

Bridging the social gap: The role of the metaverse in alleviating loneliness and language barriers among international students

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Abstract: This study aims to investigate the relationship between international students' use of metaverse technology during cross-cultural adaptation and their feelings of loneliness, with particular attention to the moderating role of language barriers in this relationship. Through empirical analysis of the sample data, the study found that the frequency of metaverse technology use did not significantly alleviate loneliness directly ($p > 0.05$). However, further moderation effect analysis indicates that the degree of language barriers plays a significant moderating role between metaverse usage and loneliness, revealing a significant interaction ($p < 0.05$). Specifically, the higher the language barrier, the more differentiated the pattern of the impact of metaverse usage on loneliness becomes. Furthermore, this study also finds that students of different age groups exhibit distinct differences in their acceptance of metaverse technology. Compared to other age groups, younger students aged 25–30 demonstrated higher acceptance and willingness to use the technology, potentially linked to this cohort's innate affinity and adaptability towards digital technologies. In conclusion, this study reveals complex, multi-layered connections between the application of metaverse technology, experiences of loneliness, and cross-cultural adaptation processes. It also provides preliminary insights into the psychological adaptation of international students in the digital age, from the perspective of social support systems. The study concludes by offering theoretical and practical implications, providing directional guidance for subsequent research in this field.

Keywords: Cross-cultural adaptation, International students, Language barriers, Loneliness, Metaverse technology.

1. Introduction

Students studying abroad are often seen experiencing various challenges as they make their way into a new place with a new culture and geographical location. These challenges are majorly in the realms of communication and social integration. These challenges are found to be having strong impacts on the student's academic performance in complex ways [1]. Causing a sense of lack of belonging can cause the students to be less determined with their studies and academic pursuits. Many of these students face such loneliness and isolation because of cultural differences, language barriers, and the immense pressure of building social networks in a foreign environment. Language barrier is found to be one of the detrimental causes of this stress among international students [2].

The difficulty in understanding a foreign language, and therefore the inability to share one's thoughts can certainly result in a lack of confidence, increased stress, and further added pressure to maintain academic efficiency. Research has shown that social disconnection does have impacts on mental health and academic performance. Therefore, bridging this gap is a critical need for universities and policymakers. Solutions like support systems and orientation programs offered by universities have been helpful traditionally, but the current need is for digital solutions that are emerging in today's time. With the advancement in technological innovation, social media, and digital platforms, the world has actually become a global village [3]. Social media have captured all lives today and have connected them through the internet, bringing lives closer than ever before.

One of the primary digital solutions therefore in today's time can be that of metaverse. Metaverse is a concept that is emerging into the digital space. It can be considered as a next-generation internet where an immersive and dynamic virtual environment is created, allowing people to engage in their work, academics, social interactions, and entertainment [4]. Metaverse equips its users with the ability to attend events virtually and collaborate with a distant colleague or friends. It does so without the constraints of being physically close. Since universities and educational institutions are also wheeling their way towards leveraging virtual platforms for education, the metaverse holds immense potential to help bridge the social gap and overcome the challenges associated with linguistics for international students. However, there exists a gap in the research field for finding the effectiveness of metaverse technologies in their ability to alleviate loneliness and language barriers. His study explored the role of the metaverse in helping international students reduce their social isolation and assist them with enhancing language learning. This research takes a quantitative approach and surveys the responses from international students and analyses their experiences and loneliness along with aspects like language barriers and their adoption of metaverse technologies. By understanding these interactions the results offer insights for students, universities, and policymakers to make better solutions for the international student community. The further sections of the paper consist of a literature review which consists of prior research on social and language challenges that international students face. The methodology explains the approach of the study, and the results showcase the findings along with discussion and a conclusion with final insights.

2. Literature Review

The challenges faced by international students need to be understood based on the historical context and the existing research. Further, the potential solutions, including digital solutions need to be analyzed to find gaps in the current repository of research. Social and linguistic barriers, specifically for international students are also explored, along with the role of digital technologies that can help in creating an inclusive environment.

2.1. International Students and Social Challenges

International students, i.e. the students who have migrated to a different country for educational purposes often face challenges of language and culture and struggle for social integration. This challenge can lead to the feeling of loneliness and isolation in the students. There have been studies from various parts of the world, including universities from major countries where such challenges and cases of loneliness have been found. International students experience loneliness which is higher as compared to domestic students [5]. The primary factors that contribute to this problem are financial issues and perceived discrimination. Studies show that those students having a weaker connections to home and their host culture report the highest amount of loneliness. Further, other studies based on international students in Australia showed that accommodation conditions also contribute to the feeling of loneliness [6]. The social composition of people staying with or around the students also contributed to this challenge. Another mixed-methods study on international students in the UK also showed that the sense of loneliness is a pressing issue among students. According to this study, three out of four students experience some level of loneliness [7]. It also shows that greater use of the support services provided by the university helped students lower their loneliness levels. This was also aided by the expansion of social networks by the students. This shows that universities do have a significant amount of responsibility in assisting international students with their concerns and ensuring they are settled promptly.

