MOJES MALAYSIAN ONLINE JOURNAL OF EDUCATIONAL SCIENCES JANUARY 2023, 11 (1)

PRIMARY SCHOOL PUPILS' PERCEPTION OF VR TECHNOLOGY IN DEVELOPING INTERCULTURAL COMMUNICATIVE COMPETENCE IN THE MANDARIN AS A SECOND LANGUAGE (MSL) COURSE

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ABSTRACT

Virtual reality has been found of great potential to develop intercultural communicative competence and as an effective tool to incorporate intercultural learning principles into engaging lessons in second language education. In this study, Intercultural Communicative Competence Virtual Reality (IC2VR) is a module that employs VR technology to promote ICC among primary school pupils. The study aims to investigate Year 5 pupils' perceptions of the use of VR technology in developing ICC in the Mandarin as a Second Language (MSL) course. A group of 32 pupils who were enrolled in the MSL course were selected from two different national schools to participate in this study. A survey questionnaire was developed to identify the pupils' technology usage and the pupils' learning experiences of the use of VR technology throughout the ICC development effort in the MSL course. Statistical analysis was conducted to analyse the data and presented as frequencies and percentages in tables. Responses from the open-ended question were gathered, coded and organised into themes. General findings were that majority of the pupils were first-time VR users and they had positive perceptions towards VR technology. The study revealed that the pupils were comfortable with VR technology used in the MSL course. It also indicated that VR technology brings enjoyable lessons to pupils and increases their interest in obtaining new cultural knowledge. This study will benefit policy makers, teachers, instructional designers, and pupils in an effort to understand pupils' perception of VR technology and how it impacts the development of pupils' ICC in MSL classes.

Keywords: *VR Technology, Perception, Mandarin as a Second Language*

INTRODUCTION

Intercultural Communicative Competence, ICC, is gaining popularity in the field of foreign language teaching and learning. ICC has been incorporated into foreign language education in a number of countries. The significance of ICC has been emphasised by the American Council on the Teaching of Foreign Language ACTFL (2017) in the National Standards for Language Learning in the 21st Century; The Common European Framework of Reference for Languages: Learning, Teaching and Assessment (CEFRL) from Council of Europe (2001) and Language and Cultures in Europe (LACE) from European Union (1997). The goal of implementing ICC in foreign language is to provide learners with the communication skills they need to communicate effectively across linguistic and cultural boundaries in multicultural and multilingual countries.

Malaysia is a multiracial country with a multilingual and multi-culture community. The Ministry of Education aims that by 2025, every student will be able to communicate in at least one additional language aside from Bahasa Malaysia and English (Ministry of Education, 2013). The Ministry continues to promote additional language lessons in national primary schools to meet the Ministry's goal of continuing to provide opportunities for every student to learn an additional language from primary to secondary school. Hence, many pupils in national primary schools have been offered the opportunity to study additional languages like Mandarin, Tamil, Arabic starting from the primary school level.

ICC helps pupils to learn the targeted languages by preparing them to communicate by building a cultural repertoire with native speakers as well as language speakers from various cultural backgrounds (Byram, 1997). For example, when learning Mandarin, pupils may also learn about Chinese culture. Learning another language leads to a better understanding of the target language's culture, as language and culture are intrinsically linked and cannot be separated (Deardorff, 2006; Kramsch, 1993; Liddicoat, 2001). Knowing Chinese taboos and customs is significant as it can assist to improve awareness and avoid conflicts while communicating with people from Chinese backgrounds. Hence, they will be able to converse effectively with Chinese friends or any Mandarin speaker such as colleagues and acquaintances.

Malaysian pupils who are studying Mandarin as a Second Language (MSL) at national primary schools seem to have various learning issues that need to be resolved including lack of motivation to learn MSL, a lack of Mandarin communication skills and a lack of exposure to Chinese culture. Teachers who intend to introduce Chinese cultural places by organising field trips are facing difficulties as a result of complexities through procedures for obtaining permission from the authority, logistics in planning, and pupils' safety. However, virtual reality (VR) allows students to be immersed in a target language culture environment, by providing a platform for them to perform culturally appropriate exercises that were previously only available through travel (Kessler, 2018). VR has been shown to provide students with an immersive experience, which is safer and more descriptive compared to the conventional instruction (Hamilton et al., 2021). Hence, immersive cultural experiences based on virtual reality appear to be more effective in inspiring students to learn ICC, which is important in Malaysia's multicultural society.

