

CHAPTER 1. TECHNOLOGY BEYOND EDUCATION

1.1 Digital Transformation in Education

One of the agreements in improving education at one of the 2015 Millennium Development Goals (MDGs) conferences was to improve the quality of human resources throughout the world through education, so that education is needed that can reach all groups, one of which is by using technology-based media, especially during the pandemic. The Covid-19 that has hit us now means that this technological learning media needs to be further developed, making teaching staff have to develop more strategies in learning. Through these technological advances, teaching staff are required to create learning media that is not only easy to understand but also interesting learning media so that they can be effective in learning (Backlund et al., 2010; Bauman, 2012; Hill et al., 2006; Martens et al., 2008). As technology develops, as an educator you must quickly adapt to situations and be able to use technology to develop learning according to current conditions.

Generation Z is a generation that is no stranger to gadgets, cell phones and games. We know that they generally like games or play, and Generation Z likes something creative, practical, and fun in various activities, including learning activities, so the use of Game-Based Learning is very suitable for learning media in the digital generation like now. Education promotes creativity within national innovation systems and is crucial for sustainable development. The quality of education must keep up with the technological advances brought about by the digital transformation caused by these technologies as developed economies enter the mature stages of the fourth industrial revolution (Shenkoya & Kim, 2023).

Digital transformation has become an inseparable part of education (Du Toit & Verhoef, 2018). It employs a systematic and selected strategy, leading to resource savings by utilizing resources as effectively as possible while avoiding typical budget limits. Digital transformation is used to improve the student experience accessibility, deliver excellent instructional resources, and offer

blended learning to draw enough upper-class students (Hashim, 2018). In addition, it impacts students' motivation, autonomy in learning, competency, and literacy (Engelbertink et al., 2020). Global phenomena like the development of the internet, information exchange, digitalization, virtualization, and social media have made it necessary for higher education to implement a digital transformation strategy to enhance student experience, particularly education delivery.

As a result, increasingly going digital has become a reliable platform to create, cultivate, and maintain competitive advantages. Simulators, in particular, replace unavailable laboratories, as was the case during the COVID-19 epidemic when access to laboratory techniques was restricted (Amalia et al., 2022). An online simulator aims to facilitate an interactive understanding of abstract or complex subjects by providing compelling images that may be challenging to attain through solely theoretical learning activities.

1.2 A Game-based Learning with AR & VR

Game Based Learning is a learning method that uses game applications or games that have been specifically designed to assist the learning process and help improve student effectiveness in learning. By using this strategy, teachers can provide stimulus to the most important parts of the learning process, namely emotional, intellectual and psychomotor students. In Indonesian, this method can be interpreted as game-based learning. Which is a learning activity adapted to teaching materials and assisted by technology. Fantasy in the context of the game demands higher learning interest in students and increases learning effectiveness.

Furthermore, GBL has the ability to boost students' enthusiasm for learning. This is due to the fact that a game-based learning environment may motivate students and offer them excellent chances to learn while having fun. Teachers that use the game technique for instruction must take into account the unique features of their pupils. In addition, this method can be utilized to allow students to engage in peer interaction, which is good for students'

interpersonal intelligence. claiming that playing a variety of games can help to enhance interpersonal intelligence.

Therefore, this method could be used in place of others to assist children in developing their interpersonal intelligence. With this game-based learning strategy, pupils' cognitive development—including their learning achievement—is substantially improved. Therefore, this method could be used in place of others to assist children in developing their interpersonal intelligence. With this game-based learning strategy, pupils' cognitive development—including their learning achievement—is substantially improved. The assertion is consistent with Vigotsky's view, which holds that learning games provide an excellent environment for cognitive development. This is based on the traits of Generation Z, who like engaging in non-boring play and learning activities. Additionally, the variety of activities that are offered to pupils will pique their interest in studying, which will help to raise learning achievement. As a result, this approach can be utilized to teach knowledge in academic topics.

Augmented reality (AR) and virtual reality (VR) will also grow in educational media. These technologies can increase students' interest in their studies by making learning more interactive and engaging (Motejlek et al., n.d.; Pelargos et al., n.d.). In many fields, including education, AR and VR are now more feasible and desirable thanks to recent technological advancements and the spread of affordable gear and software. They have also been relaunched with fresh promises that were before unthinkable.

The nature of AR and VR promises new teaching and learning approaches that more effectively fulfill the demands of students in the twenty-first century (Elmqaddem, 2019). The use of VR in education, as mentioned by (Saab et al., 2021) suggests that virtual reality technology can enhance present educational methods and facilitate learning. According to research by (Zamar & Segura, 2020) there has been an increase in interest in studying how virtual reality used in higher education, particularly over the past three years.

Approximately 80% of students are more likely to attend an AR-based class, according to (Khan et al., 2019). About 72% of them are eager to participate, and 70% said the AR enhanced their learning and sped up the process of understanding the material. AR-based learning increases student interest by making the learning experience enjoyable and welcoming. According to a current study by ARtillery Intelligence, by 2023, there will be 2.4 billion mobile augmented reality users worldwide, and the market will grow to \$72.7 billion by 2024. The sharp increase is evident when you consider that there were only 200 million users in 2015. It is increasing not only its influence in the entertainment business but also in the educational industry.

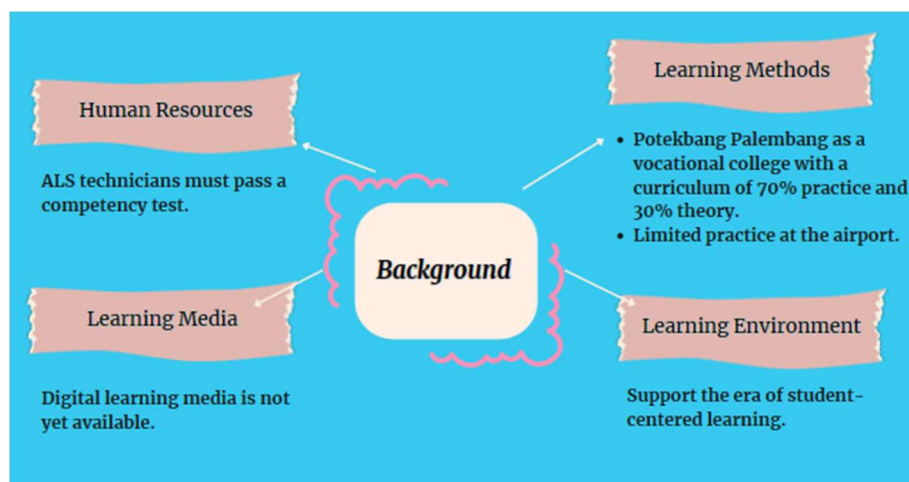


Figure 1. Problem Identification

The innovation of novelty value is a new learning product in the form of a Learning Media application platform: A game-based Airfield Lighting System Simulator that complies with Civil Aviation Safety Regulation standards. The product is developed web-based and designed with a programming architecture built in-house by considering the course learning plan and course learning outcomes.