Another study conducted on international Chinese students in Germany also found that the social structures and the level of interactions were responsible for shaping loneliness [8]. The international students showed a higher level of loneliness as compared to the local students here as well. This study however also noted that merely having emotionally supportive ties was not entirely enough to alleviate loneliness and in fact were rather related to higher levels of loneliness. This was associated with the

possible emotional burden of providing support to the dependents. Overall, the language barrier is a significant obstacle for the students that makes them averse to making social connections and therefore keeps them feeling lonely.

2.2. Digital Solutions for Social and Educational Inclusion

With the growing advancements in technology and other communication forms, the loneliness problem has been solved with various devices, applications, and other online platforms. There have been studies on the effectiveness of phone applications that can reduce loneliness. It was observed that students with higher baseline depression found this technological solution to be helpful [9]. It showed promising evidence that technologically sound interventions can have a strong impact and can play a key role in mitigating loneliness. However, other studies suggest that the impact of such digital interactions and interventions has an effect that is dependent on the way individuals engage themselves with these technologies [10]. If the students use these technologies to build newer connections and also remain connected to the existing relationships then they can be helpful in reducing loneliness. However, if these are used to just escape from the physical social interactions then these can further build up loneliness. Further, one of the crucial aspects of the metaverse, virtual reality (VR) can also be used as a tool for helping international students in their language learning. VR technologies show huge potential for a second language learning platform, helping students learn a new language [11]. This can further be used to ease them with their social anxiety and loneliness. This way the metaverse provides newer dimensions of virtual engagement and allows students to interact in a more immersive environment. Since the technologies are advanced, they do not require mandatory human intervention, therefore easing students in making connections online.

The role of metaverse in language education is an emerging phenomenon. While this field remains largely unexplored, limited studies show positive attitudes and improved learning outcomes through various metaverse platforms [12]. The majority of the research is focused on students in South Korea and China by using a quantitative and mixed-method approach. These conclude that the challenges still persist and the metaverse alone is not a standalone solution for the learning of the languages. Another study done in the context of Chinese medical universities focused on the role of the metaverse in shaping the mental health of international students. Cross-cultural dialogues in virtual environments have been found to show a positive influence on the well-being of the students [13]. These understandings from the study show that digital platforms have immense potential in facilitating cultural exchange, and therefore support the mental health of students. Another study suggested that the use of a 3D virtual environment facilitates meaningful interaction and promotes cross-cultural exchange thereby helping students ease [14]. However, these research and studies are very limited and do not provide a full picture of the real-world challenges that international students face. Therefore, future research is required to add to the current understanding.

2.3. Theoretical Framework

There are some theoretical frameworks that can help in understanding the problems and concerns of international students and their loneliness while studying in a foreign country. A prominent theory called the Social Presence Theory talks about the feeling that is conveyed by different media which varies based on the media in use. A study showed that strong correlation between social presence through the use of various platforms with sociability and social spaces [15]. Another study that was conducted for a year on 126 graduates showed that the perceived social support from domestic students and faculty members showed a decline in the loneliness of international students. Additionally, the faculty support also improved the psychological well-being of the students, showcasing the critical role of domestic students and faculty in supporting the social-emotional adjustments of international students [16]. Overall, meaningful interactions in social or virtual environments can help students with their loneliness. Learning language, using metaverse and its platforms efficiently, and taking positive steps towards socializing can help students perform well in their international curriculum while

ensuring they are not lonely there. Existing literature shows social and linguistic challenges in international students and how digital technologies help in addressing them. Metaverse has a promising presence in today's time in solving this issue. However, there exists a gap in studies focusing on the metaverse and connecting it with its potential to solve student's loneliness in an international environment. Therefore, further sections of this study entail the methodology employed to conduct research and gather data to find the impacts and effects of metaverse on international students.

3. Methodology

This study explores the role of the metaverse in helping international students to deal with their loneliness and language barriers. A survey was designed to get data on students that encompass their experiences and perceptions of the metaverse in dealing with their loneliness. This section defines the research approach in detail.

3.1. Research Approach

A quantitative approach was equipped for this study. The survey-based questionnaire was prepared to be able to conduct analysis and find the relationship between the usage of the metaverse and its effect on loneliness and language barriers. The quantitative method was applied in order to gather empirical data from students to ensure that the trends and correlations can be easily identified, which is lacking in a qualitative research approach. The survey largely consisted of close-ended questions that can be framed in a Likert scale with multiple-choice questions and responses. This helped in ensuring consistency in the responses from the students. The following aspects were considered to be extracted through the questionnaire:

- Demographic factors like age, gender, and duration of study.
- Social integration and the levels of loneliness.
- Usage of online platforms for establishing social connections.
- Impacts of these virtual interactions on loneliness.
- Communication challenges based on language proficiency.
- Adoption with metaverse and familiarity with it.
- Perception of students on the role of metaverse in supporting social and educational needs.
- Challenges and potential improvements for this adoption.

The Likert scale being considered in this questionnaire was a five-point Likert scale to understand the experiences and attitudes of students.

