

# Hybrid Interactive Multimedia Learning with Mixed Reality (A Case Study of Visual Communication Design Course at UMT)

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## Abstrak

Pembelajaran perkuliahan desain komunikasi visual menggunakan Mixed Reality dengan kaca mata Hololens yang menampilkan Motion, Image Graphics, dan minat perkuliahan yang menarik, teknologi berbasis metode Mixed Reality, kombinasi Augmented Reality dan Virtual Reality, perpaduan dunia maya dengan dunia nyata. Inovasi ini merupakan jawaban atas transisi yang baru-baru ini dari pandemi ke normal, meningkatkan daya tarik dan semangat mahasiswa dalam kegiatan perkuliahan yang terbiasa pasif mulai aktif kembali. Penggunaan Mixed Reality membutuhkan dukungan perangkat keras MR Box Hololens. Dengan aplikasi Mixed Reality, desain dan animasi 3D terlihat lebih hidup dan dari semi-nyata ke nyata. Metode yang digunakan dalam penelitian ini adalah metode penelitian kualitatif, yang menggambarkan bagaimana proses pembuatannya mencapai tujuannya. Perkembangan pembelajaran dengan Mixed Reality adalah dengan mengikuti program studi Desain Komunikasi Visual, memberikan mahasiswa gambaran yang persuasif dan, menyeluruh terhadap semua desain.

**Kata Kunci:** Hybrid; Realitas Campuran; Interaktif; MDLC (Multimedia Development Life Circle).

## Abstract

Learning visual communication design lectures using Mixed Reality with Hololens glasses that display Motion, Image Graphics, and interesting lecture interests, Mixed Reality method-based technology, a combination of Augmented Reality and Virtual Reality, a blend of the virtual world with the real world. This innovation is the answer to the recent transition from pandemic to normal, increasing the attractiveness and enthusiasm of students in lecture activities that are used to being passive begin to become active again. The use of Mixed Reality requires MR Box Hololens hardware support. With the Mixed Reality application, 3D designs and animations look more alive and from semi-real to real. The method used in this study is a qualitative research method, which describes how the manufacturing process reaches its destination. The development of learning with Mixed Reality is by following the Visual Communication Design study program, gives students a persuasive and, overview of the all designs.

**Keyword:** Hybrid; Mixed Reality; Interactive; MDLC (Multimedia Development Life Circle).

## 1. Introduction

Technology is currently developing rapidly in all lines to make it easy for people to interact in social, economic, health, and education fields. Human life, in particular, depends on digitalization technology, which has become essential for socializing and making transactions. The development of information technology is advancing quickly, affecting the world of education, especially in the learning process. Each student has different abilities and ways of thinking, which allow them to develop their understanding of material in unique ways. In the learning and teaching process, the use of learning media is crucial, as it is an integral part of the education system. Teachers can utilize interactive learning media to channel messages effectively, stimulating students' thoughts, concerns, feelings, and interests (Tafonao, 2018). Learning will be better understood by students if it is supported by appropriate learning media (Kusnadi et al., 2018). The penetration of technology has brought about a change from conventional media to digital media, providing benefits for human survival, which is known as media convergence. The transformation from conventional to digital media can be seen as media digitization. The era of digitalization has led to an increasing reliance on digital media, which is gradually penetrating the world of education. The application of digitalization, which began with the Industrial Age 4.0, evolved into Society 5.0, a concept initiated by the Japanese government and introduced in January 2019. Society 5.0 is a human-centered concept based on technology, emphasizing the integration of life between the virtual world and the real world to improve the quality of human life in various activities and social contexts. The alignment of the virtual world with the real world is embodied in Visual Reality. Virtual reality (VR) is a technology that allows users to interact with a simulated virtual environment, giving the feeling of being present in that environment. In Indonesia, virtual reality is commonly referred to as "virtual reality" (Azani, 2018). The development of the virtual world, with the creation of the latest generation of Mixed Reality, has excelled in its applications in the learning process. Innovations such as Mixed Reality (MR) are emerging alongside rapid technological advancements, which support the learning process for Visual Communication Design students.

