

Development and Evaluation of an Android-Based Islamic Wasathiyah E-Book for Enhancing Religious Moderation and Learning Outcomes Students

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Abstract

The limited integration of digital teaching materials in Islamic Religious Education (PAI) has created a gap between students' digital learning habits and the predominantly conventional resources used in classrooms. This study aimed to develop and evaluate an Android-based Islamic wasathiyah e-book designed to strengthen religious moderation, tolerance, and students' learning outcomes in junior high school PAI learning. This study employed a Research and Development (R&D) design adapted from the Borg and Gall model, covering needs analysis, product development, expert validation, product revision, and implementation. Data were collected through observations, interviews, questionnaires, documentation, expert validation sheets, practicality assessments, and learning outcome tests. The feasibility and practicality of the product were analyzed descriptively, while its effectiveness was examined through a pretest–posttest design supported by statistical testing and N-Gain analysis. The findings revealed that PAI learning resources in the observed schools were still dominated by printed textbooks, while teachers strongly needed technology-integrated materials relevant to students' characteristics. The developed e-book systematically incorporated Islamic wasathiyah values into tolerance and respect-for-differences materials through an Android-based format. Expert validation showed that the product was feasible, with content feasibility reaching 90.8% and technological feasibility reaching 81.7%. Practicality assessments also indicated highly positive responses from teachers (90.83%) and students (94.7%). The effectiveness test demonstrated improved student learning outcomes, with N-Gain results showing that most students achieved moderate improvement. These findings indicate that the Android-based Islamic wasathiyah e-book is feasible, practical, and effective for supporting PAI learning. This study contributes an empirically validated model for integrating digital learning innovation with religious moderation education in secondary schools.

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Introduction

Education plays a crucial role not only in transmitting knowledge but also in fostering moral character, social responsibility, and the capacity to live harmoniously within diverse societies. In multicultural contexts such as Indonesia, schools are expected to cultivate tolerance, mutual respect, and peaceful coexistence among students from different religious, cultural, and social backgrounds. Character education, therefore, cannot be separated from moral education, particularly in Islamic Religious Education (PAI), which aims to encourage students to practice religious teachings responsibly while appreciating diversity in everyday life (Ministry of Religion of the Republic of Indonesia, 2019). The effectiveness of this process is strongly influenced by the quality of teaching

materials used in classrooms. Teaching materials function not only as sources of information but also as pedagogical tools that facilitate value internalization, critical reflection, and behavioral development. Well-designed instructional materials can enhance learning effectiveness, support independent learning, and promote meaningful engagement with educational content (Heinich, 1999; Prastowo, 2016). However, previous studies have reported that PAI learning, particularly in the moral education domain, remains dominated by theoretical content, limited instructional variation, and assessment practices that are insufficient to support students' character formation and value internalization (D. Wahyudi & Agustin, 2018; Imron, 2019; Narsi, 2021; D. Wahyudi, 2022).

These challenges are further exacerbated by the continued reliance on conventional teaching materials in PAI classrooms. Preliminary observations conducted in junior high schools within Sub Rayon 01 of Semarang City indicate that textbooks, printed modules, and worksheets remain the primary learning resources, while the utilization of digital teaching materials is still limited. This situation contrasts with the characteristics of contemporary learners, who are highly familiar with smartphones, internet-based resources, and digital platforms in their daily lives (Safitri et al., 2015). The educational disruptions experienced during the COVID-19 pandemic further highlighted the need for innovation in instructional materials and learning delivery. Several studies have documented challenges related to teachers' technological competencies, low student engagement, and limited attractiveness of learning materials during online learning environments (Jannah et al., 2021; Lubis, 2021; Wardio, 2020). Consequently, educational institutions are increasingly required to adopt more flexible, engaging, and technology-enhanced learning approaches that align with the needs of digital-native students (Priyanto, 2020; Surani, 2019).

