Development of Augmented Reality in Islamic Religious Education as an Anti-Corruption Learning Medium

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ABSTRACT

This study aims to develop and determine the impact of using augmented reality as an anti-corruption educational medium based on the development of Islamic educational materials. The data processing used to research and development methods ADDIE model using a validity test and measurements of N-Gain scores. Three junior high schools with different environmental characteristics participated in the study. The findings first indicate that the development of augmented reality for the field of anti-corruption education can be adapted to the essential competencies of Islamic Religious Education subjects with the themes of honesty, trustworthiness, and *istiqomah*. Second, there was an increase in the cognitive domain, as indicated by the anti-corruption education values for SMP N 02 Bawang students by 79.5%; SMP N 01 Subah students by 79%; and SMP N 01 Batang students by 80.44%. On the N-Gain scale, all three achievements are considered effective. This research has implications for demonstrating that the application of augmented reality can effectively improve cognitive ability in anti-corruption education based on the development of Islamic educational materials. We recommend that these findings be used as a basis for determining anti-corruption education policies in Indonesia.

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INTRODUCTION

The increase in corruption cases in Indonesia is a worrying phenomenon. The Pacific Economic and Risk Consultancy (PERC) stated that in 2005 Indonesia was the most corrupt country in Asia.[1] The 2008 TI survey in the Global Corruption Barometer ranked political parties in Indonesia as the most corrupt, with a score of 4.2 (on a rating scale of 1-5, with 5 being the most corrupt).[2] Even more astonishingly, the Ministry of Home Affairs noted that during 2014-2019, there was an increase in corruption cases, with 105 cases involving high-ranking regional officials in 22 provinces, 90 involving regents or mayors, and 15 other cases involving governors.[3] This situation is unfortunate because it can potentially hamper growth and increase poverty in the country.[4] It indicates that rapid and appropriate steps toward instilling an anti-corruption spirit through Islamic education are essential.

In contemporary research, studies on anti-corruption education only focus on three trends. First, it considers the critical pedagogical aspect directed at building students' critical awareness of the losses due to corruption.[5] Second, in the research tendencies discussed by Landkammer, the current context of corruption education research leads to education on values, making individuals ashamed to be corrupt.[6] Third, anti-corruption education research tends to only discuss student perceptions, both from the value of independence and economic aspects, as in Sakinah and Bakhtiar's research.[7] In contrast, corruption is strongly influenced by character,[8] while learning media are one of the success factors in character education.[9] However, research on optimizing anti-corruption education learning media remains rare. Therefore, developing the augmented reality medium as a central issue of 21st-century learning is essential to be used as an anti-corruption learning approach.

This paper intends to develop an augmented reality application as a learning medium for anti-corruption education on effective Islamic religious education materials. The study focuses on two research questions. The first concern is developing augmented reality applications as anti-corruption learning media in Islamic religious education materials. The second centers on augmented reality's effectiveness as an anti-corruption learning method in Islamic religious education learning. This goal is based on the argument that augmented

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[1] Nela Suryaningtyas, Siswandari, and Nurhasan Hamidi, 'Persepsi Siswa Tentang Nilai Kemandirian Pada Pendidikan Antikorupsi (Studi Di SMK)', *Tata Arta: Jurnal Pendidikan Akuntansi* 5, no. 1 (2019): 82–94.

[2] Eko Handoyo and Martien Herna Susanti, 'Dampak Korupsi Melalui Pendidikan Anti Korupsi Dalam Membentuk Generasi Muda Yang Jujur Dan Berintegritas Di SMA Semesta Kota Semarang', *Jurnal Abdimas* 18, no. 1 (2014): 19–26.

[3] Suryaningtyas, Siswandari, and Hamidi, 'Persepsi Siswa Tentang Nilai Kemandirian Pada Pendidikan Antikorupsi (Studi Di SMK)'.

[4] Handoyo and Susanti, 'Dampak Korupsi Melalui Pendidikan Anti Korupsi Dalam Membentuk Generasi Muda Yang Jujur Dan Berintegritas Di SMA Semesta Kota Semarang', 25.

[5] Edi Subkhan, 'Pendidikan Antikorupsi Perspektif Pedagogi Kritis', *Integritas: Jurnal Antikorupsi* 6, no. 1 (2020): 15–30.

[6] Nora Landkammer, 'Reengaging Freire: Decoding and Re-Coding Freire's "Generative Images" and Critical Arts Education', *Another Roadmap School*, 2019.

