



## Augmented reality as an interactive media solution in clay craft learning in junior high school

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### ABSTRACT

This research aims to describe the development, use, and feasibility of augmented reality clay learning media for craft learning in junior high school. This research is a research and development (R&D) using the 4D model, namely define, design, development and dissemination. The resulting product is augmented reality-based learning media of clay craft material. The feasibility of the media is assessed using a media and material expert validation questionnaire. The results of this study indicate that augmented reality clay learning media has been successfully developed to increase interest in learning and mastery of soft craft materials. Augmented reality students can use clay learning media, which can increase student interest in learning. Clay augmented reality learning media is feasible to use in junior high school and is able to increase students' interest in learning. This is evidenced by the results of usability testing stating that augmented reality clay learning media can be learned, efficient, easy to remember, safe to use, and provide a level of satisfaction for students. This augmented reality clay media is feasible to be used as a learning medium in junior high school.

**Keywords:** *Media Learning, Augmented Reality, Clay, Junior High School*

### ABSTRAK

Penelitian ini bertujuan untuk mendeskripsikan pengembangan, penggunaan, dan kelayakan media Augmented Reality tanah liat pada pembelajaran kerajinan di Sekolah Menengah Pertama. Penelitian ini merupakan penelitian dan pengembangan (R&D) dengan menggunakan model 4D, yaitu define, design, development dan dissemination. Dimana Produk yang dihasilkan adalah media pembelajaran berbasis Augmented Reality materi kerajinan tanah liat. Kelayakan media dilakukan dengan angket validasi ahli media dan materi. Hasil penelitian ini menunjukkan bahwa media pembelajaran Augmented Reality Tanah Liat telah berhasil dikembangkan guna meningkatkan minat belajar dan penguasaan terhadap materi kerajinan bahan lunak. Media Pembelajaran Augmented Reality tanah liat mampu digunakan oleh siswa dan dapat meningkatkan minat belajar siswa. Media pembelajaran Augmented Reality Tanah Liat layak digunakan dalam pembelajaran di Sekolah Menengah Pertama dan mampu meningkatkan minat belajar bagi siswa. Hal tersebut dibuktikan dari hasil pengujian usability menyatakan bahwa media pembelajaran Augmented Reality tanah liat dapat dipelajari, efisien, mudah diingat, aman untuk digunakan, dan memberikan tingkat kepuasan bagi siswa. Dengan demikian media Augmented Reality tanah liat layak untuk dijadikan media pembelajaran di Sekolah Menengah Pertama.

**Kata Kunci:** *Media Pembelajaran, Augmented Reality, Tanah Liat, Sekolah Menengah Pertama*

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## INTRODUCTION

Technological advancements significantly impact the sustainability of human life. Education is one of the key factors capable of driving change in society. It serves as a critical component for any nation to achieve rapid development. A great nation prioritises education, as it is through education that poverty can be transformed into prosperity (Megawanti, 2015). Modern education must align with contemporary advancements to keep students motivated in their learning journey. Alongside technological developments, particularly in internet-based information systems, the current learning model has embraced information technology, from elementary schools to universities.

In junior high schools, there is a subject called *Prakarya* (Craftsmanship). According to Pesanggarahan Guru (2016, p. 6), *Prakarya* consists of two words: “Pra,” meaning “before,” and “Karya,” meaning “work” or “product.” Thus, *Prakarya* refers to the process of creating and producing works (products). These products may take the form of designs, models, prototypes, or preprints, aiming to foster students' skills, critical thinking, and procedural understanding, all of which contribute to shaping their character. The goal of the *Prakarya* subject is to enhance students' knowledge, skills, and self-confidence by creating products that utilise local natural resources. It is an applied science that integrates various disciplines to solve practical problems in daily life. The learning process includes both theoretical and practical elements, requiring students to generate ideas for creating valuable products.

The *Prakarya* curriculum for eighth-grade students includes crafting with soft materials, specifically clay. This topic aims to help students comprehend and appreciate the principles, types, characteristics, and production processes of clay crafts. For optimal learning and understanding, students need hands-on experiences, such as visiting workshops or industries specialising in soft material crafts. These visits allow them to observe the tools, materials, and crafting processes directly. Currently, the learning medium consists only of guidebooks with textual explanations and images, which do not provide sufficient detail. The instruction is also confined to the classroom, leading to difficulties in understanding the material and diminishing students' motivation due to repetitive and uninspiring media. Consequently, achieving the learning objectives becomes challenging. Active Learning Methods (CBSA) are necessary for teaching clay crafts, focusing on developing students' critical thinking skills. This approach not only helps students apply theoretical knowledge in practice but also enhances their skills and understanding of the processes involved.

