

## EFFECTIVENESS OF BUANA.ID: CULTURE-BASED AUGMENTED REALITY LEARNING MEDIA AS A CHARACTER BUILDER FOR STUDENTS

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### ABSTRACT

This study examines the effectiveness of BUANA.ID, an Augmented Reality (AR) learning medium that integrates local culture through East Javanese traditional games, in enhancing the learning process and character education of junior high school students. The study employed a quantitative descriptive design involving teachers and students who had implemented BUANA.ID in classroom settings. Data were collected through a structured questionnaire measuring usability, media quality, instructional value, and contributions to character development, and were analyzed using descriptive statistics in the form of percentages and mean scores. The results indicated that BUANA.ID was categorized as highly effective across all measured dimensions. The media demonstrated strong usability and visual appeal and supported clearer understanding of learning materials. Teachers reported increased student engagement and better contextualization of content through activities based on traditional games, while students experienced learning as more systematic, interactive, and meaningful. The integration of local culture in the form of East Javanese traditional games also contributed to the development of key character values, including discipline, honesty, responsibility, perseverance, and cooperation. The novelty of this study lies in its theoretical contribution to culturally responsive AR-based learning, showing that the integration of immersive technology and traditional games as representations of local culture not only enhances cognitive achievement but also serves as a pedagogical driver for student character formation.



### INTRODUCTION

The development of digital technology has changed the face of education, one of which is through the use of Augmented Reality (AR) as an innovative learning medium. AR allows the integration of interactive digital objects into the real environment so that abstract material becomes concrete and can be explored visually by students. Numerous studies have shown that AR-based learning media have the potential to increase student engagement, motivation to learn, and understanding of subject matter concepts compared to conventional passive methods (such as textbooks) due to their engaging and interactive nature (Putu et al., 2024). AR enables the integration of interactive digital content into the real environment, allowing students to see, interact with, and experience learning objects directly. This technology not only provides attractive three-dimensional visualizations, but also creates a more immersive, contextual, and meaningful learning environment compared to conventional passive learning methods. AR has been reported to increase student engagement, motivation to learn, and understanding of subject matter concepts across various levels of education and subjects (Dhar et al., 2021; Putu et al., 2024; Saleh Laia, 2021).

Previous research in elementary schools shows that AR media can increase student motivation and learning outcomes in various subjects, such as science and social studies, through interactive and contextual 3D visual displays (Prabowo & Wakhudin, 2024). In addition, AR integration based on local wisdom and culture has been proven to improve students' social literacy and appreciation of regional culture, while supporting more meaningful learning (Lokal & Sosial, 2024). However, most AR research over the past decade has focused on cognitive outcomes such as students' understanding of material and technical skills, as well as its overall effectiveness in increasing interest or motivation to learn. Research integrating AR with character building based on local culture remains limited (Misbah Binasdevi et al., 2024). Therefore, this study introduces a novel approach by integrating Augmented Reality with East Javanese traditional games (gobak sodor) as culturally grounded learning media that simultaneously support mathematics learning and character strengthening. Unlike prior studies that evaluate AR mainly from a usability or learning outcome perspective, this research emphasizes teacher and student satisfaction as indicators of both pedagogical effectiveness and character formation, offering a more holistic evaluation framework. In fact, characteristics such as religiousness, love of culture, creativity, responsibility, cooperation, and tolerance are important aspects of 21st-century education and are learning objectives expected by the national curriculum (Na & Yun, 2024; Pellas, 2023).

In addition, the use of AR developed based on local culture allows students to learn not only cognitive aspects but also build attitudes and character values through contextual learning experiences rooted in their own social environment. This integration is important to bridge the needs of character education with digital technology so that learning is not only academically effective but also has an impact on students' attitudes and behavior. Research on augmented reality learning media based on the local culture of East Java, namely the traditional games of congklak and gobak sodor, has been conducted by (Dwi Retnani Srinarwati et al., 2023; Srinarwati et al., 2025). This study describes the development of BUANA.id: augmented reality learning media used to support mathematics learning at SMP Negeri 2 Dawarblandong, Mojokerto Regency.

Based on this gap, this study needs to be conducted to determine the effectiveness of BUANA.ID: a culture-based Augmented Reality (AR) learning medium in supporting the learning process and strengthening the character of junior high school students through teacher and student satisfaction assessments. This research contributes to the literature by positioning AR not merely as a technological tool, but as a culturally responsive learning medium that embeds local wisdom into digital pedagogy. It fills the empirical gap by providing evidence on how AR-based cultural content can support the development of discipline, honesty, hardwork, responsibility, and teamwork among junior high school students in Indonesia. The results of this study are expected to provide strong empirical evidence about the role of culture-based AR learning media in developing the character of students.

