Cakrawala Pendidikan
Jurnal Ilmiah Pendidikan
Vol. 45 No. 2, June 2026, pp. 419-428
https://journal.uny.ac.id/index.php/cp/issue/view/3110
DOI: https://doi.org/10.21831/cp.v45i2.71926

Exploring an immersive pedagogical innovation: A case study of teaching History with VR-Mnemonics in Malaysia

Nurul Asyikin Hassan[1]*, Mohd Nazir Md. Zabit[1], Septian Aji Permana[2], Siti Zahrah Mahfood[1], Dg. Junaidah Awang Jambol[3]
[1]Universiti Pendidikan Sultan Idris (UPSI), Malaysia
[2]Universitas PGRI Yogyakarta, Indonesia
[3]University Malaysia Sabah (UMS), Malaysia
*Corresponding Author: nurulasyikin.h@fsk.upsi.edu.my

ABSTRACT

The central aim of this study was to explore the implementation of the VR-Mnemonic as an immersive instructional innovation in History education. The primary objective was to examine the integration of the VR-Mnemonic, while a secondary purpose was to determine its effect on history pedagogy. A qualitative design was employed, utilizing the case study approach. Three participants who had not succeeded in their history course were selected as a purposive sample. These subjects were students from a Maktab Rendah Sains MARA in Sabah. The research used document examination of supplementary materials and reflective writing. Initial findings indicated that conventional teaching methods were less effective in helping participants grasp the History subject. To address this, the VR-Mnemonic was introduced to enhance their mastery of the content. Results demonstrated that the VR-Mnemonic served as an engaging instructional alternative that could support students in mastering History, yielding positive effects in the affective domain. The study also identified that teaching and learning with VR-Mnemonic were more interactive, enjoyable, and accessible, providing students with a distinct virtual reality opportunity in History.

Keywords: pedagogy, VR-Mnemonic, immersive, innovation

Article history

Received:	*Revised:*	*Accepted:*	*Published:*
14 March 2024	*16 April 2024*	*05 June 2024*	*01 June 2026*

Citation (APA Style): Hassan, N. A., Zabit, M. N. M., Permana, S. A., Mahfood, S. Z. & Jambol, D. J. A. (2026). Exploring an immersive pedagogical innovation: A case study of teaching History with VR-mnemonics in Malaysia. *Cakrawala Pendidikan: Jurnal Ilmiah Pendidikan, 45*(2), pp. 419-428. DOI: https://doi.org/10.21831/cp.v45i2.71926

INTRODUCTION

Conflict regarding the teaching of History, whether at the primary, secondary, or tertiary level, is not unique to Malaysia but is also present in countries like India, Tanzania, Indonesia, and Australia (Stoddard, 2022; Namamba & Rao, 2017; Ghosh & Bairagya, 2018; Bain, 2011; Wijayasari et al., 2020; Velayutham & Awang, 2023). This ongoing conflict centers on weaknesses in teaching methods, reliance on conventional materials, excessive emphasis on memorization, insufficient use of technology, and teachers' attitudes. These factors collectively influence students' mastery, interest, and perceptions of the subject, with many viewing History as lacking economic and practical value (Stoddard, 2022; Peck, 2018; Gross & Terra, 2018; Talin et al., 2020; Ndomondo et al., 2022; Yulifar & Aman, 2023).

Consequently, these challenges in History instruction not only affect learners' enthusiasm and understanding of the subject but also influence outcomes in internal and national assessments, thereby affecting overall academic performance in History (*Lembaga Peperiksaan Malaysia*, 2022). As noted in *Lembaga Peperiksaan Malaysia's* report (*Lembaga Peperiksaan Malaysia*, 2020), achievement in History declined by 1.1% compared to 2019. This resulted in just 337,773 candidates qualifying for the SPM certificate, out of a total of 416,416 examinees. In effect, some 78,643 candidates were unable to attain the SPM certificate by failing to pass two core subjects,

Bahasa Malaysia and History, in 2019 (*Lembaga Peperiksaan Malaysia*, 2019). In 2018, of the 421,706 SPM participants, 83,356 did not secure the certificate (*Lembaga Peperiksaan Malaysia*, 2019). Similarly, in 2020, 62,446 candidates remained unsuccessful, given 401,105 registered for the SPM that year (*Lembaga Peperiksaan Malaysia*, 2021). In 2021, a total of 70,467 applicants did not obtain the certificate out of 407,097 who enrolled (*Lembaga Peperiksaan Malaysia*, 2021). In 2022, 33,906 of 403,637 registered examinees did not meet the requirements (*Lembaga Peperiksaan Malaysia*, 2022). These figures show that a significant number of students failed the History subject, preventing them from earning the SPM certificate, an important milestone that influences their educational and career progression (*Lembaga Peperiksaan Malaysia*, 2022; *Lembaga Peperiksaan Malaysia*, 2021; *Lembaga Peperiksaan Malaysia*, 2020).

