



## Internalisation of Entrepreneurial Character through Augmented Reality Integrated Biopreneurship Learning for Students

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### ABSTRACT

The development of entrepreneurial values is not only at the level of introduction but must also require real practice in students' daily lives so that efforts are needed to internalise entrepreneurial character in students. Therefore, the writing of this article aims to internalise entrepreneurial character through augmented reality integrated biopreneurship learning. The writing of this article uses a systematic review method based on several references in the form of books and articles as well as online scientific publications. The conclusion of this article is that internalising the entrepreneurial character of students through biopreneurship learning using augmented reality allows for more interactive learning and provides a deeper and more contextual understanding for students.

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## INTRODUCTION

One of the problems and challenges of developing countries is the high unemployment rate in productive age. Data from Indonesia's Central Bureau of Statistics (BPS) in 2023 showed that the open unemployment rate for high school graduates and the equivalent reached 8.15%, while for university graduates, the figure was around 5.18%. (Aprianti et al., 2023).. One of the reasons for this is the lack of entrepreneurial skills possessed by the younger generation so that they depend more on available employment opportunities than on creating their own jobs. This problem is exacerbated by the effects of globalisation and technology that create intense competition in the world of work, not to mention that many jobs are threatened to be replaced by automation and technology. Therefore, entrepreneurial

character is needed to equip the younger generation to become entrepreneurs and innovators who play a role in improving the Indonesian economy.

Entrepreneurship has become a very important concern for countries in the world, even the number of entrepreneurs in a country can be used as a measure of the country's economic progress. A study conducted by the Global Entrepreneurship Monitor (GEM, 2023) shows that countries with good entrepreneurship lessons have an increased number of entrepreneurs with innovative startups. Many countries that have been successful in implementing entrepreneurship education such as the United States and Germany that have good entrepreneurship programmes show that students who learn entrepreneurial character tend to be more willing to innovate and start their own businesses. While in Indonesia, the number of entrepreneurs has now reached 3.1% of the total population of 26 million, but this number is still below the percentage of the number of entrepreneurs in neighbouring countries such as Japan 11%, China 10%, Singapore 7%, and Malaysia 5% of the total population. (Jazuli et al., 2023; Nisa et al., 2022).. Therefore, the Indonesian government needs to develop a curriculum that is able to shape and motivate students to become creative and innovative entrepreneurs.

The development of entrepreneurial values is not only at the level of recognition, but is able to touch on internalisation and real practice in students' daily lives. Thus, efforts to internalise entrepreneurial values in students are needed in shaping the soul, character and entrepreneurial spirit from an early age. (Dwi Yusantika, 2021; Lutfi et al., 2023; Suardi & Samad, 2002).. Therefore, one of the efforts made is through learning biopreneurship integrated with augmented reality (AR) and virtual reality (VR). Biopreneurship is entrepreneurship-oriented biology learning that pays attention to aspects of concern for the surrounding environment so that it can create environmentally friendly entrepreneurs. (Anitasari et al., 2022; Wardhani et al., 2020).. So that by integrating augmented reality and virtual reality technology in biopreneurship learning, students not only understand the theory but also gain experience to develop entrepreneurial skills and abilities and awareness of the environment. This technology becomes a simulator to feel the challenges and solutions in entrepreneurship so that it can foster an innovative, environmentally sound and adaptive entrepreneurial character to future technology.

Internalisation of entrepreneurial character through biopreneurship learning integrated with augmented reality allows for more interactive learning, and is effective in developing student character. Where the virtual environment allows students to experiment freely and develop new ideas without fear of failure so as to build confidence in facing real situations in entrepreneurship. Therefore, the purpose of writing this article is to conduct a study of the internalisation of entrepreneurial character through virtual and augmented reality integrated biopreneurship learning which is expected to be an alternative learning reference in the future to give birth to an entrepreneurial generation.