3.2. Data Collection and Sample

The survey designed to get insights from students was administered via the SoJump platform, an online survey platform that allows for efficient data collection. A total of 109 responses were received from the students. The data was anonymized and it was also ensured to not include any questions that would make the tracking of respondents possible.

3.3. Data Analysis

The data analysis for the collected data was conducted including descriptive and statistical methods. The following analysis was conducted on the data:

- Descriptive Statistics: This included frequencies and percentages of the students providing various responses about loneliness and language barriers.
- Correlation Analysis: Pearson's correlation method was used to find the relationship between metaverse usage, perceived language improvement, and loneliness.
- Visualization: Graphs and tables are also included to show the spread of the data and show various relationships in a visual medium.

4. Results and Analysis

This section provides the results of the analysis performed on the data collected. It is divided into sub-sections focusing on the relationship between loneliness and the metaverse, language barriers and communication in the metaverse along with the usage and adoption patterns of the metaverse and the limitations of this integration.

4.1. Exploratory Analysis

Figure 1 below shows the distribution of the age group of the respondents. It can be seen that the majority of the age group is between 31-35 years with a moderate amount of respondents belonging to the 18-24 age bracket. This shows a diverse range of participants, which in turn provides a wholesome result based on the experiences of various age groups of the students. These students at some point have been studying in a foreign country as international students and therefore can provide insights that are based on experience and anecdotal evidence.

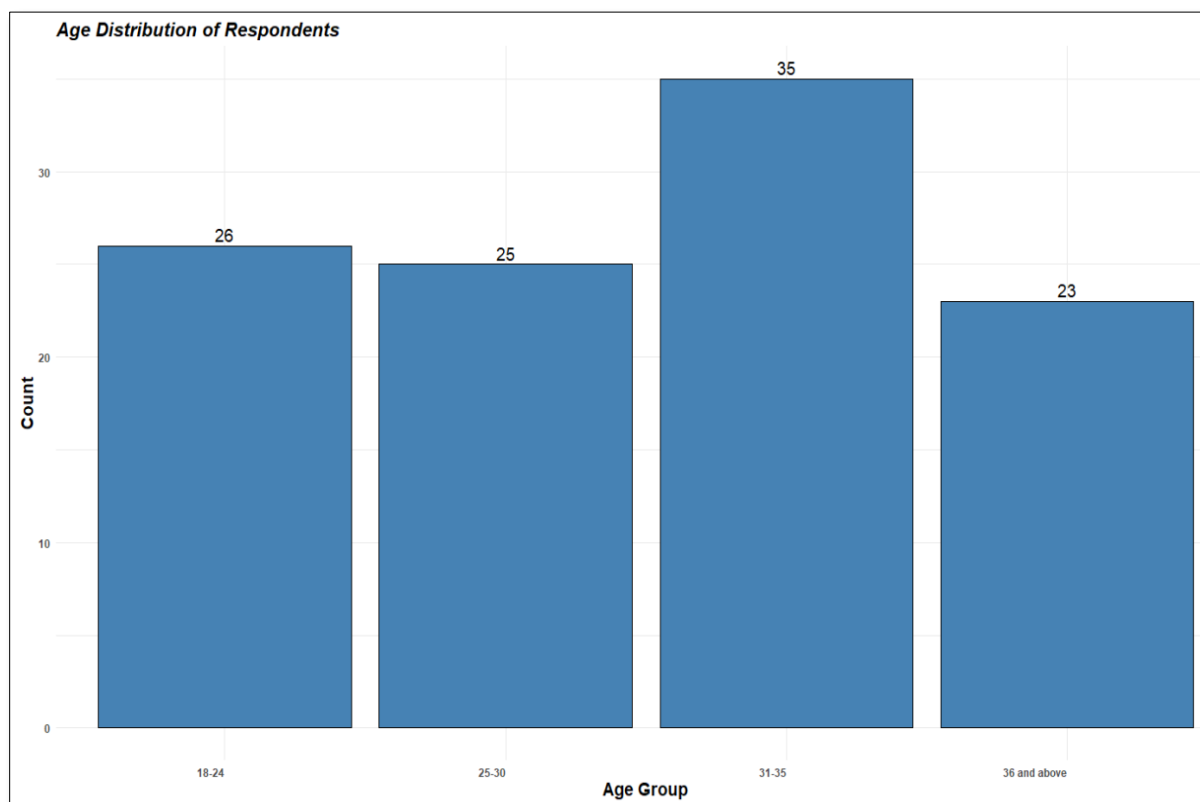


Figure 1.
Distribution of age of the respondents.

Figure 2 shows the distribution of the levels of loneliness among the participants. It is interesting to note that the majority of the students rated their level of loneliness to be a level of 4. The levels were marked as 1 (Never), 2 (Rarely), 3 (Sometimes), 4 (Often) and 5 (Always).

