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# Analysis of the cultural relevance of a gusjigang-based augmented reality science learning application through teacher and student evaluations

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**Abstract**

Quality education requires supporting facilities and infrastructure to support children's Quality education requires supporting facilities and infrastructure to support children's development. In Indonesia, inclusive education is implemented to facilitate the education of children with special needs. Children with special needs often require concrete and meaningful stimuli. Connecting science concepts to local culture will make it easier for children with special needs to understand and remember the material. This study aims to analyze the cultural relevance of the Gusjigang-based Augmented Reality Science Learning Application for children with special needs. The research method used is descriptive quantitative, which aims to systematically describe facts, characteristics, and phenomena that occur in real and in-depth. Data collection techniques used include interviews, observations, questionnaires, and documentation. Questionnaires were given to students to collect data on their responses to the application, while interviews were conducted with teachers to gain a more in-depth perspective on the use of the application in the learning process. The results of the study showed that the average student assessment of the Gusjigang-based Augmented Reality Science Learning Application was 95.30%, in the excellent category. Teachers gave positive assessments, namely that the application was easy to use, interesting, and effective in helping students, especially children with special needs, understand science learning materials. The use of this application in science learning can help teachers present interesting and practical learning media for children with special needs.

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## Introduction

The progress and prosperity of a country are seen through education (Kurniawan & Julianto, 2022). Education is an individual need that is an effort to humanize humans through learning activities between students and educators (Aliah & Fitria, 2024). Education is a right for every citizen. Based on Law No. 20 of 2003, every citizen has the same right to obtain a quality education, whether with physical, emotional, mental, or social disabilities, has the right to pursue special education (Muzakkir et al., 2020). This can be interpreted as meaning that children with special needs also have the right to obtain a quality education. Quality education needs to be accompanied by supporting facilities and infrastructure that will support child development so that good learning activities are created in creating a generation with high potential (Raharja, 2021). Facilities and infrastructure are not only intended for normal children

but are also intended for children with special needs (ABK). In Indonesia, to facilitate the education of children with special needs, inclusive education is implemented. In Law No. According to Law No. 70 of 2009, inclusive schools provide opportunities for students with physical, mental, and social disabilities, as well as children with intelligence levels above those of normal children in general, to participate in education and learning alongside normal children in one environment (Risti & Tayo, 2025). This helps realize learning equality for children with special needs.

Data from the Ministry of Education and Culture shows that the number of Inclusive Education Providers (SPPPI) reached 17,134 elementary schools, with approximately 57,155 children with special needs (A. Rozi, 2025). Bullying in inclusive schools still occurs and is a cause of low self-confidence which is important for students (Kurniasih et al., 2020); (Ardianti et al., 2023). Lack of self-confidence hinders the development of one's potential, thus preventing individuals from achieving maximum achievement (Ardianti & Wanabuliandari, 2022); (Muzakkir et al., 2020). Science learning is crucial for children with special needs because it can improve critical thinking, environmental exploration, and independent living skills (Daga et al., 2025). In inclusive education, science is not only an academic subject but also a tool for developing the observation, exploration, and problem-solving skills that are crucial for children with special needs (Elisa et al., 2023). The right strategy makes science an inclusive tool for developing the potential of children with special needs.

Observations from several inclusive elementary schools in Kudus Regency found that students with special needs (ABK) experienced self-confidence issues in learning at school. Influencing factors included discrimination by teachers, bullying by classmates, teachers not introducing the local culture, and the lack of facilities and infrastructure to support students with special needs. These factors contributed to the low understanding of the material among ABK, leading to decreased self-confidence. Improving student understanding can be achieved through a local cultural approach, as it is closely related to the students (Ardianti et al., 2019). Therefore, appropriate solutions are needed to improve the understanding of students with special needs, namely through innovative learning tools such as the Gusjigang-based Science Learning Application.

In the current digital era, innovation in delivering learning materials to students is needed, using engaging and innovative learning media. The choice of learning media can influence student learning activities during the learning process. One appropriate medium to be developed is learning media using Augmented Reality technology (F. Rozi et al., 2021). Augmented Reality is a technology that embodies virtual objects into the real world, either in two or three dimensions (Safira et al., 2022). The application of technology in education, utilizing Augmented Reality, can enhance reality by combining images, sound, and text (Permana et al., 2023). Learning using Augmented Reality can improve students' understanding of classroom material.

