

# Development of Learning Innovation Using Augmented Reality Technology with a Learning Management System as a Learning Supplement

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**Abstract:** Augmented Reality technology is making significant changes in the world of education by enriching the learning experience. This article discusses the development of innovative learning by integrating Augmented Reality into the Learning Management System as a learning support. This research aims to explain the concept of incorporating Augmented Reality into a Learning Management System as a complementary approach to increasing effectiveness and engagement in learning. The integration of Augmented Reality enables the presentation of learning content in a visual and interactive form, bridging the gap between theory and practice, and increasing student motivation and understanding. The results of using Augmented Reality in learning include increased understanding of the material, higher learning motivation, and the development of practical skills. However, this article also examines the challenges that may arise, both from a technical and pedagogical perspective, during the implementation of Augmented Reality in a Learning Management System. This research provides a comprehensive view of the potential of Augmented Reality as a complement to learning in facing the changing dynamics of modern learning. This article can be a guide for educational practitioners and researchers who are interested in incorporating Augmented Reality into learning contexts in various educational environments.

**Keywords:** Augmented Reality, Education, *Learning Management System*

## INTRODUCTION

Technology is the most influential factor that shapes the world of education today. Integrating technology into the classroom will optimize 21st-century skills in the aspect of technology mastery (Hidayah et al., 2020). In the future, students will certainly need technology both as a workforce and in their daily lives (Brown et al., 2018). Many educational institutions have shown their support in increasing the use of technology in the classroom by providing software such as tablets and computers, improving internet connectivity, and various training to improve technology mastery for teachers and students. Internet, YouTube, Facebook, WhatsApp, and many new technologies have become inseparable from their daily lives (Szeto et al., 2015). AR technology works by superimposing virtual information on top of the real world, supplementing the user's reality instead of replacing it as other technologies (such as virtual reality) would (Azuma, 1997)

A successful learning process must be participatory, enjoyable, stimulating, and inspiring in addition to giving students more room to express their creativity and gain freedom based on their interests and talents. Because augmented reality itself has an entertainment component that can increase students' interest in learning and having fun, as well as expressing it practically and related to the road, the use of learning media with augmented reality is very helpful in improving the learning process and students' enjoyment of learning. interaction among all five senses of the students.(Ramadhani & Delianti, 2022)

Education has problems staying current and suits the students' increasingly varied learning needs in the ever-evolving digital age. The way that younger generations study has changed as a result of technological advancements, with easy access to information, smart gadgets, and digital settings taking center stage. In this context, augmented reality technology has become a cutting-edge instrument that has the potential to revolutionize the educational process. While the use of Augmented Reality Technology and its integration with Learning Management Systems has taken center stage in efforts to meet these needs, traditional learning approaches are still valuable. Augmented Reality enables the merging of the physical and digital worlds, creating immersive learning

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experiences. It helps students to better understand and internalize complex concepts by presenting them in a more visual and interactive form.

The capabilities and economic viability of augmented reality (AR), virtual reality (VR), multi-user virtual environments, and various types of mixed reality (MR) are advancing quickly at the moment. About a variety of topic areas, student developmental levels, and educational settings, these new media appear to present outstanding prospects for the improvement of motivation and learning. People now have the opportunity to experience immersive learning both in official settings like classrooms and informal ones like homes, libraries, and community centers because of the development of practicable and inexpensive virtual reality and mixed reality. (Maebell & Lawrence, 2021) AR technology, especially when used in STEM education, allows students to explore, practice, and interact with STEM content without worrying about financial or ethical issues, such as costly consumables or animal injury (Petrov & Atanasova, 2020)

An e-learning platform requires a Learning Management System (LMS) to administrator learning content. LMS provides manageable tools to administer courses, and it provides communication and collaboration among learners and instructors (Chern Lim et al., 2005). Learning Management System, on the other hand, helps in organizing, monitoring, and tracking student learning progress, while allowing the personalization of learning according to the needs individual. The increasingly rapid development of technology is also in line with the increasingly developing quality of education, especially at the tertiary level. Online or online learning through e-learning, which is usually called a Learning Management System, is a reflection of the quality of higher education institutions which must be able to utilize the role of technology to be able to develop distance learning models. The development of the Learning Management System must be designed and developed optimally to support all the needs of the users of the Learning Management System, namely students, lecturers, and educational staff. (Hardika, 2021) To solve this challenge, this work combines AR technology and the Moodle platform to enhance the capabilities to motivate students during the learning process. (Rodríguez et al., 2023)

The integration of Augmented Reality and Learning Management Systems as learning supplements offers the potential to take education to the next level, providing a more engaging, relevant, and effective learning experience. Therefore, research and application of these innovations are crucial to prepare students for an increasingly changing and technology-based future. Learning innovation by integrating Augmented Reality Technology in the Learning Management System as a learning supplement has emerged as a solution to several important problems in the world of education today. One of the main issues is the need for a higher level of involvement from students. Many students experience challenges in maintaining interest and motivation in learning, especially when the learning material is less interesting. With Augmented Reality, learning becomes more dynamic and interactive because it allows students to interact directly with the content they are learning in a real-world context. This helps increase student engagement and motivates them to learn more actively and understand concepts better.

