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Development of Gender-Based Interactive Learning Media Assisted by Augmented Reality

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ABSTRACT

The demand for global technology utilization continues to grow rapidly in the world of education. Implementation of technology in education can be in the form of the use of digital-based learning media. The purpose of this study is to produce a product in the form of an interactive module assisted by gender-based augmented reality on the material of human nature. This type of research is development or Research of Development (R&D) with a 4-D design that includes define, design, develop, and disseminate. Respondents in this study were media experts, material experts, language experts, gender experts, educators, and students. Product trials were conducted on lecturers and students involved in Islamic Education lectures. The results of the study showed that the product validity value obtained an average of 94.25% with a very valid category. So it can be stated that the interactive module assisted by gender-based augmented reality on the material of human nature is a valid product and can be used as teaching material in learning Islamic Education.

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Introduction

The use of technology globally continues to grow rapidly, especially in the world of education. Technology in education can be implemented through learning media (Friesem, 2016). Learning media has an important role in the learning process (Fikram et al., 2023). Choosing the right learning media can influence student motivation and learning outcomes (Friesem, 2016; Melanda et al., 2023). However, the current choice of learning media does not pay more attention to student characteristics based on gender differences and gender bias still occurs (Pujiyanti & Sartika, 2021). Forms of gender bias in teaching materials are manifested through illustrations and story text (Zulmi & Lisytani, 2017; Kotek et al., 2021).

Learning media is an effective tool for socializing gender in education and disseminating gender construction to society (Lasaiba, 2016; Hariyanto, 2009). Education should promote gender equality by creating a gender-responsive learning process. This aims to instill a gender caring attitude and correct understanding in students regarding gender equality so as to minimize the existence of gender bias in the world of education (Mim & Tabassum, 2022; Hariyanto, 2009).

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One of the technology-based learning media is augmented reality (AR). This technology has been used in areas such as: military; drugs; engineering design; robot; telerobotics; manufacturing, maintenance and repair applications; consumer design; psychological treatment, etc (Azuma et al., 2021). This technology is able to make something virtual become real and its existence in the world of education is just beginning and is considered important (Kesim & Ozarslan, 2012).

AR technology continues to develop today with the presence of mobile technology (Sommerauer & Müller, 2014). Several studies have been carried out related to AR technology, including that AR technology is always developing and is able to become a part of human life and society. Likewise, in the educational sphere, AR technology is not only used as a learning tool but has become part of the world of education (Suzanna & Gaol, 2021). The use of AR in education is promising and helps in learning (Rahmatullah et al., 2021). The use of AR can help students understand and retain concepts better and improve learning outcomes (Kumar et al., 2018; Kristian et al., 2020).

However, for updated use it is necessary to design and coordinate multi-disciplinary research projects to improve the content and environment. Educators should work with researchers to develop augmented reality (Kesim & Ozarslan, 2012). Apart from that, hardware technology plays an important and key role to produce augmented reality applications. Apart from text, video, images and animation, AR applications are also developing towards 3D models. With its advantages, this application has very varied content support so that it can present an innovative approach to a multimedia learning environment. This provides benefits for students so that they can experience an interesting, original and motivating learning process (Ahn et al., 2012).

The use of AR also provides benefits for practical activities in schools where this technology can make it easier for students to interact in a digital context so that students' imagination and creativity also increase (Hwang et al., 2016). Several studies report that AR makes it possible to enhance student-centered learning. Vate-U-Lan (2012) acknowledged that the considered AR applications allow customization of functionality to students' learning abilities. Similarly, Kamarainen et al. (2013) reported that this technology provides a means of individualizing instruction in group settings and that the technology supports independence that frees teachers to act as facilitators. In developing AR media, it is very important to minimize discrimination against one gender. Mustaqim (2022) said that gender issues are strengthened when it is recognized that differences between men and women give rise to a sense of injustice in every part of economic poverty, prejudice or a negative image of women. So gender is considered as an aspect that influences and provides differences in quality in learning (Abdullah et al., 2017).

