A Study on Teachers' Attitudes Toward the Integration of e-Gamification in Science Teaching and Learning in Rural Primary Schools

Benedine anak Sandin[*], Kamisah Osman[**]

[*] Fakulti Pendidikan, Universiti Kebangsaan Malaysia
[**] Fakulti Pendidikan, Universiti Kebangsaan Malaysia

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Abstract- In this new digital age, e- Gamification is increasingly recognized as an innovative approach to enhancing student engagement in the classroom. However, the success of this integration largely depends on teachers' attitudes toward its use. E-gamification refers to the use of technology- based game elements in teaching activities to enhance student motivation and engagement. Therefore, this study aims to assess the level of science teachers' attitudes toward the integration of e-Gamification in teaching and learning (T&L) at rural primary schools while identifying their perceptions of the challenges faced. This study employs a mixed-method design with a quantitative survey involving 125 Science teachers in rural schools across the Kanowit District, Sarawak, and qualitative interviews conducted with 10 of those respondents. Next, the collected data was analyzed using a descriptive approach for quantitative data, while qualitative data was coded according to the same theme. The findings reveal that teachers' cognitive levels regarding e-Gamification are moderate (overall mean = 2.97), with a lack of knowledge and skills being the main challenges. Teachers' affective levels are high (overall mean = 3.16), reflecting positive attitudes toward the potential of e-Gamification in making Science learning more enjoyable. However, the behavioral level of implementing e-Gamification remains moderate (overall mean = 2.77), largely due to issues such as time constraints, poor internet connectivity, and inadequate ICT infrastructure. Thus, this study suggests continuous training, technical support, and improved school infrastructure as critical measures to overcome these challenges. The findings provide valuable insights for stakeholders to strengthen the integration of e-Gamification in rural Science education, ultimately enriching students' learning experiences.

Index Terms- Attitudes levels, e-Gamification, teaching and learning, Science

I. INTRODUCTION

In this rapidly advancing digital era, technology plays an increasingly vital role in education. The use of digital tools and mobile applications has provided educators with new teaching and assessment opportunities (Setiyani et al., 2020). One technological innovation gaining attention is *e-Gamification*, the use of digital game elements in the learning process to enhance student motivation and engagement (Sayed Yusoff et al., 2014). It includes features like rewards, achievements, leaderboards, challenges, and narratives to create a more interactive and enjoyable learning environment (Rohaila & Khalid, 2017). The use of e-Gamification in teaching and learning (T&L) has been proven effective, especially in subjects like Science that require high concentration. This approach is also known as Game-Based Learning (GBL) (Simoes et al., 2013), which integrates active human-computer interaction, psychology, and game development to stimulate learner motivation (Shariful Hafizi et al., 2019).

The use of e-Gamification in teaching and learning (T&L) has been proven effective, especially in subjects like Science that require high concentration. This approach is also known as Game-Based Learning (GBL) (Simoes et al., 2013), which integrates active human-computer interaction, psychology, and game development to stimulate learner motivation (Shariful Hafizi et al., 2019). Despite its potential, the adoption and implementation of e-Gamification largely depend on teachers' attitudes, as they are the key change agents in delivering quality education (Eadie et al., 2021). Teachers' willingness to learn, confidence in using the tools, and beliefs in their effectiveness significantly influence the success of integration. Positive attitudes typically correspond to a greater willingness to experiment with and adopt e-Gamification strategies. However, teachers who are skeptical or lack confidence in digital tools may struggle to implement them effectively. This is supported by Lubis et al. (2017), who found that many teachers are still unprepared to adopt advanced technologies in teaching.

Studies have also shown increased student engagement when gamified elements are incorporated into lessons. For example, Armadi Derus & Wan Muna Ruzzana (2021) observed improvement in student achievement and interest when using the Kahoot! platform. Rural students, who are often less exposed to modern technology, may particularly benefit from such interactive approaches (Puteri et al., 2022), which not only improve academic outcomes but also equip students with useful tech skills. Gamification has also been used to influence behavior, cultivate interest, and create enjoyable learning experiences (Ismail et al., 2018; Schell, 2014; Mohamad et al., 2020). Therefore, ensuring that rural school teachers are supported in integrating e-Gamification is essential.

