International Journal of Learning, Teaching and Educational Research
Vol. 25, No. 7, pp. 1085-1104, July 2026
https://doi.org/10.26803/ijlter.25.7.49
Received May 23, 2026; Revised Jul 6, 2026; Accepted Jul 13, 2026

The Transformational Impact of Virtual Reality Technology on High School Students' Motivation and Learning Outcomes in Indonesia

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Abstract. Lack of motivation and low student learning outcomes in Guidance and Counseling subjects in underdeveloped areas. The urgency of developing Virtual Reality (VR) digital technology in educational transformation that is able to provide interactive and real-based learning. The aim is to analyze the effect of the use of VR technology on learning motivation and learning outcomes of high school students in Guidance and Counseling subjects. The research approach is quantitative survey method. The number of samples is 260 respondents, consisting of 200 students, 40 teachers, 10 vice principals, and 10 high school principals in Banjarmasin, sampling using proportional stratified random sampling techniques. Data-collection techniques using questionnaires with a Likert scale and documentation of student academic grades. The results show that the use of VR has a positive and significant effect on student learning motivation, with a path coefficient of 0.768; CR 7.893; p value of 0.000, and an effect on learning outcomes with a coefficient of 0.541; CR 5.228; p value of 0.000. Learning motivation also has an effect on learning outcomes with a coefficient of 0.473; CR 4.987; p value 0.000. VR was found to be effective in increasing students' interactivity, engagement, learning experience, and conceptual understanding. In conclusion, VR technology is an effective digital learning innovation in improving the quality of high school learning in underdeveloped areas in Guidance and Counseling. The implication is that the development of VR-based learning media is an educational transformation that has begun to be implemented in underdeveloped areas.

Keywords: Guidance and Counseling; High School; Learning Outcomes; Motivation; Transformational; Virtual Reality

Citation:
Jarkawi, Prasiska. E., & Ridhani. A. R. (2026). The Transformational Impact of Virtual Reality Technology on High School Students' Motivation and Learning Outcomes in Indonesia. *International Journal of Learning, Teaching and Educational Research*, *25*(7), 1085-1104. https://doi.org/10.26803/ijlter.25.7.49

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1. Introduction

The development of 21st-century technology has experienced a transformation in the world of education (Herlinawati et al., 2024). A technological innovation that is rarely used by teachers to provide counseling guidance in secondary schools is VR (Han et al., 2025). In fact, VR can help students gain a more interactive understanding of knowledge (Guaña-Moya et al., 2024). With VR, students can build learning experiences based on visual, interactive, and hands-on practice (Fourqoniah et al., 2025). Data on Indonesian students' digital literacy in 2024 shows that their ability to use digital's media in learning is still in the moderate category (Fa et al., 2024). Interactive learning media training at the high school level is mostly inadequate in the learning process (David et al., 2025). This problem affects students' lack of motivation to learn, particularly in Guidance and Counseling.

Conventional learning, which is still dominated by lectures, leads to rapid boredom, inactivity, and difficulty understanding the material (Imsa-ard, 2024). Meanwhile, the use of multimedia's in students shows an increase in learning motivation (Guaña-Moya et al., 2024). Other data shows that the use of interactive learning media has an influence on student motivation and learning outcomes (Bagus & Puja, 2024). However, no previous research has examined the effectiveness of using VR in Guidance and Counseling classes in high schools. Meanwhile, the use of VR in other learning environments has been shown to be effective in increasing student motivation and learning outcomes through experiential learning (Safitri et al., 2025). With the transformation of digitals education emphasizing technology-based learning, the use of VR technology has become one of the learning innovation tools that can be implemented.

Guidance and Counseling education still face various challenges, particularly related to student motivation and learning outcomes. This affects the literacy and numeracy skills of Indonesian students (OECD, 2021). The learning process still requires innovation to ensure students are more active, motivated, and able to understand the material. Several contributing factors include the use of ineffective learning methods and the limited use of digital technology by teachers in the learning process (Makda, 2024). Teacher placement in underdeveloped areas is suboptimal due to limited facilities, teacher skills, and a lack of innovation in learning media (Barikzai et al., 2024). The use of VR in Indonesia is still limited, particularly at the high school level in underdeveloped areas. However, VR can engage students, clarify concepts, and create a more realistic and enjoyable learning experience (Simon et al., 2025).

In areas far from city centers, the use of technology still faces several obstacles, such as limited technological facilities, low access to innovative learning media, and the dominance of traditional learning methods (Akpan et al., 2024). This condition causes some students to be less active in the learning process and have difficulty understanding material that requires visualization (Suherman et al., 2023). The digital literacy level of students in some regions is still moderate, necessitating learning media that can improve digital skills and student motivation. Banjarmasin, a region with geographical challenges, makes the use of digital learning technology a crucial solution to improving the quality of education. Virtual Reality (VR) technology can be an innovative learning alternative because it provides interactive learning simulations without the constraints of space and time.