Based on several studies, it is known that AR can be used as a learning medium so that it can provide increased motivation and enthusiasm for learning for students. However, research that focuses on the use of AR in Islamic Education courses has not been widely designed and implemented in the learning process. This research is based on the argument that technology-based learning media stimulates increased high-level and creative thinking power in students. Therefore, this research focuses on developing gender-based Islamic Education learning media using augmented reality technology.

Methods

Types of research

This type of research is development or Research of Development (R&D) with a 4-D design that includes define, design, develop, and disseminate which is limited to the develop stage (Thiagarajan et al., 1974). Kosassy (2019), stated that the 4D model is more appropriate in developing learning devices, the description of the stages is more complete and systematic, and the involvement of experts in the assessment before the trial is carried out so that the product can be revised based on the assessment, input, and suggestions of experts.

Sugiyono (2015) stated that development research is research that has the aim of obtaining a product. The selection of this model aims to obtain an interactive learning media design assisted by augmented reality. The design results will be tested for validity and feasibility so that they can be used as teaching materials in learning Islamic Education.

Population and Sample

According to Edraria (2018), populations have measuring instruments, namely quantities that show the special characteristics of the population itself. The population in this study included 1st semester Islamic Religious Education students who took Islamic education courses, totaling 1648 students. The sample is representative of the population taken (Edraria, 2018). The sample was determined using a purposive sampling technique, namely a sampling technique with a specific aim of gathering information about knowledge and experience while attending Islamic Education lectures (Etikan, 2016). The samples involved in this research were lecturers, students and validators. The samples involved in this study were lecturers, students, and validators. The samples consisting of lecturers, students, and material validators are people involved in the implementation of Islamic Education lectures. While language, media, and gender validators are people who have expertise in their fields.

Data collection technique

In this study, data were collected using interviews and questionnaires. In this study, free interviews were conducted with educators and students to obtain information about the teaching and learning conditions in the classroom as well as learning facilities and infrastructure, especially teaching materials and media used. The questionnaire was used to collect data on the validity of the product submitted to expert validators in material, language, media, and gender after the media was in the develop stage. Data collection was carried out directly to the four validators by providing instruments and products of the developed media.

Data analysis technique

This technique is used to analyze qualitative data consisting of the results of interviews with lecturers and students as well as input from validators regarding the assessment of the validity of the Islamic Education Science module. The data was analyzed descriptively qualitatively as material for revising the module being developed. The validity of the media can be determined through data analysis from media experts, material experts, language experts and gender experts obtained from the questionnaire sheet that was provided previously. The measurement scale used in this data is a Likert scale which consists of 5 rating scales, namely very good (5), good (4), fair (3), poor (2), and very poor (1). Next, the validation results will be analyzed using the formula:

$$\text{Validity value} : \frac{\text{Total score obtained}}{\text{Maximum total score}} \text{ x } 100\%$$

The results of the assessment obtained are then grouped into score interpretation criteria according to the Likert scale: very valid ($80\% < x \leq 100\%$), valid ($60\% < x \leq 80\%$), quite valid ($40\% < x \leq 60\%$), no valid ($20\% < x \leq 40\%$), very invalid ($0\% < x \leq 20\%$) (Putra, 2018).

Findings and Analysis

The results of this research are interactive module products on gender-based human nature materials assisted by augmented reality (AR). This interactive module product aims to produce appropriate, practical media that can influence student motivation and learning outcomes, as well as paying more attention to student characteristics based on gender differences to avoid gender bias. Mim and Tabassum (2022) stated that gender-based interactive modules instill gender-caring attitudes and

correct understanding in students regarding gender equality, thereby minimizing the existence of gender bias in the world of education.

The product display design that has been created can be seen in Figure 1. The aim of using the AR application is to make learning easier and more focused. The use of AR in education is promising and helps in learning (Rahmatullah et al., 2021). The use of AR can help students understand and retain concepts better and improve learning outcomes (Kumar et al., 2018; Kristian et al., 2020). AR applications facilitate education and learning by using cutting-edge technology to deliver learning materials (Roussos et al., 2022; Rohman et al., 2024).