The implementation of the Merdeka Curriculum reinforces this transformation by emphasizing competency development, character education, and meaningful learning experiences. Nevertheless, interviews conducted with the Chairperson of the Semarang City Junior High School MGMP in 2024 revealed that PAI learning continues to face several obstacles. Students often perceive learning materials as overly conceptual and disconnected from their lived experiences, while limited instructional time restricts opportunities for deeper discussion of moral and religious issues. Furthermore, the predominance of text-based teaching materials limits the development of higher-order thinking skills, and many teachers still encounter difficulties in designing technology-integrated learning resources. One promising strategy for addressing these challenges is the development of e-books, which offer greater accessibility, flexibility, interactivity, and multimedia integration compared to conventional printed materials. Previous studies suggest that digital learning resources can improve students' motivation, confidence, engagement, and academic achievement, making e-books a potentially effective medium for Islamic Religious Education in the digital era (Deci & Ryan, 2000).

Beyond technological innovation, the content and values embedded within teaching materials are equally important. In the context of Indonesia's religious and cultural diversity, Islamic wasathiyah provides a relevant framework for fostering moderation, justice, balance, inclusivity, and the rejection of extremism (Shihab, 2019). The importance of strengthening these values is increasingly evident in light of persistent manifestations of intolerance among students, including tendencies to restrict social interactions to individuals with similar religious backgrounds and the misuse of social media to disseminate discriminatory views toward other religious groups. Such phenomena indicate that students' understanding of tolerance and religious moderation requires

systematic reinforcement through educational interventions (Harto & Tastin, 2019). In this regard, Islamic Religious Education teachers play a strategic role not only as instructors but also as role models responsible for nurturing moderate religious attitudes and inclusive social behaviors through classroom learning and daily habituation practices (Nurchaili, 2020).

Although studies on digital learning innovation and religious moderation have expanded considerably, limited research has integrated these two domains into a single pedagogical framework. Existing studies generally examine digital teaching materials or religious moderation separately, leaving a gap regarding the development of technology-based PAI resources that explicitly embed Islamic wasathiyah values and empirically evaluate their educational impact. Therefore, this study aims to develop and validate an e-book-based Islamic Religious Education and Ethics teaching material that integrates Islamic wasathiyah values, particularly within moral education topics concerning tolerance and respect for differences. By combining digital learning innovation with value-based Islamic education, this study seeks to contribute to the growing scholarship on technology-enhanced Islamic education while providing an empirically validated model for promoting religious moderation and improving students' learning outcomes in junior high schools (Ekawati & Yarni, 2019; W. Hidayat, 2020).

Although previous studies have examined digital learning resources in Islamic Religious Education and have also discussed religious moderation as a separate educational concern, several issues remain insufficiently addressed. Prior research has not adequately explained how Android-based digital teaching materials can be systematically designed to integrate Islamic wasathiyah values into moral education topics while simultaneously being tested for feasibility, practicality, and effectiveness in authentic junior high school learning contexts. In particular, limited empirical evidence is available on how such value-integrated digital materials can respond to the mismatch between students' digital learning habits, the dominance of printed PAI resources, and the need to strengthen tolerance and respect for differences through classroom instruction.

The novelty of this study lies in the development and evaluation of an Android-based Islamic Wasathiyah e-book that combines technological innovation, Islamic moderation values, and learning outcome improvement within a single instructional model. Unlike studies that focus only on digital media usability or only on the conceptual promotion of religious moderation, this study offers an empirically validated product that embeds wasathiyah principles into PAI and Ethics learning materials. This contribution provides new evidence that digital teaching materials can function not only as learning media for cognitive achievement but also as pedagogical instruments for promoting balanced religious understanding, tolerance, and character formation among secondary school students.

Accordingly, this study aims to develop an Android-based Islamic Religious Education and Ethics e-book grounded in Islamic wasathiyah values for junior high school students. Specifically, the study seeks to identify the need for technology-integrated PAI teaching materials, design and validate the feasibility of the developed e-book, examine its practicality based on teacher and student responses, and evaluate its effectiveness in improving students' learning outcomes on tolerance and respect for differences. Through these objectives, the study is expected to provide a practical and evidence-based model for integrating digital learning innovation with religious moderation education.