[7] Nuzus Sakinah and Nurhasanah Bakhtiar, 'Model Pendidikan Anti Korupsi Di Sekolah Dasar Dalam Mewujudkan Generasi Yang Bersih Dan Berintegritas Sejak Dini', *El-Ibtidaiy: Journal of Primary Education* 2, no. 1 (2019): 39–49.

[8] Yvonne T. Chua, *Robbed: An Investigation of Corruption in Philippine Education* (Philippine: Philippines Center for Investigative Journalism, 1999).

[9] Rusydi Ananda and Muhammad Fadhli, *Statistik Pendidikan: Teori Dan Praktik Dalam Pendidikan* (Medan: Widya Puspita, 2018).

reality applications can be developed as an effective medium in increasing student understanding.[10] The study predicts that exciting developments will improve students' abilities by integrating educational materials on honesty, trust, and istiqomah in Islamic Religious Education and Character Education based on augmented reality. It is essential, as a person's knowledge of anti-corruption education strongly influences their future actions.[11]

RESEARCH METHOD

A research and development (R&D) design employing the *Analyze, Design, Develop, Implement, and Evaluate* (ADDIE) model was used. The research subject was augmented reality-based learning multimedia in the form of a textbook integrated with an Android application. The object was the quality of the multimedia developed and its effectiveness in teaching and learning. The Islamic Religious Education and Character Education subjects of honesty, trustworthiness, and *istiqomah* were chosen as representatives of anti-corruption education. The descriptive data in the study were obtained through development procedures based on validation from media experts, material experts, question experts, and augmented reality-based learning multimedia quality data. In addition, three validators were adopted from experts in the appropriate fields. After ascertaining eligibility from the validators, the product was tested on 27 class students in each partner school, acting as an experimental class with pretest and post-test models.

Validation was conducted by media experts, material experts, and question experts. The media would be improved if the teaching materials were not valid or less valid, based on the theory and input of the validators. The validation assessment was based on several aspects, including content feasibility. Expert validation analysis was performed by dividing the score of the assessment results by the maximum score and then multiplying it by 100%. The product developed was said to be 'very valid' if the validator assessment reached 82.01% - 100%, meaning that the teaching materials could be used without revision. The materials were 'valid' if the validity value level was 62.01% - 82%; they could be used, but minor revisions needed to be made according to the validator input. If the assessment of the validators was only 44.01% to 62%, then, in that case, the teaching materials developed were considered 'less valid.' It was recommended not to use them as they needed significant revisions. Therefore, it can be concluded that the augmented reality application can be used if its validity is 62.01%. The teaching materials cannot be used if less than 62.01%.[12]

Effectiveness was tested through a material mastery competency test using the test method. The student competency test used the level of mastery of the material with an experimental model by comparing the conditions before and after its use. The indicator of effectiveness was the increasing understanding of seventh-grade students in partner schools of honesty, trustworthiness, and *istiqamah*. Hake states that N-gain analysis is conducted to classify students' test results. The level of increase before and after learning is calculated by the N-gain formula, with a minimum value that must be achieved of 56%. If it is below this,

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[10] Sakinah and Bakhtiar, 'Model Pendidikan Anti Korupsi Di Sekolah Dasar Dalam Mewujudkan Generasi Yang Bersih Dan Berintegritas Sejak Dini'.

[11] Edi Subkhan, 'Pendidikan Antikorupsi Perspektif Pedagogi Kritis'.

[12] H. Russel Bernard, *Research Methods in Anthropology: Qualitative and Quantitative Approaches* (Altamira: Walnut Creek, 2002).

the developed product will be shown to be ineffective for the partner schools.[13]

The data collection techniques used in this study involved observation, interviews, tests, and documentation. The observation aimed to determine the field conditions of the product developed. An unstructured interview model was employed as a form of a free interview without the use of interview guidelines that are systematically arranged with Islamic Religious Education teachers at the partner schools.[14] The formative test consisted of twenty multiple-choice questions validated by the experts. In contrast, the documentation method was used to gain an overview from the subjects' point of view through the written medium and other documents written or made directly by the subject in question. The four techniques are summarized in two stages. They are the development stage of augmented reality-based learning multimedia and the level of media effectiveness. The media development stage was undertaken in the microteaching laboratory of the Faculty of Tarbiya dan Teacher Training, UIN Walisongo Semarang. The media assessment was conducted at SMP N 02 Bawang, SMP 01 Batang, and SMP N 01 Subah.