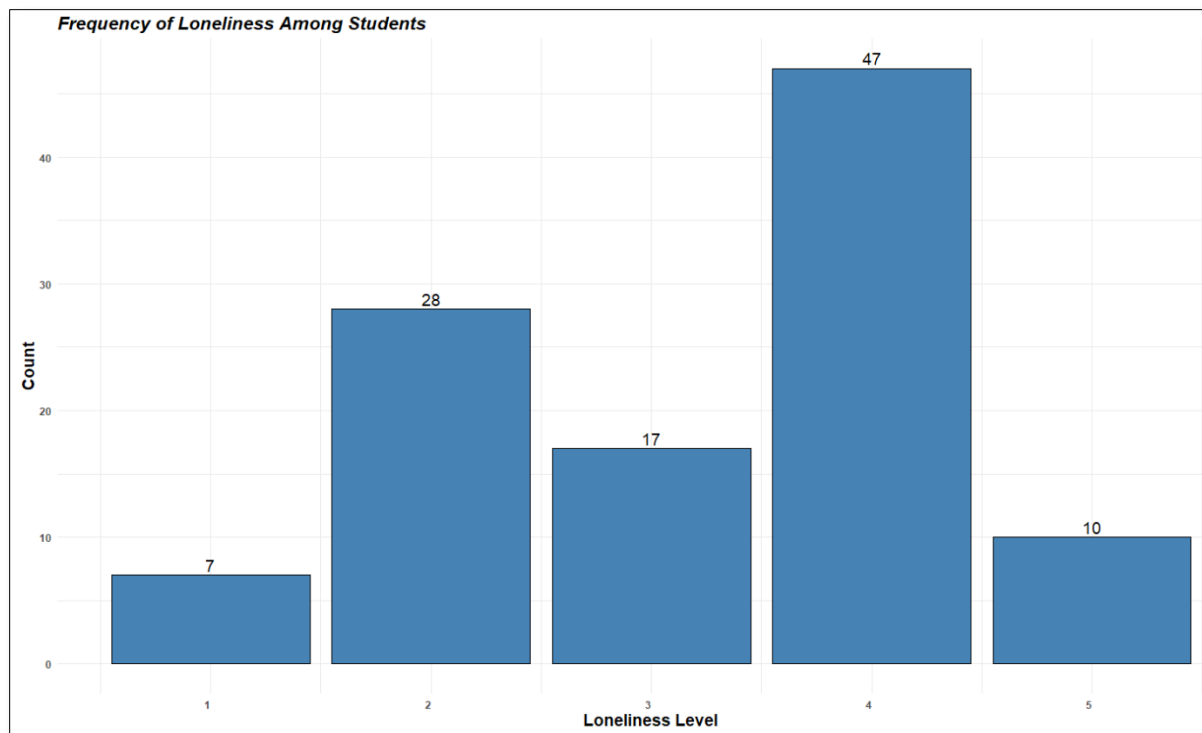


Figure 2.
Frequency of the levels of loneliness among students.

The results show that the majority of international students have experienced loneliness often at some point in their education. This number is followed by the *Rarely* category, followed by *Sometimes* and *Always*. The least number of participants responded with *Never* as an option for their loneliness.

