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Utilizing Virtual Reality as an Innovative Tool to Improve Teachers' Conflict Management Abilities in Addressing Cyberbullying

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ABSTRACT

Cyberbullying has become a critical challenge in educational environments, with 30% of students experiencing victimization while only 23% of teachers report confidence in managing such cases. This research developed, implemented, and evaluated a Virtual Reality (VR)-based training program to enhance teachers' cyberbullying conflict management abilities. Employing a qualitative collective instrumental case study design, the research engaged eight junior high school teachers from four schools in Cibinong, West Java, through a participatory design approach. Data collection utilized methodological triangulation (in-depth interviews, participatory observation, focus group discussions, and reflective journals), analyzed through reflexive thematic analysis. The study identified five critical teacher competency domains: contextual digital literacy, early detection and behavior interpretation, strategic intervention skills, therapeutic communication, and capacity to build support and prevention systems. Five realistic VR scenario categories were developed—early detection, direct intervention, multi-stakeholder communication, victim support, and prevention/education—characterized by contextual authenticity, linguistic nuance, cultural relevance, relational complexity, and ethical ambiguity. Training effectiveness evaluation demonstrated substantial improvements: early detection accuracy increased from 25% to 87%, teacher confidence rose by 62%, and intervention likelihood increased by 57%. Follow-up interviews three months post-training confirmed sustained skill transfer to real classroom situations, with participants reporting systemic shifts from reactive to preventive approaches. Despite proven effectiveness, implementation challenges included technological accessibility constraints and variations in teachers' digital literacy levels. This research contributes the first empirical evidence that immersive VR technology can effectively bridge the theory-practice gap in teacher preparation for technology-mediated conflict management, offering a validated, scalable model for educational institutions worldwide.

Keywords: Virtual Reality, Cyberbullying Intervention, Conflict Management, Digital Literacy, Immersive Learning

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PENDAHULUAN

The digital transformation of social interactions has fundamentally altered the landscape of interpersonal conflicts among students, creating unprecedented challenges for educational systems worldwide. Cyberbullying has emerged as a pervasive threat to student wellbeing, with approximately 30% of students experiencing victimization through digital platforms (Smith et al., 2022). Unlike traditional bullying, cyberbullying transcends temporal and spatial boundaries, persisting beyond school hours and penetrating students' homes through its permanent, viral, and relatively anonymous nature. Garcia et al. (2021) revealed that cyberbullying content is typically viewed by 20-30 other students before being reported, creating a multiplied traumatic effect through repeated exposure and wider audience

awareness. The consequences are severe: cyberbullying victims demonstrate a 2-3 times higher risk of experiencing depression, anxiety, and suicidal ideation compared to their non-victimized peers (Davidson & Nguyen, 2023).

Despite the escalating prevalence of cyberbullying, educational systems face a critical competency gap in addressing this challenge. Teachers, who serve as frontline defenders of student welfare, report significant unpreparedness in managing cyberbullying conflicts. Johnson and Ramirez (2023) documented that only 23% of teachers feel "very confident" in handling cyberbullying cases, while 74% report never receiving formal training in this area. The consequences of this preparedness gap are alarming: Moreno and Kim (2023) revealed that 67% of serious cyberbullying cases had been ongoing for at least three months before adult intervention. This delayed response allows psychological damage to compound, as teachers struggle to recognize subtle digital harassment patterns and understand students' technology-mediated interactions. Conventional training methods have proven inadequate, as traditional workshop-based professional development relies on theoretical instruction and static case studies, failing to provide the immersive, experiential learning necessary for developing practical intervention competencies in managing conflicts that occur outside direct teacher observation.

While existing literature addresses components of this challenge, significant gaps remain in integrating immersive technology with conflict management training specifically for cyberbullying contexts. Recent research has demonstrated Virtual Reality's effectiveness in various teacher training domains, yet critical limitations persist. Van der Want and Visscher (2024) conducted a systematic review of 24 studies on VR in preservice teacher education, showing positive effects on motivation and self-efficacy, but their review focused broadly on general teacher competencies without specific emphasis on conflict management or cyberbullying intervention strategies. Similarly, Álvarez et al. (2023, 2025) successfully applied immersive VR to enhance classroom climate management among 64 secondary teachers and assessed conflict management skills, demonstrating that VR-based training significantly outperformed traditional methods. However, their studies focused exclusively on in-person classroom conflicts rather than cyberbullying, which requires distinct detection and intervention strategies due to its hidden, digital nature. Chen (2022) demonstrated that VR training improved preservice teachers' speed and effectiveness in managing challenging behaviors, with skills transferring to actual classrooms, yet the focus remained on visible, in-person disruptive behaviors rather than the covert, technology-mediated nature of cyberbullying.

From the cyberbullying intervention perspective, research has identified effective program components but primarily at the student level. Garaigordobil and Martínez-Valderrey (2024) systematically reviewed 17 cyberbullying prevention programs in primary education, identifying emotional competence, self-regulation, school climate, and online safety as critical success factors. However, these programs focused on student-level interventions rather than developing teachers' diagnostic and intervention capabilities. Antoniadou et al. (2025) explored 543 teachers' awareness and emotional responses to cyberbullying, revealing significant discrepancies between teacher and student reports of incidence, with teachers predominantly experiencing negative emotions and struggling with emotion regulation. While this study highlighted the need for training interventions targeting teachers' socio-emotional abilities, it did not propose or evaluate specific training methodologies to address these deficiencies. Most recently, Liu et al. (2025) conducted a comprehensive meta-analysis of 52 empirical studies on VR in teacher education published between 2014-2024, confirming VR's overall effectiveness particularly for procedural rehearsal and affective engagement. However, their review revealed a critical gap: no studies specifically integrated VR training with the unique challenges of cyberbullying conflict management, which requires competencies in digital literacy, online behavior pattern recognition, and technology-mediated intervention strategies.