Despite advancements in technology, sustaining teacher engagement with gamified pedagogy remains a challenge (Ding et al., 2018). Rural schools face significantly more limitations in infrastructure, internet access, and funding compared to urban schools (Kumar Raman et al., 2019), raising questions about how effectively e-Gamification can be applied in these settings. Teachers in rural areas often rely on traditional, teacher-centered methods and need to adapt to give students more autonomy—a principle central to gamification. Amirul Mukminin (2020) confirms that game-based teaching methods outperform traditional approaches in engaging learners. This shift requires teachers to plan new activities while ensuring learning objectives are met.

Ahmad Al Hilmi & Lilia Halim (2023) highlight that in-service training (INSET) is crucial to improve pedagogical skills and help teachers present content in ways that spark student interest. However, rural teachers often face limited access to quality training due to geographic constraints (Ainisaadah Mohd Saod et al., 2024). As a result, fewer teachers from these areas attend such programs, despite their importance. Lack of training can undermine teachers' confidence and foster negative attitudes toward technology. Kamaluddin & Husnin (2022) found that teachers without ICT skills struggle to adapt to the digital transformation in education. Continuous support from school administrations and the Ministry of Education is vital to ensure rural teachers aren't left behind in educational innovation.

In conclusion, e-Gamification holds significant potential to enhance teaching and learning effectiveness in Malaysia's rural schools, especially in Science. But its success depends on teacher attitudes, willingness to adapt, and ability to tailor its use to their local contexts. Infrastructure limitations, lack of professional development, and socioeconomic challenges must be addressed to empower rural educators to use e-Gamification effectively. With the right support, e-Gamification can transform rural classrooms and provide students with more meaningful, engaging learning experiences.

II. PROBLEM STATEMENT

The study of teachers' attitudes toward the integration of e-Gamification in rural schools is highly relevant in the current educational context, where technology is becoming increasingly essential in the teaching and learning (T&L) process. In rural areas, the challenges of integrating technology are more pronounced due to limited resources, infrastructure, and facilities compared to urban schools. e-Gamification, which refers to the use of digital game elements in teaching, aims to enhance student motivation, interest, and engagement. However, the success of this practice depends on the attitudes of teachers, who are the primary drivers of the T&L process.

Generally, younger teachers tend to be more skilled and comfortable with technology. This is due to their early exposure to digital tools and possibly having experienced tech-assisted learning during their university or teacher training years (Boudalia, 2018). On the other hand, older teachers may struggle to adapt to e-Gamification due to limited past exposure to modern technologies. Hoon & Rohaizat (2024) also observed that older teachers are less enthusiastic about integrating technology-based approaches into their teaching, as they lack confidence in mastering the required skills. These teachers may view e-Gamification as a challenge rather than an opportunity because the concept is unfamiliar and not aligned with their conventional teaching methods. Fook & Sidhu (2013) supported this view, noting that older teachers are generally less interested in acquiring new skills, including those related to technology in T&L. Without strong motivation to explore new methods, these teachers are more likely to stick to familiar approaches and avoid using e-Gamification.

Teachers' negative perceptions of e-Gamification in Science T&L remain a significant issue. Although the concept of gamification emphasizes the inclusion of playful elements in learning and promises benefits such as improved student motivation and engagement (Mat Husin & Zamri Mahamod, 2023), some perception-based challenges discourage teachers from adopting it. According to Awaz Naaman Saleem et al. (2021), some teachers doubt the effectiveness of gamification in improving students' understanding. Teachers may be concerned that game-like activities could distract students from the primary learning objectives. Jong (2019) supported this by highlighting that some teachers believe games may divert students' attention rather than enhance learning. Gamification might shift focus away from learning rather than reinforcing it (Sheng Mei & Shahlan Surat, 2021). These concerns can be major barriers to the acceptance of gamification among Science teachers.

