	0.926	0.733

Item	If Item Dropped	
	Cronbach's α	Item-rest Correlation
Q6	0.927	0.727
Q7	0.928	0.658
Q8	0.931	0.561
Q9	0.926	0.731
Q10	0.927	0.713
Q11	0.929	0.628
Q12	0.931	0.547
Q13	0.932	0.484
Q14	0.927	0.687
Q15	0.934	0.438
Q16	0.926	0.755
Q17	0.928	0.659

Based on Table 6, this research instrument is valid as a data collection tool on students' perceptions of Quizizz as a learning media. Additionally, the results of the data collection survey through Google Forms highlighted students' responses on the perceptions of Quizizz (Table 7).

Table 7

Students' Responses About Quizizz (n = 204)

Dimension	Instrument/Weight	Strongly Disagree	Disagree	Agree	Strongly Agree
Fun	I feel happy when using Quizizz in learning	0%	2%	37%	62%
	I think Quizizz increases my motivation in learning	1%	3%	40%	56%
Attention	I think Quizizz makes learning more interesting	1%	3%	22%	74%

Dimension	Instrument/Weight	Strongly Disagree	Disagree	Agree	Strongly Agree
Creative thinking	By using Quizizz I am more focused on the content of the learning material	3%	7%	37%	53%
	The use of Quizizz makes me more concentrated on learning	2%	10%	42%	46%
	I think Quizizz makes me think more creatively	1%	5%	37%	58%
Activation	I feel actively involved when using Quizizz	1%	5%	37%	57%
Absence of negative effect	I don't feel nervous when using Quizizz	5%	27%	40%	29%
	I don't feel bored in learning when using Quizizz	2%	5%	39%	54%
	I don't find it difficult to understand Quizizz	3%	16%	37%	45%
	I don't feel pressured (stressed) in using Quizizz	4%	15%	39%	43%
Control	I can answer the questions in Quizizz independently	1%	1%	35%	65%
	I can operate Quizizz without the help of friends	1%	8%	39%	53%
Socialization	I have confidence that I can use the functions in Quizizz	1%	7%	46%	46%
	Quizizz allows me to cooperate with friends	12%	27%	32%	29%
Learning	I feel that I can learn better using Quizizz	0%	7%	42%	50%
	Based on my experience, Quizizz learning makes me remember materials using lessons longer	2%	6%	44%	48%

Table 7 provides a comprehensive overview of student responses regarding their experience and perceptions of using Quizizz as a learning platform. This data collected from a sample size of 204 students can be elaborated as follows:

A significant majority of students reported positive feelings towards using Quizizz, with 62% strongly agreeing that it made them happy and 56% strongly agreeing that it increased their motivation in learning. This suggests that Quizizz is perceived as an enjoyable and motivating educational tool.

The platform also scored highly on making learning more interesting (74% strongly agree) and helping students focus on learning materials better (53% strongly agree), indicating its effectiveness in capturing and sustaining student attention.

Responses indicate that Quizizz fosters creative thinking, with 46% strongly agreeing that it enhances concentration and 58% strongly agreeing that it stimulates more creative thought processes.

Most students feel actively involved when using Quizizz (57% strongly agree), though a notable percentage expressed feelings of nervousness (27% disagree), suggesting an area for further exploration to enhance user experience.

Students generally did not associate negative effects with using Quizizz. Students disagreed with feeling bored (54% strongly agree), finding it difficult to understand (45% strongly agree), or feeling pressured (43% strongly agree) when using the platform.

High levels of independence were reported, with 65% able to answer questions independently and 53% able to operate Quizizz without assistance, reinforcing the platform's user-friendliness and support for autonomous learning.

The responses were mixed in the socialization dimension. While confidence in using Quizizz was high (46% strongly agree), only 29% strongly agreed that it facilitates cooperation with friends, suggesting potential for improvement in promoting collaborative learning experiences.

On the learning dimension, 50% of students strongly feel they can learn better using Quizizz, and 48% strongly agree that it aids in remembering material longer, indicating its positive impact on learning outcomes.

The data suggest that Quizizz is perceived very positively by many students across multiple dimensions important to effective learning. It highlights the platform's capability to engage students, enhance concentration and creative thinking, and promote active learning with minimal negative effects. However, there are opportunities to further explore and address aspects related to nervousness, socialization, and cooperation to maximize Quizizz's educational potential.

Qualitative Result

Based on observations of the use of Quizizz in the classroom, students showed an enthusiastic attitude toward learning. This research shows that the utilization of Quizizz in learning is a new experience for most students. Students expressed happy behaviour seeing the results of the respective scores. Some students even requested that the Quizizz media be repeated at the next face-to-face meeting.