RESULT AND DISCUSSION
Augmented Reality in Education

The literature on the use of AR in education demonstrates a variety of purposes. Bacca et al.and Chen's review covers AR trends and uses in education, their advantages, limitations, and effectiveness. On the other hand, Phon et al. reviewed the use of AR and its potential in educational contexts, focusing on collaborative learning.[15] Santos et al. reviewed learning experiences with AR to analyze its usefulness at primary and secondary levels.[16] In addition, Espinosa focuses on educational projects with AR that have been conducted in Spain as art for the country.[17] Diegmann et al. made a systematic review of AR in five areas: discovery-based learning, skills training, training applications, games, and AR books, to determine its benefits[18], while Andik Widodo et al. published a synthesis of the relationship between AR and m-learning.[19] In another contribution, Akçayir and Akçayir presented a systematic review of the use of AR in the context of formal and informal learning education and on-the-job training.[20] Moreover, Ibáñez and Delgado-Kloos presented a qualitative content analysis between 2010 and 2017 of the use of AR technology to support science, technology,

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[13] Phil Diegmann et al., 'Benefits of Augmented Reality in Educational Environments – A Systematic Literature Review', in *Internationale Tagung Wirtschaftsinformatik* (Osnabrück, Germany, 2015), 1542–56.

[14] Robert Maribe Branch, *Instructional Design: The ADDIE Approach* (New York: Springer Science & Business Media, 2009).

[15] Danakorn Nincarean Eh Phon, Mohamad Bilal Ali, and Noor Dayana Abd Halim, 'Collaborative Augmented Reality in Education: A Review', in *International Conference on Teaching and Learning in Computing and Engineering* (Kuching, Malaysia, 2014).

[16] Marc Ericson C. Santos et al., 'Augmented Reality as Multimedia: The Case for Situated Vocabulary Learning', *Research and Practice in Techology Enhanced Learning* 11, no. 4 (2016): 1–23.

[17] José. Martínez M., *Corrupción de Estado: Conaliteg-Vamos México; El Peón de La Reina* (Spanish: Benemérita Universidad Autónoma de Puebla, 2004).

[18] Diegmann et al., 'Benefits of Augmented Reality in Educational Environments – A Systematic Literature Review'.

[19] Nurdyansyah and Andiek Widodo, *Inovasi Teknologi Pembelajaran* (Sidoarjo: Nizamia Learning Center, 2015).

[20] Murat Akçayır and Gökçe Akçayır, 'Advantages and Challenges Associated with Augmented Reality for Education: A Systematic Review of the Literature', *Educational Research Review* 20, no. 1 (2016): 1–11.

engineering, and mathematics in learning.[21]

The study conducted by Mirzaei et al. combines augmented reality with audio and video to help the deaf.[22] Through speech recognition techniques, facial expressions made it possible to capture what the narrator was saying without knowing sign language. Speech becomes a readable text displayed with AR by using a screen, enabling deaf people to read and better understand what is being communicated. Bacca et al. introduced the Paint-cAR application for students with diverse educational needs, especially those with low basic skill levels and low motivation. In the app, AR supports the learning process of car repainting in vocational education programs. This process facilitates students to follow lengthy procedures, which due to their lower level of logic and follow-up competence, are difficult for them to perform. Tobar-Muñoz et al. designed a digital game with AR called Gremlings in my Mirror, which focused on developing logical skills in mathematics and was evaluated with children with diverse learning needs, such as attention deficit hyperactivity disorder, autism, and down syndrome.

The research described in this literature review describes the use of augmented reality in education. Its contributions provide compelling reassurance in light of the current trends and challenges in the research field. Unfortunately, none of the studies reports on the current state of knowledge about the use of AR in education concerning assisting the process of confronting the increasingly rampant world of corruption. The various educational needs to promote anti-corruption characteristics have not been considered by augmented reality technology, even though AR continues to progress in the western world. In this context, the research question that will guide the researcher in filling this gap concerns how to develop and measure the impact of using augmented reality in anti-corruption education in junior high schools.

Anti-Corruption Education in Junior High Schools

At the end of this century, the world of education is displaying a worrying anomaly. Educational institutions that should have a central role in corruption cases are involved. In the Philippines, for example, prospective teachers bribe education authorities to hire them,[23] even though those employed may not necessarily be able to teach.[24] In Mexico, embezzlement of public education funds often results in the under-distribution of textbooks to schools, affecting student academic achievement. In Africa, the high attrition rate is partly due to illegal enrollment fees. It is more likely that students who have to drop out of school because of their inability to pay these illegal payments are from the poorest families.[25] In the United States, teachers who cheat on standardized tests distort incentive programs, likely

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[21] María-Blanca Ibáñez and Carlos Delgado-Kloos, 'Augmented Reality for STEM Learning: A Systematic Review', *Computers & Education* 123 (2018): 109–23.