In addition to the use of technology, culture-based learning allows all children, including those with special needs to contribute based on experience. This creates a more collaborative and inclusive learning space. Children with special needs often need concrete and meaningful stimuli. By linking science concepts through local culture, it will make it easier for children with special needs to understand and remember the material. The Gusjigang philosophy is a

regional philosophy of Kudus, Central Java, which contains 18 character values, namely (1) gus (Bagus) for example tolerance, discipline, love of peace, social care; (2) ji (ngaji) for example religious, love of reading, curiosity; (3) gang (Dagang) for example independent attitude, hard work (Ardianti et al., 2023). Research integrating Gusjigang local wisdom into AR design for children with special needs is still very limited. Previous research conducted by Pattaufi et al. (2025) related to developing Augmented Reality-based teaching materials by integrating local culture, but did not specifically examine the Gusjigang philosophy. The Gusjigang philosophy will support scientific understanding in science learning for children with special needs. The "Gus" (Bagus) dimension can be utilized for scientific character development such as honesty in observation, responsibility in experiments in inclusive science learning (Attaftazani & Zhafira, 2022). The "Ji" (Ngaji) dimension is related to the habit of systematic thinking and literacy, while the "Gang" (Dagang) dimension is related to numerical practices and procedural skills linked to scientific concepts through measurement, simple experiments, and observation (Abid, 2017). This is a novelty in this study, where the Gusjigang philosophy is integrated into Augmented Reality-based learning media to support scientific understanding in science learning for children with special needs.

Children with special needs can experience fun learning through AR and provide easy access to learning for children with special needs. The Science Learning Application with Augmented Reality Based on Gusjigang is an innovation that can be applied in science learning for children with special needs. The research questions are: (1) How do students evaluate the Gusjigang-based Augmented Reality Science Learning Application in terms of media suitability and practicality; (2) How do teachers evaluate the Gusjigang-based Augmented Reality Science Learning Application in terms of media suitability and practicality. The purpose of this study is to analyze cultural relevance in terms of suitability and practicality of the Gusjigang-based Augmented Reality Science Learning Application for children with special needs.

## Method

Researchers used quantitative research with descriptive methods. Descriptive methods are a quantitative research method used to explore social situations that will be studied comprehensively, broadly, and in-depth (Sugiyono, 2023). Therefore, it can be said that descriptive quantitative research systematically describes facts or characteristics in a concrete and accurate manner. In line with (Sholikhah, 2023) opinion, descriptive research seeks to describe phenomena that occur in a real, realistic, and actual way. This research creates a systematic description and depiction of the facts, characteristics, and relationships between the phenomena being investigated.

This research was conducted at SD 3 Barongan, an inclusive school. The subjects consisted of 13 students with special needs (ABK) categorized as slow learners and one class teacher. Data collection techniques used were non-test techniques, consisting of questionnaires and interviews. A questionnaire is a data collection technique that provides an instrument in the form of a list of questions to be answered by the subjects. An interview is a technique conducted by asking a series of questions directly or by telephone by the researcher to the subjects during the data collection process (Sungkono et al., 2022). According to (Nashrullah, 2023), a research

instrument is a tool for collecting data in a study. The research instruments used in this study were a questionnaire and an interview form. The questionnaire was used to collect data on student assessments of the learning media, while the interview form was used to collect data on teacher assessments of the learning media. The questionnaire was structured according to indicators of media suitability and practicality, outlined in 21 questions. The teacher interview form was structured according to indicators of media suitability and practicality, outlined in 13 questions. Instrument validity was assessed through content validity by experts.

Student evaluation data was analyzed quantitatively and descriptively. Assessment scores were tabulated. The assessment results were tabulated and then categorized by finding the percentage of all aspects using the following formula:

$$P = \frac{f}{N} \times 100\%$$

Description:
P : Percentage
f : Total scores obtained
N : Maximal Score

Teacher evaluation data from interviews was analyzed using descriptive narratives to support student assessment data. Student and teacher assessment data were integrated to produce a single set of results for drawing conclusions.

**Results and Discussion**

This research was conducted at SD 3 Barongan Kudus in the 2024/2025 academic year. The results present student assessment data through student response questionnaires and teacher assessment data through teacher interviews.

*Results of Student Evaluation*

In general, students gave a positive response to the use of applications that utilize Augmented Reality Learning in science learning. Student responses measured in this study consisted of 9 observational aspects, namely student responses to the material, presentation, language, illustrations, voice recording, learning evaluation, implementation, physical appearance of the module, and installation and smoothness after learning began. Then, the 9 observed aspects were made into questions to be asked to the subjects. Table 1 shows a recapitulation of the student response questionnaire based on the questions observed regarding the use of applications that use Augmented Reality Learning in science learning.