Figure 1. Product display design

Furthermore, the products in this research were tested for validity by media, material, language and gender experts. Each validator consists of one lecturer according to their expertise. The media validation process aims to obtain suggestions for improvements to the interactive module being developed so that it is suitable for use. Sugihartini and Yudiana (2018) stated that the results at the development stage are a product that is ready to measure its validity and practicality. The resulting product must go through a validation stage (Sugiyono, 2015). A product being developed has high quality if it meets the validity test requirements. Test the validity of reading learning media properly according to validators (Rofiqoh et al., 2020).

The media validation process aims to identify and correct errors in the preparation of the media being developed. The validation results from media experts can be seen in Figure 2.

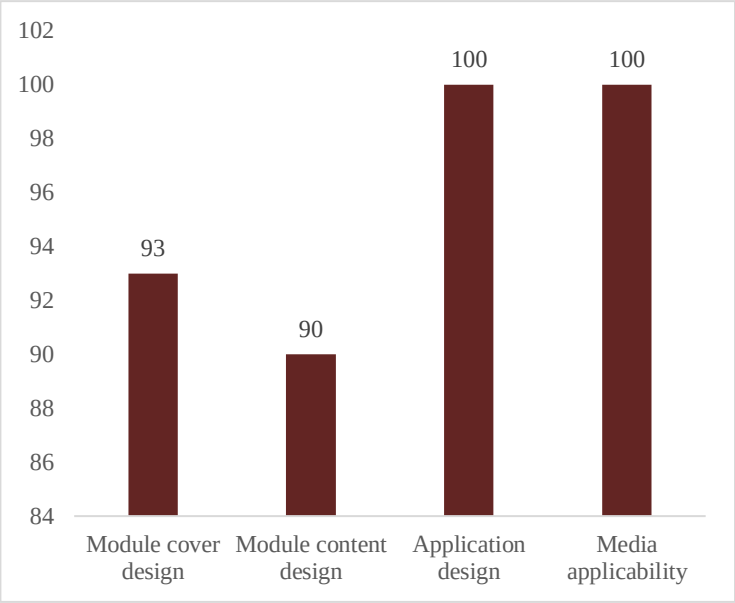

Figure 2. Media expert validation results

The validity results of media experts obtained an average score of 95% which is included in the very feasible category. Advice from media experts is to improve the learning media that has been created, including adjusting the size of images and writing in modules as well as quick response (QR) codes in media that are not yet connected to Facebook and Instagram. However, overall the appearance of learning media is considered appropriate and can attract students' attention in understanding the media. William et al. (2022) stated that an appropriate module display can increase students' interest in viewing and reading so that the module content can be better understood.

The material validation process aims to identify and correct material errors in the media being developed and improve the media based on input from material expert validators. So, the media developed is suitable for use. Validation results from material experts can be seen in Figure 3.

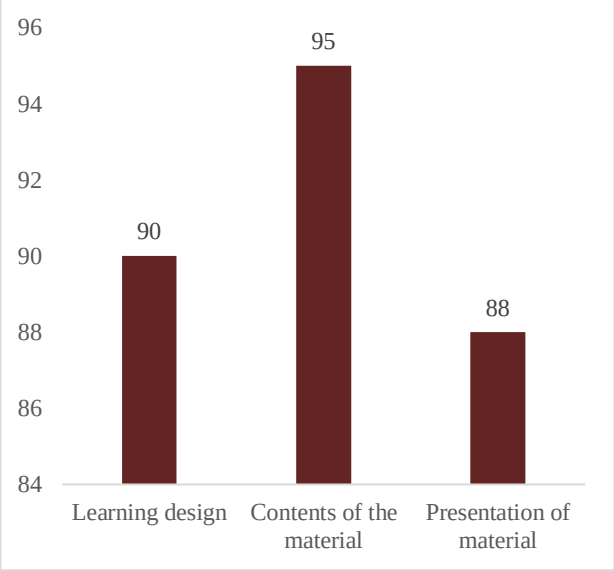

Figure 3. Validation results from material experts

The results of the validity of the material experts obtained an average score of 92% which is included in the very appropriate category. Suggestions from material experts are to add learning evaluation. Apart from that, the learning modules developed are in accordance with competency standards and are arranged systematically. Sabarudin (2018) stated that learning materials must refer to competency standards. Rahmi et al.