[22] Mohammad Reza Mirzaei, Seyed Ghorshi, and Mohammad Mortazavi, 'Audio-Visual Speech Recognition Techniques in Augmented Reality Environments', *The Visual Computer* 30, no. 3 (2014): 245–257.

[23] Chua, *Robbed: An Investigation of Corruption in Philippine Education.*

[24] Nasikhin et al., 'Tantangan Pendidikan Agama Islam Di Era Posh Truth', *Al Manam: Jurnal Pendidikan Dan Studi Keislaman* 2, no. 1 (2022): 25–36.

[25] Nasikhin and Mahfud Junaedi, 'Strategies for Delivering Islamic Religious Education Learning Materials in The Post-Truth Era', *Nuansa: Jurnal Penelitian Ilmu Sosial Dan Keagamaan Islam* 19, no. 2 (2022): 127–45.

resulting in their students receiving a substandard education.[26] In Uganda, Kenya, and India, teacher absence is a common problem in rural communities, reducing the opportunities for children in schools to learn the curriculum.[27]

There are two fragments in the anti-corruption learning experience in junior high school.[28] First, in teaching anti-corruption values, the teacher shows pictures and news about junior high school-aged children struggling to go to school across a dangerous bridge. The children were then asked for their opinion about this. Some asked where it happened, some felt sad, and some laughed. Then pictures and news of malnutrition were shown. The children's expressions varied, but many were stunned and sad. In the discussion, similar problems were stated to have also occurred in their environment.[29] The results of the investigation were then discussed in class. In 2011, the Ministry of Education and Culture published an anti-corruption education guide for universities.[30] It described the learning approach to be taken, including the role of students in the anti-corruption movement in the family, campus, and surrounding community. This orientation is exemplified by the discussion method, habituation, and the recommended assessment method. For example, the students expressed opinions to be collected and assessed.[31]

Current anti-corruption learning guides display various weaknesses.[32] First, they are not firm and do not directly invite students to behave and act against corruption. On the contrary, they tend to revolve around values, norms, and moral standards such as honesty, responsibility, simplicity, caring, independence, discipline, justice, hard work, and courage. The focus of learning in the classroom for these values to be internalized in individuals' attitudes, behavior, and character will make students focus more on these values but instead distance them from direct anti-corruption attitudes and actions. For example, students who are honest and straightforward when they enter the world of work will undoubtedly be prevented from practicing corruption.[33]

In other words, preventing anti-corruption measures requires a cultural movement and an ideological and political structure supported by religious norms.[34] As a movement, it will undoubtedly be more targeted when anti-corruption education can invite students to become part of the anti-corruption cadre directly, even more so through the content of Islamic

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[26] Brian A. Jacob and Steven D. Levitt, 'Rotten Apples: An Investigation of the Prevalence and Predictors of Teacher Cheating', *NBER: National Bureau of Economic Research* (Cambridge, 2002).

[27] Ritva Reinikka and Jakob Svensson, 'Fighting Corruption to Improve Schooling: Evidence from a Newspaper Campaign in Uganda', *Journal of the European Economic Association* 3, no. 2–3 (2005): 259–267.

[28] Syamsul Arifin, 'Islamic Religious Education and Radicalism in Indonesia: Strategy of De-Radicalization through Strengthening the Living Values Education', *Indonesian Journal of Islam and Muslim Societies* 6, no. 1 (2016): 93–126.

[29] Marzuki, Miftahuddin, and Mukhamad Murdiono, 'Multicultural Education in Salaf Pesantren and Prevention of Religious Radicalism in Indonesia', *Cakrawala Pendidikan* 39, no. 1 (2020): 12–25.

[30] Munadi, *Pendidikan Agama Islam Menyongsong Era Digital* (Jakarta: Permata Media, 2012), 31.

[31] Nanang T. Puspito et al., *Pendidikan Anti-Korpusi Untuk Perguruan Tinggi* (Jakarta: Kementerian Pendidikan dan Kebudayaan RI, 2011).

[32] Ahmad Asrori, 'Radikalisme Di Indonesia: Antara Historisitas Dan Antropisitas', *KALAM* 9, no. 2 (2015): 253–68.