Halili & Suguneswary (2017) identified lack of infrastructure as a major factor limiting ICT use in rural schools. The absence of essential technology such as computers, tablets, or high-speed internet makes implementing e-Gamification difficult, even for interested teachers. A study by the Ranau District Education Office found that 58% of teachers faced internet access issues (Goliong et al., 2020). Moreover, the lack of technical assistance for managing digital tools places an added burden on teachers, many of whom do not have advanced technical skills. Maintenance of such equipment becomes challenging due to the infrequent presence of specialists, often limited by cost (Ainisaadah Mohd Saod et al., 2024). This lack of support forces teachers to resolve technical issues on their own, contributing to frustration and negative attitudes toward e-Gamification.

In summary, teachers' attitudes toward e-Gamification play a key role in determining the success of its integration in learning.

Teachers with positive cognitive, affective, and behavioral dispositions are more likely to succeed in applying gamified approaches, while those with low confidence or negative perceptions tend to avoid them. Therefore, a deeper investigation into these issues is essential to understand the barriers preventing rural school teachers from effectively adopting e-Gamification. Understanding these challenges allows for the development of more targeted strategies to strengthen teachers' attitudes, improve teaching quality in rural schools, and offer students more interactive and effective learning experiences.

III. RESEARCH OBJECTIVE

The specific objectives of the study are:

1. To identify the level of rural primary school teachers' attitudes toward the use of e-Gamification in Science T&L from the cognitive, affective, and behavioral aspects.
2. To identify rural primary school teachers' perceptions of the challenges in using e-Gamification in Science T&L.

IV. RESEARCH QUESTIONS

To achieve the purpose and objectives of this study, several research questions were considered as follows:

1. What is the level of cognitive attitude among rural primary school Science teachers toward the integration of e-Gamification in Science teaching and learning (T&L)?
2. What is the level of affective attitude among rural primary school Science teachers toward the integration of e-Gamification in Science T&L?
3. What is the level of behavioral attitude among rural primary school Science teachers toward the integration of e-Gamification in Science T&L?
4. What are the challenges in integrating e-Gamification into Science T&L in rural primary schools?

V. METHODOLOGY

Research Design

This study employs an explanatory sequential mixed-method design, which involves two main phases: a quantitative phase followed by a qualitative phase. This design is used when the researcher aims to gain a deeper understanding of quantitative results or patterns by adding a qualitative dimension to clarify findings (Bowen et al., 2017). In the context of integrating e-Gamification into Science education in Malaysia, this approach allows researchers not only to identify patterns of technology adoption among teachers through quantitative data but also to explore deeper challenges and opportunities through qualitative insights.

Sampling

The study population consisted of 139 Science teachers from rural primary schools in the Kanowit District. However, the sample for this study was limited to 125 teachers. Purposive sampling was used to select participants who either taught Science or had experience teaching Science in rural primary schools. This method allows the selection of participants who are best positioned to provide meaningful data aligned with the study's objectives (Nur Farahin et al., 2022). The researcher believed that this sample would provide useful insights to understand the research questions (Creswell, 2015).

Research Instruments

The primary data collection tool was a questionnaire, which is defined as a printed or digital set of questions used to collect individual data (David Lim et al., 2010). The questionnaire was specifically designed based on the study's objectives and consisted of three main sections:

A. Demographic Information

Questions on gender, age, and years of teaching experience to explore potential influences on teachers' attitudes toward e-Gamification.

B. Attitudinal Measures

A 4-point Likert scale was used (1 = Strongly Disagree, 2 = Disagree, 3 = Agree, 4 = Strongly Agree) to assess cognitive, affective, and behavioral aspects. This section included items such as definitions, examples, impacts of e-Gamification, and frequency of using game-based platforms.

C. Perception and Challenges

Open -ended questions about teachers' perceptions of challenges in using e-Gamification and possible solutions.

Pilot Study and Reliability Testing

A pilot study was conducted to assess the reliability of the questionnaire using Cronbach's Alpha coefficient. Table 1 below presents the reliability index:

Table 1. Cronbach's Alpha Coefficient Values of Instrument Items

Category	Alpha Values	Number of items
Cognitive	0.872	10
Affective	0.941	10
Behavioral	0.912	10
Overall	**0.959**	**30**

These values exceed 0.872, indicating high reliability, as supported by Mohd Majid (1998) and Sekaran (2003).