The statistics indicated that many students did not pass History at the SPM level, which is recognised as the most crucial examination for school leavers. Nevertheless, various initiatives have been implemented to help students enhance their personal development and academic achievement, especially in History. A study by Pham & Nguyen (2023) observed that significant attention was given to employing project-based learning, as exemplified in their research. This approach in History was reported to offer substantial benefits, connect historical topics to contemporary contexts, and foster students' higher-order thinking skills. Furthermore, initiatives sought to boost teachers' inventiveness in applying diverse instructional strategies. This stems from the fact that teaching History requires dynamic, engaging methodologies to accommodate students' varying levels of comprehension (Ghosh & Bairagya, 2018). The findings of Ghosh & Bairagya (2018) align with those of Ogah (2023), who found that teachers generally adopt discussion, inquiry, and lecture techniques, further supported by teaching materials such as textbooks. Instructional methods were regularly refined to emphasise student-focused learning, assisted by proactive administrative backing. Moreover, the Education Ministry made notable contributions to enhancing school teaching facilities, including audio and audiovisual resources (Ogah, 2023).

Moreover, advancements in Industrial Revolutions 4.0 and 5.0 are transforming the History discipline, calling for innovative strategies for History teaching (Jiang & Liu, 2023). Research by Ca et al. (2020) shows that student-centered teaching, leveraging digital devices consistent with Industrial Revolution 5.0, can boost learner motivation and support History competence. The fourth industrial revolution merges technology with human interaction through smart robotics, the Internet of Things, cloud computing, and data processing (Saad et al., 2020). These advancements are creating a 'smart society' under Industrial Revolution 5.0, empowering communities to address challenges and increase digital literacy. Revolutions 4.0 and 5.0 are collaborative, connecting individuals with technological infrastructure for mutual progress; studies suggest that 85% of partnerships between humans and automated labor can increase productivity (Saad et al., 2020).

Given the emergence of Industrial Revolutions 4.0 and 5.0, this study aims to explore the use of virtual reality (VR) and the Mnemonik technique in teaching History. Specifically, this research focuses on blending VR with a conventional strategy (the Mnemonik technique) to engage students in historical learning. In other words, the study investigates the integration of the classic Mnemonic technique with the modern VR model in History education. This combination, referred to as VR-Mnemonic, introduces an innovative aspect to History instruction. The main goal is to assess the implementation of VR-Mnemonic in helping three students who previously failed the subject. Developing VR-Mnemonic included recording instructional videos covering Form 5 content. The teacher also created a video about answering strategies based on actual SPM exam criteria. These recordings covered the entire lesson sequence, from introduction to conclusion. Afterward, the teacher used the Canva platform to edit the videos. To use VR-Mnemonic, students accessed the video link, installed the VR-Player app, and viewed the lesson in VR using VR Box Glasses.

Generally, the public is familiar with the Mnemonic technique as a memory tool used in History education to help students recall, comprehend, and deepen their mastery of the subject (Scruggs et al., 2010; Putnam, 2015; Ni & Hassan, 2019). Research by Ni & Hassan (2019) indicated that using the Mnemonik technique and Maths Mnemonik could foster better

understanding and proficiency for struggling students in History. The investigation explored the application of Mnemonik and Maths Mnemonik, their connection to comprehension levels as measured by Bloom's Taxonomy at the second hierarchy, and the effects of their use on student achievement in History. Furthermore, the research by Çolak & Aydın (2022) investigated the influence of mnemonic strategies in History teaching on knowledge retention and students' perceptions of their exposure to such strategies. This study adopted a quasi-experimental design, and the results demonstrated that mnemonic strategies positively affected students' academic achievement in History and bolstered information retention in the subject. Additionally, it heightened students' interest and contributed to a deeper understanding of History.

Additionally, the study by Remolar et al. (2021), which explored the teaching of History through virtual and augmented reality, was implemented to address students' loss of interest during prolonged periods of focus, especially during lectures. The investigation focused on the Ancient Roman era, offering an immersive virtual experience set in multiple historical periods. The study's findings indicated that virtual reality was captivating and could stimulate students' enthusiasm for learning History and, perhaps most notably, enhance their grasp of various concepts.

