Virtual Reality-Assisted Historical Empathy-Based Multicultural Learning Model to Enhance High School Students' Empathy

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Abstract: Multicultural learning is widely used in high school history education. This study aims to determine the effectiveness of a historical empathy-based multicultural learning model (MHE), assisted by virtual reality, to enhance student empathy. The research was conducted using the Research and Development (R&D) method with the Borg and Gall development model, consisting of ten steps. Data collection instruments included interviews, questionnaires, tests, observations, and Focus Group Discussions. Data analysis involved examining product validity, practicality, and effectiveness. The results showed that the final assessment of the MHE learning model obtained a content validity percentage of 93.40% and a construct validity percentage of 92%. The final assessment of the teaching module achieved a rate of 93.39%. The final assessment of the virtual reality learning media obtained a percentage of 92.10%. Thus, the learning models, textbooks, teaching modules, and virtual reality learning media are declared "Very Valid" and "Suitable for Use." The MHE multicultural learning model makes a significant contribution to future educational research by providing a deeper understanding of the history, culture, and life experiences of diverse community groups.

INTRODUCTION

One of the reasons for the multicultural communities in Lampung is the colonization system, which led to transmigration. This multicultural situation has both positive and negative impacts (Suharsono, 2017). The negative impact manifests as intolerance in various sectors, including religion, politics, and education (Arphattananon, 2018; Jeevanantham, 2001). Lampung is one of the regions in Indonesia known for its ethnic diversity. However, this multi-ethnic composition sometimes leads to conflicts due to social jealousy (Khoiriyah, Fahri, Bramantio, 2019; Zain, 2014). To overcome these problems, empathy must be demonstrated through actions. Crucial first steps include inter-ethnic dialogue, the promotion of tolerance, and education that fosters cross-cultural understanding. These measures can help minimize conflicts arising from social jealousy and promote inter-ethnic harmony.

The life of the people of Lampung is deeply influenced by the colonization era and the transmigration period, which have created a rich cultural and historical diversity in the region. This historical experience can undoubtedly enrich the nation's life in both the present and the future (Amboro, 2015). Colonization and transmigration have fostered a sense of collective identity, leading to what is known as historical empathy—a shared
understanding and empathy for the community's past experiences (Endacott & Brooks, 2013). Historical empathy involves students' cognitive and affective engagement with historical events to better understand and contextualize life experiences, decisions, and actions within current historical and social contexts. This form of empathy is expected to foster a deep knowledge of historical contexts and figures, helping to overcome conflicts and promote unity and prosperity (Alpargu & Sahin, 2009).

Based on Oktaviani’s research in 2022, historical empathy is not yet integrated into the learning process, which impacts students, making them socially apathetic. Conventional learning models are often less effective in teaching students about multiculturalism and building empathy for individuals from different cultural backgrounds (Oktaviani, 2022). This issue also affects high school students in Bandar Lampung City. Researchers conducted a pre-study in four schools, revealing that 55% of students felt that history lessons had not fully integrated historical empathy for historical figures and events. Various studies indicate that immigration contributes to the diversity of an area, impacting education in schools (Hogan, 1969; Labibatussolihah, Adriani, Fathiraini, & Sumirat, 2022).

Historical empathy encourages students to form moral judgments and address ethical issues, such as those arising in multicultural community life. Additionally, it helps learners internalize enduring understandings related to historical themes (Perdana et al., 2019). Alternative learning models are needed to interpret historical figures and events through a multicultural lens, enhancing students' cognitive development and fostering affective empathy. History learning plays an essential role as one of the subjects that shape students' character (Umami et al., 2022).

The syntax of the multicultural learning model, based on historical empathy, becomes more engaging when presented through Virtual Reality (VR) media. VR technology provides an immersive learning experience that allows students to explore history from the perspective of different cultures. The advantages of using VR learning media include real-time 3D virtual environments and human interface devices that enhance user engagement (Fathurohman & Zaliluddin, 2022; Raza & Komala, 2020).