The gap between the realm of theory and practice in learning is another issue that needs to be addressed. By letting students see how concepts work in practice, augmented reality technology helps to bridge the gap between theory and practice. (de Paiva Guimarães et al., 2017) In this paper, a method for integrating augmented reality into LMSs was proposed. It can aid teachers who use augmented reality information to enhance their lessons and better the comprehension of their students. This suggestion is based on LOs, which are projects that provide pedagogic content that is intended to be reusable, interoperable, managed, and accessible. We discussed a packaging tool built on the LO standard SCORM.

Additionally, integration with the learning management system enables teachers to assess student progress, pinpoint areas that require more work, and give more specialized feedback. Learning innovations like augmented reality and learning management systems offer the door to solutions that can overcome these difficulties, resulting in more engaging, significant, and efficient learning experiences for the generation of students growing up in the digital era. Enhancing the quality and efficiency of the learning process is the primary goal of learning innovation that incorporates augmented reality technology into the learning management system as a learning supplement. By presenting learning content in a more visual, engaging, and pertinent manner, this innovation attempts to improve the quality of learning in the first place. Students that use are better able to comprehend and internalize difficult ideas. Additionally, integration with the learning management system enables more effective monitoring of students' academic progress.

## LITERATURE REVIEW

In this research, we explain the use of augmented reality technology in learning about the human excretory system using AR technology. In making learning applications using the augmented reality method, namely the Marker Based Tracking augmented reality method. This research aims to make it easier for students to learn and understand the material, making learning more interesting and not boring. In this application, each object is displayed in a 3D visual image using animation, sound, and attractive colors. The research methods in this research are literature study, field study, and sample calculation. The results of this research are mobile applications that

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are used as supporting tools to help the learning process (Aprilinda et al., 2020). As time goes by, learning media also follows existing technological developments, starting from print technology, audiovisual, and computer, technology. a combination of printing technology and computers. Currently, learning media combines print and computer technology so that it can be realized using Augmented Reality technology media. Augmented Reality is a technology used to transform the virtual world into the real world at one time. Earth's relief is the shape of the earth based on the height and low of the earth's surface. The Earth's relief consists of land and ocean relief. Learning media to recognize the shape of the earth using Augmented Reality can realize the virtual world into the real world, can change these objects into 3D objects, thus making the learning method not monotonous and students will be motivated to find out more, such as knowing basic examples and information from each shape of the earth (Alfitriani et al., 2021)

Augmented reality technology is one of the breakthroughs used recently in the field of interaction. The use of this technology will be very helpful in conveying information to users. Augmented Reality is an interaction technology that combines the real world and the virtual world. In augmented reality technology there are three basic characteristics, including a combination of the real and virtual worlds, interactions that take place in real-time, and the last characteristic is the shape of objects in the form of 3 dimensions or 3D. The form of contextual data in augmented reality can be location data, audio, video, or in the form of 3D models and animations (Apriyani & Gustianto, 2015)

The literature used above is used as a reference in this research. Relevant literature references in the context of learning innovation by combining Augmented Reality Technology and Learning Management Systems as learning supplements have several main objectives. These references can help in identifying and explaining the benefits that can be obtained through the integration of Augmented Reality with the Learning Management System. This includes increased student understanding, increased levels of engagement in the learning process, as well as increased effectiveness in the delivery of learning material. Apart from that, literature references can also help in explaining learning objectives that can be achieved through the use of augmented reality technology in the Learning Management System. These goals include enabling students to experience the practical application of the concepts they learn, providing a more interactive and dynamic learning experience, and facilitating the monitoring and assessment of student learning progress by educators. By referring to relevant literature, discussion, and implementation of this learning innovation can be carried out with deeper understanding and tested information. This can help educators and researchers optimize the use of augmented reality and Learning Management Systems in modern learning contexts.

## METHOD

In research related to the development of learning innovations using Augmented Reality Technology with a Learning Management System as a learning supplement, several research methods can be used. The following are several research methods used in this research:

### 1. Data

This research data uses material in learning using operating systems courses. Later there will be a selection of appropriate materials in the trial of this application.

