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Walid Nak Dewi Boleh? : Efforts to Prevent Child Grooming Through Virtual Reality (VR)-Based Digital Literacy

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Abstract

The rapid development of digital technology has increased children's exposure to online environments, creating both opportunities and risks, including the rising phenomenon of child grooming. This study aims to develop and evaluate Virtual Reality (VR)-based digital literacy media as an innovative preventive strategy to enhance students' awareness and understanding of online grooming threats. The research adopts a Research and Development (R&D) approach using the ADDIE model, consisting of analysis, design, development, implementation, and evaluation stages. Data were collected through questionnaires, observations, interviews, and documentation involving students, teachers, and experts. The findings indicate that VR-based learning media provides an immersive and interactive experience that significantly improves students' engagement and comprehension of digital safety concepts. Expert validation results show that the developed media is categorised as feasible and highly appropriate for educational use, with strong ratings in material accuracy, media design, and language clarity. The discussion reveals that VR simulations effectively support experiential learning by allowing students to recognise grooming patterns and practise decision-making in safe, simulated digital environments. In conclusion, VR-based digital literacy is an effective and innovative learning medium for preventing child grooming, as it increases awareness, understanding, and behavioural readiness among students, while also offering strong potential for integration into future digital education strategies.

INTRODUCTION

Technological advances are one of the main factors contributing to child grooming. Digital technologies such as social media, instant messaging applications, and online games have created a vast space for interaction between children and strangers, often without direct supervision from a responsible adult. Perpetrators typically exploit adolescent emotions and the innocence of children to communicate intensively, manipulate, and gradually exploit their victims (Intaniasari & Utami, 2022). The proliferation of the internet and social media has accelerated child grooming, as children frequently use their digital devices unsupervised (Hendarwati et al., 2024). According to Suratman (2021), social media is the primary means through which perpetrators approach and deceive their victims.

Hardianti, Kumorotomo, & Setianto (2023) also noted that the number of internet users worldwide increases every year, spanning children through to adults, all of whom rely on the internet to facilitate their daily lives (Hendarwati et al., 2024). Internet use requires the ability

to discern appropriate from inappropriate content. This is especially important for minors, who possess a naturally high level of curiosity and therefore deserve to be supervised and guided in their internet use (Fachrin, 2025; Idris & Rukli, 2025; Setiawati et al., 2021; Tita et al., 2023). Without adequate supervision, they are free to access any content available online.

As is widely known, not all content on the internet is appropriate or safe. Viral trends — such as the Malaysian film Walid — bear a strong connection to the issue of child grooming, particularly in the context of the abuse of power by a spiritual figure. The character of Walid is depicted as the leader of the Jihad Ummah sect, who manipulates religious teachings to approach and control young women, including teenagers, through the concept of "inner marriage." Scenes and dialogues from the film, including the line "Close your eyes, imagine Walid's face," circulated widely on social media, making the film a prominent example of the child grooming phenomenon (Charles, 2023; Wahyu et al., 2020).

Child grooming is not a phenomenon confined to Malaysia; it has also occurred widely in Indonesia, with children and teenagers constituting the majority of victims. Child grooming is a process in which a perpetrator attempts to deceive a victim by exploiting physical, emotional, or financial means to establish an emotional relationship and bond, with the aim of manipulating, exploiting, or abusing the victim (Muhammad Reffas Fahreza, 2024).

In the grooming process, perpetrators employ various methods to build trust, including giving gifts, providing emotional attention, and positioning themselves as attentive listeners. According to Hendarwati et al. (2024), perpetrators exploit children's lack of awareness and weak parental supervision to create emotional dependence. Social media has become the primary tool for reaching victims in a personal and intensive manner, amplifying the risk of grooming in the digital era.

Child groomers typically exploit the emotional vulnerability and innocence of adolescents through intensive communication to build trust, manipulate, and gradually exploit their victims. This phenomenon has been linked to significant psychological trauma in victims, particularly among young Indonesians exposed to such threats through social media. Children are rendered vulnerable not only by digital applications themselves, but also by low levels of digital literacy among both adolescents and parents. Without adequate understanding, young people are especially susceptible to manipulation and exploitation by malicious actors. The effects are not only physical but also psychological, including long-term trauma, social isolation, depression, excessive anxiety, and a loss of confidence and social skills. Unfortunately, many teenagers and parents remain unaware of perpetrators' behavioural patterns. Some may recognise warning signs but are uncertain about the appropriate steps to take in response.

