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The Impact of Using Spherical Video-Based Virtual Reality and Conventional Video on Writing Competence, Motivation, Class Engagement, and Learning Perception

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Abstract. This study aims to investigate the comparative impact of spherical video-based virtual reality (SVR) and conventional video (CV) on students' writing competence, motivation, class engagement, and student perception. A quasi-experimental method was used involving 250 junior high school students who were divided into two groups, experimental and control. The experimental group received writing instruction assisted by SVVR while the control group used CV. The instruments used were the writing competence rubric, the writing motivation scale and the class engagement questionnaire. The data analysis entailed the Shapiro-Wilk test, paired-sample t-tests, and ANCOVA. The study results showed that the use of SVVR was more effective in improving the ability to write observational texts than CV in the dimensions of organization, content, feelings, and vocabulary use. The improvement of writing skills occurs due to in-depth situational experiences through SVVR features such as videos, 360° images, background sound, and quizzes, the students being facilitated with concrete experiences, reflection, observation, and verification. The next finding was that the use of SVVR was also able to increase writing motivation, class engagement, and positive perceptions. Thus, it can be concluded that the use of SVVR is more effective in improving students' writing skills, motivation, classroom engagement, and positive perceptions than conventional video CV. This study implies that writing instruction integrated with SVVR can bridge the gap between immersive situational experiences and the achievement of writing goals, thereby improving students' writing skills, motivation, classroom engagement, and positive perceptions.

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1. Introduction

The ability to write observational texts is a crucial competency in language learning. However, as the process requires reading, comprehension, and critical thinking skills to produce observational texts (Li et al., 2023; Sterk et al., 2025), this can make it difficult for the majority of students to produce observational texts. Students' writing difficulties are caused by the learning methods and scaffolding used not being able to facilitate students' achievement of these writing competencies (Runge et al., 2025; Vallarino et al., 2025). The dominance of traditional writing learning methods results in students deficient in an immersive experience and lacking an idea of what to write. This makes it difficult for students to start writing and leads to low writing motivation (Jin, 2025; Y. Lin & Yu, 2025).

To overcome these problems, language education practitioners recommend that teachers facilitate students in gaining real-world contextual experience, not just limited to presenting knowledge (syntax and grammar) in teaching writing. Among the media that can be used to facilitate the ability to write observational texts and observational results that require visualization of the writing object are spherical video-based virtual reality (SVVR) and conventional video (Ironsi, 2023; Khodabandeh, 2022). SVVR technology is able to provide a realistic virtual experience that can optimize students' writing skills in describing or reporting the results of their observations of the objects written (Paulsen & Davidsen, 2025; Rubo, 2025).

Through SVVR media, students can gain real-life experiences, thereby enriching their schemata before writing (Chen et al., 2023; Tate et al., 2025). Several previous studies have investigated the impact of SVVR use (Khodabandeh, 2022; Peungcharoenkun & Waluyo, 2023) with study revealing that SVVR can improve observational writing skills through interactive experiences, real-world context experiences, and collaborative learning (Agusty & Chen, 2025; Hemminki-reijonen et al., 2025). Research also revealed that SVVR can increase both students' motivation to write and their active participation because this technology provides interactive, life-like experiences during the writing learning process (Boehme et al., 2025; Paulsen & Davidsen, 2025). SVVR technology is considered superior to augmented reality because it can display objects more realistically (Hao et al., 2025; Imsa-ard, 2025; Volkmann, 2025).

Further study also revealed that SVVR technology can enrich ideas and provide clearer images of objects, thus contributing significantly to more detailed descriptive power (Ebrahimi & Ebadi, 2024; Yu & Xu, 2024). SVVR technology is widely used in the language learning process, especially competencies that require object media, such as writing, speaking, and role-playing. However, until now, there has been no research comparing the impact of SVVR with conventional video (CV). The novelty of this research is that the media used are SVVR and CV. In addition, the competencies studied are more comprehensive, namely the ability to write observational texts, writing motivation, class engagement, and

student perceptions. Based on this explanation, the following research questions were formulated:

- 1) Is there a significant difference between the impact of spherical video-based virtual reality (SVVR) and conventional video (CV) on observational writing skills?
- 2) How does spherical video-based virtual reality (SVVR) technology impact writing motivation?
- 3) How does spherical video-based virtual reality (SVVR) technology impact classroom engagement and student perceptions?