[33] Zuhdi Tafqihan, 'Karakteristik Dan Pemilihan Media Pembelajaran Dalam E-Learning', *Cendekia: Jurnal Kependidikan Dan Kemasyarakatan* 9, no. 2 (2011): 141–54.

[34] Asrori, 'Radikalisme Di Indonesia: Antara Historisitas Dan Antropisitas'.

religious education as a subject that aims to form an honest character.[35] This reason is sufficient because it is vital to develop anti-corruption learning based on augmented reality in schools.

Research Result

The research and development process was aimed at producing learning multimedia products in the form of textbooks on Islamic religious education, and Budi Pekerti integrated with augmented reality on the topics of honesty, trustworthiness, and *istoqomah*. The textbook prototype was developed over several stages in line with the procedures of the ADDIE development model, namely analysis, design, design development, implementation, and evaluation. In the analysis stage, the researcher observed needs and task analysis. The fundamental problem at this stage was the limited learning resources and materials used in PAI learning. In connection with the materials related to honesty, trustworthiness, and *istiqamah* as the teacher's runway in conducting anti-corruption education, the teacher stated that it was necessary to add educational aids that use Android to increase students' interest. It is important because students' character in the 21st century is closely linked to their use of smartphones.

In the task analysis stage, the researchers observed the core and basic competencies needed to develop augmented reality-based PAI learning multimedia. The subject matter was based on the core and basic competencies in the 2013 curriculum content standards revised in 2017. The content of this competition was developed according to the need for anti-corruption education in schools. The core and basic competencies are listed in Table 1.

Table 1. Core and Basic Competencies for Islamic Religious Education in Indonesia

Core Competencies	Basic Competencies
a. Appreciate and live the teachings of their religion. b. Appreciate and display honest behavior, discipline, responsibility, caring (tolerance, mutual cooperation), politeness, and confidence in interacting effectively with the social and natural environment within reach of association and existence. c. Understand knowledge (factual, conceptual, and procedural) based on curiosity about science, technology, art, and culture related to visible phenomena and events. d. Try, process, and present (use, pars, assemble, modify, and create) in concrete and abstract	1.5 They believe that honesty, trustworthiness, and *istiqamah* are religious commands. 1.6 Display honest, trustworthy, and *istiqamah* behavior in everyday life. 1.7 Understand the meaning of honesty, trustworthiness, and *istiqamah*. 1.8 Show the meaning of honest, trustworthy, and *istiqamah* behavior, and related hadiths Material Achievement Indicators a. Explain the meaning of honesty, trustworthiness, and *istiqamah* by reading the *naqli* arguments. b. Explain the meaning of honesty, trustworthiness, and *istiqamah* by reading the *naqli* argument.

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[35] Chua, *Robbed: An Investigation of Corruption in Philippine Education*.

Core Competencies	Basic Competencies
realms (writing, reading, counting, drawing, and composing) according to what is learned in school and other sources in the same perspective/theory.	c. Mention examples of honest, trustworthy, and *istiqamah* behavior in their daily lives. d. Speak and behave in honest, trustworthy, and *istiqamah* ways.

In this section, it is clear that the learning objectives are divided into five aspects. First, students are expected to be able to explain the meaning of honesty, trustworthiness, and *istiqamah* by reading the naqli argument. Second, they are asked to explain the meaning of honesty, trustworthiness, and *istiqamah* by reading the naqli argument. Third, they are expected to be able to mention examples of honest, trustworthy, and *istiqamah* behavior in everyday life. The fourth goal is to shape students' personalities to speak honestly, be trustworthy, and be *istiqamah*. This study has a significant effect on the ability of students to fight corruption. The attitudes of honesty, trustworthiness, and *istiqamah* are the values of Islamic religious education that oppose corruption.

After the analysis, the next stage was to design the materials based on the needs and task analysis results. The design activity began with compiling a draft of the teaching materials, including augmented reality-based PAI multimedia product design. The material design developed included a cover displaying the title, core competencies, basic competencies, indicators of material achievement, concept map, 'reflect on' column, 'pay attention' column, let's behave honestly, let's behave trustworthily, let's behave *istiqamah*, the story of wisdom, summary, self-evaluation, QR code and augmented reality image. In the learning media created, the QR codes and pictures were arranged to be scanned with augmented reality applications. After the design was completed, the next stage was to develop an instrument for assessing the feasibility of teaching materials in the form of a validity assessment.

The following step was to develop, to produce good teaching materials. The activities validate media and material experts and those carried out by expert validators. After being declared feasible, the media entered the implementation stage, which aimed to determine the effectiveness of the developed materials. After all stages were completed, the next step was to evaluate the researcher. It analyzes the effectiveness of the teaching materials. It was achieved through the students' pretest and post-test results after using the multimedia.