Mixed Reality, which combines Augmented Reality (AR) and Virtual Reality (VR), is one of the innovations that makes learning faster and more effective (Yusuf et al., 2021). As a result, this technology has started to penetrate the world of education, helping students absorb lecture material prepared by instructors. This development is welcomed by both academics and practitioners as it makes it easier to describe and engage with various objects in the learning process. Learning media plays a vital role in the lecture process. The presentation of various learning media such as graphics, films, slides, photos, and computer-based learning tools contributes to a more communicative, effective, and efficient teaching-learning process (Mustika et al., 2018). The ease with which students can access learning material has motivated this research, which explores how the Visual Communication Design program integrates Mixed Reality into its blended learning approach. In this modern technological development, most operations are supported by technology-based applications. This rapid technological evolution has given rise to numerous innovations, one of which is Mixed Reality (Riyadi et al., 2017). The advent of Society 5.0 aims to place humans at the center of life, not technology. The development of Society 5.0 is a response to ensure that Artificial Intelligence (AI) and the Internet of Things (IoT) which are dominant in the Industrial Revolution 4.0—do not replace the role of humans. Instead, the goal is to ensure that technology works alongside humans to improve welfare (Falah, 2022). According to Zulfikar Alimuddin, Director of Hafecs (Highly Functioning Education Consulting Services), educators in the Society 5.0 era must be more innovative and dynamic in their teaching methods. They must leverage tools like the Internet of Things (IoT), Virtual/Augmented Reality, and Artificial Intelligence (AI) to meet the evolving educational needs of students (Pangestu & Rahmi, 2022). Technological advancements are now driving the creation of new realities, one of which is Mixed Reality. MR offers a new experience in the virtual world by merging concepts from Augmented Reality and Virtual Reality. This technology displays digital objects within the real world and allows for interaction through touch. To experience

MR, users must use a device like Microsoft HoloLens (Valentina, 2021). Research indicates that using Mixed Reality in learning offers a dynamic and immersive experience for students. It enables lecturers to deliver virtual material to students and provides a platform for introducing students to new, engaging worlds that foster creativity and enhance learning effectiveness in visual communication design (Hasyim & Senoprabowo, 2019).

## 2. Research Methods

This study employs qualitative research, aimed at deeply understanding the effectiveness of visual communication design education and observing students' needs in adapting to the development of Society 5.0. This development has recently begun to influence various fields, including education and technology-based learning. Qualitative research allows for a more thorough analysis, emphasizing the depth of data over the quantity. The depth and detail of data collected are vital, as they help provide a clearer and more accurate interpretation of the research findings.

### 2.1 MDLC (Multimedia Development Life Cycle)

In addition to observations, interviews were conducted with academics in visual communication design to gather precise data regarding the need for digital-based learning materials. The method used to design digital-based lecture materials into virtual reality media follows the MDLC (Multimedia Development Life Cycle) methodology proposed by Luther (in Binanto), which includes the stages of concept, design, material collection, assembly, testing, and distribution (product release) (Pramesti & Arifin, 2020). The development of interactive learning media requires software development methods, and one of the methods that can be applied is the MDLC. Nurajizah (2017) employed the MDLC method in creating multimedia-based children's song recognition applications, which involved six stages: concept, design, material collection, assembly, testing, and distribution. Based on these prior implementations, this study utilizes the MDLC method in developing interactive learning media for project management courses, specifically focusing on Project Management methodology teaching materials (Mustika, 2018).

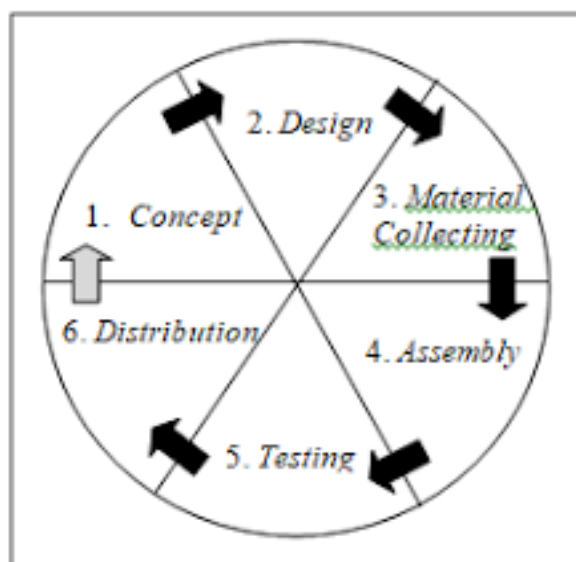


Figure 1. MDLC Method Stages

According to Sutopo, in Setiawan et al. (2021), the multimedia development method consists of six stages: concept, design, material collection, assembly, testing, and distribution. The following are the six stages of the Multimedia Development Life Cycle (MDLC) activities, as outlined by Sutopo (2021):

- 1) Concept: This stage describes the purpose and concept of the application and identifies program users.
- 2) Design: This stage involves making plans regarding the program's structure, style, theme, appearance, and the requirements needed for the application.
- 3) Material Collection: This stage focuses on gathering materials that are needed for the application being developed. These materials can include images, videos, audio, animations, and others.
- 4) Assembling: This stage involves compiling all the collected materials. Application development is based on the design stage.
- 5) Testing: The testing phase is when the application is run, and errors are identified and fixed.
- 6) Distribution: This stage involves analyzing the final application and preparing it for release and further development.