Based on a needs analysis conducted with junior high school students in the Palembang area and its surroundings, through a direct survey of their behaviour and attitudes, it was found that teenagers strongly prefer interactive and digital-based learning, as they become easily disengaged by monotonous instructional methods such as one-way content delivery without discussion or interactive elements. This study therefore undertakes prevention efforts through digital literacy that is accessible and disseminated through technology, specifically in the form of Virtual Reality (VR).

One of the most critical threats in the digital ecosystem is child grooming — a process in which perpetrators build emotional trust with minors for the purpose of exploitation. Grooming

typically involves manipulation strategies such as emotional bonding, gift-giving, persuasion, and psychological control, making it difficult for victims to recognise the danger. As established in prior literature, grooming is not an instantaneous act but a gradual process of trust exploitation that often leads to long-term psychological trauma for victims (Winters & Jeglic, 2017).

Previous research has highlighted that digital literacy plays a crucial role in reducing children's vulnerability to online threats. Studies also indicate that interactive learning approaches — including simulation-based education — are more effective than traditional lecture-based methods in improving students' awareness of digital safety. Furthermore, research on Virtual Reality (VR) in education demonstrates that immersive environments can enhance engagement, comprehension, and retention of learning materials, particularly in topics that require experiential understanding.

Additional studies have confirmed that VR-based learning media can significantly improve student learning outcomes by creating realistic, immersive, and interactive experiences, enabling learners to better understand abstract or high-risk scenarios by placing them in simulated real-world environments. The effectiveness of VR in educational contexts is further supported by meta-analytical research demonstrating consistent positive impacts on student motivation and cognitive engagement across various subject areas (Setiawan et al., 2024).

Despite these advancements, a significant research gap remains in the application of VR technology specifically for child grooming prevention. Most existing studies focus on general digital literacy or cybersafety education without providing immersive, scenario-based simulations that reflect real grooming situations. Moreover, limited research has addressed the contextual needs of junior and senior high school students in Indonesia, particularly in terms of integrating emotional decision-making within digital safety education frameworks.

The urgency of this research is driven by the increasing exposure of adolescents to online risks and the psychological consequences of grooming incidents, which include trauma, anxiety, social withdrawal, and loss of self-confidence. In many cases, victims and even parents are unable to identify early warning signs of grooming behaviour, highlighting the need for preventive education that is both engaging and accessible to young learners.

In response to this gap, the present study introduces a novel approach by integrating Virtual Reality technology with digital literacy education to simulate real-life grooming scenarios. The VR system is designed to allow students to engage in interactive decision-making processes, choosing responses to suspicious online interactions and immediately observing the consequences of their choices within a controlled environment. This immersive approach strengthens experiential learning and behavioural awareness.

The primary purpose of this study is to develop, implement, and evaluate VR-based digital literacy media as a preventive tool against child grooming among adolescents. Specifically, the study aims to analyse students' digital literacy needs, assess changes in awareness following VR exposure, and evaluate the perceptions of students, teachers, and parents regarding the effectiveness of the developed media in improving online safety understanding.

The contribution of this research lies in its integration of immersive technology with preventive education, offering a new pedagogical model for digital safety learning. The

expected benefits include increased student awareness of online risks, improved decision-making skills in digital environments, and enhanced engagement in the learning process. Furthermore, this study provides practical implications for educators and policymakers in developing innovative, technology-based strategies for child protection in the digital era.

METHOD

This research aims to develop and create a product that can be tested in terms of effectiveness, feasibility, and practicality, so that it uses the Research and Development (R&D) method with the ADDIE (Analyze, Design, Development, Implement, and Evaluation) development model approach (Charles, 2023; Wahyu et al., 2020). According to Michael Molenda, the ADDIE model is used to describe the systematic process in the development of learning programs and is synonymous with the development of education systems (ISD). This model was chosen because it has systematic stages, is easy to understand, and is in accordance with research needs. In the analysis stage, a digital literacy survey was conducted using a questionnaire to determine the level of students' understanding of online security and child grooming. The design stage is carried out by designing learning objectives, flowcharts, interactive scenarios, and smartphone-based VR media. Furthermore, at the development stage, media design is realized into real products in the form of visual assets, virtual environments, characters, and animations which are then validated by material experts. The implementation stage is carried out by testing VR media to students to find out their level of involvement, understanding, and response to the child grooming simulation. The last stage, namely evaluation, is carried out formatively through observation, interviews, and assessments of teachers and experts to assess the effectiveness of the media and become the basis for improving content and design.