**Table 1.** Student Response Questionnaire Recapitulation

| No | Indicator | Observation Aspects | Student Response | | Indicator Averrage (%) |
|---|---|---|---|---|---|
| | | | Total Score | Percentage(%) | |
| 1 | Suitability | Cultural integration | 13 | 100 | 93,84 |
| | | Presentation | 10,5 | 80,76 | |
| | | Language | 11,5 | 88,46 | |
| | | Illustration | 13 | 100 | |
| | | Physical appearance of the module | 13 | 100 | |
| 2 | Practicality | Learning evaluation | 13 | 100 | 97,12 |
| | | Implementation | 13 | 100 | |
| | | *Voice recording* | 13 | 100 | |
| | | Installation | 11,5 | 88,46 | |
| | | Rata-rata | | 95,30 | |

Table 1 shows two indicators outlined in nine aspects of the Gusjigang-based Augmented Reality Science Learning Application. For the suitability indicator, the average student evaluation was 93.84%, indicating the application was good. However, for the presentation aspect, the student evaluation only scored 80.76%. This was the lowest compared to other aspects. Students considered the presentation of the Gusjigang-based application to be simple. While the application is well-illustrated, some sections were uninteresting and too monotonous. This section concerns the material presentation. The material included in the application is still monotonous, with text and few illustrations. According to (Novianti et al., 2023), developing an application using media in the form of images enhances student learning and comprehension. The addition of appropriate illustrations and an attractive layout can capture students' attention and interest.

For the practicality indicator, the average student evaluation score was 97.12%. Within the practicality indicator, the installation aspect received a low rating compared to other aspects. The evaluation revealed that the application was specifically designed for Android smartphones. During the installation process, the smartphone detected the application as a threat, hindering the installation process, even though the application ultimately installed successfully. This contributed to the low rating compared to other aspects.

Several other assessment aspects received average maximum scores. For example, the cultural integration aspect during fifth-grade lessons at SD 3 Barongan Kudus received a score of 13, or 100%. This indicates that students agree that the Gusjigang-based Augmented Reality Science Learning Application aligns with the cultural integration aspect of learning. According to (Permana et al., 2023), the use of digital teaching materials that integrate culture can help students more easily learn and understand the material presented by the teacher during the learning process. Connecting science material to everyday cultural practices makes abstract concepts more concrete and meaningful for students. Studies in Indonesia that integrated

ethnoscience into learning reported improvements in student scientific literacy, scientific attitudes, and achievement when content was locally contextualized.

The illustration aspect during fifth-grade lessons received a score of 13, or 100%. This indicates that students agree that the Gusjigang-based Augmented Reality Science Learning Application is presented with good and engaging illustrations. According to (Ayu et al., 2022), engaging and enjoyable interactive learning media utilizes images displayed directly in 3D and augmented reality. This is in line with (Novianti et al., 2023), who stated that developing applications using image-based media makes learning more engaging and allows students to understand the material better. The application's appearance can be seen in the following image.

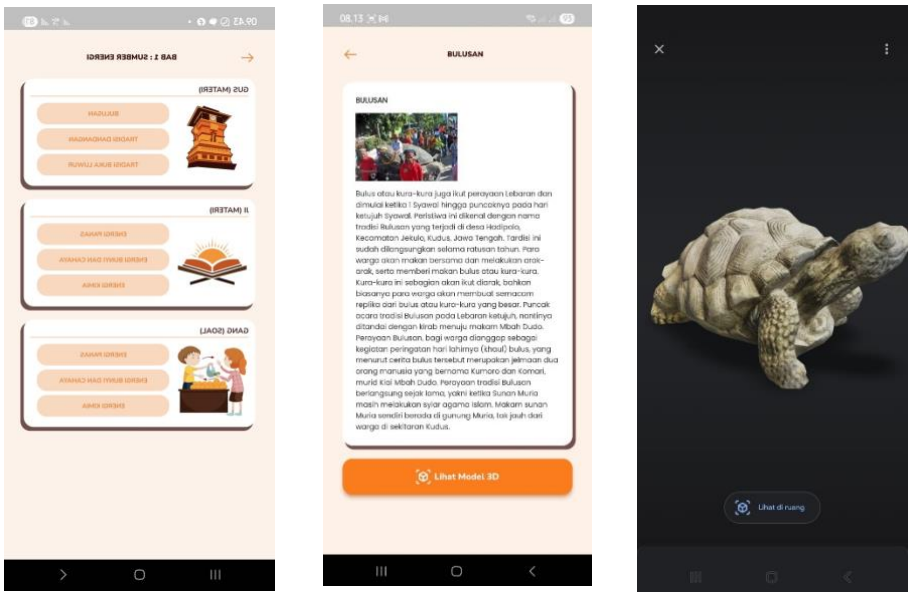



**Figure 2.** Appearance Application

The voice recording aspect during classroom learning activities received a score of 13 or 100%, indicating that students agreed that the Gusjigang-Based Augmented Reality Science Learning Application had a voice recording feature and could be used well. According to Supriyadi & Mustofa (2025), the use of voice recording, also known as automatic voice recording, serves to translate spoken words into text.