In constructivism theory, students acquire knowledge through direct experience and active interaction with the learning environment (Faridi & Izadpanah, 2024). By using VR technology, students can actively receive information and engage directly through virtual simulations, exploring objects and learning about real-life situations. Social learning theory also supports the use of VR in learning. The learning process is influenced by direct individual interaction (Zhang et al., 2025). The theory of learning motivation also supports this research through the ARCS model which consists of attention, relevance, self-confidence, and satisfaction (Mei et al., 2025). This model explains that student motivation increases when learning captures attention, is relevant to student needs, boosts self-confidence, and provides learning satisfaction. VR has visual, audio, and interactive simulation elements that can engage students and make learning more enjoyable.

Multimedia learning theory explains that learning is more effective when information is delivered through a combination of text, images, sound, and animation simultaneously. VR technology combines various multimedia elements into a three-dimensional learning experience, enhancing student understanding of the material and resulting in improved learning outcomes (Khan et al., 2025). Research in science learning in high schools shows that interactive visual media can improve student learning outcomes compared to conventional methods (Koç & Kanadlı, 2025). Research on digital simulations has higher levels of student participation and learning motivation than students who learn using lecture methods (Lin & Li, 2024).

The urgency of educational transformation demands learning innovations that can improve the quality of the teaching and learning process effectively, interactively, and in accordance with the characteristics of digital generation students in Guidance and Counseling. Because currently learning at the high school level is still dominated by the lecture method, causing students to be less active, get bored easily, and have difficulty understanding the material (Kamal et al., 2025). This situation has an impact on low motivation and student learning outcomes in Guidance and Counseling (Pham et al., 2024). The use of VR is considered relevant to the implementation of the Independent Curriculum which emphasizes technology-based learning in understanding and motivating students. The gaps in this research are differences in theory, expectations, and reality.

Theory shows that the use of VR can increase high school students' motivation and learning outcomes in science learning (Warnars et al., 2025). However, the hope is that students in schools can understand Guidance and Counseling materials by viewing them in a real-world context and can build their own knowledge, which is still limited. Research specifically examining the influence of VR technology on the motivation and learning outcomes of high school students is still limited, especially in the Banjarmasin area, Indonesia. The novelty of this research lies in the use of VR technology as an interactive learning medium for high school students by teachers in Guidance and Counseling lessons. This research not only focuses on student learning outcomes but also analyzes the influence of VR on learning motivation simultaneously, as well as testing the effectiveness of VR technology in learning. Another novelty is the integration of constructivist learning concepts, multimedia learning, and learning motivation in the use of VR, resulting in a more innovative and interactive learning approach that is appropriate to the needs of 21st-century education.

The formulation of the problem in this study is 1) Does the use of VR technology affect the learning motivation of high school students?, 2) Does the use of VR technology affect the learning outcomes of high school students in counseling guidance?, 3) How much influence does the use of VR technology have on the motivation and learning outcomes of high school students in counseling guidance?, 4) How effective is the use of VR technology in creating more interactive learning and increasing student engagement during the counseling guidance learning process?. So, the purpose of this study is to 1) analyze whether there is an influence of the use of VR technology on the learning motivation of high school students. 2) Analyze whether there is an influence of the use of VR technology on the learning outcomes of high school students. 3) Analyze whether there is an influence of the use of VR technology on the motivation and learning outcomes of high school students. 4) Analyze whether the effectiveness of the use of VR technology in increasing student interaction, involvement, and learning experience during the counseling guidance learning process.

2. Literature Review

2.1 Constructivism Theory

Constructivism theory states that students actively construct knowledge through direct experience, social interaction, and reflection on the learning environment (Saad et al., 2025). By using VR technology, students can build their own knowledge through direct learning simulations (Siddiqui et al., 2025). Students are helped to understand abstract concepts more concretely, thereby increasing motivation and learning outcomes. The use of VR aligns with the principles of the constructivist approach, which can create experiential learning (Sundman et al., 2025). Technology-based interactive learning media can increase student involvement in the material, active involvement in learning activities, and the ability to understand the material clearly (Balalle, 2024). However, not all schools have adequate technological facilities to support VR-based learning (Mallek et al., 2024). In rural areas, students still experience difficulties in using digital tools, thus reducing the effectiveness of the learning process without teacher guidance in social material (Kumi & Jessica, 2025).