Although there are several studies on the use of VR in educational contexts, research explicitly considering the effect of multicultural learning models based on historical empathy in Lampung with the help of VR on increasing cognitive and affective empathy of high school students in Lampung is still limited. This aligns with previous research indicating that developing teaching materials or history lesson modules that are engaging and avoid monotony, coupled with advancements in modern science and technology, is crucial (Putri & Firmansyah, 2022). The primary goal of using multicultural learning models based on historical empathy with the help of VR in high school environments is to enhance cognitive empathy (the ability to understand others' perspectives) and affective empathy (the ability to feel others' emotions).

Based on the identified problems and gap analysis, this study addresses two main issues: (1) How can a multicultural learning model, integrating historical empathy and leveraging virtual reality media, be developed to enhance cognitive empathy and affective empathy among high school students? (2) How feasible is this model in achieving its objective of increasing high school students' cognitive and affective empathy? The specific objective of this research is to promote tolerance among students in diverse school and community settings. Aligned with the national education development
program, Education for Sustainable Development (ESD), this study operates within the framework of educational research focused on social humanities and cultural arts. By innovatively integrating historical empathy with VR technology in educational models, our aim is to enrich multicultural education in high schools, fostering mutual understanding, tolerance, and harmony among students.

**METHOD**

The research methodology employed in this study is Research and Development (R&D) (Oktapiroka, 2023). R&D is a research method used to create a specific product and evaluate its effectiveness. The development model referred to in this study follows the development model proposed by Borg and Gall (Borg & Gall, 2003).

This development model consists of ten stages of research. The first stage involves collecting research information to determine learning needs and understand initial conditions, forming the basis for research development planning. Following this, researchers engage in systematic and comprehensive planning, including defining learning objectives, structuring modules, and selecting teaching methods.

In the third stage, researchers develop the prototype of the product. Here, they create the initial draft of the VR-based learning module based on previous research findings and the planned objectives. Subsequently, a Preliminary Field Test is conducted to conduct an initial evaluation of the module draft, identifying areas for improvement. The main product then undergoes revision based on feedback received during the preliminary stage.

This study employs a structured Research and Development (R&D) approach involving several stages to develop VR-based learning modules and media aimed at enhancing students’ cognitive empathy and affective compassion. The process begins with data collection, including needs assessment, literature review, small-scale research, and value considerations.

The initial focus of this R&D is on the history of Western colonization in Lampung, Indonesia. Based on the gathered research and data, a detailed product plan is formulated, outlining objectives, model usage, user profiles, components, and the integration of multicultural learning models with VR technology. This study aims to produce...
two main products: learning models and VR applications for educational purposes.

Data collection techniques include expert assessments through assessment questionnaires validated by five validators each for learning models, module books, and learning media. Observations and structured interviews with history teachers provide further insights, complemented by documentation from the research site.

Both qualitative and quantitative data analysis techniques are employed. Descriptive statistical analysis processes questionnaire data to evaluate the feasibility and effectiveness of learning models, modules, and VR-based learning media. The development of learning models and VR applications follows the 2013 Curriculum guidelines, with evaluation instruments designed and refined through expert trials to ensure validity.

Operational field testing assesses the effectiveness of the developed products in real educational settings. Analysis includes evaluating students' empathetic attitudes and comprehension of the material, as well as measuring the impact of multicultural learning models and VR-based learning media on affective compassion and cognitive empathy. Final revisions are made based on insights gained from operational testing, ensuring that the products are ready for dissemination and implementation in educational settings.

RESULT AND DISCUSSION

Initial Product Development

The development in this research is implemented through several stages. The preliminary study stage begins with identifying and analyzing problems based on literature reviews and field studies related to multicultural learning, student historical empathy, and historical learning media. Literature studies aim to gather relevant information by systematically reviewing theories and previous research. VOSviewer software is utilized to map the network of relationships among countries, affiliations, and authors in the field of multicultural education.

Field studies are conducted to collect empirical data that complement the literature review. To address issues related to suboptimal historical empathy in history education, a preliminary study was conducted in four schools in Bandar Lampung City: YP Unila High School, MAN 1 Bandar Lampung City, N 15 High School, and N 17 Bandar Lampung City. A survey method using Google Forms was employed, reaching 136 students. Findings from questionnaires and interviews with four history teachers revealed a consensus on the need for improved historical empathy in history education. The emphasis on traditional teaching methods and the lack of innovation in history education were identified as key challenges. Teachers often struggle to integrate historical narratives with contemporary social issues, hindering students from deriving meaningful insights from history.