Field Test Results

Multimedia learning development activities based on augmented reality concerning honesty, trust, and *istiqomah* materials were conducted with expert validation and field research, followed by revisions. The material expert validation assessed that the augmented reality-based PAI learning multimedia obtained a validity value of from expert 1 of 88.33% and from expert 2 of 90%, with an average of 89.15%, meaning it was included in the valid category. In comparison, the validation results from the media experts had an average value of 80.62%, based on the scores from validator 1 (78.75%) and validator 2 (82.5%), so media was also included in the valid category. Meanwhile, based on the validator's assessment, an

average score of 82.5% was obtained. It was included in the valid category, so the pretest and posttest questions were declared usable with minor revisions. Table 2 shows the data from the field test validation results.

Table 2. Material expert assessment results

Subcomponent	Score	
	Validator 1	Validator 2
Material equipment	9	9
Material breadth	9	9
Material depth	9	9
Evidence accuracy	9	9
Concept accuracy	8	9
Material accuracy	9	9
Total score	53	54
Mark (%)	88.33	90
Validity Level	Valid	Valid
Average Score of the Subcomponents	89.15%	

The material expert analysis shows that the augmented reality integrated Islamic religious education learning media scores were 88.3 for validator 1 and 90 for validator 2, so the average score obtained was 89.15. It can therefore be concluded that the media are feasible for use as learning materials without requiring revision.

Table 3. Media expert assessment results

Subcomponent	Score	
	Validator 1	Validator 2
Color proportion match	7	8
Image selection	8	8
Design attractiveness	7	9
Clarity of study instructions	8	8
Accuracy of the implementation of the learning strategies	8	8
Introductory components	8	8
Ease of use	8	8
Clarity and attractive colors, images, and fonts	8	9
Availability of examples and illustrations to clarify understanding of the material	8	8
Clarity of instructions for working on practice questions	9	8
Question difficulty level	7	8
Balance of practice/test questions with the material content	8	8
Clarity of problem-solving evaluation	8	8
Clarity of summary	8	8

Subcomponent	Score	
	Validator 1	**Validator 2**
Accuracy of the summary as repetition material	7	9
Benefits of summary as enrichment material	9	9
Mark (%)	78.75	82.5
Validity Level	Valid Enough	Valid
Average Validity	80.62%	

The media experts' analysis shows that the augmented reality integrated Islamic Religious education learning media scores were 78.75 from validator 1 and 82.5 from validator 2, giving an average of 80.62. Therefore, the learning media could be used without revision.

Table 4. Expert Assessment Results

Sub-component	Score
Questions are presented systematically	4
Questions conform to basic competence	5
Questions conform to the indicator	5
The use of language conforms to standard Indonesian rules	4
The language used is communicative	4
Simple sentence structure	4
The sentences are easy to understand	4
Clarity of instructions or directions	3
Total score	33
Mark (%)	82.5
Validity Level	Valid

Development Trial

After conducting a feasibility test on the learning multimedia, the next stage was the implementation of the augmented reality materials with the participants. The researcher conducted a limited face-to-face trial with seventh-grade students at SMP N 02 Bawang, SMP 01 Batang, and SMP N 01 Subah. The trial was conducted by implementing multimedia learning in a sample group of 27 students. The sample was selected based on the daily test scores of the students on the previous theme studied. The selection was based on low, medium, and high cognitive abilities, with each group comprising 9 students. The differences in the level of ability of the students are expected to be able to represent the group. The learning process was conducted in four meetings. In the first two meetings, pre-existing media were used. At the same time, in the last two, the augmented reality products developed were employed.

After the above stages have been completed, the following stage evaluation is the final step in the ADDIE learning design model. It was conducted to analyze the effectiveness of

the developed multimedia based on the pretest and posttest results.[36] Details of the 27 research respondents are shown in Table 5.