In addition, Johnsdorf et al. (2023) compared traditional teaching methods, such as mnemonics, with innovative approaches, namely virtual reality, offering an unexpected perspective. In their study, participants were instructed to recall the correct spatial arrangement using either conventional written text, a 2D video displayed on a screen, or a 3D/360° video in Virtual Reality. Also, their findings indicated that established instructional techniques, such as mnemonics, were adequate and effective for History learning, especially for reinforcing long-term memory, compared with the advanced technique of virtual reality. The aforementioned study differed from the researcher's investigation because Johnsdorf et al. (2023) assessed distinctions between two teaching styles: traditional versus contemporary. Conversely, the researcher's project did not examine the contrast between the two; instead, it focused on integrating or synthesizing both, specifically blending modern teaching strategies with conventional methods, whereas this study focused on mnemonic techniques and virtual reality.

From the literature review, the researchers discovered that the conventional Mnemonic approach used in History instruction was highly effective in boosting students' short- and long-term memory, enabling them to excel in the discipline. Studies of modern teaching methods in History, particularly those focusing on virtual reality, also revealed a positive influence, helping students master the material. Drawing on prior findings, the researcher observed that both traditional and emerging techniques could be integrated into History education to yield diverse outcomes. While some works explore mnemonic and virtual methods separately, and a few contrast the two, the researcher identified this as a possible gap and an opportunity for further inquiry. Thus, to fill this gap, the researcher considered it valuable to assess the effect of merging the mnemonic method with the virtual reality model. This specific limitation would be addressed by the researcher's plan to investigate VR-Mnemonic as an innovative development in History teaching.

The theoretical foundation for this study draws upon the Technological Pedagogical Content Knowledge (TPACK) framework, introduced by Mishra and Koehler (2006). This model expands on Lee Shulman's work by incorporating a technological knowledge dimension (Mishra & Koehler, 2006). Within this framework, assessment is centered on three core components: technological knowledge (TK), pedagogical knowledge (PK), and content knowledge. Therefore, when employing VR-Mnemonic in instruction, these elements, such as technological, pedagogical, and content expertise, are applied, integrated, and synthesized to achieve a more holistic learning experience (Augustine & Mohamed, 2023; Eng & Keong, 2019).

METHOD

The researcher's investigation employed a qualitative approach. This methodology, as outlined by Creswell (2009), is characterized by its adaptability, accessibility, and appropriateness for the present inquiry. Information was gathered through the analysis of documents,

encompassing students' assignments and reflective writings. The underlying research philosophy was constructivist, while the overall framework was that of a case study.

The research was conducted at MRSM Kota Kinabalu. The target group consisted of Form 5 students. The sample comprised three participants: informants 1, 7, and 10. These individuals were chosen through purposive sampling. Participant selection was based on their outcomes in Test 1 and Test 2. Table 1 presents the scores for both tests.

Table 1. Results of test 1 and test 2

List of Informants	Mark Test 1	Mark Test 2	List of Informants	Mark Test 1	Mark Test 2
Informant 1	30	30	Informant 13	77	80
Informant 2	75	80	Informant 14	80	82
Informant 3	68	77	Informant 15	70	77
Informant 4	75	77	Informant 16	68	75
Informant 5	70	70	Informant 17	77	72
Informant 6	77	83	Informant 18	80	80
Informant 7	35	30	Informant 19	78	81
Informant 8	65	75	Informant 20	68	78
Informant 9	70	75	Informant 21	75	75
Informant 10	25	35	Informant 22	80	80
Informant 11	71	75	Informant 23	70	75
Informant 12	78	80			

Source: MRSM Kota Kinabalu

The study instruments comprised structured questionnaires and essays. The second instrument was the reflective notes written before and after using the VR-Mnemonic method. The reflective notes included reflections on the teaching method, students' reactions, and responses. The data collection process included supporting documents and reflective notes. Supporting documents consisted of structured question exercises and essays written before and after using the VR-Mnemonic method. The questions administered aligned with the SPM syllabus. The reflective notes were employed to evaluate teaching practices before and after applying the VR-Mnemonic method.

The procedure for analyzing information involved evaluating the prepared formats within the supporting materials, specifically the student assignments and reflective notes. Triangulation was performed by examining each instrument to obtain richer, more comprehensive data. For verification, the researcher also obtained verification from experts in related fields. For example, the researcher was assisted by an external auditor, such as the Senior Subject Teacher, during the learning process and also conducted further discussions to verify the information provided by the informant for data collection.