Method

This research uses a research and development (R&D) method that aims to produce products in the form of teaching materials for Islamic Religious Education and Ethics based on Islamic wasathiyah values on moral elements. The R&D method was chosen because it focuses not only on product development, but also on testing the quality, practicality, and effectiveness of the resulting products in supporting the learning process (Ali, 2011; Saputro, 2017; Sugiyono, 2018; Gustiani, 2019). The product developed in this study is in the form of digital teaching materials that integrate Islamic wasathiyah values into tolerance materials and respect differences in Islamic Religious Education and Ethics subjects at the junior high school level.

The research was carried out in junior high schools that are members of Sub Rayon 01 and 02 of Semarang City which include Banyumanik, Gunungpati, and Gajahmungkur Districts. The selection of the research location is based on the characteristics of schools that have implemented the Independent Curriculum as well as the diversity of conditions of public and private schools which can provide a more comprehensive picture of the needs for the development of teaching materials. Meanwhile, a limited trial of the product was carried out at SMP Negeri 24 Semarang City.

The development model used refers to the Borg and Gall model which consists of ten development steps, namely information collection, planning, initial product development, initial trial, product revision, field trial, operational revision, major field test, final revision, and dissemination and implementation (Borg & Gall, 1983). In its implementation, the model is modified according to research needs by adopting the development flow proposed by Saputro (2017), so that the research process is divided into three main stages, namely preliminary studies, product development, and product validation.

The preliminary study stage is carried out through needs analysis, literature review, field observation, distribution of questionnaires, and interviews with Islamic Religious Education teachers and related stakeholders. This stage aims to obtain information about learning conditions, the use of teaching materials, the implementation of the Independent Curriculum, and teachers' needs for teaching materials that are in accordance with the characteristics of students. The results of the preliminary study were used as a basis for the preparation of an initial draft of teaching materials based on Islamic wasathiyah values.

The product development stage includes the preparation of teaching materials, the implementation of Focus Group Discussions (FGD), expert validation, product revisions, and product trials. Validation is carried out by material experts and educational technology experts. The validation of the material aims to assess the suitability of the content, language, presentation, and integration of Islamic wasathiyah values in teaching materials. Meanwhile, the validation of educational technology is carried out to assess the aspects of design, appearance, ease of use, and quality of the developed learning media. The validation results are used as a basis for product improvement before being tested on students.

Product trials are carried out in stages which include individual trials, small group trials, and limited group trials. An individual trial involved six learners to identify the initial weaknesses of the product. Furthermore, the small group test involved twelve students to obtain input related to the clarity of the material, ease of use, and attractiveness of the product. The last stage is in the form of a limited group test involving thirty students or one class to determine the level of practicality and effectiveness of teaching materials in the learning process.

This study uses a mixed methods approach that combines qualitative and quantitative data. Qualitative data is obtained through observations, interviews, documentation, as well as suggestions and inputs from experts. The data is used to support the product development and improvement process. Meanwhile, quantitative data was obtained through validation questionnaires, practicality questionnaires, and student learning test results used to measure the quality of the products developed.

Data collection techniques include observation, interviews, questionnaires, and documentation studies. Observations were used to identify the learning conditions of Islamic Religious Education and the use of teaching materials in schools. Interviews were conducted with school principals, MGMP PAI administrators, and Islamic Religious Education teachers to obtain more in-depth information about the needs of teaching materials. Questionnaires are used to measure the level of need, feasibility, and practicality of products, while documentation studies are carried out through the analysis of curriculum documents, teaching modules, teaching materials, and other learning tools relevant to the research.