LITERATURE REVIEW

The concept of virtual reality (VR) was established in the 1960s, and the first commercial VR tools were introduced in the late 1980s (Cipresso et al., 2018). Virtual reality (VR) is often depicted as a medium similar to the telephone or television. Computers, head-mounted displays, headphones, and motion-sensing gloves are frequently used to define this new medium (Steuer, 1992).

Virtual reality (VR) is a popular term for an immersive, interactive, computer-mediated experience in which people perceive a simulated world using the human-computer equipment interface (Mkdadi, 2019). Zhang and Tan (2019) defined the main characteristics of VR into four aspects, namely perception, immersion, interactivity and authenticity. Immersion allows users to become completely immersed in the scene and engage with the lifelike virtual environment. A Virtual Reality (VR) environment, according to general perception, is one in which the user is completely immersed in and able to interact with a completely artificial reality (Milgram & Kishino, 1994). According to Dalgarno and Lee (2010), the 3D virtual environment's unique learning affordances (enhanced representation of spatial information, increased incentives for experiential learning, increased motivation or engagement, enhanced learning contextualisation and richer or efficient collaborative learning than with 2-D alternatives) lead to potential benefits. Several studies have recently been conducted in different countries to investigate the benefits of VR 360 simulation in educational settings at all levels. VR technology is becoming increasingly popular in higher education, particularly in social work education (Lanzieri et al., 2021), medical education (Zhao et al., 2020), food technology education (Gorman et al.,2021) and others. Some of the primary and secondary schools used VR technology to teach science (Liu et al., 2020), physical education (Lee & Lee, 2021) and foreign language (Repetto et al, 2020). However, there have not been many studies conducted in Malaysia regarding VR.

There were various instances of early employment of new technologies in intercultural learning. According to Bylth (2017), it was initialized with "Internet-mediated Intercultural Foreign Language Education" (Belz & Thorne, 2006). Due to the development of intercultural communicative competence (Byram, 1997), telecollaboration has become one of the primary foundations of the intercultural approach in foreign language education (Thorne, 2006). Telecollaboration is an application of online communication tools to gather learners from different cultural backgrounds and different countries to develop their foreign language skills as well as intercultural competence through collaborative tasks and project work (O'Dowd, 2012).

In the earlier days, computer-mediated communication (CMC), such as e-mail, online discussions, and blogging, begin to be used in enhancing intercultural communication since it allows person-to-person interaction without regard for space or time constraints. In Taiwan, Hsu and Beasley (2019) conducted a study to identify the computer-mediated communication (CMC) perceptions and attitudes towards intercultural competence among students from the USA and Taiwan with English as a foreign language (EFL) of local (Taiwanese) university students. The pedagogical design of using CMC in intercultural activities was a success. Hence, past research has demonstrated that technology can be employed to enhance intercultural learning in the second language classroom.

In the twenty-first century, emerging technologies will continue to increase opportunities for the development of intercultural communication and foreign language learning (Blyth, 2017). Educators must have innovative ways of building interesting learning environments for students if they wish to improve learning and prepare students for a multicultural world. Various studies have indicated that VR has the ability to make learners aware of the cultural differences by transporting the knowledge into an immersive target language culture experience. Authenticity aspects of VR technology incorporate real-life scenes and objects into the virtual world and give users a more immersive experience through the best production of finest visual effects (Zhang & Tan, 2019). VR technology allows the learner to experience, explore, and practice culturally appropriate tasks in ways that would previously only be possible by traveling (Kessler, 2018). VR technology may create a realistic language learning environment for second language learners and its tactile interaction technology can significantly increase learners' learning efficiency.

In China, VR technology has recently been used to teach Mandarin as a foreign language (Zhang & Tan, 2019). The findings of the results revealed that VR technology provides great support for technological and novel instruction in Mandarin as a second language classroom, resulting in increased language proficiency. Although virtual reality technology can compensate for the lack of realistic training settings in the teaching of Mandarin as a second language, it cannot significantly improve learners' Mandarin skills in the short term (Zhang & Tan, 2019). Another study found that a Mandarin language system based on VR technology had a less immediate impact on learners' performance and the influence took longer to manifest (Vazquez et al., 2018). Therefore, the VR technology must be integrated with instructional methodology, second language acquisition principles and a well-designed lesson plan.