The research will be carried out at MAN Insan Cendekia OIC which has been willing to become a partner in the VR-based literacy media trial. The research implementation time is planned for 4 months, starting from May to September 2025.

Data Collection Techniques

This study uses a qualitative method approach, because it has the goal of understanding the phenomenon in depth, especially how students interpret and respond to VR-based digital literacy programs in an effort to prevent child grooming. The qualitative approach method is descriptive and tends to use analysis. Qualitative research generally highlights individual perspectives, flows and meanings in the study by utilizing theories as a foundation or reinforcement to be in harmony with the situation in the field (Rita Fiantika et al., 2022). According to Somantri, qualitative research sees reality as something formed from an individual's understanding and experience in social situations. Qualitative research is closer and interacts deeply with the reality being studied. In terms of language use, quantitative research generally uses formal and non-personal language, relying on numbers or statistical data.

A number of data collection techniques used in this study include observation, interviews, documentation and triangulation as follows.

1. Observations

According to Burhan (M. Makbul, 2021), observation is a routine activity carried out by humans by utilizing their five senses as the main tool. In addition, humans also utilize other senses such as ears, nose, mouth, and skin. Therefore, observation can be said to be the ability of humans to utilize all their senses in gathering information, especially through the sense of sight. Referring to Prof. Dr. A. Muri Yusuf (M. Makbul, 2021), the effectiveness of observation as a method of data collection is greatly influenced by the observer himself. This is because observers must be able to see, hear, smell, or feel the object being studied, then draw conclusions based on what they observe.

2. Interview

In simple terms, an interview is defined as a form of interaction between the person conducting the interview and the source of information through direct communication. In other words, an interview is a face-to-face meeting between the individual asking the question and the individual who conveys the information. Researchers conduct interviews to gain an understanding of a person's circumstances, for example by collecting information about the background of students, parents, education, attention, and also views on several things. (M. Makbul, 2021).

3. Documentation

Documentation is a method of collecting data in an orderly manner, whether in visual, verbal, or written form. Based on the explanation of Zuriah (2009), documentation is a way to collect information from written sources such as archives, as well as books that contain theories, views, arguments, or regulations, as well as other matters related to the research subject. Therefore, a document can be a record of Actions, activities, or events that have taken place, which are recorded and organized into an archive. These documents can be texts, photographs, or large works produced by individuals. In qualitative research, observation and interview methods were used as additions to the collection (Rita Fiantika et al., 2022).

4. Triangulation

Triangulation can be considered as one of the ways researchers collect data to ensure whether the data obtained can be trusted. This means that triangulation is an effort to check whether the information or data obtained is correct, by looking at it from various different perspectives (Rita Fiantika et al., 2022)

Data Analysis

In qualitative research, the process of conceptualization, grouping, and explanation is carried out based on events found during field activities so that data collection and data analysis take place simultaneously, interactively, and cyclically. According to Matthew B. Miles and A. Michael Huberman, qualitative data analysis includes data reduction, data presentation, and conclusion drawing and verification. Data reduction is carried out by selecting, summarizing, and focusing important information to make it easier for researchers to understand the data obtained. The presentation of data is carried out in the form of narratives, images, or charts to make the conditions of the research easier to understand, while the drawing of conclusions is carried out gradually based on the evidence found during the research. Needs analysis data was obtained through the distribution of questionnaires to 24 OIC MAN Insan Cendekia students to find out the digital literacy needs related to Virtual Reality (VR)-based child grooming. The results of data processing showed that most respondents strongly agreed with the development of VR media so that the media was considered relevant and needed as a means of learning

digital literacy. Before being used in learning, VR media and research instruments are first tested by material experts, media experts, and linguists to ensure the suitability of content, appearance, interactivity, and language clarity so that they are suitable for use in research.

RESULTS AND DISCUSSION

Product Results

The main product produced in this study is in the form of Virtual Reality (VR)-based learning media which has been designed as a means of digital literacy education to prevent child grooming among adolescents. This media is developed through the process of needs analysis, content design, creation of interactive scenarios, and validation by experts.