Data analysis was carried out qualitatively and quantitatively. Qualitative data were analyzed descriptively to describe learning conditions, teacher needs, and the teaching material development process. Meanwhile, quantitative data is used to measure the level of feasibility, practicality, and effectiveness of the product. The feasibility and practicality analysis was carried out using a five-level Likert scale by converting the scores obtained into the form of percentages (Sugiyono, 2013; Scott, 2015). The effectiveness of the product was analyzed using the One Group Pretest–Posttest Design design by comparing the learning outcomes of students before and after the use of teaching materials. The difference in pretest and posttest scores was analyzed using a paired sample t-test with the help of SPSS software version 29.0.2 for Windows to determine the effect of the use of teaching materials on improving student learning outcomes (Volunteerwa et al., 2024).

With this procedure, this research is expected to be able to produce valid, practical, and effective Islamic Religious Education teaching materials based on Islamic wasathiyah values to improve students' learning outcomes on tolerance and respect differences.

Results and Discussion

Results

This research aims to develop teaching materials for Islamic Religious Education and Ethics in the form of an e-book based on the values of Wasathiyah Islam tolerance to improve the learning outcomes of junior high school students in Semarang City. Product development is carried out with a Research and Development (R&D) model which includes the stages of needs analysis, product design, validation, revision, trial, and product implementation. The product produced is in the form of an Android-based e-book that contains moral material about tolerance and respect for differences, in accordance with the learning outcomes of the Independent Curriculum phase D grade VIII junior high school.

The results of the needs analysis show that the teaching materials used in Islamic Religious Education learning at Semarang City Junior High School are still dominated by printed books. As many as 90% of teachers use printed books as their main source of learning and only 10% use learning resources from the internet. This condition shows that the use of digital teaching materials is still relatively low. On the other hand, all teachers who were respondents stated that they needed

the development of more innovative teaching materials, in accordance with technological developments, student characteristics, and were able to increase students' creativity and learning independence. These findings show that there is a real need for teaching materials that are more adaptive and relevant to the development of the digital era.



Figure 1. Product development results

Based on the results of the needs analysis, an e-book on Islamic Religious Education and Ethics based on the values of Wasathiyah Islam tolerance was developed which is integrated with Android technology. The development of this teaching material is not only oriented towards mastering the learning material, but is also designed to instill the values of religious moderation, tolerance, respect for differences, and the formation of students' character. Through the integration of Islamic Wasathiyah values in learning materials, students are expected to be able to understand the concept of tolerance theoretically as well as apply it in daily life.

Product feasibility is tested through validation of material experts and technologists. The validation results showed that the content aspect obtained a feasibility score of 90.8% which is included in the very feasible category. Meanwhile, the technology aspect obtained a score of 81.7% with a decent category. The results show that the e-book developed has met quality standards both in terms of material and technological display so that it can be used as teaching material in Islamic Religious Education learning in junior high school. In addition, the results of the practicality test showed that teachers gave an assessment of 90.83% with the very practical category, while students gave an assessment of 94.7% with the very practical category. These results indicate that e-books are easy to use, engaging, and can help the learning process effectively.

Language Performance

Before the effectiveness test was carried out on student learning outcomes, the e-book product of Islamic Religious Education and Ethics was based on the values of Wasathiyah Islam tolerance which had been developed first through the validation stage by experts. This validation stage aims to determine the level of product feasibility which includes aspects of content, media, and the use of technology. The validation results are the basis for determining whether the developed product meets the necessary quality standards so that it is suitable for use in the learning process. The results of expert validation of the teaching materials developed are presented in the following description.