In the Malaysian context, research in the area of ICC instruction associated with the immersive learning environment in primary school is limited. DeWitt et al. (2022) discovered that MSL students in higher education institutions which have low levels of ICC and VR has the potential to improve students' ICC when they are engaged in producing their own immersive VR environments. Therefore, VR should be investigated to see if it can be utilised to develop ICC and engage Malaysian primary students. For this study, it aims to identify the perception of primary school pupils in using VR technology for the development of ICC.

METHODOLOGY

Research Design

The study conducted a survey questionnaire. The instrument used was the "Pupils' Perception of IC2VR Survey Questionnaire" which was designed to examine the perception of the pupils regarding the use of VR technology in developing ICC in the MSL course. The instrument was validated and verified by experts. A pilot test was conducted to investigate the usability of the instrument and to identify practical implementation issues rather than problems with the survey design. All responses were checked to avoid evidence of response bias. The internal consistency of each questionnaire was checked using Cronbach's alpha (see Table 1). The values in each dimension ranged from 0.846 to 0.872, which demonstrated satisfactory reliability.

Table 1
Reliability Statistics for Pupils' Perception of IC2VR Survey Questionnaire

	Cronbach's Alpha	Number of Items
Technology Usage	.846	3
Learning Experience of VR Technology Used	.872	8

On completion of the course, all the participants were asked to answer a survey questionnaire which started with the demographical background of the participants. The first section contained three questions, which investigated the perception of participants regarding technological skills and the basic concept of technology usage. The response scale ranged from 1 to 5, where scale 1 refers to "strongly disagree" and scale 5 is "strongly agree". The second section investigated the participants' learning experience with VR technology, which consisted of 8 items. The last section of the questionnaire consisted of four open-ended questions, which identified the usefulness of the module, difficulties faced, knowledge and experiences learned during the IC2VR module's implementation and overall feedback from the participants.

Participants

This sample comprised of 22 male and 10 female pupils who were enrolled in the MSL course. All of them are between the ages of 10 and 11. In addition, 75% of the participants' first language is not Mandarin, as most of the participants speak Malay language and they learn Mandarin as a second language. The research was conducted in two different national primary schools in North Kinta district in Ipoh, Perak, Malaysia. The schools are located in the urban areas of the district. The research sites were chosen as the researcher is more familiar with the environment and characteristics of the pupils who fulfilled the requirements of this study. The module comprised of 10 lessons.

Intercultural Communicative Competence Virtual Reality (IC2VR) Module

The following are the learning activities in the IC2VR module designed for this study:

1) Introducing Chinese Culture with VR tour.
There were four virtual tours included in this study.
- i) Virtual Tour (1): A Chinese Restaurant
- ii) Virtual Tour (2): A Chinese House
- iii)Virtual Tour (3): A Chinese Herbal Shop
- iv) Virtual Tour (4): Chinese Calligraphy Association

The virtual tour was shown to the participants in the lessons. Participants can use VR equipment or their mobile devices to explore the virtual tour.

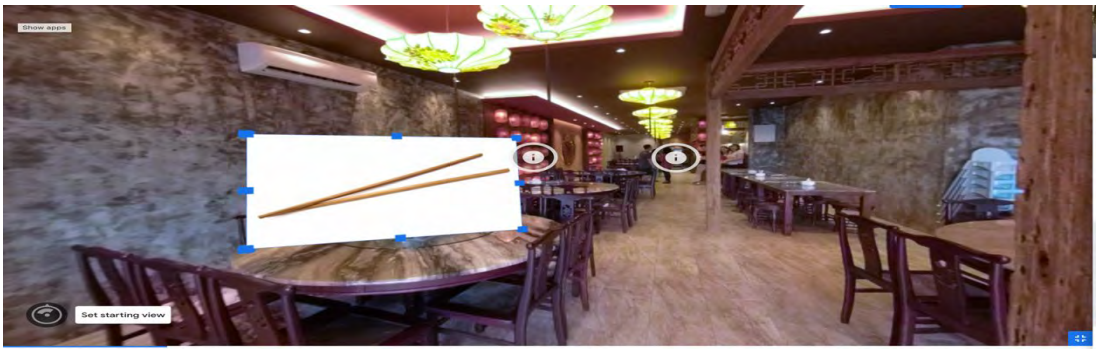

Figure 1: Chinese Restaurant shown in 360° virtual tour

2) Language Activities (Drilling on Reading)
Participants were expected to acquire vocabulary and learn sentence structure to enable them to proceed with dialogue reading.

3) Introducing Chinese Cultural Elements
In this section, the Chinese cultural elements were introduced and discussions were conducted.