Data Collection and Analysis Procedures

The data collection process involved 125 Science teachers from rural primary schools in Kanowit. The questionnaire was distributed via Google Forms through WhatsApp and Telegram applications. Once responses were collected, the data was analyzed using SPSS version 29.0. Sections A and B were analyzed using frequencies and percentages, while Section B's overall mean scores were interpreted using the 4-point Likert scale adapted from Zainudin Abu Bakar et al. (2007), as shown below:

Table 2. Mean Interpretation Scale (4-Point Likert)

Class Interval Calculation	Mean Range	Mean Interpretation
$\frac{4-1}{3} = 1.00$	1.00 – 2.00	Low
	2.01 – 3.00	Moderate
	3.01 – 4.00	High

In addition to the quantitative phase, 10 respondents were selected from the total 125 teachers for semi-structured interviews. Selection was based on their varied experiences relevant to the study topic. Interviews were conducted using a flexible, open-ended format to gain deeper insights into their perceptions and challenges regarding e-Gamification.

VI. FINDINGS AND DISCUSSION

The findings of this study are divided into five main parts: respondent demographics, cognitive attitude, affective attitude, behavioral attitude and perception of challenges in using e-Gamification.

(A) Respondent Demographics

Table 3 presents the background data of the respondents based on gender, age, and teaching experience. As shown in the table below, a total of 125 teachers from rural primary schools responded to the questionnaire, representing various age groups and teaching experience levels. The demographic analysis of the respondents is displayed in Table 3, which includes the frequency and percentage values.

Table 3. Demographic Analysis of Respondents

Variable		Frequnecy (N)	Percentage (%)
Gender	Male	55	44.0
	Female	70	56.0

Age	20 – 30 years	45	36.0
	31 – 40 years	53	42.4
	> 40 years	27	21.6
Teaching Experience	1 – 5 years	40	32.0
	6 – 10 years	48	38.4
	> 10 years	37	29.6

(B) Cognitive Attitude Towards e-Gamification

Table 4 displays responses to 10 items related to teachers' cognitive understanding of e-Gamification. Items K1 and K7 had the highest agreement rate at 76.8%. The lowest agreement was for item K5, where 36.8% of respondents disagreed. The overall mean score was 2.97, indicating a moderate level of cognitive understanding. While most respondents had basic knowledge of e-Gamification, there remains a need to enhance their skills in planning and implementing this approach.

Table 4. Teachers' Cognitive Attitude Toward e-Gamification

No	Item	Frequency and Percentage (%)			
		SD	D	A	SA
C1	I understand the basic concepts of e-Gamification in teaching and learning	0 (0)	10 (8.0)	96 (76.8)	19 (15.2)
C2	I can identify the key components in e-Gamification that can support my teaching.	0 (0)	38 (30.4)	76 (60.8)	11 (8.8)
C3	I am confident that e-Gamification can increase student engagement in teaching and learning.	0 (0)	2 (1.6)	66 (52.8)	57 (45.6)
C4	I am confident that e-Gamification helps students achieve learning outcomes more effectively.	0 (0)	17 (13.6)	77 (61.6)	31 (24.8)
C5	I can recognize situations where e-Gamification is suitable to be applied in my teaching.	3 (2.4)	46 (36.8)	63 (50.4)	13 (10.4)
C6	I am capable of planning learning activities based on e-Gamification.	1 (0.8)	42 (33.6)	73 (58.4)	9 (7.2)
C7	I understand the different pedagogical implications when integrating e-Gamification into teaching and learning.	0 (0)	22 (17.6)	96 (76.8)	7 (5.6)
C8	I feel that the use of e-Gamification can facilitate formative assessment in the classroom	0 (0)	9 (7.2)	75 (60.0)	41 (32.8)
C9	I can identify the strengths and weaknesses of using e-Gamification in teaching and learning.	0 (0)	19 (15.2)	95 (76.0)	11 (8.8)
C10	I know how to evaluate the effectiveness of e-Gamification in teaching and learning.	2 (1.6)	31 (24.8)	85 (68.0)	7 (5.6)
	Overall Mean 2.97				

In short, high agreement for understanding basic concepts and implications, but lower confidence in identifying suitable situations for implementation. This aligns with Bahtiar et al. (2020), who emphasized the need for teachers to be well-prepared and adaptable in facing evolving educational challenges.