2. Literature Review

2.1 Writing Competence, Motivation, and Class Engagement

Writing competence is a complex skill that requires students to explore ideas and describe them until objects become concrete for the reader (Taufiqulloh et al., 2025; Taye, 2025). Writing observational texts is a writing skill that involves thinking, language, and the five senses in the process. This competency is one of the academic writing competencies at the secondary school level. Students are asked to observe an object and must write down what they see, imagine, and feel (Ironsi, 2023; Khosravi et al., 2023). Based on the secondary school curriculum, the competency of writing observational texts includes three aspects: the student's ability to describe objects in an organized manner, the ability to observe objects effectively, and the ability to express feelings clearly.

In addition, other aspects that need to be considered in improving the competency of writing observational texts include fluency, vocabulary use, and punctuation (Fan & Wang, 2024; Peungcharoenkun & Waluyo, 2023). Writing motivation is a student's perception of the importance of writing, their emotions, and their expectations. The interest aspect is evident in students' increased interest in starting and completing writing assignments. Furthermore, this increased motivation is also evident in students' overall perception that writing is very important (Fang et al., 2025; Taye, 2025). This increased motivation is also evident in students' positive emotions, which lead to greater enthusiasm for participating in the writing learning process. Moreover, class engagement entails student participation in every stage of the learning process and encompasses cognitive, affective, and emotional dimensions (Evmenova et al., 2024; Yu & Xu, 2024).

2.2 Using Spherical Video-Based Virtual Reality (SVVR) and Conventional Video in Writing Learning

Virtual reality (VR) is a learning medium that utilizes a three-dimensional spatial environment, enabling students to experience the real world and observe and participate in a three-dimensional space (Hao et al., 2025; W. Lin et al., 2025). The main features of SVVR technology are immersion and interactivity. Immersion facilitates students' ability to optimize competencies through a simulated environment, enables immersion and participation, helps students filter out incongruent perceptions, and provides a realistic experience, whereas interactivity facilitates students' ability to operate objects in a simulated environment and provides feedback comparable to the real environment (Sterk et al., 2025; Vallarino et al., 2025). This virtual technology can help students gain

sensory experiences in various fields, such as entertainment, science, and technology, at an affordable cost. SVVR affords a virtual reality technology that can be an alternative for teachers and is suited to the needs of educational environments. The technology uses spherical video in the form of videos or photos that can be viewed 360°, thus presenting a realistic virtual environment (Getto et al., 2025; Li et al., 2023). Through this virtual environment, students can observe the environment or objects from any direction and are facilitated by the ability to control the objects they see. This observation process helps students see objects in greater detail than with traditional videos or images. SVVR not only assists teachers in overcoming technical issues but also provides an accessible alternative media and facilitates students' immersive interactive experiences (Fang et al., 2025; Taye, 2025).

Another technology that can be used to facilitate student writing learning is conventional video. This medium can present objects by combining movement, color, and sound in real-life situations through video content. Video is considered an effective medium for helping students interpret visual cues, and can replace photos, text, and audio (Kiziltaş & Kultas, 2025; Paulsen & Davidsen, 2025). A dual coding analysis of information processing requires a multimedia learning model and previous studies have shown that learning models that utilize multimedia are able to present text and images simultaneously more effectively than static text, and that simultaneous presentation of audio and visual materials is more effective than sequential presentation (Chen et al., 2023; Tate et al., 2025).

Therefore, it can be concluded that dual media channels, such as audio and visual, have many advantages over learning modes that only present one channel. Currently, multimedia approaches are increasingly being used in language learning. In writing lessons, conventional videos can be used to present events, scenes, and sources of information that can encourage the emergence of ideas, creative thinking, and aesthetic reactions (Ebrahimi & Ebadi, 2024; Zhang et al., 2023). Likewise, several previous studies have shown that SVVR-based learning environments can stimulate motivation and creativity in imaginative writing, improving writing skills and participation, thus contributing to the quality of students' writing (Fan & Wang, 2024; Khosravi et al., 2023).

3. Methodology

3.1 Design and Participants

This study used a quasi-experimental design involving 250 junior high school students. Participants were divided into two groups. The experimental group received an intervention to teach writing observational texts using spherical video-based virtual reality (SVVR), while the control group received a conventional video-based writing intervention. Participants were randomly assigned to both experimental and control groups because they had equal competencies. Participants ranged in age from 13 to 15 years old, with a gender ratio of 45% male and 55% female. The intervention lasted one semester, or six months so as to accommodate the school's teaching and the material in the language learning curriculum. The experimental group gained experience observing objects using SVVR, along with instructions for each step while the

control group was facilitated to observe objects through conventional video with the same instructions. All participants received a detailed explanation before participating in the study to ensure they understood the research. The study complied with research ethics by requiring participants to complete a consent form, ensuring voluntary participation.