Data Collection and Analysis

To answer the research questions, the participants' perception of VR technology from the survey questionnaire and responses from the open-ended questions were gathered. The survey questionnaire was distributed to the participants in the Google Form. Statistical analysis was conducted to analyse the data and were presented as frequencies and percentages in tables. Responses from the open-ended question were gathered, coded and organised into themes.

FINDINGS

Demographics

The participants' demographic is reported. There were 32 pupils selected from two national primary schools in the Kinta district, where Mandarin as a second language classes were held. The participants comprised of Malay (50%, n= 16), Chinese (31.3%, n=10), Indian (15.6%, n=5) and others (3.1%, n=1). The majority (69.00%, n=22) of the participants were male, and only a small percentage (31.00%, n= 10) were female (see Table 2).

Table 2
Gender Composition of the Respondents

Gender	Frequency, N	Percentage, %
Female	10	31.00
Male	22	69.00
Total	32	100.00

More than a third (37.50%, n=12) of the participants' first language was Malay language, followed by English (31.25%, n=10), Mandarin (25.00%, n=8) and Tamil (6.25%, n=2) (see Table 3). Hence, three quarters of the participants'（75.00%, n=24）first language was not Mandarin.

Table 3
First Language of the Respondents

First Language	Frequency, N	Percentage, %
Malay Language	12	37.50
English	10	31.25
Mandarin	8	25.00
Tamil	2	6.25
Total	32	100.0

Some of the participants (6.25%, n=2) do not have any experience in learning Mandarin, while a large portion (15.63%, n=5) have learned Mandarin for 1-2 years. 34.38% of respondents (n=11) have learned Mandarin for 3-5 years and 43.75% of them (n=14) have learned Mandarin for more than 5 years (see Table 4).

Table 4
Experience in Learning Mandarin

Experience in learning Mandarin	Frequency, N	Percentage, %
Never	2	6.25
1-2 years	5	15.63
3-5 years	11	34.38
> 5 years	14	43.75
Total	32	100.00

The participants' technology usage is tabulated (see Table 5). All the participants (100.00%, n=32) used technology during their free time to surf the internet, online chat, etc. Majority of students (87.50%, n=28) always used technology in their learning, with the percentage of 12.50% (n=4) not always using technology in their learning.

Table 5
Technology Usage

Question	Yes	Maybe	No
	% (n)		
I use technology (e.g. computers, iPad, mobile phone, video game, etc) during my free time.	100.00 (32)	0.00 (0)	0.00 (0)
I always use technology in my learning.	87.50 (28)	12.50 (4)	0.00 (0)
This is the first time I have used VR technology.	78.13 (25)	6.25 (2)	15.63 (5)

Note. Total number of respondents = 32

Additionally, a large number (78.13%, n=25) of participants were first time users of VR technology, with a very small portion (2) participants (6.25%) unsure whether they had used VR technology before, and some (15.63%, n=5) of the participants indicated that they had used VR technology before. This indicated that VR technology was a new technology among the participants in this study. To conclude, all participants have used technology in their free time, and most of them (87.50%, n=28) confidently claim they use technology in learning. However, among the participants who use technology, a large portion (78.13%, n=25) are using VR for the first time.

Pupils' Perceptions of VR Technology for Developing ICC

The participants' learning experience of VR technology when using the module is reported (see Table 6). Overall, most (75.00%, n=24) of participants "strongly agreed" that they enjoyed the lesson that employed VR. Most (71.88%, n=23) of participants "strongly agreed" and an additional portion (28.13%, n= 9) "agreed" that they can understand Chinese culture better when using VR technology to learn during the Mandarin lesson. This may indicate that the participants had an enjoyable learning experience with VR technology, and that the lessons were useful as it seemed to help them to develop a deeper understanding of Chinese culture.

Almost all (96.88%, n=31) of the participants (75.00% "strongly agreed" and 21.88% "agreed") indicated that the VR module increased their interest in learning Mandarin. Most (71.88%, n=23) of the participants "strongly agreed" and a quarter (25.00%, n=8) of the participants "agreed" that they have become more active in the Mandarin class after they had engaged with VR technology. Most (75.00%, n=24) of the participants "strongly agreed" and a quarter (25.00%, n=8) "agreed" that they enjoyed the lessons that used VR technology. A majority (65.63%, n=21) of the participants "strongly agreed" and some (34.38%, n=11) of the participants "agreed" that VR technology should be used in the future as a learning tool.