Table 5. List of Respondents

No	Initial Name	Code	Score UH	Category	School
1.	AN.	R-1	100	High	SMP N 2 Bawang
2.	AR	R-2	95	High	SMP N 2 Bawang
3.	TS	R-3	95	High	SMP N 2 Bawang
4.	TF	R-4	80	Medium	SMP N 2 Bawang
5.	LAS	R-5	79	Medium	SMP N 2 Bawang
6.	NAR	R-6	79	Medium	SMP N 2 Bawang
7.	AAR	R-7	65	Low	SMP N 2 Bawang
8.	TW	R-8	65	Low	SMP N 2 Bawang
9.	NSD	R-9	60	Low	SMP N 2 Bawang
10.	TW	R-10	96	High	SMP N 1 Subah
11.	ar	R-11	93	High	SMP N 1 Subah
12.	SL	R-12	91	High	SMP N 1 Subah
13.	OY	R-13	85	Medium	SMP N 1 Subah
14.	FS	R-14	85	Medium	SMP N 1 Subah
15.	Y	R-15	84	Medium	SMP N 1 Subah
16	MA	R-16	70	Low	SMP N 1 Subah
17	CM	R-17	70	Low	SMP N 1 Subah
18	R	R-18	70	Low	SMP N 1 Subah
19	S	R-19	95	High	SMP N 1 Batang
20	SK	R-20	95	High	SMP N 1 Batang
21	SH	R-21	90	High	SMP N 1 Batang
22	AL	R-22	81	Medium	SMP N 1 Batang
23	KF	R-23	79	Medium	SMP N 1 Batang
24	M	R-24	79	Medium	SMP N 1 Batang
25	G	R-25	60	Low	SMP N 1 Batang
26	PN	R-26	55	Low	SMP N 1 Batang
27	ZK	R-27	51	Low	SMP N 1 Batang

The students' pretest and posttest instruments were in the form of 20 multiple-choice questions. The approach to determining the cognitive improvement of the students was to use augmented reality modification for the Islamic religious education subjects on the subjects of honesty, justice, and *istiqamah*, namely by giving them a test at the end of the lesson. The pretest and posttest scores can be seen in Table 6. (L; passed; TL: did not pass).

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[36] Branch, *Instructional Design: The ADDIE Approach*.

Table 6. Pretest and Posttest Scores

No.	Respondent	Pretest		Posttest	
		Score	**Desc.**	**Score**	**Desc.**
1	R-1	50	TL	95	L
2	R-2	55	TL	90	L
3	R-3	55	TL	90	L
4	R-4	75	L	95	L
5	R-5	60	TL	95	L
6	R-6	40	TL	90	L
7	R-7	50	TL	85	L
8	R-8	30	TL	80	L
9	R-9	75	L	95	L
10	R-10	45	TL	85	L
11	R-11	70	TL	95	L
12	R-12	40	TL	85	L
13	R-13	50	TL	95	L
14	R-14	70	TL	95	L
15	R-15	35	TL	80	L
16	R-16	75	L	95	L
17	R-17	55	TL	90	L
18	R-18	75	L	95	L
19	R-19	60	TL	95	L
20	R-20	40	TL	85	L
21	R-21	50	TL	85	L
22	R-22	30	TL	80	L
23	R-23	75	L	95	L
24	R-24	60	TL	95	L
25	R-25	50	TL	95	L
26	R-26	75	L	95	L
27	R-27	70	TL	95	L

Information

L   : The test results reached the minimum limit

TL   : The test scores did not reach the minimum limit

Discussion

To establish whether teaching materials are suitable for use, they must go through an assessment stage by an expert validator.[37] Based on the validation results in this study, the augmented reality-based learning multimedia developed were declared valid by material expert 1, with a score of 88.33%. Material expert 2 assessed the media to be very valid, scoring

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[37] Andri Ioannou and Vaso Constantinou, *Augmented Reality Supporting Deaf Students in Mainstream Schools: Two Case Studies of Practical Utility of the Technology* (New York: Springer International Publishing, 2018).

it at 90%. Based on these data, the average validity score of the teaching materials from the experts concerning honesty, trust, and *istiqamah* material was 89.15%, so it was included in the valid category. As for the assessment of the media experts, validator 1 gave a score of 78.75%, and validator 2 of 82.5%. Therefore, the average assessment of the media experts was 80.62%, so it was included in the valid category. It shows that the PAI teaching materials and augmented integrated reality manners were deemed appropriate for use.

The effectiveness analysis was performed by conducting a pretest and posttest using augmented reality-based learning multimedia. The effectiveness in question is related to the increase in the cognitive aspects of students after using multimedia. The tests were conducted on 27 students in class VII at the junior high school level. More detailed results of the pretest and post-test are shown in Table 7.