3.2 Research Instruments and Materials

3.2.1 Spherical Video-Based Virtual Reality (SVVR) and Conventional Video (CV)

The experimental group used a head-worn SVVR device which displayed writing learning materials in an immersive scene. The device featured an elastic strap that could be adjusted to the shape of the student's head and could be worn by students who wear glasses without having to remove them. Through this technology, all students received an immersive interactive experience.

The SVVR media was tailored to the teaching theme of writing observational texts with the SVVR learning resource presented using spherical video with an Insta360 pro 8K panorama and designed using SVVR software. The presentation of objects through SVVR lasted 10 minutes. Furthermore, the conventional video used in the control group was presented as content in MP4 format, displayed on a computer and projector. The same content was used in both groups, using SVVR and SV. The content covered natural conditions, human and animal body structures, and specific buildings. Both groups used this content to improve their observational writing skills.

3.2.2 Competency Rubric for Writing Observational Texts

Based on the national language curriculum standards, the researchers adopted the Delphi method with three cycles to reach agreement on developing a rubric for writing observational texts. The rubric was used to assess students' observational writing skills across four dimensions: organization, content, emotional expression, and vocabulary use. The writing assessment encompassed students' ability to systematically describe objects, effectively observe, express feelings clearly, and use appropriate vocabulary. The rubric used levels A and B; level A required all dimensions to be met, while level B required dimensions not met. The dimensions of the rubric are presented in Table 1.

If a student's writing meets 3-4 dimensions, the overall score is A but if only 1-2 dimensions are met, the overall score is B. The correlation coefficient was used to test validity. The analysis results showed an average Pearson correlation value for the rubric of 0.85. Furthermore, the split-half method was used to test the instrument's reliability. The analysis showed a degree of instrument reliability of 0.83. Based on the validity and instrument analysis results, this instrument met the criteria for use in this study. An explanation of each dimension in the observational writing assessment rubric is presented in Table 1.

Table 1: Rubric for Assessing Dimensions of Observational Writing

Dimensions	Criteria	Level A	Level B
Organization	The description of the object moves from general to detailed or specific explanations systematically.		
Contents	The description of the object is accurate, both in terms of form and characteristics, and from various perspectives based on observations.		
Feeling expression	The description of the object uses sentences that convey the author's feelings and make the reader feel as if they are seeing and experiencing the object directly.		
Vocabulary use	The use of various words conveys clear meaning.		
Overall achievements			

3.2.3 Writing Motivation Scale

Students' writing motivation levels were assessed using a writing motivation scale adapted from Li and Shiung (2023). This scale consists of four dimensions: interest in writing, perceived importance of writing, emotions about writing, and expectations about writing. Six questions were used for each dimension, totaling 24 questions. A 5-point Likert scale was used for each measurement dimension, ranging from 5 for very consistent to 1 for very inconsistent. Some questions were negative and were reverse scored. The internal consistency analysis of the motivation measurement scale was good, with a Cronbach's alpha of 0.923.

3.2.4 Class Engagement Questionnaire

Student engagement during the learning process using SVVR was assessed using a class engagement questionnaire adapted from Paulsen and Davidsen (2025). The questionnaire consisted of 25 items covering three aspects of engagement: cognitive, affective, and emotional. The cognitive engagement aspect consisted of seven (7) items, the affective engagement aspect 10 items, and the emotional engagement aspect eight (8) items.

Examples of questions for each aspect include the cognitive aspect, "I always ask questions when I encounter difficult-to-understand content;" the affective aspect, for example, "I am able to actively discuss during the learning process;" and the emotional engagement aspect, for example, "The teaching method using SVVR makes me happy." Measurements were made using a 5-point Likert scale ranging from 1: strongly disagree to 5: strongly agree. The Cronbach's alpha value for the overall classroom engagement questionnaire was 0.80. and for each aspect of behavioral engagement, it was 0.82, cognitive engagement 0.80, and emotional engagement 0.80. These values indicate the questionnaire has high reliability and can be used in the research.

3.2.5 Semi-structured Interviews

Student perceptions were explored using a semi-structured method. Perception exploration was conducted in both experimental groups, receiving writing instruction interventions using SVVR and conventional video. Interview exploration was conducted to strengthen the quantitative findings. Interviews were conducted face-to-face with 10 randomly selected students from the experimental group. Interviews were conducted for 20 minutes per student. Seven questions were used in the interviews. The following are examples of questions used: "How does SVVR technology impact your understanding of writing concepts and objectives?", "How does SVVR impact your confidence in writing observational texts?", "What differentiates SVVR from other media that improves your writing skills?"

