A DEVELOPMENT OF ENGLISH LEARNING COMPANION USING IMMERSIVE VIRTUAL REALITY APPLICATION

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Abstract: This research developed an educational application based on immersive virtual reality application using a 360-degree camera and a software engine called Unity. The content in the application contains conversations with topics given in the English II course and listening comprehension skill exercises tailored to the needs of users, especially for Computer Science Faculty Students. Each exercise is given a score or value to monitor the improvement of students' listening skills before and after using the application. This research is part of Research and Development (R & D) research. In this study, a descriptive qualitative approach was used to explain the process, appearances, and results of application validation by six English lecturers. The result of this research was an immersive-based educational application with virtual reality technology for listening comprehension exercises using several features like text to speech, 360-degree spherical video, and scoring system. This application achieved a validation value of 94 percent. The highest value of the validation results was the suitability of the application to the needs of students, while the lowest value of this application was the video display which still has to be improved again.

Keywords: *application; conversation; listening comprehension; virtual reality.*

INTRODUCTIONS

Along with the rapid integration of technology in education and teaching, various advanced platforms or tools have been created to facilitate and increase the attractiveness of the teaching and learning process. Soto et al., (2020) stated that every institution should improve its teaching and learning process by incorporating new technology into classroom learning activities. The integration of various technology into teaching techniques while meeting the learning demands poses a tremendous task for educators working in the field of language education. Virtual reality can thus offer a cutting-edge approach of involving students in the learning process (Klimova et al., 2023).

In maximizing the success of language learning, especially learning English as a foreign language (EFL), the authenticity of the language source (native) and interaction in practicing has a very important role (Cross & Vandergrift, 2018).

Soto et al., (2020) stated that all technological features used should engage students, add to their creativity and innovation components, and make interaction a key differentiating factor from the original environment. Language learners are expected to not only act as listeners but also play an active role in a real and contextualized conversation. Based on this thought, Lan & Liao (2018) suggested to use application based on Virtual reality (VR) for foreign language learning. VR offers an immersive and interactive environment that improves and enriches the language learning experience.

Peixoto et al. (2021) contend that particularly when contrasted with traditional teaching methods, teaching foreign language with VR is largely beneficial. They pointed out that when it comes to teaching language, VR is both substantially more effective and more pleasant than using module, text, and audio. Esteves et al. (2023) states that VR offers access to

environments and circumstances that are difficult to emulate in conventional classrooms, thus making it easier to implement various teaching tactics. According to Peixoto et al. (2021), VR improves language acquisition by raising student interest, as well as increasing motivation and engagement. Virtual reality (VR) technology can also help with the acquisition of a second language, and their combination with conventional learning techniques is essential for knowledge advancement and making it easier to adapt to various circumstances and interaction styles, especially while learning a foreign language. Furthermore, language learners' engagement in this platform can also lead to increase confidence and motivation especially in learning a foreign language. Therefore, the use of application based on VR has also attracted a great deal of interest in the field of English language teaching. (Bacca-Acosta et al., 2022; Chandra & Yuyun, 2018; Frazier et al., 2020).

In the study of Chien et al. (2020), a spherical video-based VR application was developed. The design method for the application included deciding on the development environment, arranging the spherical video-based virtual reality (SVVR) system, constructing real-world learning environments, writing interaction scripts, incorporating guiding tags, and incorporating learning objectives. The goal of the design was to give students immersive experiences so they could practice English in a virtual setting and participate in real conversations. Some popular VR-based English learning apps such as Mondly VR, Immerse Me, and VR Speech are paid apps that offer more repetitive vocabulary training and contexts that are general and not based on a specific social environment (Revianti, 2022). These applications are generally designed overseas for users of different first languages, meaning that they are not specifically created for users who use Bahasa Indonesia as a first or second language, and with contexts that are culturally appropriate in Indonesia.

In the development of technology-assisted English learning, there has been considerable numerous researches on the use of VR in English language learning to improve the quality of English language learning. Mostly, virtual reality-based applications have been widely tested in various studies for English language learning. Most of these studies are used by testing existing and paid VR applications on their students. Soto et al. (2020) in his research conducted a pilot test of the Immerse Me application on several university students and looked at students' perceptions after using it using a questionnaire. The results showed that some students expressed interest in using the application and felt motivated to continue using it to improve their English skills.