(C) Affective Attitude Towards e-Gamification

No	Item	Frequency and Percentage (%)			
		SD	D	A	SA
A1	I feel happy integrating e-Gamification into my teaching and learning	0 (0)	18 (14.4)	83 (66.4)	24 (19.2)
A2	I feel more motivated when I see students actively engaged through e-Gamification.	0 (0)	9 (7.2)	57 (45.6)	59 (47.2)
A3	I am enthusiastic about exploring various forms of e-Gamification in my teaching.	3 (2.4)	16 (12.8)	76 (60.8)	30 (24.0)
A4	I believe e-Gamification makes the classroom environment more dynamic and enjoyable.	0 (0)	3 (2.4)	93 (74.4)	29 (23.2)

Table 5 presents teachers' emotional responses. The overall mean score was 3.16, indicating a high level of affective attitude. The highest agreement (97.6%) was for item A4: "I believe e-Gamification creates a more dynamic and enjoyable classroom." Only a small number of teachers expressed reluctance or a lack of motivation, as seen in item A7.

Table 5. Teachers' Affective Attitude Toward e-Gamification

A5	I enjoy the experience of using game elements in my teaching.	0 (0)	15 (12.0)	89 (71.2)	21 (16.8)
A6	I feel happy when students show greater interest through the use of e-Gamification.	0 (0)	8 (6.4)	56 (44.8)	61 (48.8)
A7	I am excited to continue using e-Gamification in my future teaching.	3 (2.4)	18 (14.4)	77 (61.6)	27 (21.6)
A8	I feel confident that e-Gamification can enhance the relationship between teacher and students.	0 (0)	16 (12.8)	92 (73.6)	17 (13.6)
A9	I feel more satisfied when students show improvement in learning through e-Gamification.	0 (0)	8 (6.4)	74 (59.2)	43 (34.4)
A10	I feel appreciated when students are more active and engaged through e-Gamification.	0 (0)	13 (10.4)	83 (66.4)	29 (23.2)
	Overall Mean 3.16				

Teachers generally enjoy integrating e-Gamification, feel more motivated, and believe it improves student engagement and strengthens teacher-student relationships. These findings support Siong & Kamisah (2018), who found that gamified environments promote collaboration and communication.

(D) Behavioral Attitude Towards e-Gamification

Table 6 shows teachers' behavioral tendencies when applying e-Gamification in T&L. The overall mean score was 2.77, reflecting a moderate level. Teachers were willing to implement e-Gamification but showed limited initiative to improve their skills or collaborate with peers. This reveals a need for more exposure to best practices and technical support (Karuppannan et al., 2022; Geoffrey et al., 2024).

Table 6. Teachers' Behavioral Attitude Toward e-Gamification

No	Item	Frequency and Percentage (%)			
		STS	TS	S	SS
B1	I frequently use e-Gamification elements in my teaching and learning (T&L).	1 (0.8)	54 (43.2)	63 (50.4)	7 (5.6)
B2	I actively engage in seeking information about effective e-Gamification methods	7 (5.6)	29 (23.2)	72 (57.6)	17 (13.6)
B3	I always adapt my teaching activities to align with e-Gamification techniques.	1 (0.8)	25 (20.0)	91 (72.8)	8 (6.4)
B4	I proactively take steps to improve my skills in using e-Gamification through courses or training.	25 (20.0)	47 (37.6)	45 (36.0)	8 (6.4)
B5	I often interact with colleagues to share experiences regarding the implementation of e-Gamification in T&L.	2 (1.6)	66 (52.8)	52 (41.6)	5 (4.0)
B6	I prepare appropriate learning materials to be used alongside e-Gamification elements.	0 (0)	22 (17.6)	98 (78.4)	5 (4.0)
B7	I ensure that students are given sufficient opportunities to participate in e-Gamification activities in T&L.	0 (0)	6 (4.8)	67 (53.6)	52 (41.6)
B8	I regularly assess student performance based on learning activities that involve e-Gamification.	0 (0)	20 (16.0)	96 (76.8)	9 (7.2)
B9	I make changes to my teaching approach based on student feedback about e-Gamification.	1 (0.8)	20 (16.0)	94 (75.2)	10 (8.0)
B10	I frequently use e-Gamification in T&L to ensure more interactive and enjoyable learning.	2 (1.6)	57 (45.6)	56 (44.8)	10 (8.0)
	Overall Mean 2.77				