Addressing historical empathy is crucial for achieving educational goals that promote tolerance across diverse ethnic, linguistic, religious, cultural, and socioeconomic backgrounds. Improved learning models are needed to engage students more effectively with historical content and its relevance to contemporary society (Gehlbach, 2004; Morrell, 2007).

To enhance students' historical empathy, alternative approaches are essential to present historical learning in a more engaging and comprehensible manner. One effective solution involves developing a historical learning model tailored to students' environments, ensuring relevance and accessibility to historical events' meanings (D’Adamo & Fallace, 2011; Okur-Berberoglu, 2015). The multicultural nature of Lampung's society also serves as a foundational consideration for integrating historical materials into a multicultural learning model (Conner & Graham, 2023).
The discussion on integrating educational dimensions into multicultural learning through historical empathy leads us to Table 1, which outlines the stages involved in developing the Multicultural Learning Model based on Historical Empathy (MHE).

<table>
<thead>
<tr>
<th>Multicultural Education</th>
<th>MHE Learning Model</th>
<th>Historical Empathy</th>
</tr>
</thead>
<tbody>
<tr>
<td>Content integration</td>
<td>Inquiry content contextual history</td>
<td>Historical contextualization</td>
</tr>
<tr>
<td>Knowledge construction</td>
<td>Recontruction</td>
<td>Affective connection</td>
</tr>
<tr>
<td>An equity pedagogy</td>
<td>Learning community</td>
<td>Perspective taking</td>
</tr>
<tr>
<td>Prejudice reduction</td>
<td>Verification</td>
<td></td>
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<tr>
<td>An empowering school culture</td>
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</tbody>
</table>

Table 1 illustrates the progression of integrating educational dimensions into multicultural learning through the elements of historical empathy. This framework encompasses several stages aimed at conceptualizing the Multicultural Learning Model based on Historical Empathy (MHE). The model, depicted in Figure 2, unfolds across five distinct steps.

Figure 2 illustrates the interconnected stages of the Multicultural Learning Model based on Historical Empathy (MHE), facilitating continuous learning. The Virtual Reality Media-Assisted MHE learning model is structured into five stages: Inquiry, Contextual History, Reconstruction, Learning Community, Verification, and Shared Perspective. The development of the Virtual Reality-Assisted MHE learning model incorporates five essential components: syntax, social system, reaction principle, support system, and instructional impact.

Furthermore, the design of the cover for the multicultural learning model book is illustrated in Figure 3(a). The MHE learning model is enhanced with the assistance of Virtual Reality learning media tailored to the learning material's content. The objective is to enable students to fully interpret each historical event through virtual presentations. Below is an overview of multicultural history learning media supported by Virtual Reality. The display of Virtual Reality learning media can be seen in Figure 3(b).
Figure 3. Product Design.

Product Validation

All designed products undergo validation by experts, involving a total of five validators for the models, five for the module books, and four for the learning media. The validation of the model book focuses on content validation and construct validation to assess the quality of the developed learning model product. Product development refers to the specific characteristics and indicators of each component. The validation data are presented in Table 2 and Table 3.

Table 2. Content Validity Results.

<table>
<thead>
<tr>
<th>No</th>
<th>Assessed Aspects</th>
<th>Validators</th>
<th>Average</th>
<th>%</th>
<th>Decision</th>
</tr>
</thead>
<tbody>
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<td></td>
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<td>I</td>
<td>II</td>
<td>III</td>
<td>IV</td>
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<tr>
<td>3</td>
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<td>18</td>
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<td>19</td>
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<td>8</td>
<td>Instructional impact</td>
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<td>33</td>
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<td>Instructional impact</td>
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<td>15</td>
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Model feasibility: SUI SU SU SU SU

Information: Suitable for Use (SU); Suitable for Use with Improvement (SUI); V (Valid)

Table 3. Construct Validity Results.