Moreover, Alemi & Khatoony (2020) conducted research by designing a VR-based application to improve students' pronunciation in English. From the results of his research, he suggested the development of VR applications with more complex and varied English learning features. In 2021, Huang et al, examined eighty-eight publications in a systematic evaluation of earlier works on language acquisition using augmented reality (AR) and virtual reality (VR). They found that VR technologies facilitated language acquisition by offering an immersive learning environment, improving motivation, fostering engagement, and lowering learning anxiety.

Shabir (2022) tested YouTube VR on university students using low-end VR devices such as cardboard VR or googles VR. The results show that there is an increase in interest in learning and understanding English material delivered through YouTube. A study by Tai (2022) found that there was an increase in the motivation to learn English of students who used applications with VR and virtual robots. The study stated that the communication interaction between English learners on the platform was one of the most important factors that attracted students. However, in the trials he conducted, students were passive by only following the visualizations displayed by YouTube VR.

In the same year, Revianti (2022) in her research used the Mozilla Hubs social WebVR platform to establish interaction between lecturers and students through remote classes using VR headsets. From the results of this research, positive results and responses from students were obtain for a new learning experience. However, some students later also complained about the appearance of simulator sickness, audio and video interference.

From the results of the literature reviews conducted, many researches have applied VR technology in the English language learning process, and many have also conducted research by examining the effectiveness of applications or platforms that can be accessed online for students. However, so far, the platforms created were still used on existing applications or developing web-based VR only. The results of these studies show

that there are still many shortcomings in the applications that have been used. In general, researchers mostly test the effectiveness and students' perceptions of VR applications that have been commercialized, published online, and using avatar or animated figures in the video displays. The topics given in the applications are general topics such as eating in a restaurant, giving direction and shopping. Most of the results of these studies state that students enjoy new experiences in language learning. However, various shortcomings of these applications are also complained about such as limited of the context that is aligned with students' learning materials and inappropriate cultural culture.

Therefore, to fill the gaps that exist in the aforementioned researches, this study developed an application using immersive VR based on educational purposes using real-life people (native speaker and students) using local cultural background. This application can be used by students with laptop, mobile phone or with the help of VR headsets. In the application, the context of the materials given is adjusted to education and conversations that will be used by students in Campus and in the world of work. The application will be used as a medium in teaching Conversation to increasing listening comprehension skills and learning English motivation especially students at Computer Science Faculty, University of Putra Indonesia YPTK, Padang.

METHOD
This research focused on developing and validating an application based on immersive Virtual Reality. The subjects of the research are students who take English II (Conversation) courses in the Informatics Engineering study program, Faculty of Computer Science in the second semester of the 2022/2023 academic year at Universitas Putra Indonesia YPTK Padang. This research is part of Research and Development (R & D) research. According to (Sugiyono, 2013). Development research is a research method used to produce certain products and test the effectiveness of these products. There are six steps to design process for interactive virtual reality applications: (1) establish the aim; (2) design the content and learning objectives; (3) choose hardware and technology; (4) create the scenario and design the interaction; (5) provide feedback and assessment; and (6) continuously improve (Esteves et al., 2023) Overall, this research has created the 360 degree videos,

developed and tested Virtual Reality application product using Unity software to test and improve Listening Comprehension skills in English II courses at the Faculty of Computer Science, UPI YPTK.

Data collection used for this research is divided into three stages, namely the first stage, library techniques to collect language learning materials, the second stage, describing application development and the third stage, describing the results of the application validity test. To measure the validity level of the application, a Likert scale is used, which is to measure a person's attitude, opinion, and perception (Sugiyono, 2013). With the Likers scale, the variables measured are translated into variable indicators. Then the indicator is described as a starting point for compiling instrument items in the form of questions or statements. To obtain the data on product validity, six English lecturers have completed validation checklists which categorized by scoring the content, and application performance. The scores ranged from 1 – 5. 1 indicates invalid. 2 indicates less valid, 3 indicates fairly valid. 4 indicates valid. 5 indicates very valid. The final score from the six validators was summed up to obtain an average score of product validity. To obtain a final score of product validity, those scores are computed in the following formula proposed by Riduwan (2005). Final score (gained score divided by maximum score) times ideal score (100). Gained score is the range score from 1 to 5 given by validators. The maximum score is 5 and the ideal score is 100.