### 2. Data Collection

This research has several techniques for collecting data in the form of:

- a. Literature study or literature study is data collection carried out by obtaining information from books, journals, or scientific works related to research.
- b. Observation is an activity or data collection carried out by coming directly to find out the type of material that can be used.

3. Data Analysis. Data analysis is an analysis carried out to determine the results of data collection obtained from observations, literature studies, interviews, problem identification, and questionnaires that have been carried out previously to obtain results in the form of data that will later be used for the Augmented Reality application development process.

The System Development Method, namely the Augmented Reality Technology application, is used to display the content and content of the Learning Management System which has been filled in previously. The image below shows how to create, package, and visualize augmented reality content. In the first stage, augmented reality tools are used to make AR applications compatible with web technologies (namely, HTML5, JavaScript, WebGL). This compatibility is because the Learning Management System usually runs in a web browser, thus avoiding portability problems. Traditional web applications generally contain scripts, HTML, CSS files, and other media, such as

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video, images, and audio. However, if you use an augmented reality app, it includes other files, such as 3D models and animations.

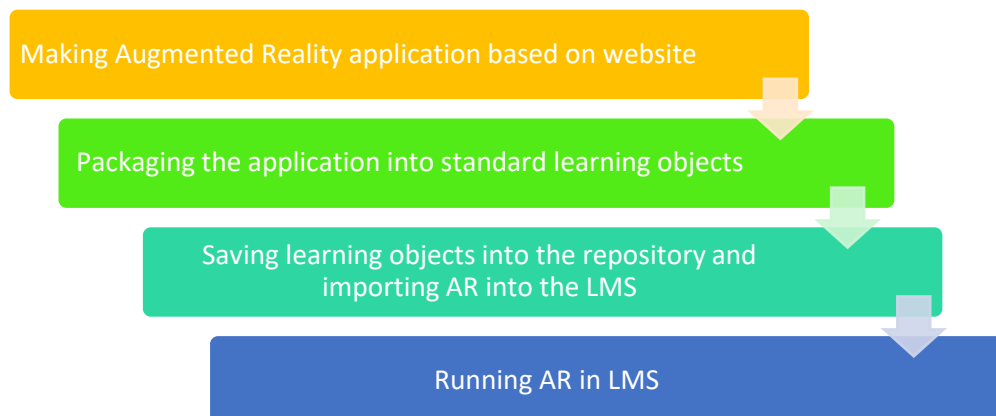


Figure 1 Research Method

The second step is to incorporate application packaging into standard object learning when creating Augmented Reality applications. The next step is to save the learning object into the repository and import Augmented Reality into the Learning Management System that will be used. The final step is to run Augmented Reality in the Learning Management System by scanning the QR code.

Before conducting research, a concept and research design plan are needed. In this research, a stage was designed on how to create Augmented Reality Technology with the stages shown in Figure 2 below. In the figure, it can be explained that the first step is to activate the camera on the smartphone, whether Android-based or iOS-based, then after the camera is active, the next step is to direct the camera to the Augmented Reality object marker. If the marker can be read properly then the object will be displayed, if not the system will repeat this stage

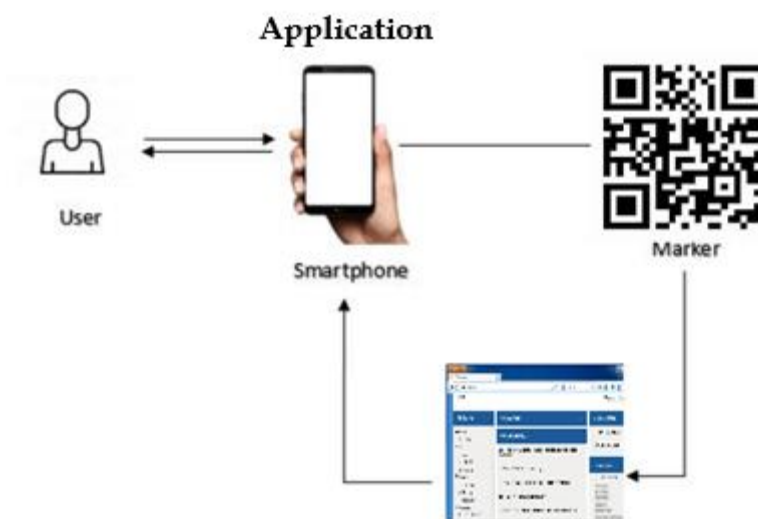


Figure 2 Architecture System

This research is a continuation of previous research. Previous research was completed regarding the development of gamification applied to MOOC learning media at the Malang State Polytechnic. This year it was developed to integrate Augmented Reality with Learning Management System as an alternative learning media. The final goal of this series of research is that integrating Augmented Reality with The Learning Management System as an alternative learning medium can increase student enthusiasm for learning.