3.3 Procedure

This study involved several stages, including a pretest, intervention, and posttest. In the initial stage, both groups received a pretest to assess their observational writing skills and motivation before receiving the intervention. Next, the instructor introduced the task of writing observational texts, focusing on natural conditions, human body structures, animal structures, and specific building objects. In the initial intervention stage, the instructor provided instruction on writing observational texts, including text structure, outline development, and writing execution. The writing instruction lasted 45 minutes, followed by a question-and-answer session.

Next, both groups used SVVR and conventional video media to analyze the objects they would write about. After observing using each medium, students were given the opportunity to write about their observations for 60 minutes. Through these different media, both groups experienced different writing experiences with SVVR and conventional video. Following the intervention, both groups received a posttest on writing observational texts using the same objects, writing motivation, class engagement, and student perceptions. Class engagement and perceptions were focused on the experimental group.

3.4 Design of Observational Writing Instruction

The use of SVVR in the experimental group and the use of conventional video were designed along with instructions for writing observational texts. The writing instructional designs used the same instructions, differing only in the media used. The design of SVVR-assisted writing instruction in the experimental group and conventional video in the control group is presented in Table 2.

Table 2: Design of Spherical Video-Based Virtual Reality (SVVR) and Conventional Video (CV)-Assisted Writing Instruction

Steps	Explanation
Explanation of learning objectives	At this stage, the instructor explains the learning objectives for writing observational texts so that students receive clear guidance on the expected final competencies.
Provision of materials and cases or examples	The instructor provides learning materials for writing observational texts, including definitions, structure, and how to compose them in detail, accompanied by examples so that students can create clear writing examples.
Introduction to SVVR (experiment) and conventional video (control)	Students receive an explanation of SVVR media in the experimental group and conventional video in the control group, including its function, benefits, and how to use it, ensuring they are able to use them effectively.
Assignments	Students are given the task of observing specific objects, such as natural conditions, human and animal body structures, and specific buildings.
Observation experience	Students are given the opportunity to observe objects using SVVR media for the experimental group and conventional video for the control group.
Writing process	Observation results are written down in the form of observational texts. Students are guided and given the opportunity to ask questions if anything is unclear.
Evaluation	The writing is assessed using a rubric for assessing the ability to write observational texts.

3.5 Data Analysis

Data analysis used the Shapiro-Wilk test, the Mann-Whitney test, descriptive statistics, paired-sample t-tests, and ANCOVA. A normality test was first performed to ensure the data were normally distributed followed by a Mann-Whitney test to investigate improvements in writing competence in detail across each dimension. Descriptive statistical analysis was used to measure students' levels of writing motivation before and after the intervention. Descriptive data analysis was also conducted to investigate the levels of writing ability in each group and the improvement in learning motivation.

Paired-sample t-tests and ANCOVA were conducted to investigate differences in class engagement across all aspects of the two groups. Furthermore, the interview results were analyzed using thematic analysis. The main themes used for the interview data analysis were active learning experiences, the role of emotions in learning, active encouragement in class, and learning enhancement strategies. The selection of themes was based on indicators of the quality of the learning process, affording a reference for the effectiveness of interventions in improving the quality of the learning process. Each student's response to the questions was analyzed and grouped into these themes.

4. Result

To investigate differences in observational text writing skills between the two groups during the pretest and posttest phases, a Wilcoxon signed-rank test was

conducted, and the results are presented in Table 3. The analysis revealed a significant difference in the experimental group from pretest to posttest with a value of ($z = -2.54, p = 0.04, r = 0.83$). However, no significant difference was found in writing skills in the control group from pretest to posttest with a value of ($z = -1.93, p = 0.08, r = 0.70$). These findings indicate that the SVVR-assisted observational text writing intervention significantly improved writing skills compared to the conventional video-assisted writing intervention. A between-subject ANCOVA test was then conducted to compare writing skills between the two groups, and the results are presented in Table 4.

The analysis revealed a significant difference in observational text writing skills between the two groups. The experimental group with the SVVR intervention had a better additional effect than the control group with the conventional video intervention. Thus, it can be concluded that the experimental group, using SVVR, made a more significant contribution to the ability to write observational texts than the control group, which used conventional video.