(2021), where the aim of preparing modules is for students to master the competencies they want to achieve in learning to the fullest. Apart from that, the material presented is prepared systematically, completely, and can increase students' knowledge in accordance with the definition of the module itself, namely teaching materials or materials that are prepared completely and systematically based on learning principles (Magdalena et al., 2020).

The language validation process aims to identify and correct language errors in the media being developed. So, the media developed is suitable for use. The validation results from language experts can be seen in Figure 4.

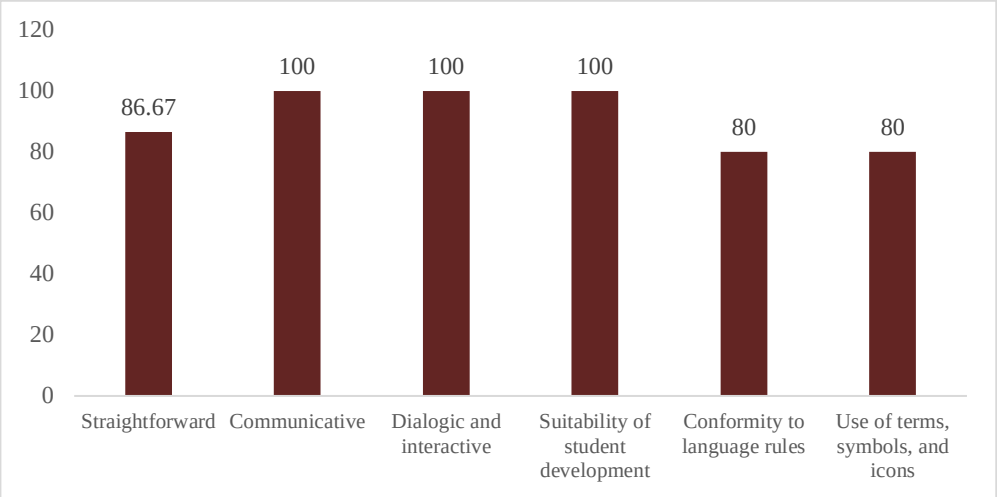

Figure 4. Validation results from language experts

The validity results of the linguist obtained an average score of 90% which is included in the very appropriate category. Suggestions from linguists are that the writing system must comply with enhanced spelling (EYD) and the preparation of the bibliography must be adapted to APA style. Apart from that, the use of language in the module is effective and easy for students to understand. This is in accordance with one of the criteria for language appropriateness of teaching materials, namely using clear, effective, informative and communicative sentences that are appropriate to the level of development of students (Ulumudin et al., 2017).

The gender expert validation process aims to identify and correct errors in gender concepts that exist in the media being developed. So, the media developed is suitable for use. Validation results from gender experts can be seen in Figure 5.

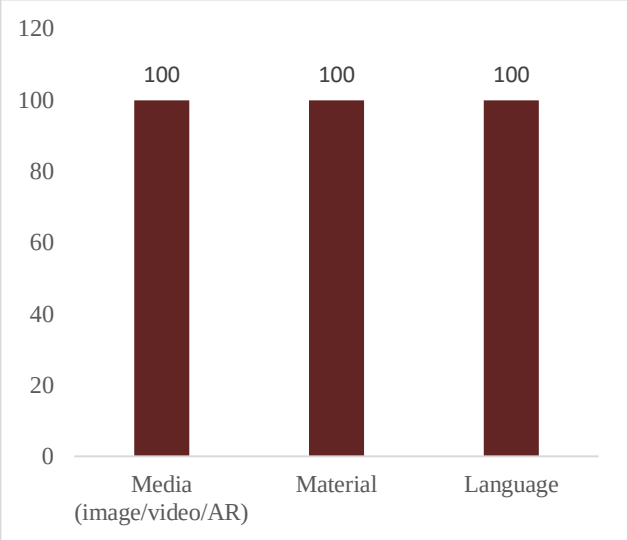

Figure 5. Validation results from gender experts

The gender expert's validity results obtained an average score of 100% which is included in the very appropriate category. Based on the validation results from gender experts, no gender bias was found in the teaching materials developed. This is because the components of teaching materials such as coloring, language and images used do not show discrimination against one gender. Zulmi and Lisytani (2017) stated that illustrative images and story texts in teaching materials should avoid gender bias. To avoid gender bias, content is balanced between men and women, selecting images that do not benefit or harm both sexes, and using gender-neutral language. This is in line with Yonata (2020) who states that gender bias in teaching materials can be avoided by using gender-free language.