Content/content Feasibility Test Results

Expert validators in the development of Islamic Religious Education teaching materials based on Islamic wasathiyah values are experts in the field of Islamic Religious Education and Ethics and are actively involved in junior high school education, especially Islamic Religious Education and Ethics Subjects. Based on these considerations, the researcher determined a validator of content/content experts, namely: Dr. Nurokhim, M.S.I. He is a PAI teacher of SMP Negeri 04 Semarang City, the management of MGMP PAI SMP Semarang City, the management of FKGP Semarang City, the Chairman of the Semarang City Ahipraya Community and the author of the PAI Book and Ethics of Erlangga Publisher. The results of the content/content feasibility test are as follows:

Table 1. Content/Content Feasibility Test Assessment Results

No	Criteria	Indicator	V1	V2	Reassess	Average Amount
1	Content Eligibility	Material suitability learning outcomes	5	5	5	15
		Accuracy of the material and the correctness of the concept	5	5	5	
		The material is systematic	5	5	5	
2	Language	Communicative and interactive	5	3	4	12
		Coherence and sequence	4	4	4	
		Plot				
		In accordance with the rules of the correct language	4	4	4	
3	Presentation	Presentation technique	5	4	4,5	8
		Communicative and interactive	4	3	3,5	
4	Psycho-humanitis approach	Active participation of Students	5	4	4,5	14,5
		The material taught according to the context of life	5	5	5	
		Students think creatively in solving Problem	5	5	5	
5	Teaching Material Design	Teaching material cover design	5	5	5	9,5
		Content design	5	4	4,5	
Quantity			62	56	59	59
Average			4,76	4,31	4.54	4,54

Based on the results of the content/content feasibility test assessment as in table 1, it is then analyzed by calculating the percentage of the feasibility level of each criterion using the following formula:

$$P = \frac{\sum Xi}{\sum X} \times 100\%$$

Description:

P : Percentage

$\sum Xi$: The total number of scores obtained from validators/experts

Skin : Ideal score number

Meanwhile, the conclusion of the feasibility level criteria refers to table 3.9 Criteria for Teaching Material Feasibility Level. Based on this, the results of the feasibility analysis were obtained as follows:

Table 2. Eligibility Criteria for Content/Content of Teaching Materials

No	Assessment Aspects	Average Amount	Maximum	Prosentase	Criteria
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		obtained	Score		
1	Content Eligibility	15	15	100%	Highly Worth It
2	Language	12	15	80%	Worthy
3	Presentation	8	10	80%	Worthy
4	Values Approach <i>Wasathiyah Islam</i>	14,5	15	96,7%	Highly Worth It
5	Teaching Material Design	9,5	10	95%	Highly Worth It
	Average	59	65	90,8%	Highly Worth It

Based on table 2 above, it can be concluded that the content feasibility aspect is 100% and the category feasibility level is very feasible. This means that the scope of the material is in accordance with the learning objectives, precise and systematically arranged. The linguistic aspect is 80% and the feasibility level of the category is feasible, this means that the language used is communicative, interactive and in accordance with the rules. The aspect of presentation is 80% and the feasibility level of the feasible category, this means that the presentation of teaching materials is interesting. The aspect of the approach to Islamic wasathiyah values is 96.7% and the level of feasibility of the category is very feasible, this means that this teaching material gives students great flexibility in developing themselves. The design aspect of the teaching materials is 95% and the feasibility level of the category is very decent, this means that the design and appearance of the teaching materials are very attractive.

The results of the assessment of the feasibility of the content/content of Islamic Religious Education and Ethics teaching materials based on the overall Islamic wasathiyah values of 90.8% and the feasibility level of the category is very feasible. It can be concluded that this material is very suitable for use as a teaching material in learning.