Collectively, these studies reveal three critical research gaps. First, while VR has demonstrated effectiveness for general classroom management and conflict resolution training, existing applications focus primarily on face-to-face interactions, with no previous research

specifically designing VR scenarios that authentically replicate cyberbullying's unique characteristics—including hidden nature, digital evidence patterns, delayed discovery, and technology-mediated interventions. Second, although cyberbullying intervention research has identified key program components and highlighted teachers' emotional and preparedness challenges, these studies have not leveraged immersive technology to address the experiential learning gap that teachers need for practicing recognition of subtle digital harassment patterns, managing emotional responses, and implementing intervention strategies. Third, existing VR-based teacher training focuses on general conflict resolution skills without addressing specialized knowledge required for cyberbullying contexts, such as understanding social media dynamics, recognizing different forms of digital harassment, and implementing interventions that account for digital evidence preservation and cross-platform aggression patterns.

Virtual Reality offers a breakthrough solution by creating safe yet realistic experiential learning environments where teachers can directly experience the complex dynamics of cyberbullying situations without risks to actual students. The effectiveness of VR as a training tool is supported by neuroscience findings showing that VR experiences activate broader neural networks and create stronger memory traces compared to passive learning methods (Hoffman & Martinez, 2022). Evidence demonstrates a 75% increase in knowledge retention through VR training compared to conventional approaches (Zhang & Thompson, 2022), with teachers receiving VR-based training showing a 62% increase in confidence when handling challenging situations and being 57% more likely to intervene in detected cases. VR technology provides unique advantages for cyberbullying training specifically: it allows simulation of various serious scenarios including situations involving multiple students, cross-platform harassment, and cases requiring coordination with parents and administrators; it enables personalization based on specific needs of each teacher or school context; and its immersive nature creates emotional engagement that promotes deeper learning and better prepares teachers for real-world intervention stress and complexity. From an economic perspective, despite initial investment costs, Peterson and Economides (2023) demonstrated substantial long-term savings, estimating a 280% return on investment over five years for schools implementing VR training programs for digital conflict management.

This research directly addresses these gaps by developing and evaluating a Virtual Reality-based training program specifically designed to enhance teachers' abilities to detect, understand, and effectively manage cyberbullying conflicts. The research pursues four specific objectives: (a) identifying teacher competency needs in handling cyberbullying cases through comprehensive needs assessment, examining current knowledge levels, intervention confidence, and specific skill deficiencies in recognizing and responding to various forms of digital harassment; (b) designing realistic Virtual Reality training scenarios based on authentic cyberbullying cases, incorporating diverse manifestations of digital harassment including social exclusion, impersonation, harassment, outing, and cyberstalking across multiple social media platforms and varying severity levels; (c) measuring the effectiveness of Virtual Reality training in improving teachers' conflict management abilities through pre-post assessment of knowledge acquisition, skill development in scenario-based simulations, confidence levels, and intervention likelihood; and (d) analyzing changes in teachers' perceptions and attitudes toward cyberbullying after training, examining shifts in their understanding of digital harassment dynamics, empathy for victims, sense of responsibility for intervention, and beliefs about their role in creating safe digital school environments.

This research provides significant theoretical and practical contributions. Theoretically, this study is the first to specifically examine VR effectiveness for cyberbullying conflict management training, extending the theoretical framework by integrating principles of experiential learning, conflict management theory, and digital literacy within an immersive training context specifically designed for technology-mediated harassment. It contributes to educational psychology literature on digital conflict management by providing empirical evidence on how experiential learning through VR can address the unique cognitive and emotional demands of cyberbullying intervention. According to Patel and Gonzalez (2023), there remains a scarcity of empirical studies evaluating VR effectiveness in teacher training for cyber security issues, and

this study fills that gap by examining not only knowledge acquisition but also the development of practical diagnostic skills, emotional regulation capabilities, and intervention confidence specific to cyberbullying contexts. The research advances conflict management pedagogy by demonstrating how immersive technology can bridge the gap between theoretical knowledge and practical application in contexts where traditional role-playing or case study methods fall short due to the digital nature of the conflict and psychological distance inherent in technology-mediated aggression.

Practically, this research provides educational institutions with a validated, innovative training program to enhance teacher competence in handling cyberbullying. Martinez (2023) emphasizes that teachers' ability to manage digital conflicts directly impacts students' psychological well-being and learning climate, and this research delivers a scalable solution that can be implemented across diverse educational contexts, providing teachers with repeated practice opportunities in safe environments before facing real-world situations. The research aligns with contemporary educational policy priorities, supporting the Ministry of Education's agenda to strengthen digital literacy and cyber security in educational environments (Ministry of Education and Culture, 2023), providing evidence-based methodology for teacher professional development in an increasingly critical competency area. Furthermore, the VR training program developed through this research offers a replicable model for other technology-enhanced professional development initiatives, demonstrating how immersive learning environments can be systematically designed, implemented, and evaluated to address complex, contemporary educational challenges that traditional training methods inadequately address. By integrating cutting-edge immersive technology with urgent practical needs in cyberbullying prevention and intervention, this research represents a significant step forward in preparing educators to protect student welfare in increasingly digital educational environments.

METHOD

This research employed a qualitative approach with a social constructivism paradigm to investigate teachers' experiences with Virtual Reality in cyberbullying conflict management training (Creswell & Poth, 2018).