Table 6

Learning Experience of VR Technology Used in the Module

Questions	Strongly Disagree	Agree	Neutral	Agree	Strongly Agree
	% (n)				
I feel motivated to learn this subject by using the VR technology	0.00 (0)	0.00 (0)	0.00 (0)	37.50 (8)	62.50 (24)
I can understand the culture better when using the VR technology to learn during the Mandarin lesson.	0.00 (0)	0.00 (0)	0.00 (0)	28.13 (9)	71.88 (23)
I felt comfortable learning Mandarin with the VR technology compared to the conventional method.	0.00 (0)	0.00 (0)	15.63 (5)	71.88 (23)	12.50 (4)
The VR module increases my interest towards learning Mandarin.	0.00 (0)	0.00 (0)	3.13 (1)	21.88 (7)	75.00 (24)

I have become more active in the Mandarin class after engaging with the VR technology.	0.00 (0)	0.00 (0)	3.13 (1)	25.00 (8)	71.88 (23)
I enjoyed the lesson that used VR technology.	0.00 (0)	0.00 (0)	0.00 (0)	25.00 (8)	75.00 (24)
I found the lesson to be useful to me.	0.00 (0)	0.00 (0)	0.00 (0)	21.88 (7)	78.10 (25)
I hope that this technology will be used as a learning tool in the future.	0.00 (0)	0.00 (0)	0.00 (0)	34.38 (11)	65.63 (21)

Note. Total number of respondents = 32

In the second part of the survey questionnaire, participants were asked four open-ended questions. Three common themes emerged from the responses for the question on whether the module was useful when learning Mandarin: useful learning content, enhances ICC and enhances learning Mandarin vocabulary. The following quote reflects the intersection of these themes: “Yes. It is useful for me. I learned to type Chinese word or *Hanyu Pinyin* when communicating with my Mandarin teacher.” The majority of participants claimed that the module's contents was beneficial and helped them learn ICC and Mandarin.

The comments represented the problems encountered during the module's implementation and were categorised into two key themes, namely inaccessible link and accessibility of internet, as well as mobile devices. The following quotation demonstrated these themes: “I couldn’t join the class today, as I don’t have mobile device.”

There were two main themes that emerged from the responses to the questions about new knowledge and experiences gained from the course: novel cultural knowledge and novel VR experience. The following quote exemplified these themes: “I get to know the places, history, art, customs and the way of communication with Chinese.” The participants revealed that they acquired new cultural knowledge such as Chinese custom, art and taboo of Chinese culture through VR technology. Besides, participants obtained new 360° simulated experience with VR technology which allowed them to explore places that they are unable to visit.

Two major themes were identified from the overall feedback, namely interest in learning with VR, and interest in learning Mandarin. The following quote illustrated these themes: “Overall, the class increased my interest in learning Mandarin and I wish to use VR to learn in the future.” Most of the participants stated that they like to learn Mandarin with VR and VR has increased their interest in learning Mandarin.

In conclusion, the findings indicated that the module is beneficial not only in improving students' ICC, but also in increasing students' interest in learning Mandarin. In addition, the module also motivates the pupils to continue the learning of Mandarin in the future by using VR technology. The results of the study revealed that the pupils gained new cultural knowledge and developed new language skills in communication when they dealt with the Chinese. Despite the fact that several issues were encountered during the implementation, the difficulties did not discourage pupils from pursuing MSL course.

DISCUSSION

Findings revealed that the participants’ perceptions were positive and they were motivated to learn ICC and Mandarin as a second language through the use of VR technology. The current study's findings

were consistent with previous research, which found that participants felt more motivated to engage in learning with VR compared to conventional education (Lanzieri et al., 2021; Gorman et al., 2021). The IC2VR module provided the participants with a novel learning experience, as they were introduced to an immersive learning environment they had never encountered before. Participants claimed that they were excited as they could explore various Chinese places with VR technology that they could not visit in the real world. The fidelity of 3D technology immersion can be a feasible option for users who are unable to visit the actual location. Besides, a majority of the participants claimed that they acquired new cultural knowledge and understood Chinese culture better when using the VR technology to learn Mandarin and ICC in the MSL course. This could be explained by the Learning Affordances (Dalgarno & Lee, 2010) which mentioned the role of 3D aspects of VR in facilitating experiential learning tasks and bringing realism (Alqahthani et al., 2017) to develop learners' understanding in the virtual environment. VR provides pupils with an immersive experience which is more descriptive, and its audiovisual effects allow it to have an advantage in transferring linguistic knowledge better than a standard textbook (Hamilton; 2021). This finding agreed with another study that learners learn better in a VR environment compared to traditional conditions (Allcoat & Muhlenen, 2018).