2.2 ARCS Theory of Learning Motivation

This motivation consists of interest (relativity), relevance (appropriateness), belief (belief), and satisfaction (satisfaction) (Lari, 2024). This concept generates strong motivation in problem-solving. With VR, visual and auditory simulations, interactive experiences offer greater enjoyment, focus, and motivation. By increasing motivation through VR, students are encouraged to learn and understand the real world (Jiang & Fryer, 2024). VR applications provide a broader interactive experience using innovative objects that complement traditional methods (Wang & Zakaria, 2025). In addition, VR design is related to common digital features that enable the use of visual and interactive media (Liu & Chang, 2024). However, contradictions arise in the application of ARCS theory to VR design. VR technology is used in conjunction with various unique visual elements and menus. Therefore, VR must be designed with various incentives to effectively stimulate student engagement (Lim et al., 2025).

2.3 Multimedia Learning Theory

Multimedia learning theory explains that learning is most effective when information is presented through a combination of text, images, audio, animation and video simultaneously (Uwingabile, 2025). According to this theory, the human brain has two main channels for processing information, namely visual and verbal (Mutawa & Hassouneh, 2024). When these two channels are optimally utilized, students' understanding and absorption of learning materials increases. Virtual Reality (VR) is a modern form of multimedia learning because it combines 3D visual elements, audio, simulation, and interaction into a learning experience (Ma et al., 2024).

Theoretically, the use of interactive multimedia in learning improves students' conceptual understanding, memory, and learning outcomes (Alshaikh et al., 2024). Learning with VR provides a more realistic experience than traditional learning methods because students can see and experience the simulation firsthand. Previous research has also shown that animation-based media and digital simulations help students grasp abstract concepts more easily and increase their engagement in the learning process (Abu Khurma et al., 2024). However, there are some inconsistencies in applying multimedia theory to Virtual Reality (Han et al., 2025). Excessive use of visual and auditory elements in education can cause mental fatigue, making it difficult for students to absorb information effectively (Suryani et al., 2024).

H_1: The effect of VR technology on high school students' learning motivation.

H_2: The effect of VR technology on high school students' learning outcomes.

H_3: The effect of learning motivation on high school students' learning outcomes.

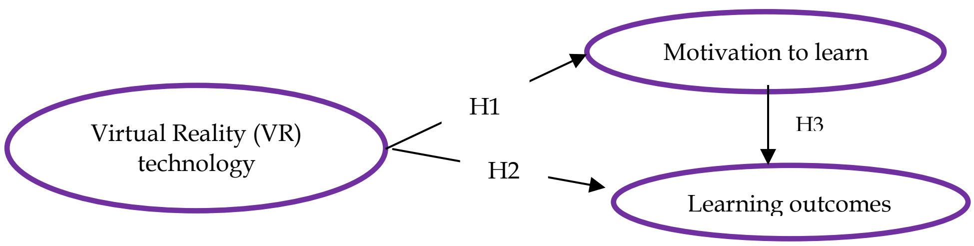

Figure 1: Research Flow

3. Methodology

3.1 Research Approach and Stages

Quantitative research approach with survey method (Jahan et al., 2025). This approach was chosen because it aimed to obtain objective data that could be analyzed statistically to determine the relationships and influences between research variables. This approach aims to measure the level of influence of VR technology use on student motivation and learning outcomes in a systematic and measurable manner. Using the survey method, researchers were able to obtain information about student, teacher, and school leadership assessments of the use of VR technology in the learning process. Data analysis in this study used the Structural Equation Modeling (SEM) method. The SEM method was chosen because it has the ability to examine complex relationships between latent variables and indicators simultaneously. SEM is used to analyze the direct and indirect influences between variables in a single research model, thus ensuring more accurate analysis results. Furthermore, the SEM method was used to test construct validity, instrument reliability, and the level of suitability of the research model through a Goodness of Fit (GOF) test.

3.2 Respondents

The subjects of this study were all parties involved in the learning process in Senior High Schools in the Banjarmasin region, Indonesia, particularly schools that use VR-based learning technology. The object of this study is the effect of VR technology use on the motivation and learning outcomes of high school students. This study focuses on how the application of VR technology can improve student engagement, learn motivation, and learn outcomes in digital technology-based learning processes. The research sample consisted of 260 people consisting of 200 high school students, 40 teachers, 10 vice principals, and 10 principals from several high schools in the Banjarmasin region.

Students were selected as the main respondents because they are direct users of VR technology in the learning process, can provide information about the level of learning motivation and learning outcomes obtained after using the media. Teachers were selected because they play a role in the implementation of VR-based learning, Guidance and Counseling materials, and can provide assessments of the effectiveness of technology use in Guidance and Counseling teaching activities. Meanwhile, vice principals and principals were selected because they have responsibilities in managing educational policies, providing digital learning facilities, and evaluating the implementation of technology in the school environment.