Table 3: Results of The Wilcoxon Signed-Rank Test for Writing Ability

Source	Type III sum of squares	<i>df</i>	Mean square	F	p
Corrected model	.684 ^a	1	.596	.672	.685
Intercept	.010	1	.010	.484	.963
Group	.585	1	.596	.193	.784
Error	46.436	15	4.382		
Total	47.082	17			
Corrected total	47.092	16			

^a $R^2 = .013$ (adjusted $R^2 = -.058$)

Table 4: ANCOVA Test of The Inter-Subject Effect of Writing Ability

Group	N	Mean	SD	Wilcoxon	W	Z	p	r
Experimental	Pretest	6,45	9.56	1.57	29.03	2.54**	0.04	.94
	Posttest	9,46	12.54	0.89				
Control	Pretest	6,36	8.56	1.42	20.05	1.93	0.08	.72
	Posttest	7,25	11.21	1.60				

** $p < .01$

Next, the analysis of observational text writing skills was presented based on the themes used using a writing assessment rubric with A and B level labels. The results of the writing skills data analysis are presented in Table 5 and show that overall, observational text writing skills in the experimental group using SVVR improved more significantly and more consistently than in the control group using conventional video. The number of students falling into the A level category was higher in the experimental group than in the control group. This finding indicates that the observational text writing skills of the experimental group (SVVR) were better than those of the control group (conventional video). However, the number of A level results in the control group also showed a gradual increase.

Table 5: Descriptive Analysis of Writing Competency in The Two Groups in The Posttest Phase

Group	Natural conditions		Human body structure		Certain buildings		Total	
	Level A	Level B	Level A	Level B	Level A	Level B	Level A	Level B
	Experimental (SVVR)	40	1	35	2	45	2	120
Kontrol (CV)	2	40	2	45	3	33	7	118

Because the data were hierarchically ordered, a Mann-Whitney test, which is considered more accurate with samples of more than 20 participants, was used to test non-parametric hypotheses. The results of the Mann-Whitney test for observational text writing competency are presented in Table 6. Based on the analysis, a significant difference was found in writing ability between the experimental group (SVVR) and the control group (conventional video) overall, with a score ($U = 845$, $p = .064$). Significant differences were also found in each observational text writing theme in both groups, with the following scores for each theme: Natural conditions ($U = 67$, $p = .026$), Human body structure ($U = 93$, $p = .0672$), and Certain buildings ($U = 91$, $p = .783$). From these data, it can be concluded that the experimental group receiving the SVVR intervention demonstrated better writing competency than the control group receiving the conventional video intervention.

Table 6: Mann-Whitney Test Results For Writing Achievement for Each Theme

Theme	N	U	Z	p
Natural conditions	83	67	21.57	.026
Human body structure	83	93	21.84	.672
Certain buildings	84	95	20.48	.783
Overall	250	845	22.95	.064

Based on the rubric for assessing the ability to write observational texts, the assessment was conducted based on four dimensions: organizational, content, feeling and vocabulary usage. The calculation was carried out on the number of students who showed grades of A and B levels obtained by both groups in the four dimensions. The results of the analysis of the ability to write observational texts for each dimension are presented in Table 7 with the results indicating that the experimental group (SVVR) showed a higher number of students who had A grades in the organizational and content dimensions than the control group (conventional video), whereas in the dimensions of feeling and vocabulary usage the numbers showed little difference.

However, the number of students who had A grades in the experimental group was higher in the dimensions of feeling and vocabulary usage than the control group. Furthermore, to investigate the differences in the two groups for each dimension in more detail, a Mann-Whitney test was conducted on the four writing ability dimensions, the results of which are presented in Table 8. The analysis found significant differences in Organization ($U=786$, $p=.042$) and Content

($U=710$, $p=.004$), but no significant differences were found in the Feelings ($U=845$, $p=.735$) and Vocabulary Usage ($U=838$, $p=.672$) dimensions between the two groups. However, the experimental group's scores were still higher than those of the control group.

Table 7: Descriptive Analysis of Writing Ability for Each Dimension

Group	Natural conditions		Human body structure		Certain buildings		Total	
	Level A	Level B	Level A	Level B	Level A	Level B	Level A	Level B
Organization								
Experimental (SVVR)	39	1	36	2	45	2	120	5
Control (CV)	2	41	2	45	2	33	6	119
Contents								
Experimental (SVVR)	41	1	36	2	45	0	122	3
Control (CV)	2	40	2	46	2	34	5	120
Feeling								
Experimental (SVVR)	40	0	36	1	47	1	123	2
Control (CV)	2	43	2	45	2	34	3	122
Vocabulary use								
Experimental (SVVR)	38	2	37	1	46	1	121	4
Control (CV)	2	43	2	45	2	34	3	122