*Results of Teacher Evaluation*

Fifth grade teachers responded to the Gusjigang-based Augmented Reality Science Learning Application for children with special needs. Teachers' responses to the Gusjigang-based Augmented Reality Science Learning Application for children with special needs were obtained through structured interviews. The results of interviews with fifth grade teachers provided positive responses when using the Gusjigang-based Augmented Reality Science Learning Application, which has advantages because it contains Gusjigang culture which makes learning more active and interesting. Teachers stated that:

*"This application is interesting it has integrated local culture into the material and is easy to use because it can be installed on a smartphone."*

Integrating local culture into Augmented Reality-based learning applications is a

strategic approach to bridging abstract science concepts with students' real-life experiences, particularly for children with special needs who require concrete, meaningful, and repetitive learning contexts. Augmented Reality enables three-dimensional visualization and direct interaction with virtual objects that appear to be present in the real world, thereby reducing students' cognitive burden in understanding complex science concepts. When this technology is combined with the local cultural context, learning becomes more personally and cognitively relevant because students learn through a familiar socio-cultural environment. In the context of science, local cultural values can function as a cognitive bridge connecting everyday experiences with scientific concepts, for example through cultural activities that illustrate physical, chemical, or biological processes in the surrounding environment (Wahyu et al., 2025). Thus, students do not learn science as abstract knowledge, but as part of the reality of life. The teacher's opinion is in line with (Purri et al., 2024) who stated that learning will be interesting and active if the material content is close to students. This teacher's opinion aligns with (Purri et al., 2024) who stated that learning will be engaging and active if the content is close to students.

The integration of local culture in AR also aligns with the Cognitive Theory of Multimedia Learning, which asserts that learning will be more effective when information is presented through a meaningful combination of visual and verbal elements. When the visual context in AR is drawn from local culture, students more easily connect new information with their existing knowledge schemas, thus maximizing the assimilation and accommodation of science concepts. Digital teaching materials, including augmented reality, can provide visual, audio, and kinesthetic representations. When these representations are built from familiar local cultural elements, students don't need to construct a contextual framework from scratch; the cultural elements already serve as anchors for meaning, allowing auditory and visual processing channels to operate more efficiently. For children with special needs who often have difficulty understanding symbols or abstract concepts, culturally based presentations serve as scaffolding that facilitates understanding and retention of learning. The use of local wisdom culture in increasingly developed and varied digital media can introduce and develop culture according to research conducted by (Puspitasari & Resmalasari, 2023). (Arifah et al., 2023) stated that children with special needs can be helped by using digital media during the learning process. This is in line with the opinion of (Novianti et al., 2023) who stated that digital-based media is one solution to overcome problems in learning.

The class teacher gave positive comments on the application that utilizes Augmented Reality features as a way to introduce students to 3D cultural forms. The teacher also stated that:

*"The presence of AR and voice recorder adds value to this application."*

Teachers expressed their appreciation for the addition of a voice recorder feature to the Gusjigang-Based Augmented Reality Science Learning application, which added value and advantages to the application. Furthermore, the voice recorder feature makes it easier for children with special needs to use the application. This is also in line with the results of student assessments, where overall students agreed that the voice recorder helps simplify the application's use, making it more practical. According to (Matre et al., 2024), for children with special needs who have difficulty writing or typing, a voice recorder provides an alternative use

of the application. Students simply speak to answer assignments and explain observations, thereby reducing barriers to access to learning activities. The use of a voice recorder can encourage verbal expression practice, social interaction, and repetition of speech in children with special needs (Safi et al., 2023).

Class teachers agree that the Gusjigang-based Augmented Reality Science Learning Application has the advantage of making learning activities more active. According to Yusup (2023), teachers' perspectives on learning media are tools to facilitate the achievement of learning objectives. This is in line with the opinion of (Safira et al., 2022), who stated that the use of Augmented Reality in the learning process has been proven to improve understanding of subject matter better according to individual students' needs. Teachers also commented that the application is very flexible because it is easy to install on a cellphone and there are no problems when using it, and it can be carried anytime and anywhere.

## Conclusion

Based on the results of the research and discussion of student and class teacher responses, it can be concluded that the responses given are positive responses when using the Science Learning Application with Gusjigang-Based Augmented Reality. The results of the study showed that the average student assessment of the Gusjigang-based Augmented Reality Science Learning Application was 95.30%, in the excellent category. The Science Learning Application with Gusjigang-Based Augmented Reality has a very attractive appearance and application tools and is easy to use. The use of Augmented Reality and voice recorder are superior features in the use of the application. The use of the application during the science learning process runs smoothly, indicated by the cellphone used during the learning process does not suddenly stop.

## Credit Authorship Contribution Statement

**Sekar Dwi Ardianti**: Conceptualization, writing original draft, revision, editing. **Wawan Shokib Rondli**: writing and editing. **Savitri Wanabuliandari**: Methodology, data analysis. **Gunarhadi**: Conceptualization, review.

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