The sampling technique in this study used purposive sampling and proportional stratified random sampling. Purposive sampling was used to identify schools with digital learning support facilities and technology-based learning media. Furthermore, proportional stratified random sampling was used to determine the number of respondents based on specific groups or strata, namely students, teachers, vice principals, and principals, so that each group received an appropriate sample proportion. The selection of a sample size of 260 respondents was also based on the need for analysis using the SEM method, which requires a relatively large sample size for more stable, valid results, and able to meet statistical assumptions and answer the research objectives. In this study, the approval of the ethics review board of educational practitioners was requested and informed consent was requested, as well as protection of the respondents' biodata.

3.3 Data-collection Technique

The data-collection technique in this study was conducted using a survey method by distributing questionnaires to respondents consisting of students, teachers, vice principals, and principals at high schools in the Banjarmasin region, Indonesia. In addition to using questionnaires, data collection was also supported by documentation in the form of student academic grades and supporting information from schools regarding the implementation of learning using VR technology. The data-collection process began with the development of research instruments based on indicators for each research variable. The variable of VR technology use was measured through indicators of learning interactivity, visual and audio quality, ease of use of the technology, impressive learning experiences, and the attractiveness of the learning media.

The questionnaires were distributed in person and online using a Google from link. Direct distribution was carried out by handing out questionnaire sheets to respondents during learning activities at school. Meanwhile, online distribution was carried out using digital media Google Forms shared through the learning platform group used by the school and WhatsApp groups. The use of these two distribution methods facilitated more effective data collection, expanded the reach of respondents, and simplified the questionnaire filling process. The assessment scale used in this study was a five-point Likert scale. The Likert scale is able to measure respondents' attitudes, perceptions, and opinions quantitatively with the assessment criteria used being score 1 = Strongly Disagree, score 2 = Disagree, score 3 = Somewhat Agree, score 4 = Agree, and score 5 = Strongly Agree.

In this study, there are three variables, namely the use of VR technology as an independent variable (X), learning motivation as an intervening variable (Z), and learning outcomes as a dependent variable (Y). The variable of VR technology utilization (X) consists of five indicators, namely learning interactivity, visual and audio quality, ease of use of technology, immersive learning experience, and the attractiveness of learning media. These five indicators are used to measure the effectiveness of using VR technology in learning. The learning interactivity indicator assesses students' active involvement in the learning process, while visual and audio quality assesses the quality of the display and sound that supports the learning process.

Ease of use of technology measures the level of ease for students in operating VR technology, impressive learning experience measures the level of involvement and realistic experience of students during learning, and the attractiveness of learning media measures the level of interest of students in VR learning media. The learning motivation variable (Z) uses the ARCS model which consists of four indicators, namely attention, relevance, confidence, and satisfaction. These four indicators are used to determine the level of student motivation during learning using VR technology. Attention is related to the media's ability to attract students' attention, relevance is related to the suitability of the material to students' learning needs, self-confidence measures the level of students' confidence in the learning process, while satisfaction measures the level of students' satisfaction with the learning experience they have obtained. The learning outcome variable (Y) consists of four indicators, namely understanding the material, increasing academic grades, ability to remember concepts, and ability to complete assignments.

3.4 Data Analysis

The data analysis technique in this study used SEM. This method simultaneously tests the complex relationship between variables of VR technology usage, learning motivation, and student learning outcomes. Before conducting the SEM analysis, several preliminary testing procedures were carried out to ensure the data met statistical requirements. The initial stage was data editing by checking the completeness of respondents' answers, the appropriateness of questionnaire completion, and identifying incomplete data. Then, data coding, data tabulation by grouping data into tables. Then, validity and reliability testing continued using Cronbach's Alpha value ≥ 0.70. Next, normality testing was carried out through skewness and kurtosis values with a critical ratio (CR) value in the range of ± 2.58. Then, an outlier test was carried out using the Mahala Nobis Distance value for the presence of extreme data that could affect the analysis results. The next stage was a multicollinearity and singularity test to ensure there was no excessively high relationship between the research variables.

After all requirements were met, the analysis was carried out through two main stages: the Confirmatory Factor Analysis (CFA) measurement model and the structural model. The CFA stage is used to test the relationship between indicators and latent variables based on a minimum factor loading value of ≥ 0.50. Next, a structural model test is conducted to test the hypothesis with the path coefficient value, CR value (CR ≥ 1.96), and significance level (p value ≤ 0.05). Then, the GOF test uses Chi-Square, Goodness of Fit Index (GFI), Adjusted Goodness of Fit (AGFI), Comparative Fit Index (CFI), Tucker-Lewis Index (TLI), Root Mean Square Error (RMSE), and Normed Chi-square (CMIN/DF) indicators to determine the level of suitability of the research model with the empirical data.

4. Results and Findings

The following are the results of the respondents' assessments and data analysis. The analysis data is consistent with the SEM method and was based on 260 respondents who were asked to provide assessments.