RESULTS AND DISCUSSION
During the process of building VR application, some steps have been taken. Firstly, compiling the conversation materials based on the RPS of the teaching materials in the English II course. Secondly, selecting the conversation topics to be used. Third, finding native speakers and students who will conduct the conversations. Overall, there were 5 conversations conducted, namely, small talk, giving instruction, giving advice, describing things, and job interview. However, for the prototype product at the beginning of making this application, the initial conversation with the theme of small talk was used. The conversations were conducted by 5 students from Computer Science Faculty, with a native speaker from the UK named Ricky. Facilitating conversations with native speakers is one of the important components to build with VR application (Khatoony, 2019). By interacting with native

speakers in the virtual world, students will be able to reduce their tension and nervousness when talking to foreigners. They can also learn to relax and become less anxious while conversing with native speakers in real situations. The settings for the 360-degree were filmed in classrooms, on campus, in computer labs, in cafes, and in the cultural centre, Aditiawarman Museum, Padang. The findings of previous research evaluations indicated that the majority of AR and VR studies on language acquisition were carried out in computer laboratories (Reitz et al., 2019) and classrooms (Berti et al., 2020) where it was convenient for researchers to supervise the technology and keep an eye on the study process. Other places are cultural attractions (Chang et al., 2019) and colleges (Lee, 2020).

After recording the video conversations, the next steps is the process of making the application with following stages: (1) 360 video cropping. The Main video cropped so they could be uploaded to the application. (2) Creating Text to Speech for Application Usage Instructions. Text to Speech software is used to give guidance on how to use the application. Besides that, the application also recorded a male and a female voices to be used by the users. (3) Creating a 360-degree video player and organiser with Game object Sphere using Unity Software. (Figure 1) (4) Inputting videos that have been edited and cut into Unity software. The fact that researchers used Unity, a gaming engine capable of producing virtual material, to build a VR learning environment is not unreasonable (Yang et al., 2020) ; (Hagstrom & Winman, 2018). This software allows researchers to organize and edit videos according to learning needs, divide scenes, create question panels, and add a scoring system.
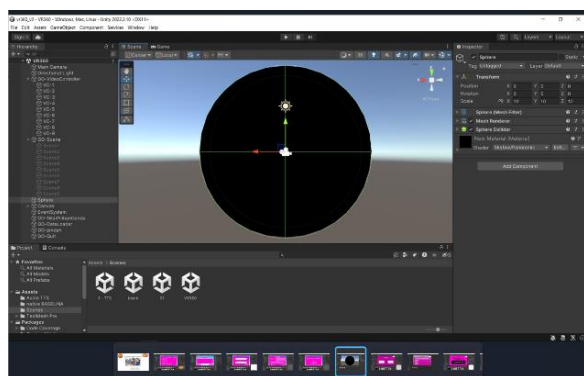

Figure 1. *Unity software*

In making this application, some of the obstacles encountered. Namely, some buttons cannot be run because they have the same panel, for this problem the solution is to separate the video panel from the Text to Speech panel. Then, the second problem is that the video size is too large, so it takes a long rendering time, the solution to this problem is to split or cut the video. And the last one is the problems when inputting questions or questions into the sphere application.

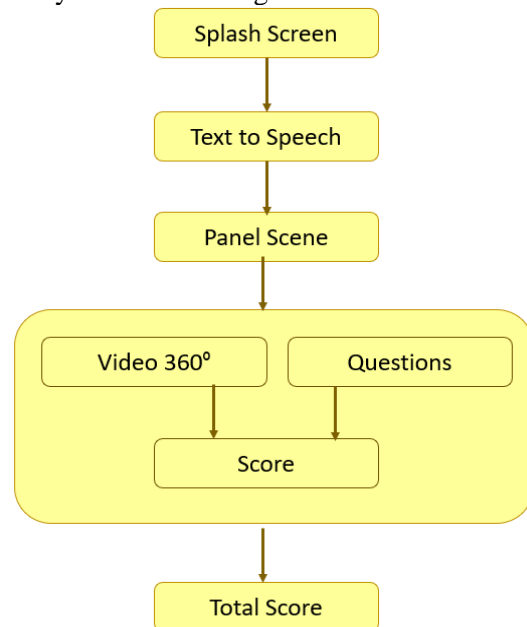The Interactive experience process in Virtual Reality is shown in diagram 1.