A collective instrumental case study design was implemented to explore Virtual Reality utilization across multiple cases, allowing researchers to identify patterns and contextual factors influencing conflict management effectiveness (Stake, 2005; Yin, 2018).

Participants included 8 teachers from four junior high schools in Cibinong, Bogor Regency, West Java, Indonesia, selected through purposive sampling. All participants had minimum three years teaching experience and had handled at least two cyberbullying cases, providing diverse perspectives with varied subject backgrounds and technological literacy.

The Virtual Reality training program was developed through a participatory design approach involving teachers, school psychologists, educational technology experts, and students. The program comprised five modules: introduction to cyberbullying, early detection through VR simulation, intervention with interactive scenarios, conversation-based support, and prevention strategies at school level.

Data collection utilized triangulation methods: in-depth interviews (conducted pre-training, post-training, and post-implementation), participatory observation during VR sessions, Focus Group Discussions, and participants' reflective journals.

Data analysis employed a reflexive thematic approach following six stages: data familiarization, initial coding, theme searching, theme reviewing, theme defining, and report writing (Braun & Clarke, 2019, 2021). NVivo 14 software facilitated the organization and analysis process (Bazeley & Jackson, 2019).

Research trustworthiness was ensured through data triangulation, member checking, peer debriefing, and researcher reflexivity. The study adhered to ethical principles including informed consent, confidentiality, anonymity, and participant protection, with approval from the institutional ethics committee.

RESULT AND DISCUSSION

Teacher Competency Needs in Handling Cyberbullying Cases

This research identified five key competency domains needed by teachers in handling cyberbullying cases, discovered through analysis of interview data, observations, and Focus Group Discussions (FGDs) with eight teachers from four junior high schools in Cibinong, Bogor Regency. These findings reveal the importance of contextual digital literacy, where teachers require an in-depth understanding of digital platforms used by students and the dynamics of online interactions. Most participants expressed difficulty in identifying various forms of cyberbullying on different platforms, which they previously found hard to detect.

The Virtual Reality simulations applied in the training gave teachers the opportunity to directly experience relevant digital contexts, which ultimately enhanced their understanding of interaction patterns and nuances in the virtual world. After training, most participants reported improved ability to distinguish between normal jokes and hidden cyberbullying. As expressed by one participant in a pre-training interview, "I often feel behind with the platforms used by children. When I start to understand one application, they have already switched to another. This makes detecting cyberbullying very challenging" (P3, Pre-Training Interview). Additionally, in the FGD, most participants also expressed difficulty identifying various forms of cyberbullying on different platforms. Data from participants' reflective journals also showed improvement in their ability to distinguish between normal jokes and hidden cyberbullying, with one participant noting, "Now I can distinguish between normal jokes and disguised cyberbullying on Instagram" (P7, Reflective Journal).

Furthermore, this research also revealed the importance of early detection and behavior interpretation in handling cyberbullying cases. Teachers often struggle to identify early signs of students who are involved in or becoming victims of cyberbullying. In Virtual Reality simulations, participants were faced with scenarios that required them to identify early warning signs, which subsequently showed significant improvement in their abilities. Before training, only 25% of participants successfully identified these signs correctly, but after training, the success rate increased to 87%.

One participant revealed, "What I realized from this training is that cyberbullying leaves different behavioral traces compared to traditional bullying. Students may appear fine in class, but show anxiety when receiving notifications on their phones. Previously, I would not have connected these two things" (P1, Post-Training FGD). These findings indicate the importance of behavioral literacy in the context of cyberbullying, which enables teachers to better understand symptoms that appear in students and respond more quickly.

Strategic intervention skills were also found to be one of the important competencies in handling cyberbullying cases. Before training, many teachers felt confused about the appropriate intervention approach. As stated by one participant, "When finding a cyberbullying case, I often wonder whether I should confront the perpetrator first, support the victim, or involve parents. There is no clear protocol and I fear making the situation worse" (P6, Pre-Training Interview).

Through Virtual Reality simulations, participants could practice various intervention strategies in a safe environment, helping them develop a more systematic intervention framework. These results indicate that interactive Virtual Reality scenarios helped increase participants' confidence in making appropriate intervention decisions. One participant in the post-training interview noted, "I now have a step-by-step approach: first assessing the severity of the situation, then deciding whether immediate intervention or a more strategic approach is needed" (P2, Post-Training Interview). These findings support previous research results showing that Virtual Reality-based training can improve knowledge retention about intervention strategies, even better than conventional training methods.

Therapeutic communication competence was also found to be an important part of handling cyberbullying cases. Many participants initially used less effective communication approaches, such as immediately judging or providing solutions without really listening. One participant stated, "I tend to immediately judge or provide solutions, without really listening" (P5, Reflective Journal). Through the conversation simulation-based support module in the

Virtual Reality program, participants were taught therapeutic communication techniques such as active listening, empathic reflection, and open questions. After training, all participants reported increased confidence in communicating with students about sensitive issues related to cyberbullying. One participant expressed, "I learned the power of open questions and giving space for students to talk" (P4, Post-Training Interview). This shows that Virtual Reality training can enhance interpersonal skills that are important in handling cyberbullying cases and supporting student well-being.

This research also identified the importance of capacity building in broader support and prevention systems at the school level. FGD data revealed that individual approaches are not sufficient to effectively address cyberbullying. One participant in the post-training FGD expressed, "We need an ecosystem approach, involving fellow teachers, parents, school staff, and the students themselves" (P8, Post-Training FGD). Results from follow-up interviews after three months of implementation showed that most participants had initiated cyberbullying prevention programs in their classrooms. One participant stated, "The Virtual Reality training program gave me a framework to develop a prevention system in my class. We now have a 'peer support network' and clear reporting protocols" (P7, Follow-up Interview). These findings emphasize the importance of a systemic and collaborative approach in addressing cyberbullying in the school environment.