Table 1: Results of Respondent Data Editing

Description	Total
Number of questionnaires distributed	260
Questions returned	260
Incomplete questionnaires and questions dropped	5
Questions eligible for processing	255

Table 1 shows the results of data editing, which consisted of 260 questionnaires administered to 260 respondents. From the data editing results, all questionnaires were returned to good condition with a 100% return rate. Of the 260 questionnaires, five contained incomplete answers and showed inconsistencies in filling them out, making them unusable in the analysis process. After data review, 255 respondents met the requirements for further processing. This number met the minimum requirements for SEM analysis, as the sample size was more than 200 respondents. The research data was assumed to be sufficiently representative to illustrate the impact of the use of VR technology on the motivation and learning outcomes of high school students. The data that met the requirements were then continued to test validity, reliability, statistical assumptions, and the SEM model.

Table 2: Results of Construct Validity Test

Variables	Lowest Loading Factor	Highest Loading Factor	Criteria	Results
VR Usage	0.698	0.892	>0.50	Valid
Learning Motivation	0.722	0.904	>0.50	Valid
Learning Outcomes	0.683	0.881	>0.50	Valid

Table 2, the results of the construct validity test show that all research indicators have a loading factor value > 0.50. The VR technology usage variable has a loading factor value of 0.698–0.892. The learning motivation variable has a value between 0.722–0.904. The learning outcome variable has a value of 0.683–0.881. These results confirm that all indicators have a good ability to represent the research variable construct. The highest loading factor value was found in the learning motivation variable, 0.904, indicating a very strong relationship between the indicator and the latent variable. All instruments in the research indicators have met the requirements of construct validity, so that the statement items can measure the research variables accurately and consistently.

Table 3: Reliability Test Results

Variables	Cronbach Alpha	Composite Reliability	Criteria	Results
VR Usage	0.912	0.934	≥0.70	Reliable
Learning Motivation	0.894	0.918	≥0.70	Reliable
Learning Outcomes	0.885	0.906	≥0.70	Reliable

Table 3 shows the reliability test results for all variables with a very good level of reliability. The VR usage variable obtained a Cronbach's Alpha = 0.912 and a Composite Reliability = 0.934. The learning motivation variable obtained a Cronbach's Alpha = 0.894 and a Composite Reliability = 0.918. The learning outcome variable obtained a Cronbach's Alpha = 0.885 and a Composite Reliability = 0.906. All these values are > 0.70.

Table 4: Results of Data Normality Test

Variables	CR Skewness	CR Kurtosis	Criteria	Results
X	1.876	2.221	±2.58	Normal
Z	1.652	1.995	±2.58	Normal
Y	1.941	2.116	±2.58	Normal

Table 4 shows the results of the normality test for all variables within the range of ±2.58. The VR usage variable has a skewness value of CR = 1.876 and a kurtosis value of CR = 2.221. Learning motivation values = 1.652 and 1.995, while learning outcomes values = 1.941 and 2.116. These values indicate that the research data is normally distributed, thus meeting the SEM assumptions. By meeting the normality requirements, the data can proceed to the next testing stage.

Table 5: Outlier and Multicollinearity Test Results

Testing	Result Value	Criteria	Decision
Mahalanobis Distance	52.314	<57.342	No outliers
Determinant Matrix	0.002	>0.00001	No singularities
Correlation Between Variables	0.742	<0.90	No multicollinearity

Table 5 shows the results of outlier and multicollinearity tests. The Mahalanobis Distance value of 52.314 is still below the maximum limit of 57.342, indicating no extreme data. The determinant matrix value of 0.002 indicates no singularity. The correlation between variables, 0.742, is also below the limit of 0.90, indicating no multicollinearity. These results indicate that the research data obtained meets the SEM assumptions.

Table 6: SEM Model Goodness of Fit Results

GOF Index	Result Value	Cut-Off	Description
Chi-square	224.387	Small	Good
Probability	0.072	≥0.05	Good
GFI	0.924	≥0.90	Good
AGFI	0.903	≥0.90	Good
CFI	0.961	≥0.95	Good
TLI	0.954	≥0.95	Good
RMSE	0.038	≤0.08	Good
CMIN/DF	1.342	≤2.00	Good

Table 6 shows the GOF results indicating a good fit with the empirical data. The GFI = 0.924, AGFI = 0.903, CFI = 0.961, and TLI = 0.954 values meet the established criteria. The RMSE = 0.038 indicates a relatively low model error rate. The CMIN/DF = 1.342 also indicates that the model is in the GOF category. The SEM model is acceptable and suitable for testing the relationship between variables.