(E) Perception of Challenges in Using e-Gamification

Teachers in rural schools face notable challenges in implementing e-Gamification, with poor internet access being one of the most critical. Respondent 1 shared that "internet and electricity cuts are common obstacles," while Respondent 2 noted that the "lack of internet coverage lowers teacher confidence." Limited ICT equipment further complicates implementation, as schools often lack sufficient devices and students do not have their own. As Respondent 9 explained, "We lack ICT facilities and students don't have their own devices."

Time constraints also emerged as a barrier. Teachers expressed that heavy workloads and tight schedules left little time to plan gamified activities. "Teachers in small rural schools have heavier workloads," said Respondent 4, and Respondent 8 added, "Tight schedules make it hard to plan e-Gamification activities." Additionally, some teachers lacked confidence or knowledge, with Respondent 10 admitting, "I've heard of gamification but don't know how to use it in class."

Despite these issues, teachers proposed practical solutions such as using Kahoot! offline, manual reward systems, and curriculum-based training. They also suggested simple visual guides to support implementation. Overall, while rural teachers face structural and skill-based challenges, their willingness to adapt reflects strong potential if supported with the right resources.

VII. RECOMMENDATIONS AND CONCLUSION

The findings of this study revealed that Science teachers in rural primary schools exhibit moderate levels of cognitive and behavioral attitudes towards the integration of e-Gamification in teaching and learning, despite showing a high level of affective attitude. This indicates that while teachers are emotionally open and enthusiastic about using gamification in their classrooms, they still face constraints in terms of knowledge, skills, and actual implementation. These challenges are rooted primarily in limitations related to infrastructure, digital tools, internet connectivity, time constraints, and insufficient training.

To overcome these issues, several measures are recommended. Firstly, continuous professional development programs should be provided specifically to equip rural teachers with both theoretical understanding and practical skills in using e-Gamification tools. These training sessions should not only introduce the concept and applications of gamification but also provide hands-on exposure to platforms like Kahoot!, Quizizz, and other offline alternatives that can be adapted to suit rural school contexts. Importantly, the training must be aligned with the national Science curriculum so that teachers can apply what they learn directly into their lesson planning.

In addition, it is crucial that education stakeholders and school administrations address the infrastructure gap in rural schools. Schools must be equipped with adequate ICT facilities, including stable internet connections, sufficient devices for teachers and students, and regular technical maintenance. Without addressing these foundational needs, the implementation of digital-based pedagogies like e-Gamification will remain limited and inconsistent. Moreover, support from school leadership plays a vital role in ensuring successful adoption. School heads should encourage collaboration among teachers and provide time for them to share experiences, conduct peer coaching, and explore innovative practices in a supportive environment. Teachers should also be given time within their workload to plan and integrate gamified elements into their lessons effectively.

The implications of this study suggest that while e-Gamification holds great potential to transform Science education in rural settings, its success is closely tied to teacher readiness and systemic support. Therefore, education policymakers must not only promote innovation through national policies but also ensure that such policies are inclusive and responsive to the unique realities of rural education. Strategic planning must be grounded in equity, providing rural teachers with the same opportunities and resources as their urban counterparts to engage in digital pedagogical transformation.

In conclusion, this study highlights that although rural Science teachers generally possess positive emotional attitudes toward e-Gamification, they are constrained by various systemic and contextual challenges. These limitations hinder their ability to fully integrate gamified strategies into their teaching. Nevertheless, the enthusiasm shown by the teachers and their willingness to explore alternative methods reflect their openness to pedagogical innovation. With targeted interventions in the form of training, infrastructure development, and administrative support, the integration of e-Gamification can be successfully expanded to rural schools. This will not only enhance teaching effectiveness but also provide students with more engaging and meaningful learning experiences in science education.