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### RESULT

In its implementation, augmented reality is created using 3D objects. The application can provide interactive explanations about various types of hardware. Users can explore 3D models of the device and get detailed information about its functionality and usage. Application creation can have detection and tracking features to identify the hardware used by the user. For example, when a user holds a particular Augmented Reality device in front of the phone's camera, the app can detect it and provide specific information about the device. Creating 3D objects using Unity and then exporting them into 3D computer form. Objects consisting of computers, keyboards, mice, and other computer devices are shown in Figure 3 below:



Figure 3. 3D Augmented Reality Object

With 3D AR objects, students can explore learning material in real three dimensions, making abstract concepts more concrete. The result is increased student interest and motivation to learn, as they can actively interact with the learning content in an immersive virtual environment. Then the input of the 3D augmented reality object above is made into a QR code so that through any media students can detect the form of augmented reality directly.



Figure 4 Augmented Reality in the Learning Management System

Figure 4 shows the integration of the Learning Management System with augmented reality which was previously converted into a QR code generator. This QR code is used as a media interface so that students can learn augmented reality directly via cell phones or other media.

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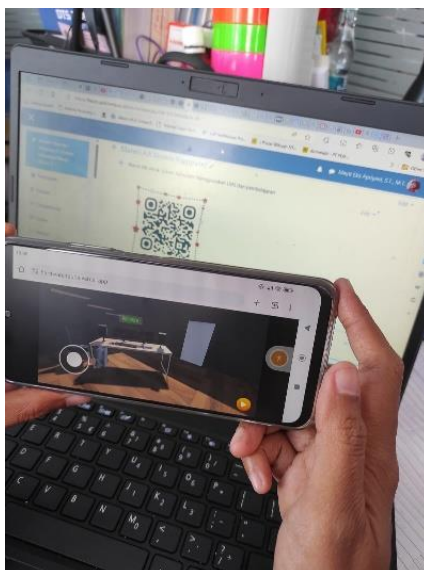


Figure 5 Integration of Augmented Reality in the Learning Management System

Figure 5 shows the integration of augmented reality with the Learning Management System which allows other forms of learning from students in more detail and real-time. This helps educators to provide more timely and personalized feedback to students, as well as identify areas that need more attention. The result is an increase in learning effectiveness and students' understanding of the subject matter. 3D augmented reality objects also bring real benefits in facilitating student engagement. Students can collaborate on augmented reality-based projects, develop their creativity, and experience practical applications of the concepts they learn. It stimulates critical thinking and invaluable practical skills.

Overall, the result of integrating 3D augmented reality objects with the Learning Management System is to create a learning environment that is more immersive, interactive, and relevant to the ever-evolving digital world. This helps students understand and remember the material better and prepares them for an increasingly technologically advanced future.

## DISCUSSIONS

Related research illustrates the importance of innovation in education, especially in combining Augmented Reality Technology and Learning Management Systems as learning supplements. The combination of Augmented Reality and Learning Management systems allows learning to be more interactive, dynamic, and relevant to the ever-evolving digital world. The advantages of Augmented Reality include its ability to visualize abstract concepts in real contexts, bridge the gap between theory and practice, and increase student engagement through interactive learning experiences. On the other hand, the Learning Management System helps in learning management, monitoring student progress, and personalizing learning according to individual needs. Through this innovation, education can keep up with rapid technological developments and meet the increasingly diverse needs of students. The result is a learning experience that is more meaningful, effective, and relevant to an increasingly digital future.

## CONCLUSION

Learning innovation that combines Augmented Reality Technology with a Learning Management System as a learning supplement promises significant progress in the world of education. The aim is to improve the quality of learning, increase engagement, and bridge the gap between theory and practice. By utilizing augmented reality, students can experience learning that is more dynamic, interactive, and relevant to their world full of technology. Integration with the Learning Management System enables more efficient learning management and personalization of the learning experience. Through this innovation, education can adapt to ever-growing technological developments and increasingly diverse learning needs. Students can develop a deeper understanding of the learning material and become actively involved in their learning process. Thus, this innovation carries the potential to create a generation of students who are better prepared to face the challenges of an increasingly complex and digital world. With further developments in AR technology and proper implementation of the Learning Management System, the future of learning can become more interesting, meaningful, and effective for all parties involved in the educational process.

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