FINDINGS AND DISCUSSION

Findings

Supporting documents

To evaluate the informant's advancement in completing the exercise, both structured and essay questions were utilized. Each participant received two structured queries and two essay prompts. The assessments were administered before and after the VR-Mnemonic approach was applied. The items were designed in alignment with Bloom's Taxonomy to assist the researcher in gauging the informant's progress. Furthermore, the queries adhered to the current question guidelines. The rubric for measuring the informant's improvement in tackling the exercise was drawn from Bloom's Taxonomy and was validated by the Senior History Teacher. Based on the informants' responses, evaluated with Bloom's Taxonomy rubric, we identified shifts in their answer scripts pre- and post-implementation of the VR-Mnemonic method. In the earlier phase, some informants did not fully address the provided exercise questions. Nevertheless, after employing the VR-Mnemonic method, their performance improved; they answered all the questions. Initially, the informants' responses were quite restricted, and they struggled to answer

advanced questions. Conversely, after using the VR-Mnemonic method, they produced strong answers across multiple levels of Bloom's Taxonomy, particularly on challenging questions. Tables 2 and 3 present sample analyses of students' responses for the essay and structured questions applying Bloom's Taxonomy rubric.

Table 2. Analysis of students' exercise answers before using the VR-Mnemonic method

Index	Informants' Answers	Coding	Theme
Structure Questions: Based on your knowledge of History, summarise the positive effects of imperialism as implemented by the British colonisers on the development of civilisation			
Mel/1	Great	Understanding of History of Europe's development was unsatisfactory.	Building understanding
Essay Question: Explain the effects of the Agricultural Revolution			
Mel/2	To provide and prepare food for the people, the Industrial sector and for trade.	Analysis of understanding/General	Building understanding

Source: MRSM Kota Kinabalu

Table 3. Analysis of students' exercise answers after using the VR-Mnemonic method

Index	Informants' Answers	Coding	Theme
Structure Questions: Based on your knowledge of History, summarise the positive effects of imperialism as implemented by the British colonisers on the development of civilisation			
Mel/3	The positive effect of imperialism on development of civilisation was that the locals could learn the English language.	Analysing understanding/excellent	Building understanding
Mel/4	This was because at that time, the lower administrative staff were given basic knowledge of the English language.	Interpretation of understanding	Building understanding
Essay Question: Explain the effects of the Agricultural Revolution			
Mel/7	Some of the effects of Agricultural Revolution was that agriculture was a cause for decrease in a country's economic resource.	Interpretation of understanding Analysing understanding/excellent	Building understanding
Mel/8	This is because agricultural activities have been carried out on a large scale to be traded	Interpretation of understanding Analysing understanding/excellent	Building understanding

Source: MRSM Kota Kinabalu

Tables 2 and 3 indicate a variation in the informants' responses before and after implementing the VR-Mnemonic method.

Reflective notes

The reflective notes drew on observations made before and after implementing the VR-Mnemonic method during the teaching process. In these reflections, the researcher meticulously recorded informants' reactions throughout instruction. To clarify, before using the VR-Mnemonic method, a conventional teaching approach was employed, structured in stages with defined resources and activities. During this initial phase, informants appeared disengaged and uninvolved, with scant exposure to positive emotions. For instance, informant 1 reported:

> *"Informant one (1) did not focus when the teacher was teaching. He seemed to be lost in his own world, he did not answer the teacher's questions and seemed to look at the teacher's explanation with a vacant expression." (Informant 1/Teacher's Reflection Notes, January 9, 2023).*

During the VR-Mnemonic teaching session, the researcher provided each informant with an Android smartphone and VR Box Glasses to facilitate active participation in the lesson. Informants received a link to a video lesson to download and view individually. Immersed in virtual reality, they experienced an environment aligned with contemporary industry

advancements. The VR-Mnemonic approach inspired marked positive changes; informants exhibited heightened focus, emotional investment, and involvement in History. Observable outcomes included smiling, showing enthusiasm, concentrating on instruction, and actively interacting. For example:

> *Generally, the researcher could see a more positive change shown by the students. They became very active, and they discussed happily during the usage of the VR-Mnemonic. The class was no longer silent with rigid learning; instead, the students were free to explore learning using VR-Mnemonic. They experienced learning using virtual reality, and this helped them to answer the tasks and increased their interest in the History subject." (Teacher's Reflection Note, January 20, 2023).*

To ensure accuracy and credibility, the researcher enlisted the Senior Teacher of History, who validated the reflection notes. Guided by the study objectives, the researcher identified two core elements in the instrument analysis.