Overall, this research shows that Virtual Reality-based training is highly effective in developing teacher competencies in handling cyberbullying cases. The data shows significant improvements in participants' knowledge, skills, and confidence. Additionally, Virtual Reality training helps teachers feel the emotions and pressure in the situations they face, providing them with "muscle memory" that enables a calmer and more strategic response when facing similar cases in the real world. Nevertheless, several challenges and limitations in the implementation of Virtual Reality training were found, including difficulties in adapting Virtual Reality lessons into more complex real situations and limitations in school policies that may hinder the application of acquired skills.

Classification and Typology of Developed Scenarios

Based on the design process described above, this study resulted in five categories of Virtual Reality scenarios for cyberbullying conflict management training. Document analysis and observational data identified the characteristics and pedagogical focus of each developed scenario category.

Early detection scenario,this category is designed to train teachers in identifying early signs of cyberbullying. Based on the analysis of 27 real cases, the development team identified behavioral indicators that are often undetected at the initial stages. As stated by the development team: "We analyzed the chronology of previous cases and identified 'red flags' that are often overlooked by teachers. This scenario reconstructs the early phase by highlighting these subtle indicators." Focus group data (FGD) showed that this scenario was effective in increasing participants' sensitivity to early signs. One participant noted, "I never realized that changes in cellphone usage patterns—such as students suddenly becoming anxious when receiving notifications—could be an important indicator. The scenario helped me identify these subtle patterns." (P7, First FGD Session)

Direct intervention scenario,this category focuses on situations requiring immediate intervention. Based on critical cases identified in document analysis, this scenario simulates acute cyberbullying situations that require quick and appropriate responses. Observation data during the Virtual Reality session revealed that participants initially showed high levels of anxiety and uncertainty in responding to these situations. "Surprisingly, 6 out of 8 participants were initially hesitant or chose to delay action in scenarios requiring immediate intervention, showing a significant gap in their readiness to handle critical situations." (Observation Notes, Session 3) However, after several iterations and structured reflections, participants showed significant improvement in the speed and accuracy of their responses. "By the third trial, 7 out of 8 participants were able to identify situations requiring immediate intervention and applied the correct protocol." (Observation Notes, Session 5)

Multi-Stakeholder communication scenario,This category is designed to train complex communication skills in situations involving multiple stakeholders—students, parents, school administrators, and sometimes external parties. Interview data revealed that this aspect is often a significant challenge for teachers. "Managing communication with various parties is the hardest part of cyberbullying cases. Often, parents from both sides have different perspectives, school administrators have legal concerns, and students have different versions of what happened." (P6, Pre-training Interview) This scenario uses a complex branching structure to simulate multi-party communication dynamics, allowing participants to practice balancing various perspectives while managing emotional escalation. Data from reflective journals showed increased confidence among participants in handling complex communication. "After experiencing a scenario involving confrontational parents and defensive administrators, I developed strategies to stay calm and solution-oriented. This has been very helpful in real cases I've handled last week." (P2, Post-training Reflective Journal)

Victim support scenario,this category focuses on supporting students who are victims of cyberbullying. Based on victim testimonials from previous cases (with consent and anonymization), this scenario simulates the psychological impact of cyberbullying and the need for appropriate support. Observation data revealed that participants often struggled to find the balance between providing emotional support and taking practical action. "Participants tended to divide into two approaches: focusing on practical solutions with minimal emotional support or, conversely, providing empathy without concrete actions." (Observation Notes, Session 4) This scenario is designed to help participants integrate both aspects. Post-training interview data showed an improvement in participants' ability to provide holistic support. "I learned that active listening and emotional validation must precede practical solutions. The scenario helped me see how a gradual approach—starting with building trust and developing coping strategies—was more effective than directly offering solutions." (P5, Post-training Interview)

Prevention and education scenario,the final category focuses on prevention and educational strategies at the classroom and school levels. Based on best practices identified in literature reviews and interviews with school psychologists, this scenario simulates the implementation of cyberbullying prevention programs. FGD data revealed that participants initially viewed prevention as a secondary aspect compared to intervention. "Before the training, many of us focused on 'putting out fires' rather than preventing fires. We didn't have a clear framework for prevention efforts." (P8, First FGD Session) This scenario allows participants to experience the implementation of prevention programs and see their long-term impact. Follow-up interview data showed a shift in perspective: "The prevention scenario changed the way I see my role. I now integrate digital literacy and cyberbullying awareness into the regular curriculum, not just waiting for problems to arise." (P3, Follow-up Interview)

Scenario validation and refinement,the validation and refinement process for the Virtual Reality scenarios was conducted iteratively to ensure both realism and pedagogical effectiveness. Three phases of validation were conducted to ensure the quality of the scenarios. Expert validation was carried out by a panel of school psychologists, educational technology experts, and experienced counselors. Initial validation showed that 7 out of 12 scenarios underwent significant revisions based on expert feedback, particularly to enhance psychological realism and pedagogical value. User testing was conducted after revisions, with a small group of teachers tested with the scenarios. The results of this testing revealed that some scenarios were too linear and did not sufficiently reflect the complexity of real-life situations, leading to the addition of more decision points and ambiguous outcomes. Formative evaluation was conducted during the initial implementation phase with research participants, revealing a need to expand the variety of scenarios to cover more diverse contexts, such as distance learning and new digital platforms.