## 2.2 Multimedia

Multimedia has been widely used in learning. According to Istiyanto (2011), multimedia is a form of media that integrates two or more elements, including text, graphics, images, photos, audio, and animation, into a cohesive system. Mayer (2009) defines multimedia as the presentation of material using both verbal (word-based) and pictorial (image-based) forms. According to Delima (in Dedy, 2021), multimedia is the use of a computer to present and combine text, sound, images, animation, and video with tools and links that allow users to navigate, interact, create, and communicate. Several multimedia systems play specific roles, such as text, graphics, sound, video, and animation.

## 2.3 Analysis and Synthesis

The analysis of the needs in the field of education, particularly in response to the challenges presented by Society 5.0, identifies key factors to consider in preparing visual communication design graduates. It also explores how technological developments can be harnessed effectively and meaningfully in education. The analysis revealed the following points:

- a) Learning transcends spatial and temporal boundaries.
- b) Technology-based design learning is essential.
- c) There is a need for creative and innovative learning approaches.

The synthesis of these findings suggests that the development of learning methods using virtual reality is a promising approach. This technology combines the virtual and real worlds, offering a dynamic and interactive learning experience. Generation Z, also known as the digital generation, can leverage these applications to create graduates who are well-prepared for the challenges of Society 5.0 an era that demands creative and technology-based competencies from the millennial generation.

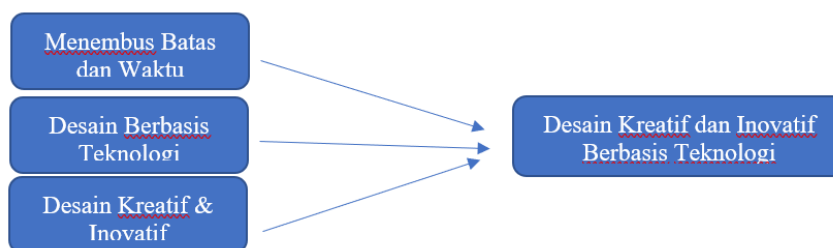


Figure 2. Analysis and Sintesa

## 2.4 Mixed Reality

The concept of this technology was first discussed by Paul Milgram and Fumio Kishino in 1994. They stated that with the progression of time, our environment will evolve into a virtual space that will serve as a medium for communication, combining the real world and the virtual world within a single scope. The illustration below depicts the spectrum of how Mixed Reality operates. On the left is Augmented Reality, where this technology intersects with the real world in its application. On the right is Virtual Reality, where the surrounding environment is completely transformed into the digital realm. Mixed Reality, positioned in between, signifies the integration of both where the real world and the digital world intersect and can interact with one another. Despite the vast potential of this technology, there remains a lack of enthusiasm among students to attend offline lectures on campus. This is due to their comfort with online lectures, which do not require the effort of commuting, making students reluctant to participate in on-campus, face-to-face classes.

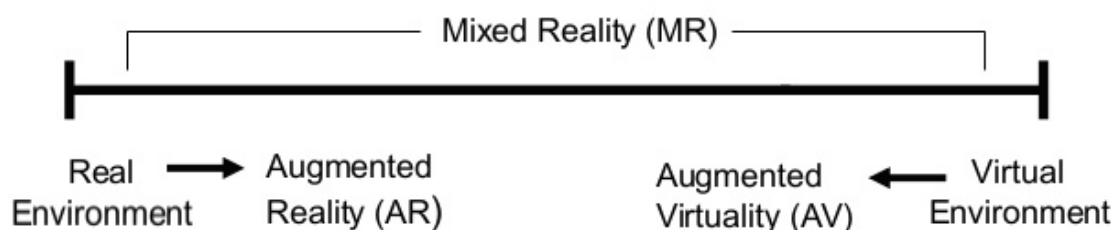


Figure 3. Mixed Reality (MR)