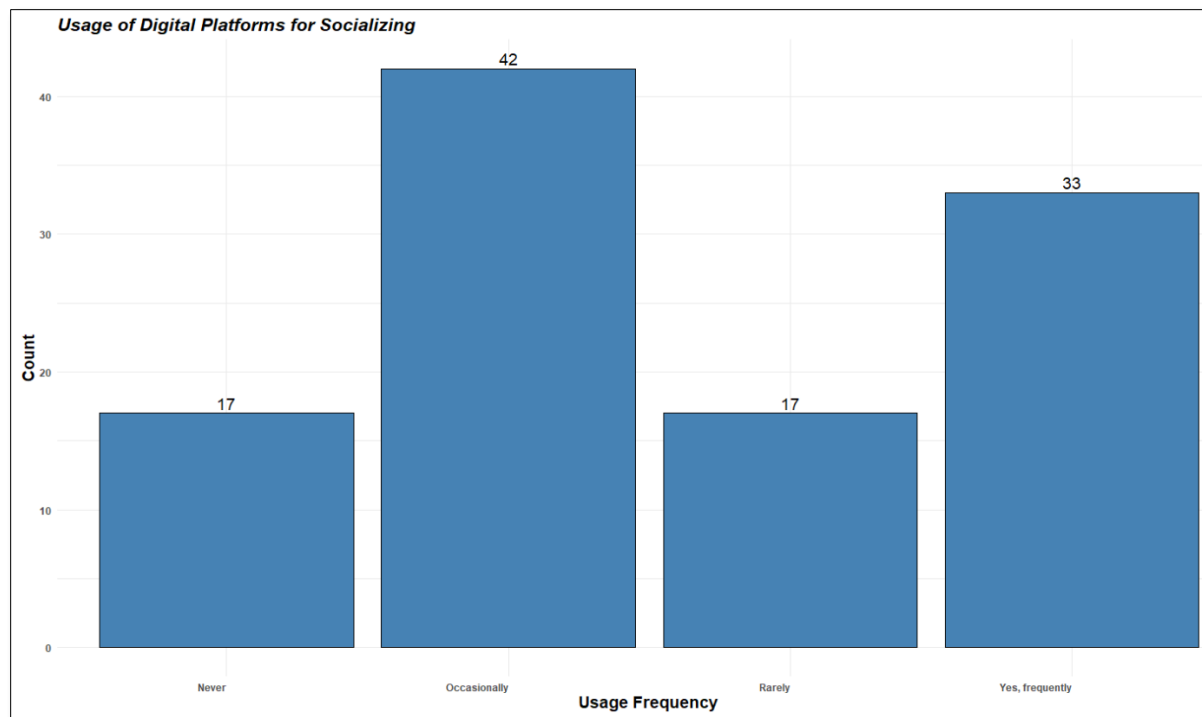


Figure 3.
Frequency of usage of digital platforms for socializing.

Figure 3 shows the distribution of the respondents based on their usage of digital platforms for the purpose of socializing. It can be noted that the majority of the respondents occasionally use social media and digital platforms to interact and socialize. This number is followed by the respondents who use the platforms very frequently. The least number of respondents responded with rarely and never.

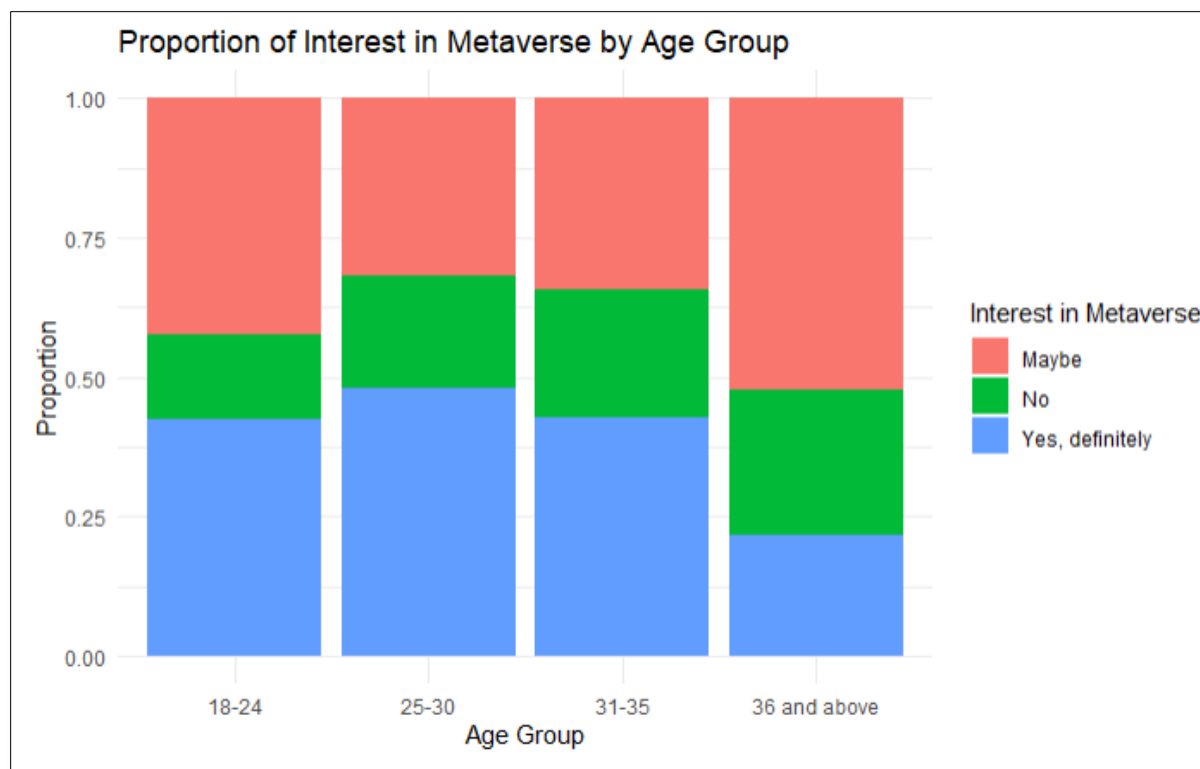


Figure 4.
Interest in metaverse by various age groups.

Further, Figure 4 shows the interest distribution of the respondents in metaverse technologies including AR (Augmented Reality) and VR (Virtual Reality) as tools of the metaverse. It can be noted that the young population of the respondents was found to be interested in the metaverse technologies majorly. The age group of 25-30 has the maximum number of respondents showing interest in the metaverse, while the age group of 36 and above shows the least interest. A very few proportion of the age groups of the students have respondents with no interest in metaverse technologies. While this might not reflect on the current effects and usage of these technologies, but definitely shows a potential for a rise in the use of metaverse technologies in the future, since most of the students are interested in this technology.

Figure 5 shows the proportion of students having some sort of familiarity with the metaverse. It can be noted that about 42.4% of the respondents show somewhat familiarity with the metaverse, while about 25.8% of the respondents show extensive familiarity with the metaverse. Only 8.3% of the respondents do not have any reference or familiarity with metaverse, showing its growing reach among students.