Obstacles Experienced by Students When Learning to Use Quizizz

The qualitative questions designed for the focus group discussions aimed to explore various dimensions of student experience with Quizizz, including but not limited to usability, engagement, motivational aspects, and any challenges encountered. Specifically, questions such as "What challenges do you face while using Quizizz in a classroom setting?" and "Can you describe any technical issues encountered during Quizizz sessions, including details about the nature of these issues?" were posed to elicit rich, detailed responses about the hurdles faced by students, particularly focusing on their experiences with network connectivity.

Following the collection of qualitative data from these discussions, a thematic analysis approach to identify, analyze, and report patterns (themes) within the data was deployed. This involved a detailed reading of the transcripts to become familiar with the depth and breadth of the content, followed by the generation of initial codes that represented ideas relevant to the research questions. Through a collaborative team effort, these codes were then grouped into potential themes, iteratively refined, and finally defined and named. This process allowed for significant insights about technological barriers, such as network issues, as reported by the students during focus group discussions.

Students generally expressed positive sentiments about using Quizizz, noting its enjoyable and engaging nature. A common obstacle highlighted by many students was the issue of network connectivity. Despite these challenges, most students felt that their learning experience was not significantly hampered. However, a few expressed that network issues did cause momentary frustration and anxiety, particularly when they were eager to participate. In terms of solutions, students with data packages on their smartphones seemed less affected by the Wi-Fi issues. Overall, there was a consensus that Quizizz positively impacts learning, with technical issues being seen as minor obstacles. When asked about their preference, students who owned smartphones with data packages expressed a tendency to rely on their personal data for a more stable connection. As for suggestions, students hoped for better campus Wi-Fi but also appreciated the flexibility Quizizz offered for use with different types of Internet access.

From the quantitative data analysis several key themes emerged reflecting students' positive perceptions of Quizizz as described in Table 8.

Table 8

Themes and Codes of Students' Perception on Using Quizizz

Themes	Codes	Evidence
Positive emotions and motivation	Happy, increased motivation, enjoyable	A significant majority of students reported positive feelings towards using Quizizz, with 62% strongly agreeing that it made them happy and 56% strongly agreeing that it increased their motivation in learning

Themes	Codes	Evidence
Engagement and attention	Interesting, better focus, sustaining attention	The platform scored highly on making learning more interesting (74% strongly agree) and helping students focus on learning materials better (53% strongly agree), indicating its effectiveness in capturing and sustaining student attention
Cognitive enhancement	Creative thinking, concentration, stimulating thought processes	Responses indicate that Quizizz fosters creative thinking, with 46% strongly agreeing that it enhances concentration and 58% strongly agreeing that it stimulates more creative thought processes
Active involvement and independence	Active involvement, nervousness, independence, user-friendliness, autonomous learning	<p>The majority of students feel actively involved when using Quizizz (57% strongly agree), though a notable percentage expressed feelings of nervousness (27% disagree), suggesting an area for further exploration to enhance user experience</p> <p>High levels of independence were reported, with 65% able to answer questions independently and 53% able to operate Quizizz without assistance, reinforcing the platform's user-friendliness and support for autonomous learning</p>
Minimal negative effects	Not boring, easy to understand, no pressure	Students did not associate negative effects with using Quizizz. Most students disagreed with feeling bored (54% strongly agree), finding it difficult to understand (45% strongly agree), or feeling pressured (43% strongly agree) when using the platform
Socialization and collaboration	Cooperation with friends, collaborative learning experiences	The responses were mixed in the socialization dimension. While confidence in using Quizizz was high (46% strongly agree), only 29% strongly agreed that it facilitates cooperation with friends, suggesting potential for improvement in promoting collaborative learning experiences
Learning outcomes	Better learning, remembering material longer, positive impact on learning outcomes	On the learning dimension, 50% of students strongly feel they can learn better using Quizizz, and 48% strongly agree that it aids in remembering material longer, indicating its positive impact on learning outcomes

The qualitative data from focus group discussions revealed additional nuances and challenges faced by students. Thematic analysis of these transcripts uncovered the themes related to obstacles described in Table 9.

Table 9

Obstacles Experienced by Students

Themes	Codes	Evidence
1 Network connectivity issues	Wi-Fi problems, Internet access, data packages on smartphones	A common obstacle highlighted by many students was the issue of network connectivity
2 Emotional impact of obstacles	Frustration, anxiety	A few students expressed that network issues did cause momentary frustration and anxiety, particularly when they were eager to participate
3 Solutions and preferences	Personal data usage, better campus Wi-Fi, flexibility of Internet access	Students with data packages on their smartphones seemed less affected by the Wi-Fi issues

Discussion

The findings underscore a general positive perception among students towards Quizizz as an educational tool, reinforcing the game-based learning paradigm's potential to enhance student engagement and learning outcomes through fun and competitive elements. This alignment with the neurofunctional response process to pleasure and joy in learning, as identified by Greipl et al. (2021), signifies the neurocognitive benefits of gamification in educational settings. The elevation of neural responses connected to emotion and reward, as observed, further corroborates the effectiveness of gamified learning in activating critical cognitive abilities outlined in Bloom's taxonomy (Anderson, Krathwohl, Airasian, et al., 2001), spanning basic recall to creative application.