## 3. Results and Discussion

### 3.1 Results

Interactive multimedia encourages students to learn by utilizing technology so that it can facilitate and overcome student difficulties in learning (Kurniawan, 2021). Interactive multimedia helps the learning process to be more fun, and not boring, can be used as a companion and the information provided can also be explained more broadly (Suandi et al., 2019). The use of interactive learning multimedia has a significant effect on learning achievement (Junedi & Sari, 2020). The use of interactive multimedia in visual communication design student lectures with the mixed reality method, lectures are conducted. The more sophisticated the technology, the more real it is when using modern technology for learning tools, meaning, along with the development of the times, watching videos, and even playing games is like entering a virtual world green screen like the real world with a VR tool. Of course, you can use VR on an Android smartphone. But you also need an app for VR devices.

- 1) Cardboard
- 2) Youtube VR
- 3) Google VR Services

This research emphasizes how lectures continue and are attended by lecturers and students wherever and whenever based on mixed reality technology in which augmented reality and virtual reality support the success of hybrid lectures that are interactive across boundaries. Lectures like this are more interesting for students with virtual world breakthroughs into the real world. The pandemic transition towards normal distancing can be felt in activities that have been passive for a long time to become active again, for lecturers and students, the Hybrid Interactive Mixed Reality lecture, it makes it easy for students in one semester they can still stay at home from 14 meetings, students are given a dispensation to attend lectures from home for 3 to 4 meetings by accessing mixed reality supporting

applications, and still feel the atmosphere of lectures in the classroom, with lecturers and the Camera 360 application students can look around when the lecturer gives lectures as if it were real. Likewise, with course lecturers, they are helped if they are unable to attend because of off-campus seminars and training, they are still able to provide material and prepare answers that students are likely to ask, with the help of several supporting applications for hybrid mixed reality lectures called Hololens. Lecturers are required to pre-record the material and lectures that they will deliver on the green screen provided, or use the filming provided by the university. Lecturers can remotely during lectures in class. the technology connected to the projector will help make it easier for lecturers to control it remotely. Students can use mixed reality hololens that have been set in class. Lecturers no longer use Whiteboards but use Motion, Image, and Graphics technology.

### 3.1.1 Implementation of MDLC (Multimedia Development Life Circle)

#### 1) Concept

This stage is the stage of determining goals and who will use the application (Audience identification), and what applications will be used in making Mixed Reality material that makes students feel like they are in a lecture class even though they access it wherever and whenever, because Mixed Reality is made supporting lecturers are tapping that they make themselves or by shooting involving photographers and programmers. Description of the application concept used:

- 1) Hololens Mixed Reality are glasses with hybrid technology that have a semi-transparency screen to be able to see real points of view and virtual monitors (Graphics / Animation)
- 2) Blender is used to create modeling and animation and create space
- 3) Photoshop to create or edit objects/materials in support of modeling, and textures in Blender
- 4) Unity to inform 3D objects to be virtual (so they can be used in MR/Hololens glasses)

#### 2) Design (Design)

Design is the stage where creating the flow of the creation of Mixed Reality, from the style, appearance, and materials that are made as attractive and lively as possible, and the supporting requirements for a successful manufacturing process are generated