Table 7. SEM Hypothesis Testing Results

Relationship Between Variables	Path Coefficient	CR	P Value
VR Use → Learning Motivation	0.768	7.893	0.000
VR Use → Learning Outcomes	0.541	5.228	0.000
Learning Motivation → Learning Outcomes	0.473	4.987	0.000

Table 7 shows the results of hypothesis testing, the use of VR technology has a positive and significant influence on student learning motivation with a path coefficient of 0.768, a CR value of 7.893, and a p value of 0.000. These results indicate that increased use of VR technology increases student learning motivation in the Guidance and Counseling subject. The use of VR also has a positive influence on student learning outcomes in the Guidance and Counseling material with a coefficient value of 0.541 and a CR value of 5.228. Learning motivation also has a positive influence on student learning outcomes with a coefficient of 0.473. The p value of all relationships is <0.05, so all research hypotheses are accepted. These results confirm that VR technology can increase learning motivation and have an impact on improving high school students' learning outcomes, especially in Guidance and Counseling material.

5. Discussion

5.1 The Use of VR Technology on High School Students' Learning Motivation

The use of VR technology was found to have a positive and significant impact on increasing high school students' learning motivation in counseling guidance materials. The higher the intensity and quality of VR technology is used in learning, the higher the students' motivation in learning. The use of VR can create a more interesting, interactive, and enjoyable learning environment, thus enabling students to be more focused, enthusiastic, and actively participate in social science learning.

Impressive learning experiences make students feel directly involved in the learning material, increasing their attention and curiosity throughout the learning process. The findings of this study are in line with the ARCS learning motivation theory, which explains that learning motivation can increase if learning is interesting, relevant to students' needs, increases self-confidence, and provides satisfaction while learning (Guaña-Moya et al., 2024). VR technology, with its visual, audio, and interactive simulation elements, fulfills all four components, and has been found to increase learning motivation among high school students in the Banjarmasin area.

Constructivism theory supports this research finding, as VR allows students to gain hands-on learning experiences and actively construct knowledge (Saad et al., 2025). The findings of this study also strengthen previous research on interactive multimedia in increasing students' learning motivation after using technology-based media (Guaña-Moya et al., 2024). The findings of this study also strengthen other research, interactive learning media can increase student participation and involvement compared to lecture methods (Oubibi et al., 2024). The findings of this study confirm that VR technology is an innovative learning medium that is effective in increasing high school students' learning motivation in Guidance and Counseling materials in the digital era in the Banjarmasin area, Indonesia.

5.2 The Impact of Using VR Technology on High School Students' Learning Outcomes

The use of VR technology was found to improve material comprehension, conceptual recall, and improve students' academic performance in completing Guidance and Counseling assignments. VR provides a more concrete and realistic learning experience, enabling students to grasp abstract material more easily than conventional learning. Three-dimensional visual displays and interactive simulations facilitate student retention of learned information. This research finding is supported by multimedia learning theory, which explains that learning is more effective when information is presented through a simultaneous combination of text, images, audio, and animation (Uwingabile, 2025). Using VR technology, this study integrates all interactive virtual multimedia elements to enhance students' understanding of the learning material. Constructivism theory also supports the findings of this study, as students gain knowledge through direct experience and active exploration in a virtual environment, resulting in better learning outcomes.

The findings of this study also strengthen research on the use of Augmented Reality in science learning in high schools, which shows that interactive visual technology-based learning media can improve student learning outcomes compared to conventional methods (Apriza et al., 2025). Other research also strengthens the findings of this study regarding three-dimensional animated learning media, which also emphasizes that interactive visual media can improve students' conceptual understanding and memory in social subjects (Oubibi et al., 2024).

5.3 The Influence of VR Technology on High School Students' Motivation and Learning Outcomes

The use of VR technology was found to have a significant impact on the motivation and learning outcomes of high school students in Banjarmasin, Indonesia. The magnitude of this influence is seen in the path coefficient of VR use on learning motivation = 0.768, which is considered strong, while the effect of VR use on learning outcomes = 0.541, which is considered in the moderate to strong category. Learning motivation also has a positive influence on learning outcomes, with a coefficient value = 0.473. These findings indicate that the use of VR technology has a direct impact on learning outcomes and an indirect effect through increased student motivation. Learning motivation serves as an intermediary variable, strengthening the relationship between VR use and student learning outcomes. These findings indicate that VR-based learning can create a more effective learning experience than conventional learning.

Students become more engaged, active, and focused during the learning process, resulting in increased understanding of the material and academic achievement. This is especially important for learning that requires high visualization, because VR can provide realistic and interactive learning simulations. These findings are supported by social learning theory, which states that the learning process is influenced by the interaction of individuals with the learning environment. The interactive virtual environment in VR technology can enhance students' learning experiences, resulting in higher engagement (Warnars et al., 2025). These findings also reinforce previous research on digital simulations that has shown the use of interactive simulation media significantly increases student participation and motivation (Chatzea et al., 2024). Other research supports this finding, interactive learning technology has a positive relationship with improved student learning outcomes (Boadu, 2024).