Table 8: Results of The Mann-Whitney Test for Writing Ability for Each Dimension

Dimension	N	U	Z	P
Organization	250	786	-3.256	.042
Contents	250	710	-3.485	.004
Feeling	250	845	-0.324	.735
Vocabulary use	250	838	-0.542	.672

Next, a motivation analysis was conducted to investigate the impact of the intervention on writing motivation. The analysis was based on four aspects of writing motivation measurement: interest, importance, emotion, and expectancy in both the experimental and control groups during the pretest and posttest phases. Writing motivation in the experimental group showed a more significant increase in the posttest than in the control group. Furthermore, to obtain detailed data on the increase in motivation in both groups, an independent sample t-test was conducted, the results of which are presented in Table 9 and show that the overall increase in writing motivation in the experimental group was better than that in the control group. This is further supported by the higher scores for each dimension of writing motivation in the experimental group (SVVR) than in the control group (CV).

Table 9: Results of The Independent Sample T-Test for Writing Motivation

		Diff(post-pre)	SD (post-pre)	t	P
Total	Experiment	0.36	0.526	-0.846	.562
	Control	0.43	0.534		
Interest	Experiment	0.53	0.637	0.436	.752
	Control	0.42	0.852		
Importance	Experiment	0.53	0.512	-0.134	.874
	Control	0.10	0.425		
Emotion	Experiment	0.53	0.783	-0.152	.874
	Control	0.38	0.915		
Expectation	Experiment	0.75	0.924	-3.120	.052
	Control	0.68	0.632		

Table 10: Results of The ANCOVA Test of Class Engagement in Both Groups

Variable	Group	N	Mean	SD	Adjusted mean	SE	F	p	η^2
Overall classroom engagement	Experimental	125	7.53	0.47	7.62	0.05	0.687	0.032	0.008
	Control	125	4.62	0.63	4.47	0.05			
Behavioral engagement	Experimental	125	7.46	0.42	7.38	0.07	4.583	0.022	0.009
	Control	125	4.35	0.50	4.70	0.08			
Cognitive engagement	Experimental	125	8.45	0.47	8.75	0.07	6.328	0.044	0.052
	Control	125	4.58	0.58	4.84	0.07			
Emotional engagement	Experimental	125	7.58	0.63	7.58	0.09	5.267	0.028	0.003
	Control	125	4.68	0.69	4.63	0.09			

The next analysis was student engagement in the writing learning process. An ANCOVA test was used within the groups, as presented in Table 10. The analysis revealed a significant overall difference between the experimental and control groups with a score ($F = 0.687$, $p = 0.032$). The scores for each aspect also showed significant differences between the experimental and control groups, with scores for behavioral engagement ($F = 4.583$, $p = 0.022$), cognitive engagement ($F = 6.328$, $p = 0.044$), or emotional engagement ($F = 5.267$, $p = 0.028$) between groups. These findings indicate that the SVVR intervention significantly impacted classroom engagement compared to the conventional video intervention.

Furthermore, analysis was conducted on the results of semi-structured interviews to investigate students' perceptions of the intervention's contribution to their learning outcomes. Data analysis of the interview results was based on the themes of engaging learning experiences, the role of emotions in the learning process, active encouragement from the intervention, and strategies for improving the learning process. To uncover these data, 10 students were selected from each group. The results of the interview analysis for each theme are presented in Table 11.

Table 11: Analysis of Experimental Group Interview Results

Theme	Code	Frequency
Engaged learning experience	Benefits of SVVR learning	48
	Learning styles that influence student engagement	34
	Effectiveness of cognitive processes	51
	Teacher as facilitator	32
The role of emotion in learning	Increasing student enjoyment of learning	54
	Growing student confidence in learning	68
	Speed of learning engagement	74
Active classroom encouragement	Encouraging students' critical thinking skills	52
	Evaluating argumentation elements	58
	Perceptions of collaborative learning	21
Learning enhancement strategies	Suggestions	15
	Need for visualization	0
	Tendency toward lecture methods	1
	Need for authentic learning	0

To support the presentation of quantitative data, qualitative analysis was conducted on the interview results based on thematic analysis to uncover the role of interventions on writing competence, writing motivation, classroom engagement, and student perceptions. The first theme was engaging learning experiences during the intervention. Interviews revealed that students in the SVVR experimental group expressed positive perceptions of SVVR-assisted writing instruction. One student stated that SVVR's interactive features, such as videos, 360° images, and background sound, encouraged her to explore every detail of an object and helped her visualize it in writing. The next theme was the role of emotions in the learning process and interviews revealed several statements indicating increased enjoyment in participating in the learning process during the SVVR intervention. The third theme was active encouragement in the learning process from the intervention.