VR Product Description

This VR media can be run using a VR headset or a smartphone device with VR mode. The initial view or main menu consists of five main sections:

1. Main lobby view
   When the VR app is running, the user will enter the main lobby area. In this section, you'll find a simple navigation menu with several interactive icons to choose from, just like a portal. The menu has three options, namely Material, Simulation, and Exit. The design is made quite simple but attractive, using bright colors and easy-to-read fonts, making it easier for students to use it without feeling difficult.
2. Material about Child grooming with quizzes
   This feature explains interactively the meaning of child grooming, the steps usually taken by the perpetrator, the signs that need to be watched out, and how to prevent it. The material is presented in the form of short text, images, and sound. After studying the material, students were given the task of working on a short quiz in the form of multiple-choice questions to strengthen their understanding.
3. Simulation of child grooming
   In this feature, students will experience scenarios in real time where they play the role of victims who are being approached and invited by strangers. The scenario runs narratively with a text-based conversation, and then the user is given several action options. This feature aims to train students to safely deal with real-world situations.
4. Answer received
   If students choose an answer that accepts an invitation from a stranger, such as getting acquainted, then the scenario will show negative consequences educationally. For example, a warning will appear that the action is dangerous and can pose a risk, and a video will be shown containing a child *grooming victim*. This aims to increase students' understanding of the dangers of *child grooming*.
5. Answer Rejected
   If students choose to decline the invitation, the scenario will display a positive impact, such as a motivating message that their actions are correct and safe. In addition, students are also given additional tips, such as how to report suspicious accounts or set privacy settings. This helps reinforce the understanding that refusal and reporting are the best options when faced with similar situations.

Here are some photos of the display in VR.

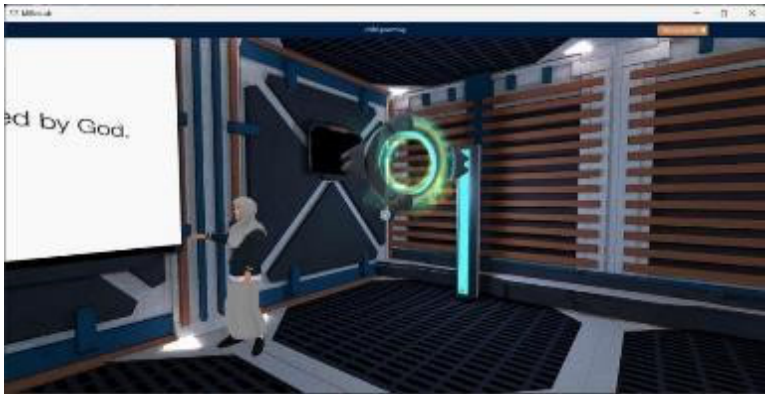


Figure 1. Main lobby view



Figure 2. Digital literacy and quiz display



Figure 3. Simulation *view of child grooming*



Figure 4. Reject option view



Figure 5. Receiving option view

In this section, we will discuss the findings of the study. The findings will be described based on information obtained from interview sessions, observations, and various documents that have been collected. The discussion in this section is obtained from data collection activities through document research, observations, interviews with relevant participants in this study, as well as discussions that focus on the issues being researched. In the section on the findings and discussion of this research, various information related to the results of interviews conducted in September 2025 will be presented in... In Ogan Komering Ilir Regency, about Efforts to Prevent *Child Grooming* Through Virtual *Reality-Based Digital* Literacy (VR).

This study applies a qualitative method with a descriptive methodology. Based on Meleong's views in the book Qualitative Research reviewed by Rita Fiantika and her colleagues in 2022;, qualitative research is a type of research that prioritizes a natural approach, with the goal of understanding and giving meaning to emerging phenomena. This research was carried out by involving various existing techniques. In this paper, the author researches natural approaches so that the results can be used to provide an understanding of the phenomenon by involving various research methods. In qualitative research, commonly used techniques include interviews, observations, and document analysis. The qualitative descriptive analysis method is an approach used to describe the process or event that is happening in the field that is the object of research. After that, the data or information obtained is analyzed to find solutions to existing problems (Rita Fiantika et al., 2022) .

This research is carried out through several systematic stages to obtain valid and comprehensive data. The stages are validation tests that include material experts, media experts, and language experts.