Metaverse Familiarity

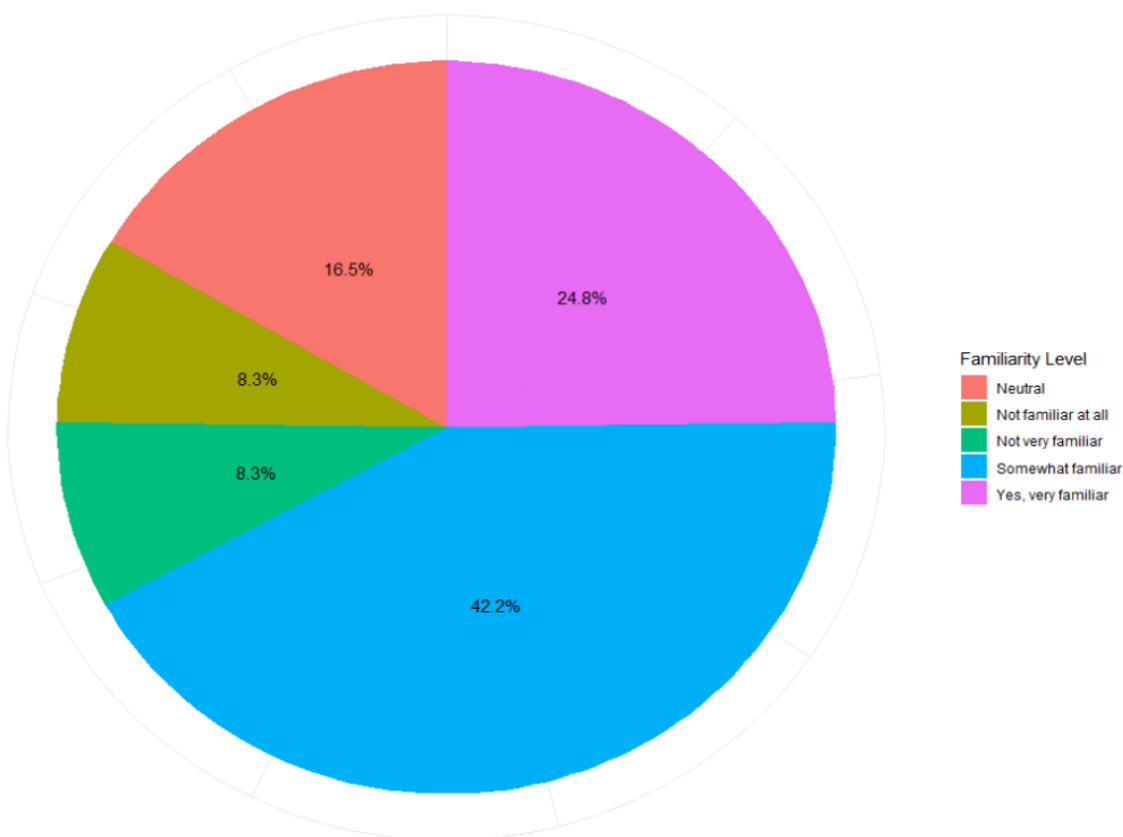


Figure 5.
Familiarity with the metaverse.

4.2. The Relationship between Loneliness and the Metaverse

The primary findings from the analysis suggest that metaverse alone does not significantly show a pattern of decreasing or alleviating the loneliness factor among international students. The results obtained from regression conducted on the data show that the use of the metaverse and the help extended by it in solving loneliness have a weak association with self-reported levels of loneliness. This showcases that while digital interactions may build some kind of connection and confidence among students, it is not entirely responsible for solving the problem of loneliness among international students. This result can be seen represented in Table 1 below.

Table 1.
Coefficients of the variables.

Variable	Estimate	p-value
Loneliness (Never)	-1.1910	0.2059
Loneliness (Often)	-0.3463	0.7383
Loneliness (Rarely)	-1.2369	0.1740
Loneliness (Sometimes)	-1.3769	0.2188
English Proficiency (Native-like)	1.9928	0.0209

It shows that the loneliness is not alleviated by the use of metaverse as much as expected. Therefore, the use of metaverse can be an assistive method, along with other interventions to solve the problems of loneliness.

4.3. Language Barriers and Communication in the Metaverse

While the use of metaverse and its technologies can be enticing in terms of enhancing communication among students, the findings suggest that there are mixed effects of metaverse in terms of helping with language barriers and communication. This aspect showed a mix of results where the majority of the students showed a perceived benefit of metaverse in helping with their communication and language learning, others did not conform with this to the same extent. Figure 6 shows these results in the form of a bar graph.

