



# DEVELOPMENT OF A LEARNING MODEL FOR INDUSTRIAL CONTROL ENGINEERING COURSES WITH METAVERSE TECHNOLOGY

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## ABSTRACT

Modern three-dimensional technology, the metaverse, merges the actual world with the highly developed digital realm. Through virtual reality (VR) and augmented reality (AR) technologies, people worldwide can congregate in the metaverse and engage with one another. The objectives of this study are to (1) build a METAVERSE-based program for use in Industrial Control Engineering courses, and (2) ascertain student reactions to existing learning applications. Research & Development (R&D) research is this kind of study. Both professors and students served as the research subjects' models and users. Application testing utilizing user feedback surveys and black box testing techniques. The study's findings were attained (1) Course on Industrial Control Engineering Application The quality of the application generated is in line with the program offered, according to the findings of black box testing; (2) Students respond well to learning apps that have been created. A presentation value of 88% was acquired for the indicator of simplicity of use, while a presentation value of 90% was obtained for the indicator of aiding in the learning process.

**Keywords:** Learning model; metaverse

## 1. INTRODUCTION

Digitalization has been actively replacing current structures and hierarchies and has various social effects. On the other hand, the system's structure, as it is now, has also been altered by ongoing digitalization. Mayor changes result from digital

transformation since the process is converted into an electronic system. The digitalization of many industries today has spread, including public services like automation, telecommunications, banking, tourism, health, transportation, manufacturing, education, and services.

The industrial revolution is primarily driven by digitalization, which has resulted in significant adjustments to corporate strategy, planning, production processes, automation, order picking, marketing, and product delivery because every order transported uses digital technology. This enormous development demonstrates how crucial digital literacy or a digital lifestyle are in the modern world. The development of industry and the world of work (IDUKA) is currently undergoing a digital transition that is causing rapid changes. The current social phenomenon has started a new age known as the Industrial Revolution 4.0. The era was characterized by the widespread adoption of digital processes in many industries where people had previously dominated the economy. According to Merkel (2014), the Industrial Revolution 4.0 is a total transformation of all industrial production processes based on traditional industrial models, utilizing digital technologies and internet services.

The metaverse is a 3D virtual world idea that was developed by combining augmented reality, virtual reality, and video technologies. It is intended to be the future of internet updates. Theoretically, it involves involving multiple individuals in any activity, but carrying it out digitally or online to give the impression that it is taking place in the real world. A better educational process has a lot of potentials to be supported by metaverse in education. The most frequently utilized Metaverse application is audiovisual education, which is used in many educational settings. Experiential learning, for instance, is excellent if it includes a hands-on or simulated experiential learning process because it allows students to see, read, and feel when they have had enough. The Metaverse technology can help with this simulation. The possibilities suggest that schooling on the metaverse offers a unique educational experience. Today's technology and educational media can be streamlined and made more efficient by the metaverse.

With VR headsets, users can enter the metaverse, a 3D virtual reality environment. The player finds himself in a 3D environment where he can live, engage, and carry out various tasks. Virtual reality, augmented reality, and video are some technology components that make up the metaverse. The employment of these three combinations in the virtual world known as the metaverse is made possible by these three combinations. Technology in the metaverse differs from VR and AR in three different ways. First, whereas the metaverse has a stronger aspect with ongoing social content and meaning, VR concentrates on physical techniques and rendering. Second, AR and VR technology are not required for the metaverse. Therefore, a platform can still be a Metaverse application even if it does not support VR and AR. Third, the metaverse offers

scalable environmental capabilities that can support a large number of users, hence enhancing the social significance that this technology emphasizes.

## 2. METHODS

Research and development (R&D) is the term for this kind of study. The study involved designing a learning paradigm for courses in industrial control engineering using metaverse technology. The Department of Informatics Engineering, Faculty of Science and Technology, UIN Alauddin Makassar will be the site of this study. the course Industrial Control Engineering. This study's implementation process begins with a survey of the research's difficulties and ends with data collection on the study's implementation-related findings. The process of developing a learning model is broken down into three sets of activities, including pre-development (analysis and design), development, and model application (implementation and evaluation).

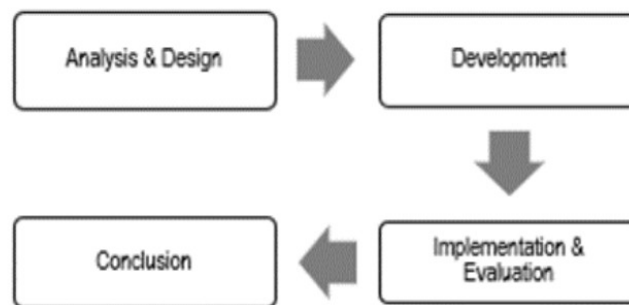


Figure 1. Data analysis process

The research was conducted in several stages, from checking all research documentation to making observations during the learning process, followed by interviews. Observations are made to determine students' creativity during the learning process. Documentation is used to measure students' abilities. Interview techniques are carried out to strengthen the results obtained from student observations.

### 3. RESULTS AND DISCUSSION



Figure 2. Simulation of the use of metaverse technology



Figure 3. AR Model on Arduino and Application of industrial automation systems



Figure 4. VR Model in metaverse learning media

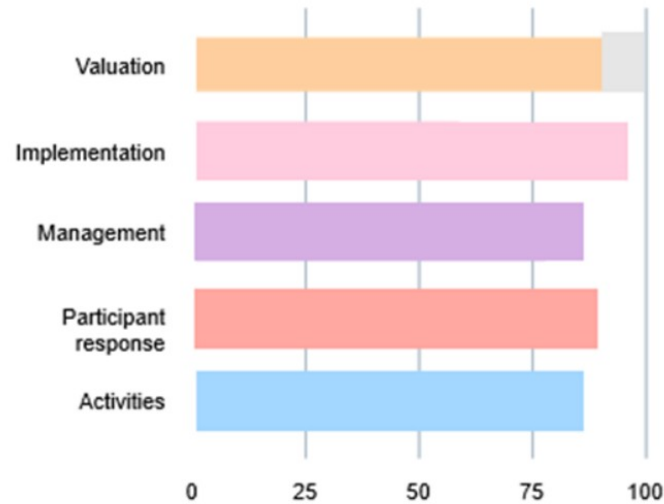


Figure 5. Graph of the effectiveness of the implementation of the metaverse model

Learning resources that contain information and expertise are typically used for learning to be more effective and efficient. Additionally, educational media can spice up the learning process and improve students' drive to learn. Learning media plays a part in bridging the process of delivering and sending messages as well as information from resource persons to students who carry out the learning process during the teaching and learning process. With the aid of media and technology, the exchange of knowledge and information between senders and receivers can happen effectively and efficiently. You can see from the graph that the technique is up to 89 percent effective.

## CONCLUSION

Because educational media are designed to assist students in the learning process, whether or not educators are present during the educational process, using educational media with metaverse technology can directly provide learning wherever and whenever students want to carry out the process Learning. This can influence students' attitudes toward issues and events that occur in everyday life. According to the objective of the learning media, metaverse learning media can visualize abstract concepts for comprehension and the structure of an object model, making the metaverse a more effective medium.

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