Validation tests of VR media and research instruments were carried out as a first step. This validation involves three parties, namely material experts, media experts, and linguists. Subject matter experts check whether the content in VR media is in accordance with the learning goals of digital literacy and efforts to prevent child grooming. Media experts assess the technical aspects and appearance of VR media so that they can be easily used by students. Linguists ensure that the language used in VR scenarios is easy to understand, communicative, and appropriate to the learner's skill level. The purpose of this validation test is to ensure that the media and instruments used are feasible and ready to be used in the research (Sugiyono, 2019).

After the validation process is completed, the researcher provides a closed questionnaire to students as a first step. This questionnaire aims to find out the level of students' understanding and awareness of digital security and the dangers of child grooming before they participate in learning through VR. The next stage is to conduct a VR simulation. Students took turns undergoing interactive scenarios in VR media that displayed potential child grooming situations in cyberspace.mDuring the activity, the researcher made observations to pay attention to students' involvement, their response to the scenario, and their ability to recognize and respond to suspicious invitations. This observation was carried out using observation sheets that had been prepared beforehand.

After the VR simulation was completed, the researcher conducted interviews with several students and teachers to find out their experiences when using VR media, the change in understanding they felt, and their opinions on the effectiveness of the media in improving digital literacy skills. All stages of the research were recorded in the form of photos, videos, and notes directly in the field. These notes serve as supporting materials to reinforce the results of questionnaires, observations, and interviews.

Expert Validation Results

Validation tests were carried out to assess the feasibility of Virtual Reality (VR) media that has been created for use by students. This validation process is carried out by three experts, namely material experts, media experts, and language experts. Each expert gave an assessment according to the relevant aspects, using a scale of 1 to 4, where 1 indicated not feasible, 2 indicated quite feasible, 3 indicated feasible, and 4 indicated very feasible.

The results of the assessment from the three experts are then calculated in the form of a percentage of eligibility and grouped into certain criteria, namely Very Feasible, Feasible, Quite Feasible, or Not Feasible. The test results that have been tested by experts will be presented in the form of a table as follows.

Table 1. Linguist test results

Indicator	Item	Score
Using good and correct Indonesian	1	3
Using the appropriate conjunction in the instructions	2	3
Every sentence used is communicative	3	3
The language used is not repetitive	4	4
The language used is short, concise, and clear	5	3
The language used according to the stage of development	6	3
The language used is easy for junior high school students to understand	7	4
Total Score Earned (∑x)		23
Respondent response percentage (P)		82,14%
Criteria		Worthy

Table 2. Results of the subject matter expert test

Indicator	Item	Shoes
Material Conformity with indicators	1	`4
Suitability of the Material to the learning objectives	2	4
The truth of the material concept is reviewed from the scientific aspect	3	4
Clarity of material delivery.	4	3
Systematics of material delivery.	5	3
Material attractiveness.	6	4
Completeness of the material.	7	4
Conformity of the questions to the material and learning objectives.	8	3
Truth of the answer key	9	3
Clarity of workmanship instructions.	10	3
Clarity of the questions given.	11	4
The Truth of the Concept of Question.	12	3
Variety of questions.	13	3
Use of the Language provided	14	4
Accuracy of the use of the term.	15	4
Ease of understanding the flow of the material.	16	4
Encourage students' curiosity.	17	4
Improving the media in helping students to open up.	18	4
The ability of the media to increase student understanding.	19	4
The ability of the media to increase knowledge of hazards.	20	4
Total Score Earned (∑x)		72
Respondent response percentage (P)		91,25%
Criteria		Highly feasible

Table 3. Results of the media expert test

Indicator	Item	Shoes
Accuracy of the use of terms	1	4
Language Suitability with the Student's Level of Thinking.	2	4
Media support for student independence	3	3
Media capabilities add knowledge	4	4
The ability of the media to improve students' understanding	5	4
Media Ability Increases Student Learning Motivation	6	3
Ease of media operation	7	4
Reusable	8	3
Media development opportunities for the development of science and technology	9	3
Color selection suitability	10	3
Suitability of font size selection	11	3
Image display compatibility	12	3
Design attractiveness	13	4
The camera displays 3D that matches the image on *the Marker*	14	4
Creativity and innovation in learning media	15	3
Total Score Earned (∑x)		52
Respondent response percentage (P)		86,6%
Criteria		Worthy

The discussion in this study discusses how Virtual Reality (VR)-based learning media can increase students' understanding and awareness of the dangers of child grooming in the

digital world. In addition, it is also discussed how this product fits the needs of users, the results of assessments from experts, and its relationship with pre-existing theories and research.