REFERENCES

[1] Ab Hakim, Nor Amalina & Zanaton H. Iksan. 2018. Pengetahuan, Kemahiran Pelaksanaan dan Sikap Guru Terhadap Pembelajaran Berasaskan Masalah (PBM) dalam Mata Pelajaran Sains. *In Seminar Antarabangsa Isu-Isu Pendidikan (ISPEN 2018)*: 72-82.

[2] Ahmad Al Hilmi & Lilia Halim. 2023. Pelaksanaan Pendidikan STEM: Pengetahuan Pedagogi Isi Kandungan, Sikap, Kemahiran Pedagogi dan Penilaian Guru. *Malaysian Journal of Social Sciences and Humanities,8*(2): 1-19. https://doi.org/10.47405/mjssh.v8i2.2146

[3] Ainisaadah Mohd Saod, Ahmad Rushdi, Nor Amalina, Azreen Anoar, Mohd Aswad Aziz & Aziah Ismail. 2024. Komitmen Guru dalam Meningkatkan Pencapaian Murid Orang Asli di Pedalaman: Satu Kajian Kes. *International Journal of Modern Education, 6*(20): 394 – 411.

[4] Amirul Mukminin Mohamad. 2020. Quizizz sebagai E- penilaian Norma Baharu Terhadap Penutur Antarabangsa dalam Kursus Bahasa Melayu. *PENDETA: Journal of Malay Language, Education and Literature,* 11(Edisi Khas): 80 – 92.

[5] Bowen, P., Rose, R., & Pilkington, A. 2017. Mixed Methods- Theory and Practice. Sequential, Explanatory Approach. *International Journal of Quantitative and Qualitative Research Methods, 5*(2): 10 - 27.

[6] Ding, L., Er, E., & Orey, M. 2018. An Explanatory Study of Student Engagement in Gamified Online Discussions. *Computers & Education,* 213–226. https://doi.org/10.1016/j.compedu.2018.02.007

[7] Eadie, J., Koutsouris, Y., & Papanastasiou, E. 2021. The Role of Teachers in Providing Quality Education: A Systematic Review. *Educational Review, 73*(2): 177 – 202. Doi:10.1080/00131911.2020.1727201

[8] Fook, C.Y., & Sidhu, G.K. 2013. Peranan Teknologi Maklumat Terhadap Peningkatan Motivasi Pembelajaran di Kalangan Pelajar Universiti. *Journal of Chemical Information and Modeling, 53*(9): 1689 – 1699.

[9] Geoffrey, F.C. Lim, Norshamshizar Abdul Jalil, Hidup, Dayang Suraya Awang Hidup & Marlissa Omar. 2024. Pengintegrasian Teknologi dalam Pendidikan: Cabaran Guru. *International Journal of Modern Languages and Applied Linguistics, 8*(1): 49 – 67.

[10] Hoon, A.W.C. & Rohaizat Ibrahim. 2024. Isu dan Cadangan Terhadap Penggunaan Teknologi Maklumat dan Komunikasi dalam Pengajaran dan Pembelajaran:

Persepsi Guru. *International Journal of Advanced Research in Education and Society*, 800-815. https://doi.org/10.55057/ijares.2024.6.3.67

[11]

[12] Ida Puteri Mahsan, Elis Syuhaila Mokhtar, Muliyati Mat Alim. 2022. Isu Pelaksanaan dan Inovasi E- Pembelajaran Pendidikan Seni Visual Sekolah Luar Bandar di Fasa Pandemik Covid 19. *Journal of Engineering,Technology & Applied Science, 4*(3): 131 – 139. 10.36079/lamintang.jetas-0403.465

[13] Karuppannan, G., Duari, H., & Heng, S. P. 2022. Hubungan Antara Amalan Profesional Komuniti Pem-belajaran (PLC) dan Efikasi Guru: Analisis Kuantitatif ke Atas Guru Sekolah Menengah di Malaysia. *Jurnal Dunia Pendidikan, 4*(2): 21-33.