The lack of motivation of the learners in learning Mandarin as a Second Language (MSL) was the major critical issues in teaching MSL. However, after the module was implemented, the interest in learning Mandarin among the MSL learners seemed to increase. Most of the participants stated that they liked to learn Mandarin with VR as it increased their interest in learning Mandarin and ICC. They insisted on having extra classes to learn more about Chinese culture and also actively participated in the class. Obviously, the learning motivation of the participants was triggered by the immersive learning experience; hence, they were actively engaged with the IC2VR module. Various research indicated that a powerful learning experience is one in which learners are constantly inspired and engaged in learning activities (Mkdadi, 2019; Oprean & Balakrishnan, 2020; DeWitt et al., 2022). The results are consistent with previous studies that have shown the impact of an immersive learning environment on learners' engagement (Vignaux et al., 2021; Chan et al., 2021; DeWitt et al., 2022). This indicated that the module with VR technology, which created an immersive learning environment, engaged the MSL pupils in the lessons constantly and the learners were keen on continuing to learn Mandarin and ICC in the MSL course.

In this study, VR technology was used as a potential instructional medium to deliver the contents of the module and aimed to give pupils a new educational learning environment for developing ICC and learning Mandarin as a second language. Virtual reality (VR) technology has been proven to provide an immersive learning experience for ICC learners and VR has the potential for improving ICC levels as it could be used to develop positive attitudes towards another culture (DeWitt et al., 2022). Based on the findings, the VR technology assisted the participants in having a more authentic view of cultural areas and they proved to have learned more about Chinese culture.

Participants had a positive impression of the learning activities in the IC2VR module, and, as a result, they were inspired to learn the intercultural content while studying the language. A representative example of this is a study from Chaya and Inpin (2020) that investigated the effects of technology-enhanced learning instruction on Thai university EFL students' speaking skills and ICC. The findings indicated that the instruction was effective in enhancing students' English-speaking skills and the pupils' ICC. Hence, the IC2VR module not only enhances the participants' ICC, but also improves their language proficiency.

Due to the COVID-19 pandemic, the design of the instruction was switched from a physical face-to-face lesson to online classes using Google Meet to overcome the school closure problem and pupils studying from home. Several issues arose during the implementation, including an inaccessible connection, a lack of internet access, and the use of mobile devices. Many other countries have faced the same problem, and network connectivity has a huge impact on teaching and learning effectiveness (Yang, 2021). This present research not only developed a digital intercultural instruction approach and immersive learning experience, but it also helped to accelerate the growth of online education.

This study will benefit policy makers, teachers, instructional designers, and pupils in an effort to understand pupils' perception of VR technology and the current online learning environment, as well as how it impacts the development of pupils' ICC in MSL classes.

CONCLUSION

The findings of this study helped us to better understand how the VR-enhanced IC2VR module affected MSL pupils' ICC levels in primary schools. This study also adds to our understanding of how primary school pupils have adopted and used virtual reality innovations in developing the ICC. In Malaysia, using virtual reality to construct ICC module is a new intervention in the educational setting of primary schools.

In the present study, the application of learning affordance of 3-D virtual environment theory (Dalgarno & Lee, 2010), which combined the aspects of representational fidelity and the concepts of social fidelity in providing a 3-D learning environment, was found to be successful in developing ICC. Virtual reality technology's 3-D learning affordances, which provide a realistic interface and interactivity that is compatible with the real world, can help to improve ICC, particularly in terms of intercultural attitudes and knowledge. This is due to the fact that virtual reality technology has created new 3-D learning environments that are more unique than simply viewing 2-D images or videos.

The study can be conducted at other levels of MSL course and should involve more schools to increase the accuracy, validity and reliability of the study's results. To make the lesson more appealing, the content of the modules should include more cultural subjects and appropriate adaptations of the dialogue content in order to provide speaking practises and incorporate more real-life settings and conversation. The VR technology used should be more interactive and allow the participants to interact with the technology to practice dialogue or transform themselves into avatars. It should also provide self-learning and communication pace for learners. The VR based module not only enhanced the development of ICC and Mandarin proficiency among primary schools' pupils, but it also helped to bridge the cultural gap.

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