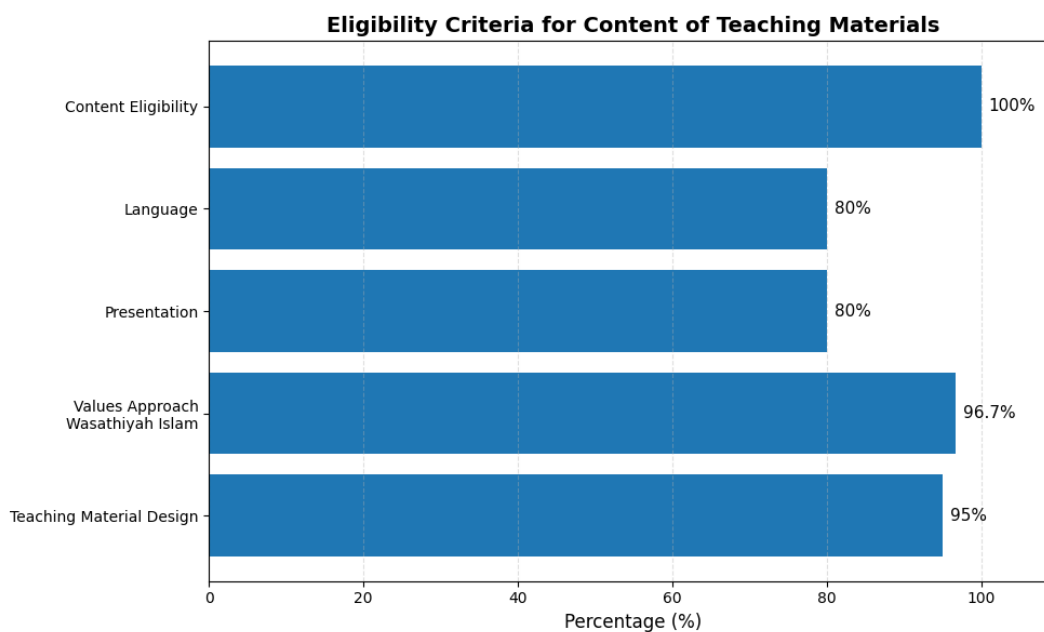


Figure 2. Recap of the Results of the Feasibility Test of Content/Content of Teaching Materials

Quality of Research Instruments

Before being used to measure student learning outcomes, the test instrument first goes through a series of quality tests that include an analysis of the level of difficulty, differentiation, effectiveness of the deception, validity, and reliability. The results of the difficulty level analysis showed that the

questions developed had varying levels of difficulty, consisting of difficult, medium, and easy categories. The composition shows that the instrument is able to measure students' abilities proportionally at various levels of material mastery. Most of the question items are in the medium category so they are considered suitable for use in the evaluation of learning outcomes.

The results of the differential power analysis showed that most of the question items had a good ability to distinguish between students who had high and low abilities. The Corrected Item-Total Correlation value is mostly above 0.40 and belongs to the good to excellent category. In addition, the results of the analysis of the effectiveness of the trickster show that almost all alternative answers work well because they are chosen by the students, thus reducing the possibility of answering randomly. There was only one trickster that did not function optimally because it was not chosen by the respondents.

Furthermore, the results of the validity test showed that all question items had a greater correlation coefficient value (r calculated) than the r table (0.254), so that all items were declared valid and suitable for use as research instruments. Meanwhile, the results of the reliability test obtained a Cronbach's Alpha value of 0.772 which is above the minimum limit of 0.60. These results show that the instrument has a good level of internal consistency and is reliable in measuring student learning outcomes. Thus, the test instruments used in this study meet the quality requirements of the instrument and can be used to measure the effectiveness of the Islamic Religious Education e-book based on the values of Wasathiyah Islam tolerance to student learning outcomes.

Results of Teaching Material Effectiveness Test

The results of the analysis showed that the use of Islamic Religious Education and Ethics e-books based on the values of Wasathiyah Islam tolerance had a positive impact on student learning outcomes. This can be seen from the increase in the average pretest and posttest scores at the two test schools. At SMP Negeri 24 Semarang, the average score increased from 81.50 to 95.33, while at SMP Negeri 22 Semarang it increased from 79.50 to 90.17. In addition, the median score and minimum score also increased, which shows that the improvement in learning outcomes does not only occur in students with high ability, but also in students with relatively low initial ability. This finding indicates that the e-book developed is able to help students understand the material better after following the learning process.

This condition requires further analysis using nonparametric statistics. However, the results of the normality test do not reduce the validity of the research findings, but rather become the basis for determining the analysis technique that is in accordance with the characteristics of the data obtained.