Objective 1: To explore the usage of VR-Mnemonic in the teaching of history

The main finding is that VR-Mnemonic, as an immersive pedagogical tool, helped reinforce mastery and creativity in learning and thinking. In the initial teaching stage before using the VR-Mnemonic method, the researcher used the usual teaching method (the conventional teaching method) for teaching History. In the induction stage, the researcher used stimulus materials related to the topic being taught and then proceeded to activities in the teaching development stage. During the development stage, the researcher used activities such as Rally Robin and Gallery Walk to help students master the material. In the final stage, the researcher concluded the lesson with simple activities, such as a one-sentence summary of the learning. The informants' responses during teaching were discouraging and did not indicate that they were interested in completing the task. For example, they did not seem to focus on the task, they were not actively involved, and found it difficult to master the History subject. As a result, the researcher found that the informants encountered difficulties when completing the assigned tasks. The informant's review found that they did not answer the questions well and that some did not complete the task. Some of them could not explain well. This left them unable to provide creative answers to the high-level thinking questions (KBAT). Some of the informants' answers did not align with Bloom's Taxonomy for the given question. The findings of this study were supported by Sebbowa and Ng'ambi (2020) study, which found that conventional teaching methods made students inactive. The study by Sebbowa and Ng'ambi (2020) was reinforced by the researcher's reflection notes, which stated that,

> *"Informants 1,7 and 10 found it difficult to master the History subject, especially the topic taught in class. Informants 1, 7, and 10 showed low focus and did not follow the lesson well. When they were asked, they could not answer as they had forgotten what had been taught by the teacher. The researcher could see that Informants 1, 7, and 10 were facing problems in answering the structured questions and essay." (Informant 1, 7, and 10 /Teacher's Reflection Notes, January 9, 2023)*

After observing that Informants 1, 7, and 10 struggled to learn History, the researcher decided to combine conventional and modern approaches through the VR-Mnemonic method. Instruction began with a set induction using relevant resources, progressed through student-centered activities, and concluded with simple exercises such as exit tickets that required active student involvement. Only the teaching phase differed by employing VR-Mnemonic.

The informants were fully engaged as they followed instructions in the virtual lesson. With VR Box Glasses, they could access the lesson video at any time without restriction. To help them answer specific questions according to the Sijil Pelajaran Malaysia format, they received a recording of the Question Answering Strategy. This unrestricted access allowed informants to consult the VR-Mnemonic as needed. VR-Mnemonic supported them in retaining the content and completing exercises. After using VR-Mnemonic, the researcher observed changes in their responses.

Informants 1, 7, and 10 were very excited to use the VR Box Glasses. They appeared to interact with the virtual world, which enabled them to focus on their learning and remain fully

engaged in the lesson. They walked, smiled, and explored each lesson using the VR-Mnemonic. In other words, they were very active in their learning. Based on their responses, informants 1, 7, and 10 completed the exploration task easily using the provided guide. The findings were supported by a comparison of pre-test and post-test scores prior to and after using the VR-Mnemonic method. Table 4 compares the informants' marks before and after using the VR-Mnemonic method.

Table 4. Comparison of marks from Test 1, Test 2 and final exam

List of Informants	Before using the VR-Mnemonic Method			After using the VR-Mnemonic Method		
	Test 1	Test 2	Final Year Exam	Test 1	Test 2	Final Year Exam
Informant 1	30/F	30/F	55/C+	81/A-	85/A	85/A
Informant 7	35/F	30/F	50/C-	76/B+	78/B+	78/B+
Informant 10	25/F	35/F	50/C-	77/B+	81/A-	83/A-

Source: MRSM Kota Kinabalu

The researcher's findings correspond with those of Saad et al. (2020), Awang et al. (2016), and Sebbowa and Ng'ambi (2020). Collectively, these studies indicate that immersive technology fosters a highly capable generation by driving technological advancement, innovation, and creativity for human convenience. This provides a basis for interpreting the effects of VR-Mnemonic in education.

Objective 2: To explore the effects of VR-Mnemonic usage in the teaching of History

When teaching with the VR-Mnemonic method, the researcher identified a key finding: it enhanced the learning experience by targeting the affective domain to reinforce mastery of History. Studies have shown that Virtual Reality methods can enrich learners' emotions by developing affective factors for stronger History comprehension (Yeo et al., 2020). Gunawan et al. (2023) also confirm that virtual reality promotes enjoyment and prevents boredom in History classes. Their conclusions align with this study's results.