<table>
<thead>
<tr>
<th>No</th>
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<th>Validators</th>
<th>Average</th>
<th>%</th>
<th>Decision</th>
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<tbody>
<tr>
<td></td>
<td></td>
<td>I</td>
<td>II</td>
<td>III</td>
<td>IV</td>
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<td>9</td>
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<td>MHE model syntax</td>
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<td>14</td>
<td>14</td>
<td>14</td>
</tr>
<tr>
<td>4</td>
<td>Social system</td>
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<td>23</td>
<td>22</td>
<td>23</td>
</tr>
<tr>
<td>5</td>
<td>Reaction principle</td>
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<tr>
<td>6</td>
<td>Support system</td>
<td>13</td>
<td>14</td>
<td>14</td>
<td>14</td>
</tr>
<tr>
<td>7</td>
<td>Instructional impact</td>
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<td>14</td>
<td>14</td>
<td>14</td>
</tr>
<tr>
<td>8</td>
<td>Model quality</td>
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<td></td>
<td>Total</td>
<td>115</td>
<td>120</td>
<td>117</td>
<td>120</td>
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</table>

Model feasibility: SUI SU SU SU SU

Information: Suitable for Use (SU); Suitable for Use with Improvement (SUI); V (Valid)
Based on the content feasibility results, four validators stated that the multicultural learning model based on historical empathy (MHE) was "Suitable for Use (SU)", and one validator stated it was "Suitable for Use with Improvement (SUI)". For the construct assessment, three validators declared it "SU" and two stated "SUI". The final assessment results indicated that the MHE learning model achieved a content validity percentage of 93.40% and a construct validity percentage of 92%. Consequently, the MHE learning model is deemed "Valid" and "Suitable for Use".

Similar to the learning model, the textbook also undergoes a validation process before use. Five validators assess aspects such as language, presentation, the impact of the teaching modules on MHE models, and overall design. All validators stated that the teaching modules are suitable for use. The following are the results of the expert assessments of the teaching modules.

Table 4. Recapitulation of Teaching Module Validity Assessment.

<table>
<thead>
<tr>
<th>No</th>
<th>Assessed Aspects</th>
<th>Validators</th>
<th>Average</th>
<th>%</th>
<th>Decision</th>
</tr>
</thead>
<tbody>
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<td>95.0</td>
<td>V</td>
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<td>2</td>
<td>Presentation aspect</td>
<td>I II III IV V</td>
<td>32.2</td>
<td>92.0</td>
<td>V</td>
</tr>
<tr>
<td>3</td>
<td>Teaching module effect on MHE Model</td>
<td>I II III IV V</td>
<td>22.8</td>
<td>91.2</td>
<td>V</td>
</tr>
<tr>
<td>4</td>
<td>Comprehensive view</td>
<td>I II III IV V</td>
<td>28.4</td>
<td>94.7</td>
<td>V</td>
</tr>
<tr>
<td>5</td>
<td>Quality of teaching modules</td>
<td>I II III IV V</td>
<td>4.8</td>
<td>96.0</td>
<td>V</td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>I II III IV V</td>
<td>107.4</td>
<td>93.4</td>
<td>V</td>
</tr>
</tbody>
</table>

Model feasibility SU SU SU SU SU

Information: Suitable for Use (SU); Suitable for Use with Improvement (SUI); V (Valid)

Based on the results of content eligibility, all five validators declared the teaching module "Suitable for Use (LD)". The final assessment results showed that the teaching module achieved a content validity percentage of 93.39%. Therefore, the teaching module book is considered "Valid" and "Suitable for Use".

In addition to learning models and teaching module books, virtual reality learning media also undergo a validation process before use. Four validators assessed aspects such as presentation content, display design, media usage, and overall learning media quality. All validators stated that the virtual reality learning media is suitable for use.

Table 5. Recapitulation of Learning Media Validity Assessment.