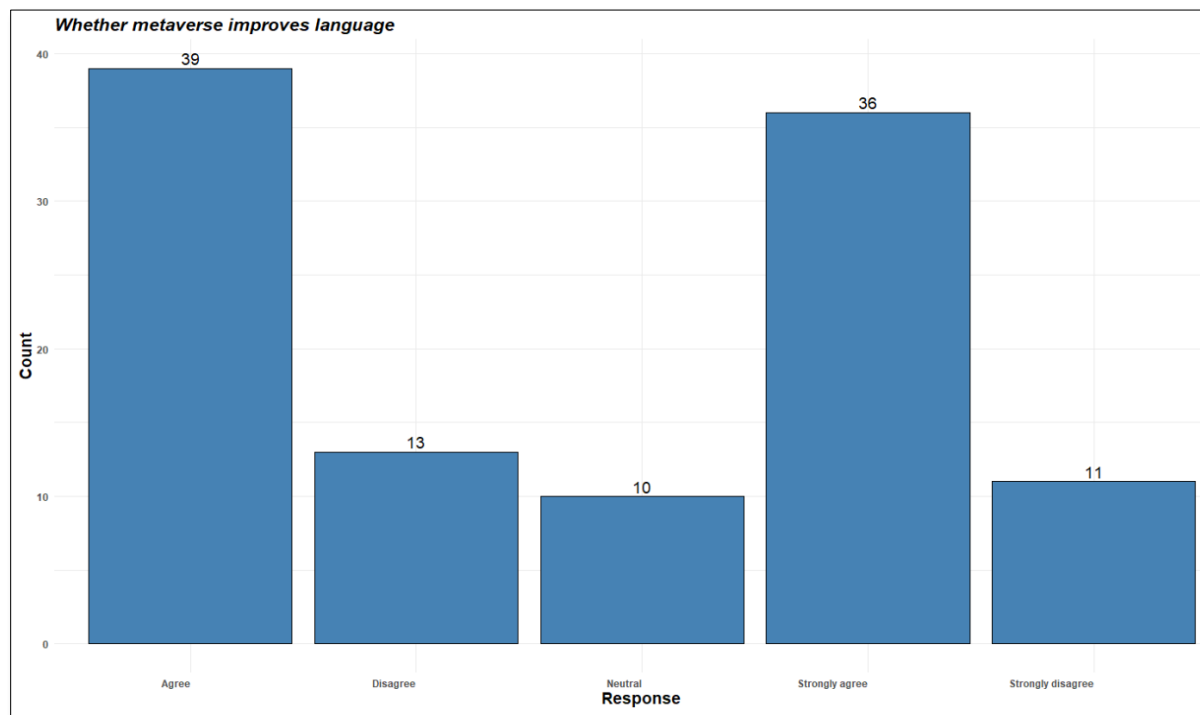


Figure 6.
Frequency of perception of language improvement by Metaverse.

Further, Figure 7 shows the suggestions provided by the students regarding the use of metaverse and how they can be made more relevant for them. The majority of the students think that using metaverse in the form of a cultural exchange activity would make it the most useful for international students in dealing with their loneliness. Trailing behind a substantial decrease in frequency is language barrier support and academic collaboration along with virtual social events. Therefore, students believe that cultural exchange events are something that needs to be conducted to help them meet and interact with other fellow students in a more open and interactive manner.