Diagram 1. *The interactive experience process in virtual reality*

In the diagram above, it can be seen the experience process using VR applications by students. First, when the application is used, a Splash Screen will appear for five seconds which contains, the campus logo, foundation, photo, and name of the researcher or application maker. This splash screen display is shown in Figure 2.
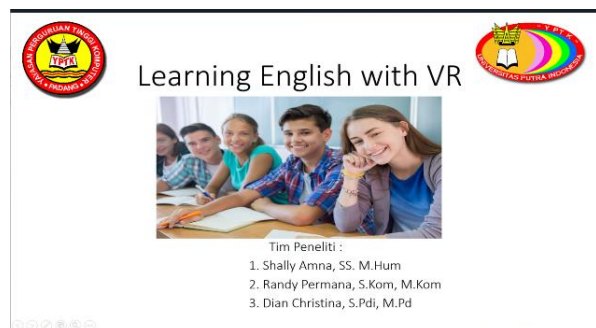

Figure 2. *Splash screen*

After the splash screen, the Unity software logo will appear and continue with guidance which will be displayed using Text to Speech. This guidance says "Welcome students, to English Comprehension Activity using Virtual Reality, before you begin, there is some information you need to know. You must input the user's name and

student number. Next, you will watch some scenes of conversation videos. Remember, this is a 360-degree video so you can move in the direction you wish to see the surroundings and also to see who's speaking. After each scene, there will be some multiple-choice questions for you to answer. Choose the correct answer by clicking or touching the options given. Each score will be calculated and by the end of the session, the system will show your final score. Do not forget to screenshot your score and send it to your lecturer. So, are you ready? Let's do it." After that, there will be a panel where students can input their names and student numbers (Figure 3).
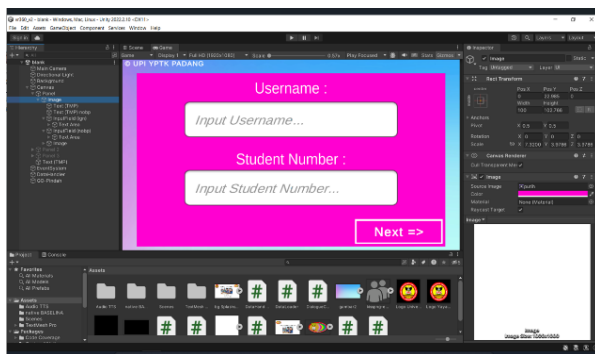

Figure 3. *Name and student number registration*

Next, students will directly enter the panel where students can watch 360 videos while rotating the video to 360 degrees to see the situation and who is talking in the video (figure 4). In this first prototype video, there is one native speaker from England, and five students from Computer science Faculty having a small talk conversation for about 30 minutes. This video then cut into several scenes and questions boards.

Figure 4. *VR video 360 degrees*

The first video contains small-talk conversations. The topics discussed in the conversations are about the student's hobbies, activities, and dreams. Moreover, they also discussed about socio-cultural context like culture-shocks which commonly happen to foreigners who live in Padang, West Sumatera. After that, the app will continue to proceed six

more videos with topics discussed in English Course II, Faculty of Computer Science, namely, social media, Describing IT Devices, Giving Instruction, Problem Solving, and Job Interviews. These subjects are covered in the lecture materials for the Informatics Engineering Department's Conversation course. In order for instructors and students in conversation courses to utilize this application as a companion in addition to modules and audio in the future.

To reduce cognitive load while using the VR app, developer can apply a method that gradually provides information (Bacca-Acosta et al., 2022) and insert text word-for-word in the application to increase comprehension by reducing cognitive load during learning exercises (Lin et al., 2021). Therefore, the video will be played for about two to five minutes and followed by 2-4 questions (figure 5). Questions are given in the form of multiple choice.
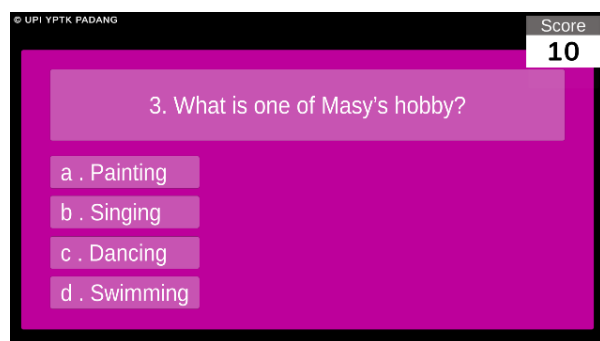