[14] Kumar Raman, Norasmah Othman & Mohd Affandi. 2019. Jurang Penggunaan Teknologi Maklumat dan Komunikasi (TMK) di Sekolah Bandar dengan Luar Bandar. *Jurnal Pendidikan Malaysia, 44*(1) Isu Khas (2019): 109 – 119.

[15] Maimun Aqsha Lubis, Wan Nurul Syuhada Wan Hassan, Mohd Isa Hamzah. 2017. Tahap Pengetahuan dan Kesediaan Guru- guru Pendidikan Islam Sekolah Menengah di Selangor terhadap Penggunaan Multimedia dalam Pengajaran Pendidikan Islam. *ASEAN Comparative Education Research Journal on Islam and Civilization (ACER-J), 1*(1): 1-13.

[16] Monaim Mohamad, Fatin Kamilia Mohd Arif, Alias, Bity Salwana Alias & Melor Md Yunus. 2020. Online Game- Based Formative Assessment: Distant Learners Post Graduate Students' Challenges Towards Quizizz. *International Journal of Scientific and Technology Research, 9*(4): 994 – 1002.

[17] Nur Aisyah Kamaluddin & Hazrati Husnin. 2022. Penggunaan Teknologi Maklumat dan Komunikasi (TMK) dalam Pendidikan. *Jurnal Dunia Pendidikan, 4*(2): 333 – 343. https://doi.org/10.55057/jdpd.2022.4.2.29

[18] Rahayu Ahamad Bahtiar, Sham Ibrahim, Halijah Ariffin, Nor Hazimah Ismail, & Wan Mohd Khairul Wan Isa. 2020. Peranan dan Cabaran Pemimpin Pendidikan dalam Memastikan Matlamat dan Agenda Pendidikan Dilestari dalam Tempoh Perintah Kawalan Pergerakan (PKP) Covid-19. *Institut Aminuddin Baki, Kementerian Pendidikan Malaysia.*

[19] Rohaila Mohamed Rosly & Fariza Khalid. 2017. Gamifikasi: Konsep dan Implikasi dalam Pendidikan. Dalam Rohaila Mohamed Rosly, Nabila Atika Razali & Nur Atikah Jamilluddin. (Editor)., *Pembelajaran Abad ke-21: Trend Integrasi Teknologi*, 144 – 154.

[20] Sayed Yusoff, Tan, W.H. & Muhammad Zaffwan. 2014. Digital Game- Based Learning for Remedial Mathematics Students: A new teaching and learning approach in Malaysia. *International Journal of Multimedia Ubiquitous Engineering, 9*(11): 325 – 338.

[21] Shariful Hafizi Md Hanafiah., Abd Hakim Abdul Majid, & Kamarul Shukri Mat Teh. 2019. Gamifikasi dalam Pendidikan: Satu Kajian Literatur. *Asian People Journal,* 2(2): 31-41. https://journal.unisza.edu.my/apj

[22] Simoes,J., Redondo, R.D., & Vilas, A.F. 2013. A Social Gamification Framework for AK-6 Learning Platform. *Computers in Human Behaviour, 29*(2): 345 – 353. https://doi.org/10.1016/j.chb.2012.06.007

[23] Siti Hajar Halili & Suguneswary, S. 2017. Penerimaan Guru Terhadap Penggunaan Teknologi Maklumat dan Komunikasi Berasaskan Model Tam dalam Pengajaran Mata Pelajaran Bahasa Tamil. *JuKu: Jurnal Kurikulum & Pengajaran Asia Pasifik, 4*(2): 31-41.

[24] Siong, W.W. & Kamisah Osman. 2018. Pembelajaran Berasaskan Permainan dalam Pendidikan STEM dan Penguasaan Kemahiran Abad ke-21. *Politeknik & Kolej Komuniti Journal of Social Sciences and Humanities, 3*(1): 121 – 135. https://app.mypolycc.edu.my/journal/index.php/PMJSSH/article/view/153

AUTHORS

First Author – Benedine anak Sandin, Universiti Kebangsaan Malaysia (UKM), P130098@siswa.ukm.edu.my

Second Author – Kamisah Osman, Universiti Kebangsaan Malaysia (UKM), kamisah@ukm.edu.my

Correspondence Author – P130098@siswa.ukm.edu.my