<table>
<thead>
<tr>
<th>No</th>
<th>Assessed Aspects</th>
<th>Validators</th>
<th>Average</th>
<th>%</th>
<th>Decision</th>
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<tbody>
<tr>
<td>1</td>
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<td>92.0</td>
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<td>Display design aspect</td>
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<td>Media use aspect</td>
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<td>V</td>
</tr>
<tr>
<td>4</td>
<td>Quality of learning media</td>
<td>I II III IV V</td>
<td>4.8</td>
<td>95.0</td>
<td>V</td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>I II III IV V</td>
<td>87.5</td>
<td>92.1</td>
<td>V</td>
</tr>
</tbody>
</table>

Model feasibility SU SU SU SU

Information: Suitable for Use (SU); Suitable for Use with Improvement (SUI); V (Valid)

Based on the results of content eligibility, all four validators declared the virtual reality learning media "Suitable for Use (SU)". The final
assessment results showed that the virtual reality learning media achieved a content validity percentage of 92.1%. Therefore, the virtual reality learning media is considered "Valid" and "Suitable for Use".

Multicultural learning plays a vital role in shaping a deep understanding of a nation’s history and culture. Globalization and technological advances have significantly changed the scope, concept, and goals of socially responsible education systems (Moghadam et al., 2023; Oliveri & Markle, 2017). One approach to achieving this is the Multicultural Learning Model Based on Historical Empathy (MHE) supported by virtual reality (VR) media. This approach fosters learner-centered and strategy-oriented learning, incorporating examples such as virtual reality (VR), augmented reality (AR), and the Internet of Things (IoT) (Alkhabra et al., 2023; Jesionkowska et al., 2020). Historical empathy skills are essential in developing students’ historical understanding (Savenije & de Bruijn, 2017). Empathy is part of the social attitudes developed in Indonesia’s secondary school curriculum (Susanto & Purwanta, 2022). The success of teachers in learning history is determined by several factors, namely the application of strategic methods and the use of media in learning (Laila et al., 2021). Some scholars also argue that historical viewpoints can contribute to citizenship in multicultural societies because they promote recognition and understanding of the views of others (Barton, 2012; Heyer, 2003; Rusen, 2004).

Integrating Lampung’s local wisdom in the learning model emphasizes recognition and respect for traditional values, history, and local culture. Learning Lampung’s local wisdom through VR allows students to experience how these values are reflected in everyday life. This not only enhances students’ cognitive understanding of local wisdom but also stimulates the formation of affective empathy for their cultural heritage. Implementing a learning process integrated with local wisdom can positively impact students, such as improving their higher-order thinking (Abidinsyah et al., 2019; Dewi et al., 2017; Wahyuni, 2016). Additionally, learning based on local wisdom can encourage the improvement of effective learning outcomes, attitudes, and innovations (Pamungkas et al., 2017; Yanti et al., 2022)

The final assessment of the Multicultural Learning Model based on Historical Empathy (MHE) indicated a content validity percentage of 93.4% and a construct validity percentage of 92%. These figures reflect the high quality of the learning model, demonstrating that MHE can provide a solid foundation for understanding history and culture effectively. The teaching module developed for this learning approach received an excellent assessment, with a final percentage of 93.4%. This module is crucial for conveying information to students in an engaging and effective manner. These results confirm that integrating the Historical Empathy approach into the teaching module can stimulate student interest and engagement, making the learning material more compelling. However, some experts have noted that the implementation of empathy aspects in textbooks can sometimes be confusing (Endacott & Brooks, 2018). Three criteria can be used as a reference in developing textbooks to train historical empathy independently by students: 1) presentation of clear and relevant textual and contextual perspectives, 2) use of primary narratives according to historical context, and 3) narratives...
containing sympathetic imagination (Morgan, 2015; Thexton et al., 2019). Such criteria allow students to think reflectively.

In the context of virtual reality learning media, the final assessment results reached a percentage of 92.10%, showing the effectiveness of using VR technology in presenting immersive learning experiences. Developing a learning model based on Lampung’s local wisdom by utilizing VR media is an innovative step that can strengthen the values of Historical Empathy in high school students. Appreciation of past, present, and future relationships makes students better characters (Rani, 2022). Every step they take is guided by consideration in choosing positive values that they have understood (Fahruddin, 2020). In this context, Lampung’s local wisdom is the foundation for linking local history and culture with a more profound learning experience through VR.