Figure 5. *Questions and scoring*

The score will increase if students can answer the questions correctly. At the end of the panel, there will be a score summation (figure 6). This final score can later become a measuring tool for students' listening comprehension skills after using VR applications.
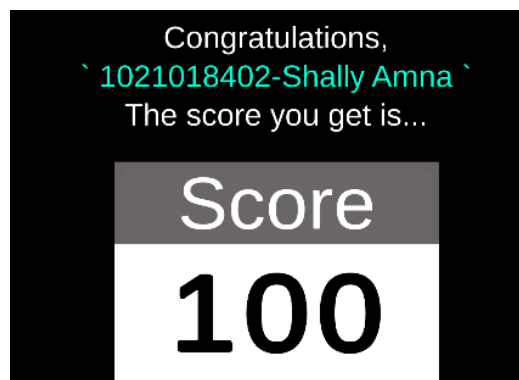

Figure 6. *Total score*

For the purpose of improving their grades, students can utilize the app as much as necessary. Sun et al., (2020) argued that the VR application should give students the chance to get feedback,

and establish a safe learning environment in order to further lower anxiety and boost confidence. Hence, an important consideration in the creation of VR language learning programs is comfort. Creating a secure and encouraging setting that reduces fear and promotes active engagement is essential to creating a successful VR language learning environment (Liaw, 2019). Learners can feel more at ease practicing and making mistakes in the virtual environment and finally can come up with the best results.

Following the use of the program, six English academics were invited to validate the study. This validation was carried out to find out how much percent of the feasibility of this VR application to improve listening comprehension skills in English II courses at the Faculty of Computer Science UPI YPTK. The validation was collected by using questionnaires which consisted of ten questions. These ten questions are divided into two categories, namely the category of application content (Question 1 to question 5) and the category of application performance (Question 6 to Question 10). The answers of the questions are specified into absolutely very valid (5 score), valid (4 score), valid (3 score), less valid (2 score) and not valid (1 score).

The questions of the questionnaire are mentioned as followed. First question, The Listening Comprehensive materials in the Application refer to the English II Courses Material Guidance. Second, the materials provided are aligned with the basic competencies of students in English II Course. Third, the display of the lesson material is easy to follow. Fourth, the order of presentation of the material is correct. Fifth, the material provided contains listening comprehension training that is aligned with the faculty competencies. Sixth, the media display is interactive with an active 360-degree system. Seventh, the instructions for using the media are clear and easy to follow. Eighth, good video and image display quality. Ninth, attractive colour composition. And tenth, spatial arrangement and layout are appropriate so that it is easy to use. The result of the validation questionnaire is displayed in Table 1.

Table 1. *Questionnaire validation*

No	Questions	Validators							
		A	B	C	D	E	F	Total	%
A	Application Content								
1	The listening Comprehension materials refer to the English Courses Material Guidance.	5	5	5	5	5	5	30	100
2	The materials provided are aligned with the basic competencies of students in English II Courses materials.	5	5	5	5	5	5	30	100
3	The display of the lesson materials is easy to read and comprehend	5	5	5	5	5	5	30	100
4	The order of presentation of the materials is correct.	5	5	5	5	4	5	29	97
5	The materials provided contain listening comprehension exercises that are aligned with the faculty competencies	4	4	5	5	5	5	28	93
B	Application Performance								
6	The media display is interactive with an active 360-degree rotating system.	5	4	5	4	5	4	27	90
7	The instructions for using the media are clear and easy to follow.	5	5	5	4	5	5	29	97
8	The application has good video and image display quality	5	4	4	4	4	3	28	80
9	The application has an attractive color composition	4	4	5	5	5	5	28	93
10	The spatial arrangement and the layout of the application are appropriate and easy to be used.	5	5	5	5	5	5	30	100
	Total Score								94

Based on the results of the English lecturer validation questionnaire results that appear in Table 1, it can be seen that 100 percent of lecturers validated that the application made contained materials are aligned with English II subject matter at the Faculty of Computer Science

(Q. 1 and Q. 2). In term of application performance, the spatial arrangement and layout also stated 100 percent valid as it is easy use by the students (Q. 10). In addition, it can also be seen that the appearance of the material (Q. 3), and instructions for using the media (Q. 7) are clear and can be followed easily. For these two categories, the validator stated a score of 97 percent valid. The next score is 93 percent for the order of presentation of the material (Q. 4), the suitability of the material with the required listening comprehension skills (Q. 5), and colour composition (Q. 9). The lowest validation percentage was 80 percent for video image display. Most validators stated that the video was not too clear enough and the lighting was blurry. This is an input for researchers and video development teams to improve the clarity of images produced in 360-degree videos in this application. Overall, this VR application stated 94 percent valid for use by students to improve their listening comprehension skills. However, this percentage also comes with a note to revise some application features so that they can be further improved.