## METHOD

This study uses a quantitative descriptive approach to describe the effectiveness of BUANA.ID, a culture-based Augmented Reality (AR) learning medium, in supporting learning and character building among junior high school

students. The study was conducted at SMP Negeri 2 Dawarblandong, Mojokerto Regency, involving 35 students and 4 teachers who had implemented BUANA.ID in the learning process.

The research subjects consisted of teachers and students at Dawarblandong State Junior High School in Mojokerto Regency who acted as respondents. Research data was collected using a satisfaction questionnaire in the form of a Likert scale given to teachers and students after using the learning media (Amalia et al., 2019; Dewi et al., 2024; Pujiastuti & Rufi'i, 2024). The questionnaire was developed using a Likert scale with four response options (1 = very disagree, 2 = disagree, 3 = agree, 4 = strongly agree). The instrument consisted of four main items for each aspect, so that the maximum possible score for student respondents was 140. The Likert scale is used to measure respondents' level of agreement or satisfaction with various aspects of the media, such as ease of use, appearance, clarity of material, and its usefulness in supporting the teaching and learning process. while the questionnaire was designed to measure several aspects, including ease of use, media appeal, usefulness in learning, and the contribution of BUANA.ID to strengthening student character, which includes religiosity, responsibility, cooperation, discipline, creativity, curiosity, love of culture, and tolerance.

Before being administered, the questionnaire instrument underwent expert validation by two experts in educational technology and learning media. The validation process focused on the relevance, clarity, and suitability of each indicator with the research objectives. Revisions were made based on the experts' suggestions to improve the wording and alignment of the items. After validation, the instrument was tested for reliability using Cronbach's Alpha to ensure internal consistency (Tavakol & Dennick, 2011). The results indicated that the questionnaire had a reliability coefficient above the acceptable threshold ( $\alpha > 0.70$ ), confirming that the instrument was reliable for data collection.

The collected data were analyzed using descriptive statistics in the form of mean scores and percentages. The results were then classified into categories of effectiveness. BUANA.ID was considered effective if the results fell into the effective or very effective categories from both teachers' and students' perspectives and showed a positive contribution to strengthening student character.

## RESULT AND DISCUSSION

The research results were obtained from an analysis of satisfaction questionnaires filled out by 35 students at SMP Negeri 2 Dawarblandong after using BUANA.ID, a culture-based Augmented Reality (AR) learning medium, in the learning process. The questionnaire covered aspects of ease of use, media appeal, learning usefulness, and the media's contribution to strengthening student character. The following are the results of the satisfaction questionnaire filled out by the students.

**Table 1. Results of student satisfaction questionnaire**

Aspects Assessed	Maximum Score	Score	Average Score	Category
Ease of use of media	140	124	3,54	Strongly Agree
Attractiveness of the learning media	140	130	3,71	Strongly Agree
Usefulness in learning	140	126	3,60	Strongly Agree
Strengthening Student Character	140	121	3,46	Agree
<b>Overall Average</b>	<b>140</b>	<b>125,25</b>	<b>3,58</b>	<b>Strongly Agree</b>

In general, the results of descriptive statistical analysis show that BUANA.ID is in the highly effective category. The majority of student respondents gave positive assessments of the ease of use of the media. The media is considered easy to operate, does not require a long time to adapt, and can be used as a learning support in the classroom. In terms of attractiveness, students stated that the visual display and interactivity of AR made learning more interesting and not boring. This has an impact on increasing student engagement and active participation during the learning process. Teachers also assessed that the use of BUANA.ID helps create a more lively and conducive learning atmosphere. In

terms of learning effectiveness, the survey results show that BUANA.ID helps students understand the material better. The visualization of traditional game cultural objects and mathematics learning materials in AR form is considered to be able to concretize concepts that were previously abstract. In addition, teachers stated that this media supports contextual learning and facilitates the delivery of material.

Here is a preview of the BUANA.ID learning media developed to support the mathematics learning process for junior high school students.



Figure 1. BUANA.ID display: Traditional Game-Based Mathematics Learning Media

In addition, BUANA.ID learning media also contributes positively to strengthening students' character. The most prominent characters include responsibility, cooperation, discipline, creativity, curiosity, love of culture, and an attitude of respect and tolerance. The integration of local cultural content and traditional games in learning media is considered capable of fostering pride in regional culture and increasing students' awareness of the importance of social and cultural values. The following are the results of the teacher response survey regarding BUANA.ID learning media.