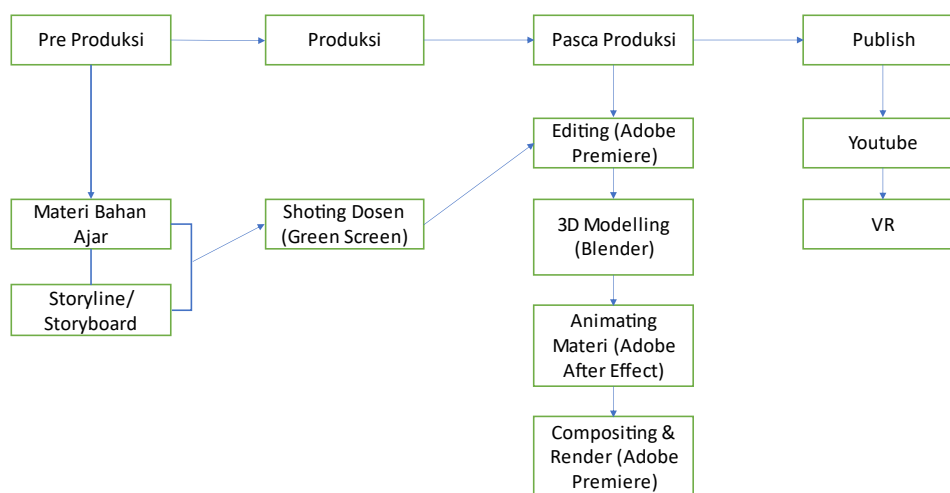


Figure 4. Flowchart Design

### 3) Material Collecting

At this stage, learning materials were obtained from the Visual Communication Design Study Program lecturer team, while materials related to making applications such as image illustrations were obtained from the internet by ensuring that the illustrations were free of copyright. The lecturer collects the material needed to make the Mixed Reality material application and some of the materials needed to make the application. Hardware, Laptop, Scanner, Sound Recorder, Camera. Software, Unity 3D/Artivive, Freemake Video Converter, Blender/After Effects, Adobe Illustrator/Adobe Photoshop. Making a Mixed Reality Lecture application also requires visual effects. The visual effect used is a green background (green screen) which is used in creating content in the form of motion graphics. Besides that, it also uses several types of audio including; Audio dubbing, audio back sound, and audio effects.

### 4) Assembly

The Assembly stage is the stage for all objects and designs that you want to display in Mixed Reality, at this stage the lecturer starts making materials that will be given to students, such as making markers, motion graphics, and 3D content, and starting to make Mixed Reality applications.

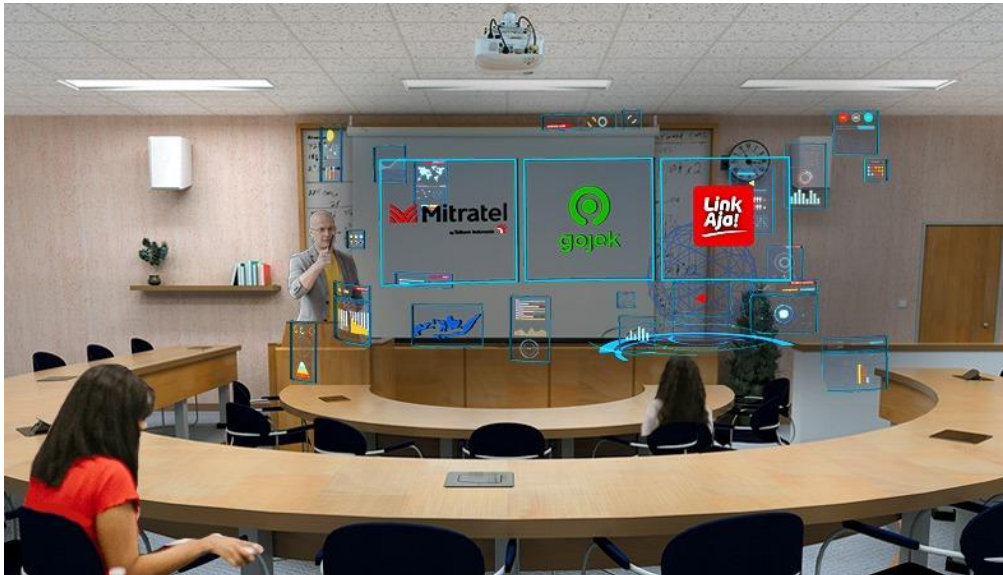


Figure 5. Simulation Making Learning Hybrid Application

This stage makes motion graphics so that when students tap Mixed Reality access to lectures it looks like this, the classroom atmosphere looks like realtime, and students can also see the lecturer and the material provided as if they were receiving material in class.

### 5) Testing

This stage is carried out when all the manufacturing processes are complete and ready to be tested for the missed stages, repairs if there are indeed error stages, and the addition of features that according to the testers require additional features or want to be perfected so that objects and components can function properly, and according with the design that has been made before in the design.



Figure 6. Use of HoloLens

6) Distribution (Distribusi)

After the learning media application has been produced and tested, it is already in the form of an APK, the application can be uploaded to Mixed Reality, or stored using a flash drive, CD, and DVD and ready for student access for learning lectures for courses that have been tapped and uploaded.