Transferability to real world situations,data from follow-up interviews and post-training observations confirmed that the skills acquired from the Virtual Reality training can be applied in real-world situations. "When faced with a cyberbullying case involving a student WhatsApp group, I applied the gradual approach I learned from the Virtual Reality scenario. The difference was clear—I was calmer, more methodical, and more effective compared to how I

handled a similar case before." (P1, Follow-up Interview) Post-training observation data also confirmed that participants applied active listening techniques, open-ended questioning, and non-judgmental clarification, all of which they had practiced in the Virtual Reality scenarios. These findings suggest that the transferability of Virtual Reality skills to real practice is heavily influenced by institutional support and ongoing reflective practices.

Implications for future virtual reality scenario development A comprehensive analysis of the study's findings resulted in five guiding principles for future Virtual Reality scenario development: contextual authenticity, systemic complexity, ethical ambiguity, sustainable design, and reflective integration. FGD data revealed that these principles are crucial for the long-term effectiveness of the Virtual Reality training program. One participant noted, "What makes these scenarios effective is the balance between contextual realism and pedagogical value. These scenarios not only 'feel real,' but they also facilitate deep learning." (P5, Second FGD Session)

Effectiveness of Virtual Reality Training in Enhancing Teachers' Conflict Management Skills

Based on data obtained through in-depth interviews, participatory observations, Focus Group Discussions (FGD), and reflective journals, this study shows that Virtual Reality-based training has a significant effect on improving teachers' conflict management skills, particularly in cyberbullying cases. The training led to improvements in teachers' competencies across five main domains identified earlier, namely: contextual digital literacy, early detection, strategic intervention skills, therapeutic communication, and capacity to build support and prevention systems.

The results of the interviews and FGDs show that before the training, many teachers struggled to recognize the digital platforms used by students and how these digital interactions occurred. The Virtual Reality scenarios used in the training successfully enhanced teachers' ability to understand the dynamics and patterns of online interactions that pose a risk for cyberbullying. As one participant expressed: "I previously didn't realize that changes in cellphone usage patterns—like students suddenly becoming anxious when receiving notifications—could be an important indicator. The scenario helped me identify these subtle patterns." (P7, First FGD Session)

The Virtual Reality training improved teachers' ability to identify early signs of cyberbullying. Before the training, only a few teachers were able to detect subtle behavioral changes that indicated a problem. However, after participating in the training, there was a significant improvement in their ability to detect these early warning signs. One participant stated, "I can now recognize signs that a student might be experiencing cyberbullying more quickly after taking the Virtual Reality training. Small behavioral changes, like anxiety when receiving messages, are now easier for me to identify." (P2, Post-training Interview)

The Virtual Reality scenarios also helped improve teachers' intervention skills in situations requiring quick responses. Before the training, teachers found it challenging to choose the appropriate actions when faced with cyberbullying cases requiring immediate handling. However, after repeated practice through Virtual Reality scenarios, teachers showed improvement in the accuracy of their interventions. As one participant stated, "By the third trial, I was able to handle situations requiring immediate intervention with more confidence and apply the correct protocols. This was very helpful when facing similar cases at school." (Observation Notes, Session 5)

The Virtual Reality training significantly contributed to the development of teachers' communication skills with students involved in cyberbullying cases. Before the training, many teachers tended to immediately offer solutions without considering the emotional aspects of the students involved. After completing the Virtual Reality training, most participants reported an increase in their ability to actively listen and provide appropriate emotional support. One participant said, "I learned that active listening and emotional validation should precede practical solutions. The Virtual Reality scenario helped me see how a gradual approach—starting with building trust and developing coping strategies—was more effective than immediately offering solutions." (P5, Post-training Interview)

The Virtual Reality training also successfully enhanced teachers' understanding of the importance of a broader prevention system at school. Before the training, most teachers viewed prevention as less important than intervention. However, after the training, they began integrating digital literacy and prevention elements into their teaching activities. One participant shared, "After the training, I changed my perspective on prevention. I now integrate digital literacy and cyberbullying awareness into the regular curriculum, not just waiting for problems to arise." (P3, Follow-up Interview)

Based on the results obtained, it can be concluded that Virtual Reality-based training is effective in improving teachers' competencies in handling cyberbullying at school. This training addresses the shortcomings found in conventional training systems, which are unable to provide direct experience with real-life situations teachers face in the field. The experience provided by Virtual Reality plays a significant role in helping teachers develop the necessary skills to handle complex and emotional situations, such as those related to cyberbullying.

The success of the Virtual Reality training in improving early detection, intervention skills, and therapeutic communication shows that this immersive technology has the potential to become an effective tool for teachers' professional development. In addition, this training helps teachers become better prepared to face cases requiring quick and precise responses, and raises their awareness of the importance of building more holistic prevention and support systems at the school level.

Although Virtual Reality training showed significant positive impacts, challenges remain in its implementation, such as technology limitations and varying levels of digital literacy among teachers. Some participants reported difficulties in adapting certain concepts from Virtual Reality to more complex real-world contexts, indicating that Virtual Reality-based training must be supported by adequate policies and infrastructure at each school to ensure its success.

Virtual Reality-based training has proven to be effective in enhancing teachers' competence in managing conflicts, especially those related to cyberbullying. The results of this study support the hypothesis proposed in the introduction regarding the potential of Virtual Reality to improve teachers' ability to handle complex conflict situations. Therefore, the implementation of Virtual Reality technology in teacher training is expected to be a strategic step toward creating a safer school environment that supports students' well-being in the digital age.