5.4 Effectiveness of Using VR in Enhancing Interaction, Engagement, and Learning Experience

The use of VR technology has proven effective in enhancing student interaction, engagement, and learning experiences during the learning process. This effectiveness is evident from respondents' high assessments of learning interactivity, immersive learning experiences, and the appeal of learning media in the VR usage variable. Students feel more active in the learning process because they can interact directly with virtual learning objects, explore materials independently, and gain a more realistic learning experience compared to traditional learning methods.

The use of VR also allows students to focus more and avoid boredom during the learning process. These findings indicate that learning using VR can create a more lively and participatory learning environment. Students do not only receive information passively but are directly involved in learning simulations, so that the learning process becomes more meaningful in the Guidance and Counseling learning process. The immersive learning experience created by VR technology also increases students' curiosity and encourages emotional involvement in learning. This has a positive impact on students' attention, concentration, and enthusiasm during the teaching and learning process.

These findings strengthen multimedia learning theory and support research findings, as VR combines visual, audio, and interactive simulation elements, making learning more effective (Uwingabile, 2025). Previous research on three-dimensional animation also shows that interactive visual learning media can increase student engagement in learning (Suprapto et al., 2024). Research on Augmented Reality has also found that interactive digital technology can increase student attention and participation (Lin et al., 2024). These findings demonstrate VR technology's effectiveness as an innovative learning medium that can improve the quality of interaction and learning experience for high school students in Guidance and Counseling materials. VR technology can improve learning motivation, learning outcomes, student engagement, and create a more interactive and enjoyable learning experience. These findings provide empirical evidence that VR technology can be used as an effective alternative modern learning medium to support educational transformation in the digital era.

Further findings also illustrate that the use of digital technology in learning not only improves students' academic quality but also helps develop 21st-century skills such as critical thinking skills, digital literacy, and technology exploration skills. The contribution of these findings is also evident from research conducted in the Banjarmasin region, which still has limitations in the use of modern learning technology. These findings prove that in areas with limited technological facilities, the use of VR can still have a positive impact on the learning process. This confirms that VR technology has the potential to be implemented more widely in the Indonesian education system, including in underdeveloped areas.

The practical implications of this research for education, particularly at the high school level, are that the use of VR technology can significantly improve student learning motivation and learning outcomes in Guidance and Counseling subjects.

Schools can utilize VR technology as an alternative and innovative learning medium to support a more interactive, engaging, and effective learning process for students. Teachers can use VR to help explain abstract or difficult-to-visualize material through conventional methods, such as science, geography, history, and mathematics, including Guidance and Counseling materials. The use of VR can also increase student engagement in learning, making students more active, focused, and enthusiastic during the learning process. Schools can provide supporting facilities such as VR devices, internet access, and technology training for teachers to ensure optimal implementation of VR-based learning. The government can also use the results of this research as a basis for designing digital education transformation policies, particularly in implementing a curriculum that emphasizes the use of technology in the learning process in high schools for Guidance and Counseling materials.

The limitations of this study need to be considered so that it can be used as evaluation material for further research. This research was only conducted in the Banjarmasin region, so the results cannot be generalized widely to all regions of Indonesia, which have different educational conditions, technological facilities, and student characteristics. This study used a quantitative approach with a survey method and SEM analysis, so the research data were obtained primarily from respondents' perceptions through questionnaires. This approach is unable to explore students' learning experiences in more depth, such as through direct observation or qualitative interviews. This study only focused on the effect of VR technology use on student learning motivation and learning outcomes, so it did not address other factors that might influence learning success, such as teacher competence, technological infrastructure preparation, school economic conditions, or student learning environment support.

Research recommendations for schools, governments, and future researchers. Schools and teachers are encouraged to develop and use technology-based learning tools such as VR more widely in the teaching process. The use of VR can be particularly helpful in subjects that require a lot of visuals, allowing students to better understand the learning material. Teachers also need training on how to use VR technology so they can create more innovative and interactive lessons that meet the needs of students in the digital age. Support is crucial from schools and governments for the widespread use of VR technology, even in areas with limited educational facilities. For future researchers, it is recommended to expand the research to cover a wider area and include a larger sample size so that the results are more representative.

6. Conclusion

In conclusion, the use of VR technology has a positive, significant, and meaningful impact on learning motivation and academic outcomes of high school students in Guidance and Counseling materials. VR technology functions as a visual tool to support learning and acts as a teaching instrument that can transform traditional learning methods into a more constructive digital learning experience and focuses on active student engagement. Learning motivation plays a key role as an intermediary factor that strengthens the relationship between VR use and improved student learning outcomes. The effectiveness of VR comes from its ability to offer clear, realistic, and relevant learning simulations. This makes it easier for students to understand abstract concepts, improve memory, and enhance their skills in completing learning tasks. This research strengthens the theory of constructivism, multimedia learning theory, social learning theory, and the ARCS motivation model in technology-based learning, especially in Guidance and Counseling materials that have been carried out conventionally. The use of VR can be an innovative solution to low motivation and low quality of learning in high school, especially in areas that still face limited access to educational technology. The use of VR technology heralds a new way of learning and plays a key role in educational transformation. This change focuses on interaction, digital skills, real-world learning experiences, and student development.