## **METHODS**

This research is a qualitative study using a systematic review method based on various references in the form of books and articles and online scientific publications. Systematic review is a research method used to identify, evaluate and interpret research results that are relevant to the research problem. (Siswanto, 2010). Thus, the stage carried out is to describe important issues relevant to the internalisation of entrepreneurial character through virtual and augmented reality integrated biopreneurship learning. The systematic review method includes synthesis, which is summarising various kinds of writings through articles and scientific publications with meta-synthesis techniques and data integration to obtain new theories and concepts or a deeper and more comprehensive level of understanding (Perry & Hammond, 2002). (Perry & Hammond, 2002).

The data sources used in this research are books, journals and articles relevant to the topic of this research. Data sources were obtained online using digital libraries such as Semantic Scholar, Google Scholar, Garuda and Elsevier. Search and selection of articles using keywords that match the topic by determining the exclusion and inclusion criteria. The data collection technique uses cumulative research results that have relevance to previous research and the included studies allow generalisation of the focus on the research topic area. Data analysis used the content analysis method, which is an analysis of the content that focuses on the internalisation of entrepreneurial character through virtual and augmented reality integrated biopreneurship learning (Schreier, 2024).

## **FINDINGS AND DISCUSSION**

### ***Internalisation of Student Entrepreneurial Character***

The increase in entrepreneurship learning today is a result of awareness about the importance of entrepreneurial character in the younger generation, therefore the cultivation of entrepreneurial spirit given early on is very helpful for the formation of quality entrepreneurial character (Ie & Fransiska, 2021). Basically, entrepreneurial character has an important role in shaping mental attitudes, innovation power, creativity, courage, perseverance, hard work spirit, fighting power that synergises with knowledge skills and innovation to determine business success (Indarto & Santoso, 2020). Thus, the internalisation of entrepreneurial character must begin with teaching the basic values of entrepreneurship such as independence, creativity, resilience, work ethics, and innovation so that students are able to understand the importance of these values in the real world.

The internalisation of entrepreneurial character is developed through a structured process involving planning, implementation and evaluation that can foster an entrepreneurial mindset (Hastuti & Maslamah, 2023). These findings suggest that early entrepreneurial learning (which varies based on education and training, experience and mentoring) is associated with entrepreneurial character (which varies between high discipline, high commitment, honest behaviour and conduct, and creative and innovative) has a positive impact on students' entrepreneurial spirit and motivation. So instilling entrepreneurial character in students from an early age is very important for their future success and innovation as entrepreneurs (Badawi, 2024).

One of the most effective approaches for internalising entrepreneurial character is experiential learning. In this approach, students are given the opportunity to learn through hands-on experiences that involve them in business simulations, small entrepreneurial projects, or activities such as buying and selling simulations and simple business management. This experiential learning allows students to understand and experience the process that an entrepreneur goes through so that character values such as responsibility, commitment and independence can be internalised naturally. Thus, internalisation of entrepreneurial character is the process of instilling and appreciating entrepreneurial values through coaching and guidance so that these values can become attitudes that are applied in everyday life.. Basically, this process aims to form a strong entrepreneurial character through a holistic and integrated learning approach.

### ***Biopreneurship***

Biopreneurship is a rapidly growing discipline that connects biotechnology and business, with a focus on integrating science, biology, and technology with business to make products usable by society at large (Sinha et al., 2021). Biopreneurship evolved from fields such as biotechnology, bioenergy, agriculture, health, and the environment, which utilise biological sciences to create innovative solutions. Along with technological developments, biopreneurship has also experienced rapid development in various countries such as Japan, which has developed biopreneurship with advanced

technology and recognised biotechnology as a strategic industry (Wardhani et al., 2020). (Wardhani et al., 2020b).. Meanwhile, in Indonesia, biopreneurship opportunities provide the potential for new startups with various forms of environmentally friendly product development.