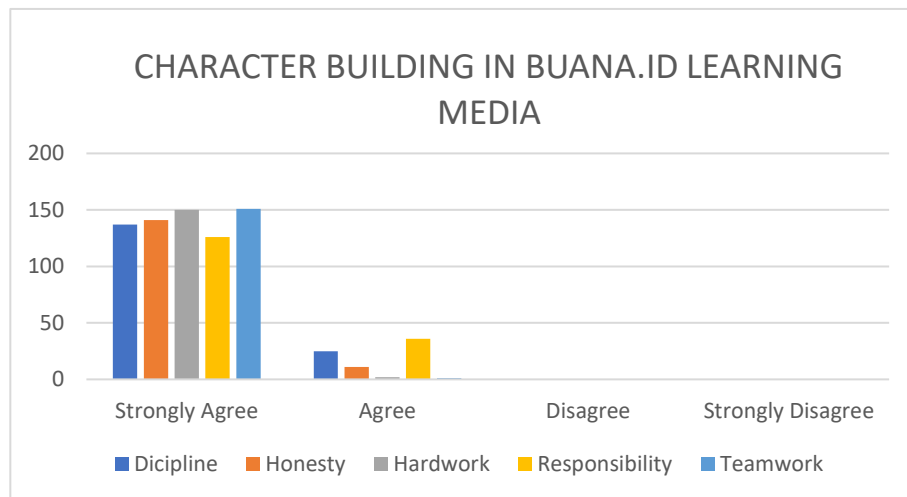
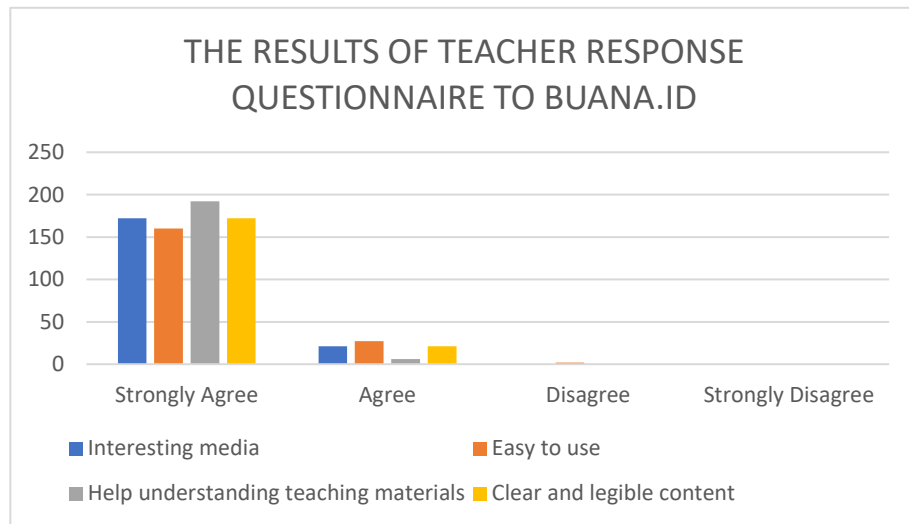


Figure 2. Results of the teacher response survey to BUANA.ID

Based on the findings of this study, BUANA.ID is effective as an innovative learning medium in junior high schools. The high level of satisfaction among teachers and students is in line with the characteristics of AR-based learning, which is interactive, visual, and contextual. AR media allows students to learn through direct experience, thereby increasing their engagement and motivation to learn.

The effectiveness of BUANA.ID in helping students understand the material supports previous research findings that AR is capable of visualizing abstract concepts in a more concrete and understandable way. This reinforces the role of AR as a medium that is not only visually appealing but also pedagogically meaningful. The integration of local culture, namely traditional games in BUANA.ID, provides added value compared to AR media in general.

Culture-based learning allows students to relate the material to the context of their daily lives, making learning more relevant and meaningful. This contributes to the character building of students, particularly in terms of cultural appreciation, tolerance, and respect for diversity. Character strengths such as discipline, honesty, hard work, responsibility, and cooperation emerge as a result of learning activities that involve structured and collaborative exploration of the media. Thus, BUANA.ID functions not only as a technology-based learning medium but also as a tool to support character education.

Based on these results and discussions, it can be concluded that the use of BUANA.ID has a positive impact on the learning process and character building of junior high school students, making it worthy of further development and wider application in technology- and culture-based learning.

## CONCLUSION

Based on the results of the research conducted in the results and discussion section, it can be concluded that:

BUANA.ID as a culture-based Augmented Reality (AR) learning medium is able to create a more contextual, engaging, and meaningful learning experience for junior high school students. From a practical perspective, BUANA.ID can be used by teachers as an alternative digital learning medium to enrich instructional strategies, increase student engagement, and connect learning materials with students' local cultural contexts. BUANA.ID provides an interesting and contextual learning experience, thereby helping students understand the learning material.

From a theoretical perspective, this study contributes to the literature on AR-based learning media and character education by demonstrating that the integration of local culture into digital learning media can support both cognitive and character development in secondary education. The integration of local culture, namely traditional games in BUANA.ID, contributes to strengthening student character, including discipline, honesty, hard work, responsibility, and mutual cooperation. Future studies are recommended to investigate in greater depth the long-term effects of BUANA.ID on students' character formation and academic performance across different subjects and educational levels, including both immediate and sustained learning outcomes.

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