Several students in the experimental group stated that the SVVR intervention encouraged them to participate more actively in collaboration and discussions during the writing learning process. The final theme was strategies to improve writing learning with the experimental group stating that several SVVR features made the observational text writing learning strategy more effective in improving writing competency.

“Not only did I understand the concept of writing observational texts, but I also enjoyed being able to see the objects directly through SVVR. The 360° observation feature made me feel like I was there.”

"SVVR media helped me have a pleasant experience and made me enjoy the interesting learning process. SVVR media helped me solve problems in a fun way and didn't get boring."

"The material and object feature in virtual reality format helped me better understand the learning material and writing objects. In addition, the spherical video format made the images or objects more detailed, which contributed to my ability to explain the objects in greater detail."

Based on interview data, the experimental group using SVVR technology performed better than the control group that only relied on conventional video media in terms of engaging learning experiences, the role of emotions in the learning process, active encouragement from the intervention, and strategies to improve the learning process. These qualitative findings reinforce the quantitative findings that the SVVR intervention in teaching observational writing was more effective than conventional video in improving students' observational writing skills, writing motivation, class engagement, and positive perceptions.

5. Discussion

This study investigated the impact of spherical video-based virtual reality (SVVR)-assisted writing instruction compared to conventional video-assisted writing instruction on students' observational writing skills, writing motivation, classroom engagement, and perceptions of the learning process. The findings indicate that the SVVR-based writing instruction contributed significantly more to observational writing skills than the conventional video-assisted writing intervention. Improvements in observational writing skills were evident across all dimensions of organization, content, feelings, and vocabulary usage. These improvements occurred because the SVVR features facilitated students' ability to obtain a clear, detailed picture of an object. Among the features that significantly contributed to writing skills were SVVR's interactive features, such as video, 360° images, background sound, and quizzes, which encouraged students to explore every detail of an object and helped them visualize it in writing.

These findings are supported by experiential learning theory, which states that learning is based on real experiences (W. Lin et al., 2025; Rubo, 2025). There are several stages teachers can take in creating real experiences, including presenting concrete experiences, reflection, observation, abstract conceptualization, and active verification (Alharthi, 2021; He, 2019). The findings of this study are supported by previous research showing that the use of SVVR can improve observational writing skills, particularly in explaining the object of writing (Hao et al., 2025; Vallarino et al., 2025). Furthermore, other studies have also confirmed that the use of SVVR in writing lessons can improve the quality of students' writing and create a more interactive and enjoyable learning environment (Rasteiro & Limpo, 2023; Runge et al., 2025).

Further findings indicate that SVVR-assisted writing instruction interventions can improve students' writing motivation better than conventional videos. This increase in motivation is evident in students' increased interest in writing, importance, emotions, and expectations. The interest aspect is evident in students'

increased engagement in starting and completing writing assignments. Furthermore, this increase in motivation is also evident in students' overall perceptions of writing as very important as well as in students' positive emotions, which result in greater enthusiasm for participating in the writing learning process. Finally, this increase in writing motivation is evident in students' expectations of writing competence, which they hope will support their academic competency. This increase in motivation through SVVR media aligns with situational interest theory, which states that situational interest is a direct emotional response to specific stimuli and changes in the learning environment (Agusty & Chen, 2025; Huang et al., 2025).

This interest falls into the category of short-term learning interests and is situational. Students learning to write using SVVR tend to be curious, enabling them to adapt to the learning environment, which leads to a consistent increase in their interest and motivation to write (Ekizoğlu & Demir, 2025; Park, 2025). This finding is supported by previous studies showing that virtual-based technologies such as AR or video-based GenAI can increase students' learning motivation (Paulsen & Davidsen, 2025; Wang, 2025). Furthermore, other studies have shown that virtual language instruction can stimulate enthusiasm for language learning.

The next finding is that the SVVR-assisted writing instruction intervention contributed more significantly to class engagement than conventional video-assisted writing instruction. Increased student engagement in the learning process was evident across all dimensions, cognitive, affective, and emotional, where significant differences were seen, with the most prominent being cognitive engagement, followed by affective and emotional. This increased intensity of class engagement occurred because the SVVR media was able to transform the classroom atmosphere into a more interesting and enjoyable one, thus encouraging students to actively participate. Cognitive engagement was most dominant in the discussion and question-and-answer sessions. Schemata and knowledge obtained from the results of the observation process through the SVVR media encouraged students to actively share their knowledge with their friends.