Learning biopreneurship will accustom students to create creations and innovations that require students to think creatively and innovatively. This thinking ability can change the way students view the development of business ideas and opportunities. Therefore, learning with a biopreneurship approach can increase students' entrepreneurial interest. (Aqil et al., 2020). Furthermore, the application of biopreneurship in the Merdeka curriculum can support the development of students' entrepreneurial spirit and local wisdom. (Purnomo et al., 2023).. Thus, the biopreneurship approach can be relied upon as an economic development strategy through education (Artayasa et al., 2023). (Artayasa et al., 2024).

As a goal in learning biopreneurship is to be able to provide students with various skills that can be used in the future. In addition, it can form and foster entrepreneurial character supported by a confident and optimistic attitude, task and result oriented, dare to take risks and like challenges, leadership, creative and inventive, future-oriented, able to see opportunities, and care for the environment as a provision for improving the quality of life by finding or creating new innovations.

### ***Augmented Reality in Learning***

The use of information technology-based learning media shows a significant increase. The use of mobile devices in learning has become a necessity in supporting the teaching and learning process. Mobile devices such as laptops, tablets, and smartphones have become a new alternative in learning that presents ease of learning. One of the learning media trends in education is Augmented Reality (AR) technology. AR technology is the development of Virtual Reality (VR) which has a different concept, when VR brings users as if entering into a three-dimensional environment, then AR adds existing and real reality in the real world with objects added so as to eliminate the three-dimensional virtual world to be fused with the real world. In short, AR is a technology that is able to combine two-dimensional and three-dimensional virtual objects into a real environment and displayed in realtime. (Aripin & Suryaningsih, 2019).

The use of AR methods in learning is considered more efficient because it can be done anywhere and anytime without being bound by space and time as long as it is in the network. In some studies, the use of AR as the media that gets the most positive response from students because it is able to show virtual worlds such as dynamic images or videos that can bring students as if they are in that world so as to make learning interesting. (Andriani & Ramadani, 2022; Nisatulloh et al., 2023).. Thus, the use of AR in learning can present a more immersive, interactive, and contextualised learning experience for students. Therefore, by providing access to both real-world and virtual world simulations, students can develop better understanding and practical skills without time or space constraints.

### ***Integration of Biopreneurship Learning with Augmented Reality and Virtual Reality***

Entrepreneurial skills are important things that are expected to be developed in education to grow creative industries that can increase the number of jobs. Biopreneurship is one of the contextual approaches that can guide students in having the ability to develop new ideas and find new ways to see opportunities or problems faced. (Ratten & Usmanij, 2021).. The implementation of biopreneurship in learning requires the right learning model and media that allows students to produce products for entrepreneurial activities. The implementation of biopreneurship learning is identical to activities that can be carried out in the laboratory or outside the laboratory with various appropriate biological materials. Bioentrepreneurship learning can run well and easily if implemented through practicum activities outside of learning hours.

One way to provide hands-on experience in biopreneurship learning is to utilise AR technology. The use of AR creates a highly interactive and immersive learning experience, when applied in an educational context, this technology not only promises a visually appealing experience, but also opens up a deeper and more contextualised understanding for students. One of the main advantages of AR in education is its ability to present learning materials in a more concrete and relevant format. For example, in natural science studies, students can use AR to directly observe microscopic structures of living organisms, which are difficult or even impossible to see with the naked eye. This not only enhances students' curiosity but broadens their view of abstract concepts that are difficult to grasp with traditional learning methods alone (Tohir et al., 2024). Thus AR not only facilitates more active learning but also supports the formation of deep and sustainable understanding.

## CONCLUSION

Internalising the entrepreneurial character of students through biopreneurship learning using augmented reality allows for more interactive learning. Learning biopreneurship requires the right model and media and allows students to produce products for entrepreneurial activities. One form of integration is the use of Augmented Reality can create a highly interactive and immersive learning experience that not only provides a visually appealing experience, but also opens a deeper and more contextual understanding for students.

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## CONFLICTS OF INTEREST

The authors have no conflicts of interest to disclose, and there are no financial relationships or affiliations that could influence the results of this research.

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