Student Needs Analysis

Based on the results of the needs survey, most respondents stated that they "strongly agree" with the importance of digital literacy learning and the use of interactive media (see Figure 3.3). There were 15 respondents who voted "strongly agree", 5 respondents "agreed", and 4 respondents "disagreed". This shows that there is a real need for learning media that is innovative, engaging, and contextual, especially in digital security topics that are often considered abstract when taught only theoretically.

The Effectiveness of Using VR Media in Learning

Research shows that using VR media provides a more interactive and enjoyable learning experience than regular ways of learning. Students show increased understanding of digital literacy materials, especially in recognizing early signs of suspicious interactions from strangers in cyberspace. These results are in line with the research of Huda, Setiawan, and Yuliantri (2023) which states that the use of VR in learning has a major impact on improving student learning outcomes, although the impact is not too large but consistent.

VR media is able to create a learning environment similar to the real world, so that students can experience certain situations firsthand, so that information is easier to understand and remember (Setiawan et al., 2024).

The research of Charles et al. (2022) also supports these findings, as the use of VR has been shown to increase students' concentration and active participation in learning.

Previously abstract learning can become more real through the images and interactions that VR technology offers (Charles, 2023). This can be seen in this study, where students showed high interest when trying a simulation of slowly teasing children in VR media.

The Role of Digital Literacy and Interactive Simulation

The provision of digital literacy materials and quizzes before the simulation is very important to provide basic knowledge to students. This is in line with research (Fachrin, 2025), which states that digital literacy strategies that use interactive simulations and educational games are effective in shaping safe behaviors in the digital world.

Research by Idris and Rukli (2023) also shows that the delivery of digital literacy materials in a structured manner before the simulation can increase students' awareness of the risks of interacting online (Idris & Rukli, 2025). In the context of this study, the introductory material provides a foundation of knowledge that prepares students so that they are better prepared and able to respond well when facing interactive scenarios in VR simulations.

Barriers and Contextual Factors

Limited technological facilities and infrastructure are the main obstacles. Not all schools have VR devices or computers with adequate specifications, so the implementation process is carried out alternately and limitedly. This condition is in line with research by Purwotomo & SDN Panjang III which found that the limitations of digital infrastructure are one of the main obstacles in the implementation of digital literacy in elementary schools (Intaniasari & Utami, 2022).

In addition, Setiawati et al. (2021) emphasized that the role of teachers and parents is very important in strengthening students' understanding of digital security (Setiawati et al.,

2021). Digital literacy training for parents and educators is helpful in creating a learning environment that supports students' awareness of cybersecurity.

Product Needs and Relevance Assessment

Preliminary analysis shows that most students need innovative, contextually appropriate learning media to understand digital security issues. This is in accordance with the findings (Fachrin, 2025), which states that students respond faster to simulation-based learning methods than to ordinary lecture methods.

The VR media features developed, such as the main lobby display, digital literacy materials and quizzes, interactive simulations, and "refuse" and "accept" option scenarios, have proven to be suitable for these needs. This medium not only informs, but also helps students practice decision-making skills in digital security situations.

CONCLUSION

The study concludes that Virtual Reality (VR)-based digital literacy learning media is an effective and innovative approach for preventing child grooming among adolescents. The developed VR application provides immersive, interactive, and contextual learning experiences that allow students to understand the concept, recognize warning signs, and practice decision-making in simulated online grooming scenarios. Based on expert validation results and student needs analysis, the media is categorized as feasible and highly relevant for digital literacy education. The findings also indicate that students demonstrate increased awareness, engagement, and understanding after interacting with the VR simulation, suggesting that experiential learning significantly enhances their ability to identify and respond to potential online threats.

For future research, it is recommended that the development of VR-based digital literacy media be expanded with larger and more diverse participant samples to improve generalizability across different educational levels and regions. Further studies should also explore long-term behavioral impacts to determine whether increased awareness translates into sustained safe online behavior. In addition, future research may integrate artificial intelligence or adaptive learning systems within VR environments to create more personalized learning experiences. Comparative studies between VR-based learning and other immersive technologies such as augmented reality (AR) are also encouraged to identify the most effective approaches for digital safety education in different contexts.

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