The high assessment results on MHE learning models, teaching modules, and VR learning media create a solid foundation for applying local wisdom in the curriculum. VR technology allows students to experience firsthand the historical and cultural situations they are studying, increasing engagement and deepening their understanding. Thus, VR learning media is a very effective tool for delivering subject matter innovatively. With positive assessment results, this learning model, teaching module book, and VR learning media can be regarded as "Valid" and "Suitable for Use." This success illustrates that an approach integrating historical empathy with the help of VR technology has great potential to improve students' cognitive understanding of history and culture and develop their affective empathy towards different social realities. Thus, this approach can be an essential foundation in producing a generation of students who are more open, tolerant, and full of empathy for the diversity of cultures and world history.

The gap analysis of previous research into developing a virtual reality-assisted Multicultural Learning Model based on Historical Empathy (MHE) highlights several aspects related to student empathy. Firstly, existing studies predominantly explore how the MHE learning model impacts students' understanding of history and tolerance, but few specifically measure its influence on empathy levels. Secondly, research integrating virtual reality technology into MHE learning is still limited, necessitating further investigation into its potential to effectively enhance student empathy. Additionally, there is a need for deeper exploration into implementation strategies and factors affecting the effectiveness of virtual reality-assisted MHE learning models to identify gaps in their development and implementation.

Research on developing multicultural learning models based on Historical Empathy (MHE) assisted by virtual reality introduces novelty in several aspects. This study expands the application of virtual reality technology in multicultural education, particularly in enhancing student empathy. By integrating virtual reality into the MHE model, this research contributes to the development of more engaging and effective learning approaches aimed at fostering students' tolerance and respect for diversity. Furthermore, this study aims to deepen understanding of how virtual reality experiences can impact students' empathy levels, an area that has been underexplored in previous research. Therefore, this research is poised to bridge the gap in knowledge regarding the influence of virtual reality technology on the development of student empathy. Additionally, practical
aspects such as technology availability, school and teacher support, and student reactions to virtual reality use in learning will be carefully examined in this study. When comparing the ideal conditions for developing a multicultural learning model based on virtual reality-assisted Historical Empathy (MHE) with the actual situations encountered, several differences become apparent that need to be addressed. In theory, ideal conditions involve leveraging virtual reality technology to enable students to directly experience historical and cultural perspectives, thereby enhancing their empathy and understanding. This model is also expected to reach students from diverse backgrounds and mitigate stereotypes and prejudices. However, in practical field settings, various challenges emerge. These include limited access to virtual reality technology, readiness among teachers to implement this model, and aligning content with curriculum requirements and student needs. Additionally, ensuring that virtual reality technology not only engages students but also effectively achieves learning objectives poses another significant challenge. To bridge the gap between ideal conditions and reality, concerted efforts are necessary. This includes providing teachers with sufficient resources and training, as well as developing content that is relevant and adaptable to students' diverse needs. Addressing these challenges will be crucial in realizing the potential of virtual reality-assisted MHE models in multicultural education.

CONCLUSION

The conclusion of this study underscores the success in developing a multicultural learning model based on historical empathy (MHE) with the assistance of virtual reality. By following the steps outlined in the Borg and Gall development model, the study meticulously detailed the process of creating, validating, and evaluating learning models, teaching modules, and virtual reality learning media. High percentages in content validity, construct validity, and product feasibility indicate that the MHE learning model and its associated aids meet established needs and standards. The assessment results, with content validity reaching 93.4%, construct validity at 92% for the MHE learning model, 93.4% for teaching modules, and 92.1% for virtual reality learning media, highlight the robust quality of the developed products. These high validity and feasibility scores strongly support the effectiveness of the MHE learning model in enhancing students' historical understanding and empathy. The study underscores the importance of integrating multicultural learning, particularly in history education at high schools, as evidenced by these results. The MHE learning model effectively enhances students' grasp of history and fosters empathy towards racial, ethnic, and cultural diversity in Indonesia. This positive impact contributes significantly to shaping students' character and fostering tolerance for future generations.

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