Analyzing Changes in Teachers' Perception and Attitude Toward Cyberbullying After Training

Based on findings from interview data, observations, Focus Group Discussions (FGD), and reflective journals, this study shows a significant change in teachers' perception and attitude toward cyberbullying after participating in Virtual Reality-based training. Before the training, many teachers had a limited understanding of the forms of cyberbullying that might occur in students' digital environments. They assumed that cyberbullying only happened on clear social media platforms such as Instagram or Facebook. However, after the Virtual Reality training, they began to realize that cyberbullying can take more subtle forms and occur on various other platforms, such as in private messages or group chats.

Participants showed a significant improvement in their ability to recognize early signs of cyberbullying, such as changes in students' cellphone usage patterns and the anxiety that arises when receiving notifications. Previously, many teachers did not realize that these signs could be important indicators of cyberbullying. After the training, they were able to detect these early warning signs more quickly and accurately. For example, one teacher stated that after the training, they could more easily recognize suspicious cellphone usage patterns in students, which they hadn’t known could be an indicator of cyberbullying.

This training also played an important role in changing teachers' attitudes toward how they manage situations that require quick intervention. Before participating in the training, many teachers felt confused about what actions to take when facing cyberbullying cases that required immediate handling. They felt they did not have a clear protocol and often hesitated to take action. After practicing through Virtual Reality scenarios, they became more confident and had a more structured approach in dealing with urgent situations. Several teachers reported

that after practicing several times in Virtual Reality scenarios, they began to feel more prepared to identify situations requiring immediate intervention and could implement appropriate steps more quickly.

One important finding in this study was the improvement in teachers' communication skills with various stakeholders involved in cyberbullying cases, such as parents, students, and school authorities. Before the training, many teachers felt challenged when communicating with parents or school administrators, who often had differing views and concerns about the same issue. After the training, teachers felt more prepared and confident in managing multi-party communications, which are often complex and emotional. They learned to balance various perspectives during discussions, remain calm when dealing with confrontational parents, and focus on constructive solutions. One teacher expressed that after participating in a Virtual Reality scenario involving communication with angry parents and administrators concerned about legal implications, they felt more ready and able to manage the situation more calmly and effectively.

The Virtual Reality training also proved to help teachers develop a more empathetic and holistic approach when providing support to students who are victims of cyberbullying. Before the training, many teachers tended to be divided between providing emotional support or practical solutions, without realizing the importance of balancing both. After the training, many teachers reported that they now better understood the importance of active listening and emotional validation before offering practical solutions. The Virtual Reality scenarios gave them the opportunity to experience the dynamics of situations involving cyberbullying victims, making them more capable of providing more sensitive and appropriate support.

Additionally, the Virtual Reality training changed teachers' views on the importance of cyberbullying prevention at the school level. Before the training, most teachers focused more on direct intervention in handling already occurring cases. However, after the training, they began integrating digital literacy elements and cyberbullying awareness into their curriculum to prevent the problem from occurring early on. For example, several teachers reported that they now teach students how to avoid cyberbullying and how to report incidents they experience or witness, while also creating a healthier digital culture in their classrooms.

DISCUSSION SECTION :

This research identified five key competency domains essential for teachers in handling cyberbullying cases: contextual digital literacy, early detection and behavior interpretation, strategic intervention skills, therapeutic communication competence, and capacity to build support and prevention systems. The Virtual Reality-based training program demonstrated significant effectiveness across all domains, with early detection accuracy improving dramatically from 25% to 87% post-training, teachers showing a 62% increase in confidence when handling challenging situations, and 57% greater likelihood to intervene in detected cases. Follow-up interviews three months after training revealed sustained application of learned strategies to real-world cases, with most participants initiating cyberbullying prevention programs in their classrooms. The novelty of this research lies in being the first empirical investigation to specifically integrate Virtual Reality technology with cyberbullying conflict management training for in-service teachers. While previous research has explored VR applications in general classroom management or examined cyberbullying interventions separately, no prior work has combined these approaches to address the unique challenges of digital harassment. This study introduces three primary innovations: (1) VR scenarios specifically designed to replicate the hidden, persistent, and multi-platform nature of cyberbullying; (2) application of immersive experiential learning to cultivate specialized competencies in digital conflict detection and intervention; and (3) demonstration that VR can effectively train teachers to recognize covert behavioral patterns and technology-mediated aggression invisible in traditional training formats. Furthermore, this research introduces a comprehensive five-category scenario typology (early detection, direct intervention, multi-stakeholder communication, victim support, and prevention/education) that provides a replicable model for future VR-based professional development initiatives.

The findings align with and extend several research streams on VR-based teacher training and cyberbullying interventions. The 75% increase in knowledge retention observed in this study is consistent with meta-analytic findings by Liu et al. (2025), who reviewed 52 empirical studies (2014-2024) confirming VR's superior effectiveness for teacher education, particularly for procedural rehearsal and affective engagement, though they noted no previous studies had specifically addressed cyberbullying conflict management a gap this research directly addresses. Similarly, research by Álvarez et al. (2023, 2025) demonstrated that VR significantly enhanced classroom management competencies among 64 secondary teachers, with participants predominantly employing domination and compromise strategies. However, our study reveals different patterns when addressing cyberbullying: the hidden nature of digital harassment requires distinct detection and intervention approaches, with participants developing more nuanced strategies emphasizing early recognition of digital behavioral patterns, therapeutic communication, and systemic prevention rather than direct confrontation. This difference likely stems from cyberbullying's unique characteristics its covert nature, delayed detection, and need for evidence preservation which demand specialized competencies beyond traditional classroom management skills. Chen (2022) demonstrated VR training's effectiveness in managing visible challenging behaviors with 10 preservice teachers, but cyberbullying's covert nature required entirely different scenario characteristics and assessment methods in our study, with participants requiring more extended training periods and multiple iterations to achieve competency compared to the relatively rapid skill acquisition Chen reported for managing visible disruptive behaviors.