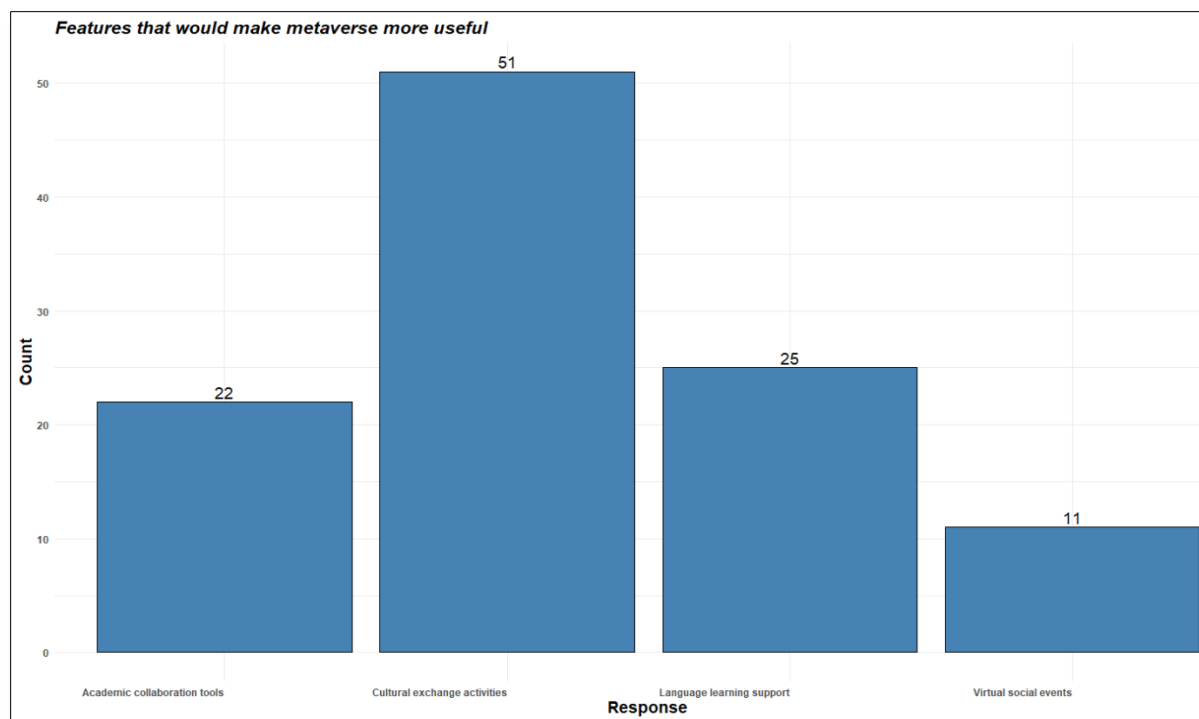


Figure 7.
Features suggested by students that can make Metaverse more useful.

5. Discussion

5.1. Key Findings

Several key findings have been identified in this study. The following is a summative list of the valuable insights found through this study. Firstly, there is a limited impact of the metaverse on the mitigation of loneliness among international students, as demonstrated by regression analysis indicating no significant effect of metaverse knowledge and adoption in alleviating loneliness. Building on this, the second finding reveals that the use of the metaverse has a mixed effect on language barriers and communication. While access to software, platforms, and AR-VR tools can assist with language learning, technical limitations and cultural nuances remain challenging. Third, age differences emerged, with younger students showing more interest in metaverse technologies compared to older students. Lastly, international students generally prefer cultural exchange activities in the metaverse over other forms of utility, as they consider these activities most helpful in addressing loneliness. Taken together, these findings highlight the need for metaverse use to be more closely integrated with the curriculum to enhance its adoption and effectiveness in supporting international students' well-being.

5.2. Comparison with Existing Literature

The findings from this study show a strong linkage with the currently available research, indicating consistency in the aspects of the use of digital platforms and their interaction with loneliness and language learning for international students. Furthermore, while the metaverse can assist in forming digital connections, attending events online, and facilitating collaborations, it cannot entirely take away the loneliness factor in international students. Additionally, language learning does show some improvement through the use of the metaverse. Finally, it is also noted that the familiarity and accessibility of this technology are highly related to the adoption of these technologies, as seen by the interest among younger participants and their adoption proportion.

5.3. Implications for International Students and Universities

Research findings have far-reaching practical implications for multiple stakeholders, including students, higher education institutions, and policymakers. For international students, metaverse technology can serve as an auxiliary tool to enhance social interaction and promote language learning. However, it is important to note that this technology should not be relied upon exclusively to address feelings of loneliness. Students should recognise that participating in real-world activities is more beneficial than relying solely on digital means. Combining offline participation with metaverse technology may constitute a more effective solution to alleviate loneliness. At the same time, clearly understanding the limitations of these technologies will help students actively explore other potential alternative solutions. For universities and support systems, the research results clearly show that relying solely on metaverse technology to assist students in adapting to new environments is not an effective approach. A more reasonable approach is to adopt a hybrid support model that organically integrates traditional counselling services and orientation programmes with metaverse technology, which can truly help international students quickly adapt to new environments and effectively alleviate loneliness. It is worth noting that students particularly emphasised the need to combine metaverse technology with cultural exchange programmes, suggesting that universities should not limit digital services to the transmission of academic and social activities but should instead focus on integrating them into the design and implementation of cultural exchange programmes. In other words, while metaverse technology cannot be regarded as a panacea for addressing cross-cultural loneliness among international students, it can indeed play a significant mitigating role through scientific and reasonable application.

6. Conclusion

This study was conducted to explore the roles of the metaverse in alleviating and addressing the issues of loneliness and language barriers in international students. The research took a quantitative approach and performed analysis on the data collected from international students. The findings from the data analysis along with the knowledge gathered from the previous research as explored through the literature review suggest that the metaverse has potential for enhancing digital engagements. However, the study also concludes that the metaverse alone cannot be a one-stop solution for dealing with the loneliness of international students. Instead, it can be taken as a supplementary force along with other solutions like physical participation, efforts from universities, and language learning to overcome loneliness. In terms of language barriers, the use of metaverse has the potential to serve as a language-learning aid where the use of AR and VR technologies can come in handy. Further, it was also noted that younger students are more interested in metaverse and therefore the general adoption rate needs to be equalized by considering easing out of technical advancements. Universities should adopt the metaverse as a hybrid approach in providing international students with options and support in their journey of dealing with loneliness. As suggested by the students in the survey, the use of metaverse in cultural exchange programs is the most desired way of integrating it into the curriculum. This study contributes to the ongoing field of research about the effects, needs, and impact of metaverse in alleviating language barriers and loneliness in international students. Future study can be further extended by considering aspects like accessibility, inclusivity, and the integration of metaverse along with artificial intelligence directly into academic and social settings.

Transparency:

The author confirms that the manuscript is an honest, accurate, and transparent account of the study; that no vital features of the study have been omitted; and that any discrepancies from the study as planned have been explained. This study followed all ethical practices during writing.

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