Listening comprehension plays an important role in language learning. It is essential to learning a language since it is a prerequisite to learn other abilities (Vandergrift & Baker, 2018). Nonetheless, EFL students frequently perceive listening comprehension as challenging and anxious. (Chen, C., 2019); (Jiang & Dewaele, 2019a). Most language students often consider listening comprehension in English a difficult skill to master because of the anxiety of misunderstanding (Chen, C.W., 2019); (Jiang & Dewaele, 2019). Listening comprehension is a basic necessary skill in communication, especially in the world of engineering work. In the research of (Li, 2016) found that many language learners have difficulty in listening comprehension if they only use read-aloud or audio-recording techniques, without being accompanied by images and visuals that represent the context of the audio. Other research also states that listening input listened to through conventional audio players such as CD players is not interesting, teacher-cantered, and not contextualized (Lan & Liao, 2018).

Immersive VR-based educational applications can make students practice listening comprehension skills by actively engaging in the virtual world. A lot of researches recommended using virtual world, sometimes called the desktop virtual environment as a way to overcome students' listening barriers (Lan & Liao, 2018); (Liao & Lu, 2018).VR is beneficial as it offers a simulated environment for interactive listening learning centre (Lan, Y., 2020). Virtual Reality (VR) is a technology that allows users to enter and then feel truly present in the virtual world. In addition, VR can also be accessed through mobile phones that almost all language learners already have today, which allows them to be able to access VR more easily.

As with any technology, the introduction of this technology raises great expectations in the education sector regarding the capabilities it can offer. In this research, the proposed virtual reality concept is an immersive virtual reality with the use of a game engine software called Unity. This software acts as an editor to create a virtual environment and embed programs into the virtual environment. The addition of interaction using input controllers and audio that supports virtualization will achieve the goal of a An Immersive Virtual Reality experience. By using this application, students can not only practice listening comprehension with audio and video, but also get the experience of interacting with the ability to rotate the video 360 degrees. This allows the user to be in the middle of the conversation because he can look where he wants, such as turning the camera towards who is talking. This is in line with Lan & Liao, (2018) study which stated that L2 learners enjoyed the listening lesson in the immersive VR setting and it had improved their listening comprehension.

In some previous studies, researchers list a few drawbacks of virtual reality use. (Tuli & Mantri, 2020) and (T. Y. Tai & Chen, 2021) said that the implementation of VR technologies in language learning was time-consuming. Some students would just concentrate on the virtual material rather than the learning content. Also, according to Chen, Y. et al., (2020) the VR technology was deemed to be time-consuming by students. In order to alleviate the concerns, this study includes an assessment system at the conclusion of the VR video, diverting students' attention from watching the content to solving the provided questions. Furthermore, students were provided with sufficient time to rehearse using the laptop-installable application, enabling them to practice as much as required to get an acceptable grade.

From the results of the validation conducted by the Validator, this immersive-based Virtual Reality application is valid or feasible to use for students of the Faculty of Computer Science UPI YPTK to improve their English language skills.

From these results, it is also conveyed that several shortcomings such as an unclear video display. Although the results of the video taken with the 360-degree camera are very good, at the time of inputting the video into the application there are some obstacles so that the resulting video is not optimal. This requires a solution and larger application specifications and cutting the video into several scenes to be able to produce clearer video images. Besides that, the team also needed to double-checked and equalised the size of the video rendering in the panel with that taken from the 360-video. Furthermore, the research will continue to expand the features like having multi-scenario panel, and adding speech recognition software so that the users will experience full immersive virtual reality in practicing English. Finally, a mixed-experimental method will be carried out in further research to see the significance of changes in student learning outcomes using this Virtual Reality application.

CONCLUSION

This research is developing a Virtual Reality technology using a 360-degree camera using Unity Software to provide a new experience for English students that allows them to interact, adventure, and understand English contextually. In this application several video scenes and questions have been arranged to train students' Listening Comprehension skills. The contents of the videos have been adjusted to the needs of the students' subject area. This application features listening panel, video and audio image, user interface, and interactive 360-degree direction which can be rotate by the users. This application has been declared 94 percent valid for Computer Science Faculty students by the validators who are English lecturers who will use this application at the Faculty of Computer Science UPI YPTK Padang. Furthermore, this application will be revised according to the validators' directions, developed with more features and finally will be tested on students in an advanced method.

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