7. Conflict of Interest

In writing this paper, there is no conflict of interest between the authors and any other parties. We also express our gratitude to all respondents who provided research data in a thorough and objective manner. All biographical information is anonymized.

8. Acknowledgments

In editing this article, we used AI as an aid, Napkin AI. However, Napkin AI was minimally used, as we manually rewrote the text to improve layout and language quality. All content was thoroughly analysed and interpreted by the author, leading to the final conclusions.

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Appendix 1

Table 1: Variables, Indicators and Research Instruments

Variables	Indicators	Statement Items
Use of VR Technology (X).	Learning Interactivity	1. VR technology makes me more active while learning. 2. I can interact directly with learning objects through VR. 3. Learning using VR makes me more engaged in learning activities. 4. VR helps me participate more in learning. 5. I understand the material more easily through VR interactions. 6. Using VR makes learning more dynamic.
	Visual and Audio Quality	1. The images displayed in VR are clear. 2. The colors and visual design of VR attract my attention. 3. The audio in VR is clear. 4. The combination of sound and images in VR helps me learn. 5. The quality of VR visuals helps me understand the material. 6. The quality of VR audio and visuals makes learning more engaging.
	Ease of Technology Use	1. VR technology is easy to use. 2. I have no difficulty using VR. 3. The instructions for using VR are easy to understand. 4. I can operate VR without excessive assistance. 5. Using VR does not confuse me. 6. I quickly adapted to using VR.
	Immersive Learning Experience	1. I feel like I'm in a real-life situation when using VR. 2. VR provides an engaging learning experience. 3. I feel more focused when using VR. 4. VR makes me feel as if I'm experiencing the material firsthand. 5. The learning experience using VR is enjoyable. 6. I feel more fully engaged when using VR.
	Appeal of Learning Media	1. VR makes learning more interesting. 2. I'm more interested in learning using VR than traditional methods. 3. VR keeps me from getting bored easily while learning. 4. Using VR increases my interest in learning. 5. VR media makes learning more enjoyable. 6. I want to use VR in my next lesson.
Learning Motivation (Z).	Attention	1. VR learning captured my attention. 2. I focused during VR learning. 3. VR made me more interested in learning the material. 4. I paid close attention to the material explanations when using VR. 5. Using VR made me enthusiastic about learning. 6. I concentrated better during VR learning.
	Relevance	1. The material presented in VR suited my learning needs. 2. Learning VR was relevant to everyday life. 3. I found the material more meaningful through VR. 4. VR helped me understand the application of the material.

Learning Outcomes (Y).		5. I found VR learning useful.
		6. The material presented in VR aligned with my learning goals.
	Confidence	1. I felt more confident when learning in VR.
		2. I was confident I could understand the material using VR.
		3. I was more confident answering questions during VR learning.
		4. I was confident I could complete assignments with the help of VR.
		5. Using VR increased my confidence in learning.
		6. I believe my learning abilities improved with VR.
	Satisfaction	1. I was satisfied with learning VR.
		2. I felt happy after learning VR.
		3. I was satisfied with the VR learning experience.
		4. Using VR provides a satisfying learning experience.
		5. I feel my learning outcomes have improved through VR.
		6. I would like to use VR in my learning again.
	Understanding Material	1. I understand the material more easily using VR.
		2. I can re-explain the material I've learned.
		3. VR helps me understand difficult concepts.
		4. The material becomes easier to understand with VR.
		5. I understand the learning content well.
		6. I can connect the learning concepts well.
	Improving Academic Grades	1. My grades improved after using VR.
		2. Using VR helped improve my exam results.
		3. I achieved better learning outcomes after using VR.
		4. My academic performance improved after using VR.
		5. VR helped me achieve my learning goals.
		6. Using VR supports my academic performance.
	Ability to Memorize Concepts	1. I remember the material more easily through VR.
		2. I still remember the material after the lesson is over.
		3. VR helps me remember important concepts.
		4. I remember the images and simulations in VR more easily.
		5. I can recall the material well.
		6. VR helps improve my memory.
	Ability to Complete Assignments	1. I complete assignments more easily after using VR.
		2. I can do assignments better.
		3. VR helps solve learning problems.
		4. I was able to apply the material to the assigned task.
		5. I completed the task more quickly using the understanding from VR.
		6. Using VR improved my ability to complete the task.