In addition, SVVR features such as 360° observation, videos, and quizzes encouraged students to actively participate throughout the learning process. Their positive emotional responses emerged as a result of the pleasant classroom atmosphere, thus increasing their enthusiasm for learning. These findings support previous studies that revealed that virtual technology can encourage students to participate more actively in the second language learning process compared to conventional learning (Kim et al., 2025; Tate et al., 2025). Furthermore, virtual learning environments facilitate students' acquisition of learning materials more meaningfully through hands-on experiences (Sawaki et al., 2024; Yu & Xu, 2024). Moreover, virtual learning processes facilitate students' understanding of difficult concepts and help them solve practical problems.

Another finding is that the SVVR-assisted writing instruction intervention created positive perceptions of the writing learning process. Students' positive perceptions were evident across each theme: engaging learning experiences, the

role of emotions in the learning process, active encouragement from the intervention, and strategies for enhancing the learning process. Several participants stated that the learning experience using SVVR provided a more engaging learning experience than conventional video instruction. Furthermore, regarding the role of emotions in the learning process, students expressed that participating in the learning process using SVVR was very enjoyable because it had several features that stimulated their interest and engagement in the learning process.

Additionally, in the theme of strategies for improving writing learning, students stated that several features of SVVR made the strategy for learning to write observational texts more effective in improving writing competence. This finding is supported by previous studies that revealed that the use of learning media and technology will change students' perspectives on the learning process (Fan & Wang, 2024; Peungcharoenkun & Waluyo, 2023). This occurs because the use of these technologies facilitates the learning process and improves its quality. Previous studies also confirmed that the use of technology in the language learning process can produce better cognitive, affective, and emotional responses, thereby creating a positive perspective on the learning process (Khosravi et al., 2023; Rubo, 2025).

6. Conclusion, Implication, and Recommendation

Spherical video-based virtual reality (SVVR)-based writing instruction can significantly improve observational writing skills and writing motivation. Furthermore, the use of SVVR was found to increase student engagement in the learning process and created positive student perceptions. Improved writing skills were evident in the dimensions of organization, content, feelings, and vocabulary usage. Improved writing motivation was evident in interest, importance, emotions, and expectations while increased student engagement in the learning process was evident in the dimensions of behavioral engagement, cognitive engagement, and emotional engagement.

Finally, positive student perceptions of the intervention were evident in the active learning experience, the role of emotions in learning, active encouragement in the classroom, and learning enhancement strategies. Improved writing skills occurred because the immersive situational experiences presented through SVVR technology helped students gain concrete experiences, reflection, observation, abstract conceptualization, and active verification. Furthermore, various interactive features of SVVR technology, such as videos, 360° images, background sound, and quizzes, encouraged students to explore objects in detail. SVVR features can also increase students' motivation, class engagement, and positive perceptions because they create an engaging and enjoyable virtual learning environment. This process encourages students to actively participate in every moment. Therefore, it can be concluded that the use of SVVR technology in writing learning not only improves students' ability to write observational texts but also increases students' motivation, class engagement, and positive perceptions.

This study implies that the use of technology in language learning is considered capable of facilitating students' effective and enjoyable writing competency acquisition, thereby contributing to their motivation and perception of learning. Furthermore, this study implies that technology integration in language learning can form the basis for curriculum development to achieve competency. This research can also be used as training material for teachers to improve the quality of students' writing skills. However, this study has several limitations, including involving participants from one level, the exploration only focused on the type of observational text, not exploring other competencies that contribute to writing skills, such as critical, reflective, and creative thinking, not being integrated with conventional learning methods, and the intervention being carried out for a relatively short duration. Based on these limitations, the researchers recommend involving participants at more diverse levels, and testing interventions on other types of text that require virtual media, such as descriptive texts and reports.

In addition, future studies should investigate competencies that contribute to writing skills, such as critical, reflective, and creative thinking skills. Conventional methods that are compatible with SVVR technology should be used, and interventions should be conducted over a longer period to obtain more comprehensive results. Researchers also recommend the use of SVVR technology by teachers in the writing learning process to effectively improve competency. However, policymakers and schools can accommodate this technology, both in the curriculum and in providing resources to facilitate language learning. This research contributes to teachers' knowledge of using technology to optimize observational writing skills as well as to the literature on technology integration in language learning.

Conflict of Interest

The authors declare that they have no competing interests.

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