In the present study, the researcher observed that informants 1, 7, and 10 exhibited diverse positive emotions during VR-Mnemonic sessions. For example, they laughed and interacted more dynamically during virtual reality lessons. Their participation and focus during VR-Mnemonic contrasted markedly with the disengagement, boredom, and unhappiness noted previously. This illustrates the method's effect on students' affective engagement.

With stress-free learning facilitated by enhanced affective factors, informants strengthened their mastery of History. Skobelev & Yu (2017) found that, due to the technological surge in Industrial Revolutions 4.0 and 5.0, students could build a more comprehensive foundation of knowledge in History. For informants 1, 7, and 10, VR-Mnemonic effectively supported the retention and retrieval of topics. The researcher confirmed that these informants felt at ease during training, as virtual reality positively influenced their affective states (Yeo et al., 2020). Table 5 shows the assessment of informants' performance before and after VR-Mnemonic use.

Table 5. The overall evaluation of the informants in answering the tasks before and after the use of VR-Mnemonic

Informant	Before the use of VR-Mnemonic	After the use of VR-Mnemonic
1	x	v
7	x	v
10	x	v

Discussion

Findings from Johnsdorf et al. (2023) showed that mnemonic methods are very helpful in teaching History because they can improve one's memory and facilitate one's understanding of the subject. Johnsdorf et al. (2023) also supported the findings of the aforementioned study,

stating that the mnemonic method is sufficient and does not require additional resources to master the History subject. Nonetheless, studies show that the mnemonic method has a weakness. It still requires prolonged training to maintain long-term memory, and it is not produced in the short term (Putnam, 2015). As such, given this weakness, the mnemonic method needs to be supported by other resources, as researchers have carried out. This is done by combining the mnemonic methods with virtual reality to make VR-Mnemonic. Therefore, the researcher wanted to explore what would happen if the mnemonic method were combined with the virtual reality method. This was different from the study by Johnsdorf et al. (2023), who found differences between the mnemonic and virtual reality methods in the teaching of History.

Findings from this study indicated that VR-Mnemonic is one of the immersive pedagogical alternatives that can help students master History by fostering positive affective aspects. These study findings also showed that the mnemonic method has its own strengths, such as improving memory and facilitating mastery and understanding of the History subject. Additionally, virtual reality has certain strengths, making teaching and learning more engaging and aligned with the learning needs of the researcher's students. Thus, in this study, combining the conventional mnemonic method with the 21st-century VR-Mnemonic method strengthened students' mastery of History. Furthermore, it had a positive effect on the students' affective growth. The findings of this study are supported by those of Gunawan et al. (2023), who stated that positive affective growth is very important for learning, enabling students to master History well without stress. This particular effect caused them to pass with distinction in History. Positive affective development is also very important, as healthy emotions foster virtues, in line with the History subject's learning objectives (Saad et al., 2020).

To further improve this study, the researcher suggests integrating the virtual reality method with other methods, such as the mnemonic method, to enhance interactivity. The researcher also felt that other studies could be integrated with teaching methods utilising virtual games to make the learning process more interactive and interesting. This is because integrating with other methods can capture students' interest and attention, enabling them to better master the History subject. This suggestion is in line with the findings from the researcher's reflection notes, which have been confirmed by the Senior Teacher for the subject:

> *"Informants 1,7 and 10 showed a very positive response, and they mastered the learning. Perhaps it would be better if the VR-Mnemonic method were integrated with other methods so that the learning could be more interactive and aligned with the development of their age and generation." (Teacher's Reflection Notes, January 20, 2023)*

CONCLUSION

The discussion focused on how VR-Mnemonic supports History learning. Gunawan et al. (2023) found that using virtual reality in History not only engages students but also enhances concentration and, importantly, problem-solving abilities. This was illustrated as informants 1, 7, and 10 completed all assigned tasks. The researcher agreed with Putnam's (2015) claim that mnemonic strategies should be combined with other instructional approaches to assist students with specific needs in History. These findings were corroborated by the informants' reflective writings and supporting materials. The study met both objectives, demonstrating that combining mnemonic strategies with virtual reality reinforces long-term retention. Radović and Manzey (2019) found that combining traditional and modern strategies increases cognitive resilience and enhances memory retention.

ACNOWLEDGEMENTS

This research was supported by the Ministry of Higher Education through the Fundamental Research Grant Scheme (FRGS): 2022-0066-107-02.

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