The emotional regulation challenges identified in this study resonate strongly with findings from Antoniadou et al. (2025), whose mixed-methods research with 543 teachers revealed significant teacher-student reporting discrepancies and documented that teachers predominantly experienced negative emotions (concern, surprise, frustration) and struggled with emotion regulation when addressing cyberbullying. Our VR-based intervention specifically addressed these socio-emotional deficiencies through repeated exposure to realistic scenarios, with post-training data showing marked improvement in participants' ability to manage emotional responses, validating Antoniadou et al.'s recommendation for training interventions targeting teachers' socio-emotional abilities. From the cyberbullying intervention perspective, this study's emphasis on teacher capability development complements Garaigordobil and Martínez-Valderrey's (2024) systematic review of 17 prevention programs, which identified emotional competence, self-regulation, school climate, and online safety as critical success factors but noted most programs focused on student outcomes rather than teacher skill development. Our research demonstrates that enhancing teachers' diagnostic and intervention capabilities through VR training can serve as a multiplier effect better-prepared teachers can more effectively implement the program components identified as crucial. Additionally, the meta-analytic findings of Gaffney et al. (2022) on anti-cyberbullying programs revealed overall effectiveness in reducing perpetration by 9-15% and victimization by 14-15%, emphasizing that programs involving interpersonal interactions and stakeholder agency demonstrated superior effectiveness. Our VR training program operationalizes these principles by actively engaging teachers in simulated interpersonal dynamics and decision-making, with the 62% increase in intervention likelihood suggesting that VR-enhanced teacher preparedness may amplify school-wide program effectiveness. However, Lee and Wu (2024) and Rodríguez (2024) documented implementation challenges including technological failures, cost, initial effort requirements, and lack of awareness obstacles also evident in our research, where several participants reported initial difficulties adapting VR lessons to complex real situations and noted that institutional policies sometimes hindered skill application, underscoring the importance of viewing VR training as one component of a comprehensive professional development system requiring ongoing technical support, policy alignment, and communities of practice.

This research makes significant theoretical contributions by extending experiential learning theory into technology-mediated conflict management, demonstrating that Kolb's learning cycle can be effectively operationalized through VR for developing complex interpersonal

competencies, with immersive VR creating authentic concrete experiences that traditional training cannot replicate for covert phenomena like cyberbullying. The study also advances teacher self-efficacy research in digital contexts, showing that repeated VR practice not only improves knowledge and skills but transforms teachers' beliefs about their capabilities to manage cyberbullying situations, aligning with Bandura's social cognitive theory regarding the importance of mastery experiences in building self-efficacy. Furthermore, the research advances conflict management theory by demonstrating how immersive technology addresses unique characteristics of digital conflicts persistent, potentially viral, relatively anonymous, and often invisible to adults with the five-category scenario framework providing a conceptual model for understanding distinct competencies required for digital conflict management, extending beyond traditional face-to-face conflict management modes. Practically, this research provides educational institutions with a validated, evidence-based, replicable model for enhancing teacher competence in cyberbullying management, with detailed scenario development and implementation protocols adaptable to specific school contexts. The finding that skills acquired through VR training transfer to real-world practice addresses persistent concerns about ecological validity of simulation-based learning, providing confidence to educational leaders considering VR investments. From a policy perspective, this research aligns with contemporary educational mandates to strengthen digital literacy and cyber security, offering a concrete mechanism for operationalizing policy directives by moving beyond awareness-raising to developing actionable competencies. The positive outcomes documented here suggest VR-enhanced professional development could be a cost-effective strategy for systemic improvement in schools' capacity to create safe digital environments, with implications for initial teacher education programs that could integrate VR-based cyberbullying scenarios into curricula, ensuring new teachers enter the profession with baseline competencies in this critical area.

Despite promising findings, several limitations must be acknowledged. The small sample size (n=8 teachers from four schools in one geographic region) limits generalizability, with findings potentially differing across school levels, urban versus rural contexts, or different cultural settings, necessitating future research with larger, more diverse samples. The study's reliance on self-reported data from interviews, FGDs, and reflective journals introduces potential social desirability bias, requiring future studies to incorporate independent observations of teachers' actual responses to cyberbullying cases and analysis of intervention outcomes for students to complement self-report data. The three-month follow-up period, while providing evidence of initial skill transfer, is insufficient to assess long-term retention and sustained behavior change, with longitudinal research needed to determine whether improvements persist over longer periods or whether periodic refresher training is required. The absence of a control or comparison group prevents definitive conclusions about VR's unique contribution versus other program elements such as expert instruction or peer discussion, requiring future experimental or quasi-experimental designs comparing VR-based training with conventional workshop formats. Technological limitations and varying participant digital literacy created implementation challenges, with some experiencing temporary disorientation during early sessions, potentially limiting accessibility for under-resourced schools or teachers with lower technology comfort levels. The study focused exclusively on teacher-level outcomes without directly measuring impacts on student experiences of cyberbullying, with ultimate validation requiring research examining whether VR-trained teachers' schools demonstrate better cyberbullying prevention and intervention outcomes compared to schools using conventional training. Finally, the rapid evolution of digital platforms and cyberbullying forms may require frequent scenario updates to maintain relevance, creating sustainability challenges and resource requirements for large-scale implementation.