Table 7. Minimum Completeness Criteria for PAI Subjects and Morals for Grade VII at Partner Schools

No.	Criterion	Score
1.	Pass	≥ 75
2.	Did not pass	< 75

Table 8. Meaning of Effectiveness Category according to N-Gain

Percentage (%)	Interpretation
< 40	Ineffective
40-55	Fairly effective
56-75	Sufficiently effective
>76	Effective

Table 9. Calculation Results of the Pretest and Posttest Scores

No.	Respondent	*Pretest*		*Posttest*		Percentage of *N-gain*	Interpretation
		Score	Desc.	Score	Desc.		
1	R-1	50	TL	95	L	90%	Effective
2	R-2	55	TL	90	L	77%	Effective
3	R-3	55	TL	90	L	77%	Effective
4	R-4	75	L	95	L	80%	Effective
5	R-5	60	TL	95	L	87.5%	Effective
6	R-6	40	TL	90	L	83%	Effective
7	R-7	50	TL	85	L	70%	Sufficiently effective
8	R-8	30	TL	80	L	71%	Sufficiently effective
9	R-9	75	L	95	L	80%	Effective
10	R-10	45	TL	85	L	72.7%	Sufficiently effective
11	R-11	70	TL	95	L	83%	Effective
12	R-12	40	TL	85	L	75%	Sufficiently effective

No.	Respondent	Pretest		Posttest		Percentage of *N-gain*	Interpretation
		Score	Desc.	Score	Desc.		
13	R-13	50	TL	95	L	90%	Effective
14	R-14	70	TL	95	L	83%	Effective
15	R-15	35	TL	80	L	69.2%	Sufficiently effective
16	R-16	75	L	95	L	80%	Effective
17	R-17	55	TL	90	L	77%	Effective
18	R-18	75	L	95	L	80%	Effective
19	R-19	60	TL	95	L	87.5%	Effective
20	R-20	40	TL	85	L	75%	Sufficiently effective
21	R-21	50	TL	85	L	70%	Sufficiently effective
22	R-22	30	TL	80	L	71%	Sufficiently effective
23	R-23	75	L	95	L	80%	Effective
24	R-24	60	TL	95	L	87.5%	Effective
25	R-25	50	TL	95	L	90%	Effective
26	R-26	75	L	95	L	80%	Effective
27	R-27	70	TL	95	L	83%	Effective
Total		1515		2450		1745%	Effective
Mean		54.07		89.25			
% Mean						79%	

Table 10. Average Pretest and Posttest Results

Posttest Mean Score	Pretest Mean Score	N-Gain Test Results	Category
54.07	89.25	79%	Effective

Based on the research data, it has been demonstrated that the students experienced an increase in cognitive aspects before and after using the augmented reality media. Their cognitive improvement occurred after learning using the teaching materials, from an average value of 54.07% to 89.25%. It was analyzed using the N-gain formula, which indicated an improved score of 79%, thus included in the "effective" category. In detail, the improvement score for SMP N 02 Bawang in R1-R9 was 79.5%, for SMP N 01 Subah in R10-18 79%, and SMP N 01 Batang in R19-R27 80.44%. 79% - 80.44% scores are considered effective on the N-gain scale. The environmental characteristics of the three schools are different. SMP N 02 Bawang is in a mountainous area, while SMP N 01 Subah is in the northern coastal area. In contrast, SMP N 01 Batang is located in an urban area. It is simply that augmented reality can be effectively used for educational institutions with different environmental characteristics. In addition, it can be said that the equitable distribution of technology utilization in junior high schools in Batang is fair. This research is in line with the results of

Wu Shin Kai, which show that augmented reality can be effectively used in learning.[38] However, it is in contrast to the research of Spina Charli, which claims that augmented reality is a medium that requires the internet, so it is not suitable for learning in rural areas.[39] The findings reinforce the need for students' involvement in the teaching-learning process to encourage their interaction with the lesson rather than taking a passive role that does not go beyond simply receiving information. Ensuring children's interactions and positive involvement in educational activities is considered a guarantee of learning, regardless of the media used, as revealed in Al-Yousefi's research.

CONCLUSION

Augmented reality (AR) has excellent potential to be used in anti-corruption education. Because of this potential, many European and American scientists are interested in AR technology. They develop discovery-based learning, object modeling, AR books, game-based learning, and skills training. This study has demonstrated AR technology's effectiveness in anti-corruption education in Junior High Schools. The study's findings show that the three schools in Indonesia with different environmental characteristics can be deemed suitable as objects of the AR study. Although the measurements only refer to the pedagogical realm, it cannot be denied that this field will play a significant role in welcoming children's behavior in the future. This finding is helpful for research on the application of AR education in the broader scope, as the benefits of using the technology are not merely limited to anti-corruption education.

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