The final results of the interactive module validity assessment from the four experts can be seen in the following table.

Table 1. Final Validity Value Results

Respondent	Mark	Category
Media expert	92%	Very valid
Materials expert	95%	Very valid
Language expert	90%	Very valid
Gender expert	100%	Very valid
Average	**94,25%**	**Very valid**

Based on the data in the table above, the final validity value was obtained with an average of 94.25% in the very valid category. After revisions have been made based on suggestions and input from the four learning media experts, it can be tested at the next stage.

The interactive module developed can increase students' motivation to learn and help students learn independently, as proven when students use the module with focus and enthusiasm in paying attention to each component of the module. An attractive appearance equipped with appropriate images, videos and AR is one of the factors. In contrast to the use of Microsoft PowerPoint in the classroom which is considered normal and only places students as passive elements in the learning process, the use of AR in learning helps to produce an interactive learning process (Kamelia, 2015). Apart from being able to attract attention and direct students' concentration, the use of multimedia such as AR can help students understand teaching material and create motivation to learn (Noerr, 2021). Students' learning motivation will influence learning success in the learning process (Emda, 2018). Likewise, the use of AR can attract students' interest in learning which can then influence students' understanding of concepts and learning outcomes (Aryani et al., 2019).

The interactive module developed can be accessed offline and online so it does not completely require an internet network and minimizes internet network problems. Lady et al. (2021) stated that problems often occur in online learning, such as an unsupported internet network. To minimize this occurrence, this interactive module can be accessed online or offline. Offline access using an interactive module with PDF file format. The advantage of the PDF file format is that it is very flexible and can be opened on any computer or even smartphone without any changes to the data or contents (Rezki & Siahaan, 2021).

The module developed is also equipped with augmented reality (AR) features and QR codes which aim to attract and motivate students in learning. Guo et al. (2016) argue that the use of augmented reality (AR) aims to make students more interested and motivated to study more diligently and the augmented reality (AR) feature can be easily accessed using various types of gadgets, such as smartphones, iPads and tablets. Using QR

codes can increase the effectiveness and accuracy of using mobile phones to retrieve information more quickly. Researchers also utilize technology in the form of QR codes, this is in line with research by Pratiwi (2021) which explains that QR codes have the ability to store data and transmit information quickly, enabling the creation of learning media that is in line with technological advances. Research by Hafi and Supardiyono (2018) shows that the use of interactive modules using augmented reality technology has proven to be an effective way to improve student learning outcomes. Imawati and Chamidah, (2018) stated that by incorporating augmented reality into learning, students remain actively involved because of its interesting and challenging nature. This technology allows them to interact, create and manipulate virtual objects. The advantage of using animated learning videos in augmented reality-based learning media is that it makes objects appear clearer and more alive and gives students the impression that they are seeing the object right in front of them.

Conclusion

The interactive module of human nature material based on gender assisted by augmented reality (AR) that was developed has been validated by experts. The results of the module validation test by experts include 92% material experts, 95% media experts, 90% language experts, and 100% gender experts. The average final value of the interactive module validity is 94.25% with a very valid category, so the interactive module is suitable for use in teaching and learning activities.

The learning media developed in this study can help create a more interesting, interactive, easy-to-understand learning environment for students, create a more inclusive learning environment, by reducing gender bias and providing equal opportunities for all students to understand the material in depth. More realistic and interactive visualizations make it easier for students to understand the concepts being taught. So that this AR-based interactive learning media can improve the quality of learning, support gender equality education, and become a useful tool in teaching at various levels of education.

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