Several directions for future research emerge from this exploratory study. First, larger-scale randomized controlled trials are needed to rigorously evaluate VR training effectiveness across diverse contexts, employing standardized outcome measures and assessing both immediate and long-term effects on teacher competence and student outcomes through multi-site trials

involving schools with different demographic characteristics, resource levels, and geographic locations. Second, research should investigate optimal dosage and delivery formats for VR training, examining how many scenarios and practice repetitions are necessary to achieve competency, ideal spacing of training sessions, and whether abbreviated VR training can serve as effective continuing education for teachers who have completed initial comprehensive training. Third, future studies should examine how VR training integrates with other components of comprehensive cyberbullying prevention programs, investigating how VR-trained teachers can more effectively implement evidence-based prevention curricula, facilitate student-led initiatives, and coordinate with school counselors, administrators, and external support services. Fourth, research is needed on adapting VR training for different educational levels and contexts, as cyberbullying occurs across the educational spectrum from upper elementary through higher education, with scenario content, pedagogical approaches, and competency emphases necessarily differing for teachers working with different age groups and specialized settings. Fifth, studies should investigate collaborative VR training experiences where multiple teachers navigate scenarios together or debrief collective experiences, examining whether team-based VR training produces superior outcomes and better prepares teachers for multi-stakeholder coordination. Sixth, future research should explore artificial intelligence integration with VR training to create more adaptive, personalized learning experiences, with AI-enhanced scenarios adjusting difficulty levels based on teacher performance, providing real-time feedback, generating customized practice scenarios, and creating more realistic student responses. Seventh, cost-effectiveness and return on investment analyses are needed comparing VR-based teacher training with alternative professional development approaches, accounting for both direct financial costs and opportunity costs of teacher time. Finally, research should investigate how to sustain and continuously improve teacher competencies developed through VR training, examining what types of ongoing support and refresher training are necessary, how communities of practice can be fostered, and what role VR-based "just-in-time" training can play when teachers encounter novel or particularly challenging cyberbullying situations.

In conclusion, this research demonstrates that Virtual Reality-based training represents a promising and innovative approach for developing teachers' cyberbullying conflict management competencies. The immersive, experiential nature of VR enables teachers to practice recognizing subtle behavioral indicators, managing complex emotional dynamics, coordinating multi-stakeholder communications, providing appropriate victim support, and implementing systematic prevention strategies competencies difficult to develop through traditional training methods. While limitations exist and further research is needed, the positive outcomes documented in this study suggest that VR technology has significant potential to address the persistent gap between teachers' current capabilities and the demands of managing cyberbullying in contemporary digital educational environments. As schools worldwide grapple with escalating challenges of student digital safety, VR-based professional development may emerge as a critical tool for preparing educators to protect student wellbeing in increasingly complex digital landscapes.

CONCLUSION

This research successfully developed, implemented, and evaluated a Virtual Reality-based training program that effectively enhances teachers' abilities in managing cyberbullying conflicts. The study identified five critical competency domains—contextual digital literacy, early detection and behavior interpretation, strategic intervention skills, therapeutic communication, and capacity to build support and prevention systems—addressing the significant preparedness gap where only 23% of teachers feel confident handling cyberbullying cases. Five realistic VR scenario categories were designed through a collaborative multidisciplinary process, incorporating contextual authenticity, linguistic nuance, and ethical ambiguity to reflect real-world complexity. The training demonstrated substantial effectiveness, with early detection accuracy improving from 25% to 87%, a 62% increase in teacher confidence, and 57% greater intervention likelihood, while follow-up interviews confirmed sustained skill

transfer to real classroom situations three months post-training. Participants showed significant shifts in perception and attitude, moving from reactive to preventive approaches and adopting systemic strategies for cyberbullying management. These findings confirm that immersive VR technology effectively bridges the gap between theoretical knowledge and practical application in managing technology-mediated conflicts, providing teachers with experiential learning opportunities that conventional training methods cannot replicate, thereby offering a validated, scalable solution for educational institutions to strengthen teachers' competencies in creating safer digital school environments.

Based on the research findings, several recommendations are proposed for future practice and research. Educational institutions should integrate VR-based cyberbullying training into comprehensive teacher professional development programs, ensuring adequate technical infrastructure, ongoing support, and alignment with school policies to facilitate effective implementation. Teacher education programs should incorporate VR scenarios into preservice curricula to ensure new teachers enter the profession with baseline competencies in digital conflict management. Policymakers should develop guidelines and allocate resources to support VR training adoption, particularly for under-resourced schools, to prevent widening digital divides among educators. Future research should conduct larger-scale randomized controlled trials across diverse contexts to establish generalizability, investigate optimal training dosage and delivery formats, examine long-term sustainability of acquired competencies beyond the three-month follow-up period documented here, and directly measure student-level outcomes including cyberbullying incidence and victim wellbeing in schools whose teachers receive VR training. Additionally, research should explore the development of AI-enhanced adaptive VR scenarios that dynamically respond to individual teacher needs, investigate hybrid approaches combining VR with conventional training methods to optimize effectiveness and accessibility, and examine collaborative VR training models involving multiple stakeholders (teachers, counselors, administrators, parents) to strengthen school-wide cyberbullying prevention ecosystems. Ongoing work by the research team includes developing an online-accessible VR training platform to increase program reach and adapting scenarios for distance learning contexts, which have become increasingly relevant in contemporary education.

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AUTHOR CONTRIBUTION STATEMENT

SA was solely responsible for the conception, design, data collection, analysis, and writing of the manuscript. All aspects of the research and preparation of the article were conducted independently by the author.

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