The advent of the Fourth Industrial Revolution (Industry 4.0) has profoundly influenced education, a field crucial for fostering innovation and character development through the integration of arts and technology. Statistical data reveal that, on average, people remember only 20% of what they hear and 30% of what they see but nearly 90% of what they experience (Sari & Priatna, 2020). Industry 4.0 presents an opportunity to improve education quality in Indonesia, particularly as the nation approaches its demographic dividend in 2030 when 64% of its population will be of working age (Widyastuti, 2022, p. 14).

Augmented Reality (AR) enables users to interact with virtual objects integrated into their actual environment. These virtual objects convey information that users perceive naturally through their senses, enhancing their interaction with the real world. AR can be applied across various sensory modalities, including auditory, kinesthetic, and visual domains. In modern technological developments, AR is widely utilised in fields such as entertainment, medicine, military, advertising, and, notably, education, where it contributes to improving education quality.

In light of these considerations, Augmented Reality technology was developed as a supplementary medium for classroom learning. This technology can be easily accessed via smartphones with AR applications installed, classifying it as a mobile learning tool.

Previous research by Eka Legya Franita (2015), titled *"Development and Analysis of Computer Assembly Learning Using Augmented Reality for Android Platforms at SMK YPKK 1 Sleman,"* concluded that AR is an effective learning medium, receiving positive feedback during feasibility tests conducted by media and subject matter experts. Similarly, Reinaldi (2020), in his study titled *"Development of Simulation Media Based on Augmented Reality for Science Subjects in Sixth Grade at MI*

*DDI Kalukuang Makassar*," found that AR media is practical and flexible for both in-class and out-of-class learning, offering a more engaging and effective alternative to traditional methods.

Based on the issues identified in the background, the development of Augmented Reality (AR) for clay craft learning in junior high schools was proposed. AR technology has been shown to enhance memory retention and improve understanding of information, making it an ideal solution to address these challenges. By using visual aids to explain clay craft materials, AR simplifies the learning process for students, enabling them to retain better and comprehend the subject matter. Additionally, this approach is expected to create a more engaging and enjoyable classroom environment, which will positively impact the overall quality of learning.

This research focuses on developing AR-based learning media specifically for teaching clay crafts in junior high schools, addressing the lack of AR as a learning medium for craft education.

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## METHOD

The research method used for the *\*Development of Augmented Reality Media for Clay Craft Learning in Junior High Schools\** is the research and development (R&D) method. According to Sugiyono (2022, p. 30), the R&D method primarily focuses on product development through the stages of planning, production, and evaluation of the product's validity. This method involves a systematic scientific approach to research, design, production, and validation testing of the developed product, which can be summarised as the 4Ps: *\*Penelitian\** (Research), *\*Perancangan\** (Design), *\*Produksi\** (Production), and *\*Pengujian\** (Testing). Thiagarajan proposes that the steps in the R&D process follow the 4D model: Define, Design, Development, and Dissemination (Sugiyono, 2022, p. 37).

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## RESULT AND DISCUSSION

### Augmented Reality

Augmented Reality (AR) is a technology that integrates two-dimensional or three-dimensional virtual objects into a real three-dimensional environment and projects these virtual objects in real time while maintaining a close connection to the real environment. AR differs from virtual environments, often referred to as Virtual Reality (VR). According to Ronald T. Azuma (1997) in his paper *A Survey of Augmented Reality*, "Some researchers define AR in a way that requires the use of Head-Mounted Displays (HMDs). To avoid limiting AR to specific technologies, this survey defines AR as systems that have the following three characteristics: 1) Combines real and virtual, 2) Interactive in real-time, and 3) Registered in 3-D."

The quote above highlights three defining characteristics of AR. The first is the combination of the real and virtual worlds. The second is real-time interactivity. The third is the ability to present content in a three-dimensional format.

### Learning Media

Learning media refers to tools or resources that convey information and knowledge, facilitating the learning process. Media that supports activities aimed at acquiring knowledge, skills, and attitudes is commonly referred to as learning media (Heinich et al., 2008, as cited in Priyadi, 2017, p. 15).