Recent literature, such as Zainuddin et al. (2020) and Foroutan Far & Taghizadeh (2022), highlights the innovative and engaging nature of gamified learning tools like Quizizz. Their reports suggest that these tools not only trigger competitive and creative learning processes but also foster independence and self-regulation among students. This study adds to the narrative by demonstrating how Quizizz can be a promising platform, echoing the call for incorporating competitive and challenging elements in learning. However, infrastructural barriers such as inadequate Internet access is identified, aligning with the concerns raised by Olateju (2019) and Yusuf (2020), which can significantly impede the efficacy of such digital learning tools. This insight extends the discourse on the necessity of robust technological support for the effective implementation of gamified learning solutions.

Quantitative data, primarily derived from the use of surveys and questionnaires, provides a solid baseline for understanding the overall students' perception and efficacy of Quizizz as a learning medium. When comparing these data points with the current educational framework by Olateju (2019) and Yusuf (2020), particularly the emphasis on personalized and engaged learning environments, results resonate with the growing body of research advocating for adaptive learning technologies. For instance, the positive perceptions highlighted in the quantitative analysis align with the principles of motivational theory in education, which suggests that student engagement increases with interactive and responsive learning tools (Robinson et al., 2006; Ullah & Anwar, 2020). These findings underscore the potential of gamified learning environments, like Quizizz, to cater to diverse learning needs and preferences, echoing the call for more personalized educational strategies within modern pedagogical models.

Qualitative insights gained from focus group discussions reveal intricate details about students' experiences, challenges, and the contextual factors influencing their perceptions of Quizizz. This rich narrative complements the quantitative outcomes by providing depth to the observed positive trends, revealing nuances such as the motivational boost from gamification elements and specific pedagogical advantages like instant feedback. These firsthand accounts are invaluable for understanding the complex interplay between student engagement, learning technology, and educational outcomes. The embodied cognition theory, which posits that cognitive processes are deeply rooted in the body's interactions with its environment (Lynott et al., 2013; Pecher & Zwaan, 2005; Rowlands, 1999; Ziemke, 2016), offers a theoretical lens to interpret our qualitative findings. The tactile and interactive nature of Quizizz, as described by participants, can be seen as facilitating a more immersive and embodied learning experience, fitting into the current shift towards experiential and holistic educational practices.

The observational data, documenting student behaviour and interaction with Quizizz in real-time, provides concrete evidence of engagement and active learning. Observing students' non-verbal cues and their navigation through the game offer additional layers of understanding, indicating the degree of ease, motivation, and cognitive engagement experienced by students. This approach aligns with the socio-constructivist learning theory, which values collaboration, social interaction, and the construction of knowledge through active participation (Vygotsky, 1997). The observational insights highlight how gamified learning tools like Quizizz can foster a collaborative and interactive learning atmosphere (Rughinis, 2013; Wahyuni et al., 2023; Yunus & Hua, 2021), echoing the educational framework's emphasis on collaborative learning environments and technology's role in facilitating these interactions.

By situating this study within these current educational paradigms, it's evident that gamified learning tools like Quizizz not only align with but actively support the evolving goals of educational frameworks (Katanosaka et al., 2021; Wahyuni et al., 2023; Yunus & Hua, 2021), including the facilitation of engaged, personalized, and experiential learning experiences. These insights reinforce the significance of incorporating diverse methodological approaches to fully capture and understand the implications of innovative educational technologies. While this research highlights the potential benefits of using game-based electronic learning media to enhance student engagement and learning outcomes, it is recognized that this approach may not be equally effective or accessible for all students. Educators adopting such tools should consider the diverse needs of their learners, including

those who may require accommodations, have different learning styles, or face technological limitations. Tailoring the use of gamified learning environments to suit individual learner profiles and ensuring equitable access to the necessary technological resources are critical steps in maximizing the educational benefits of these tools.

The EGAMEDU instrument, validated by Gonzalez et al. (2022), serves as a comprehensive framework for evaluating the educational impact of game-based learning environments. Our application of this instrument to Quizizz and the findings generated therein invite further scrutiny within the context of current education literature. Given the distinct characteristics and pedagogical approaches inherent to each game-based learning tool, as well as the unique demographics and learning styles of various student cohorts, the generalizability of the EGAMEDU instrument across all settings may be constrained. Therefore, caution should be exercised when interpreting the results obtained through this instrument in the context of Quizizz. These findings should be considered preliminary and specific to the conditions under which this study was conducted. Further research is warranted to adapt and validate the EGAMEDU instrument or develop new assessment tools tailored to different game-based learning platforms and target populations, ensuring a more accurate and context-sensitive evaluation of their educational value.

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