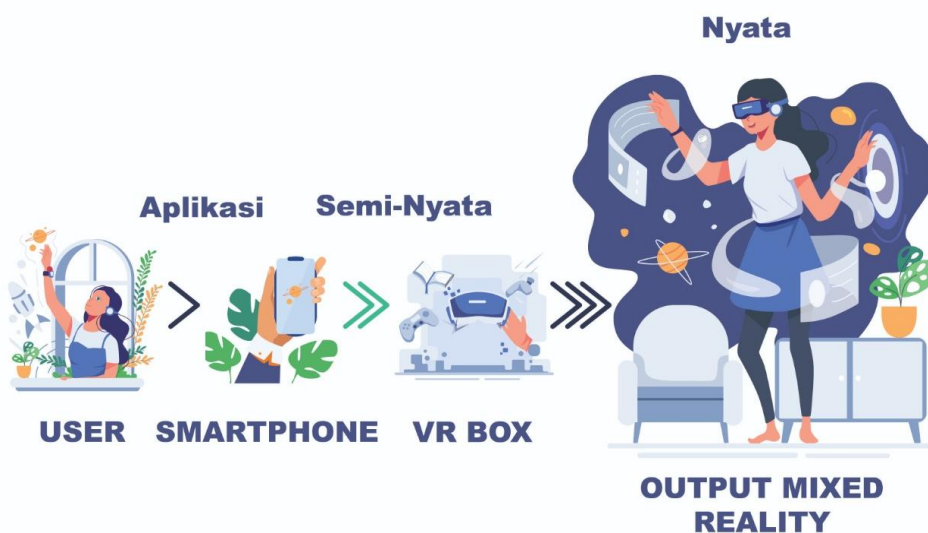


Figure 7. Distribution

3.2 Discussion

Interactive learning using Mixed Reality (MR) technology has a significant impact on the learning process, especially in the field of visual communication design. As explained by Pramesti and Arifin (2020), learning based on the Multimedia Development Life Cycle (MDLC) method allows the development of more interesting and effective learning media. MR facilitates students to interact directly with the material through an immersive visual experience, thereby increasing their engagement in class. With MR, students can access materials in a more innovative and interactive way, in line with the thoughts of Pangestu and Rahmi (2022) who stated that technology such as MR in the Society 5.0 era can improve the quality of education by creating a more dynamic and creative learning experience. Along with technological advances, MR provides solutions to learning challenges faced by students, such as limited interaction in traditional classes. Yusuf et al. (2021) noted that MR can overcome these problems, especially when switching from offline to online due to pandemic

learning. With devices such as Hololens, students can experience learning as if they were in class even though they are attending lectures from home. This technology allows them to interact with learning materials in 3D, which provides a more realistic and engaging learning experience. The application of the MDLC model in the development of MR-based learning applications, as explained by Mustika et al. (2018), ensures that every stage, from concept to distribution, is carried out carefully to produce applications that are not only technical, but also relevant to teaching and learning needs. Each step in the MDLC process ensures that the application developed is effective in achieving learning objectives, improving the quality of teaching in the field of visual communication design. Although MR technology offers many benefits, challenges remain, especially in terms of student engagement who prefer daring learning. However, Valentina (2021) stated that MR can provide a solution to this problem by combining daring and offline learning in a hybrid format. With MR, even though students are not physically present on campus, they can still experience a more interactive and immersive classroom experience. In addition, teachers who cannot attend class for some reason can still provide materials and interact with students through MR learning technology. Ultimately, the application of MR in learning also has an important impact on student preparation in the Society 5.0 era. Anta (2022) stated that Society 5.0 emphasizes the integration of technology between the virtual world and the physical world to improve the quality of human life. MR plays an important role in preparing students to adapt to these technological changes, because they will be equipped with the skills to interact with the virtual world and the real world simultaneously. This technology provides opportunities for students to develop skills that are relevant to the needs of the creative industry which is increasingly dependent on technology, as exemplified in Azani's research (2018), which states that Virtual Reality and Mixed Reality are very effective in providing a more interactive and immersive learning experience.

#### 4. Conclusion

This research creates a Mixed Reality learning application for Visual Communication Design students, in which they receive material with lectures giving explanations and explaining the material presented in MR Hololens. Hybrid Learning provides added value to the Visual Communication Design study program in responding to the challenges of Era Society 5.0 which are being adopted by Indonesia in all fields including Education. By using the MDLC (Multimedia Development Life Circle) Model, perfecting this research, with the steps taken in making the application of this material, the stages of preparing the learning concept, and collecting material that is suitable for courses and Mixed Reality applications, with good results, and tested first in to get maximum results, making this hybrid learning application perfect. Hybrid Mixed Reality is a breakthrough in the field of education and not many have used it for the lecture learning process.

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