Learning media encompasses anything used to transmit messages and stimulate students' thoughts, feelings, attention, and motivation, thereby promoting a deliberate, goal-oriented, and controlled learning process (Suryani et al., 2018, p. 4).

### Assembly

The development of this application involved the use of both hardware and software. The specifications are as follows:

#### 1) Hardware

##### a) Laptop for Design Creation

Operating System: Windows 10 Pro 64-bit (10.0, Build 19045)

Processor: Intel(R) Core(TM) i5-5200U CPU @ 2.20GHz, 2.20 GHz

RAM: 8 GB

Graphics: Intel(R) HD Graphics Family

Storage: 2055 MB

b) Laptop for AR Development\*\*

Operating System: Windows 11 Home Single Language 64-bit

Processor: 11th Gen Intel® Core™ i3-1115G4 @ 3.00GHz (4 CPUs), 3.0GHz

RAM: 8 GB DDR

Graphics: Intel® UHD Graphics for 11th Gen Intel® Processors

2) Software

Unity 3D version 2021.3.0f1.2 Personal with Unity Hub version 3.2.0

Photoshop CS6

Blender 3D

Figma

Vuforia Engine 10.8

### Development

At this stage, the author carries out the design and creation of AR in the form of 2D and 3D objects. In this activity, a display design was prepared on the clay Augmented Reality application menu. Following are the results.



Picture 1. Display of the main menu page for the Clay AR Application



Picture 2. Display of the Clay AR Application identity page



Picture 3. Display of the Guide page for using the Clay AR Application



Picture 4. Clay AR page view



Picture 5. Quiz page view

## Validation

This phase focuses on testing results to identify potential errors in the application's operation and to ensure that all components and buttons function correctly. The testing process employed Blackbox testing, which included User Acceptance Testing and testing the camera's distance from the marker. The tests were conducted using Android devices. According to Ningrum et al., as cited in Wijaya and Astuti (2021), Blackbox testing is a software quality testing method that focuses on the functionality of the software. The purpose of Blackbox testing is to identify incorrect functions, interface errors, data structure errors, performance issues, and initialisation or termination errors.

The expert feasibility test aims to evaluate the appropriateness of the content and media used in the AR Clay learning media. In this research and development process, media and content validation were conducted by a single expert: Ms. Aida Roihana Zuhro, M.Pd., a lecturer in the Craft Education Program at *FBSB* UNY. The validation process produced descriptive data, including suggestions and improvements for the AR Clay learning media application.

Table. 1 Media and Material Expert Assessment Scores

| No | Aspect   | Average | Category        |
|----|----------|---------|-----------------|
| 1  | Learning | 21      | Highly Feasible |
| 2  | Media    | 22      | Highly Feasible |
| 3  | Design   | 23      | Highly Feasible |
| 4  | Total    | 66      | Highly Feasible |

Based on the table above, the learning aspect received a score of 21, categorised as feasible; the media aspect scored 22, also categorised as feasible; and the design aspect scored 23, categorised as highly feasible. The validation results from the media and content expert concluded that the Augmented Reality clay media achieved a total score of 66, placing it in the highly feasible category.

## Dissemination

This stage represents the final phase of the development process, focusing on the distribution and storage of the developed application to ensure accessibility at all times. The distribution process involves exporting the application into the appropriate file extension, followed by storing it on a public platform, such as Google Drive, to facilitate easy access.

## CONCLUSION

The application has been successfully developed and can now be operated on both Android and iOS smartphones, featuring clay craft content that has been adapted using the 4D design model (Define, Design, Development, Dissemination). The application's design was created using a storyboard, and testing was conducted through usability testing. Based on the results of these tests, the development of the Augmented Reality Clay Learning Media was successful and is deemed suitable as a learning tool for crafting in Junior High Schools. The Augmented Reality Clay application has been successfully used by both students and teachers with ease, helping students better understand the material and providing satisfaction in its use. The straightforward system of the application allows users to comprehend information about clay crafts quickly. The objects within the application are also easy to remember, enabling users to correct any mistakes they make while using the application. The Augmented Reality Clay application is a viable learning medium that effectively supports the teaching of clay craft, as it is easy to learn and offers additional information uniquely and engagingly. By utilising this Augmented Reality learning media,

teachers can offer an alternative medium that captures students' interest in learning about clay crafts.

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