Furthermore, a homogeneity test was carried out to determine the similarity of variance between the data groups. The test results show that the pretest and posttest data do not meet the homogeneity assumption. The difference in learning outcomes that occurred between before and after treatment showed the influence of the use of teaching materials applied in learning. In other words, changes in learning outcomes obtained by students do not occur by chance, but are influenced by the use of Islamic Religious Education and Ethics e-books based on the values of Wasathiyah Islam tolerance used during the learning process.

To test the significance of differences in learning outcomes before and after the use of e-books, the Wilcoxon Signed-Rank Test was conducted. This test is used because the results of the normality

test show that the data is not normally distributed, so the analysis is carried out using nonparametric statistics. The results of the Wilcoxon test are presented in the following Table X.

Table 3. Wilcoxon Test Results Signed- Ranking Test

Ratings		N	Average Rating	Number of Ratings
Post-Experiment Pre-experiment	Negative Rating	3 ^a	4.50	13.50
	Positive Rating	26 ^b	16.21	421.50
	Series	1 ^c		
	Quantity	30		
Pre Control Postal Control	Negative Rating	3 ^d	13.17	39.50
	Positive Rating	26 th	15.21	395.50
	Series	1 ^f		
	Quantity	30		

Based on the results of the Wilcoxon Signed-Rank Test, most students experienced an increase in learning outcomes after using e-books based on the values of Wasathiyah Islam tolerance. To find out the magnitude of the increase in learning outcomes that occurred, an N-Gain analysis was carried out. This analysis is used to measure the effectiveness of the use of teaching materials based on the difference in pretest and posttest scores obtained by students. The results of the recapitulation of the N-Gain category in both schools can be seen in the following Table X.

Table 4. N-Gain Category

No	N-Gain Category	N-Gain Range	Number of Students	Percentage (%)
1	Height	$g > 0.70$	6	10,00
2	Medium	$0.30 \leq g \leq 0.70$	52	86,67
3	Low	$g < 0.30$	2	3,33
Quantity			60	100,00

Based on Table X, most of the students are in the category of moderate improvement. Of the total 60 students, 52 students were in the medium category, 6 students were in the high category, and only 2 students were in the low category. These findings show that the use of e-books based on the values of Wasathiyah Islam tolerance is able to provide an improvement in learning outcomes for the majority of students.

To determine the level of effectiveness of improving overall learning outcomes, an analysis was carried out on the group's average N-Gain score. The results of the analysis showed that the average value of N-Gain was 0.684 which was included in the medium category. The complete data of the group's N-Gain analysis results are presented in Table X below.

Table 5. N-Gain recapitulation results

No	School	N-Gain Criteria		
		Low	Medium	Height
1	SMP Negeri 24 Semarang	1	26	3
2	SMP Negeri 22 Semarang	1	26	3
Total		2	52	6

Source: SPSS data processing version 27, year 2025

The effectiveness of the use of teaching materials can be seen through the results of the N-Gain analysis. The results of the recapitulation show that most of the students are in the category of moderate improvement. Of the total students who were the subjects of the study, the majority experienced an increase in learning outcomes in the medium category, while a small percentage were in the high and low categories. These findings show that the use of e-books not only impacts some

specific students, but is able to improve learning outcomes evenly in most students who participate in learning.

Table 6. Group N-Gain Score

Descriptive Statistics					
	N	Minutes	Max	Means	Std. Deviation
Ngain Score Experiments	60	-2	1	0.684444	0.11366
A Percentage Experiments	60	-200	100	68.4444	11.336
Valid N (in the direction of the list)	60				

Source: SPSS data processing version 27, year 2025

The analysis of the group's N-Gain score showed an average value of 0.68 which was included in the medium category. This category indicates that the improvement in learning outcomes that occur is at a fairly good level of effectiveness. The increase shows that the use of e-books based on the values of Wasathiyah Islam tolerance contributes to increasing students' understanding of tolerance and appreciation for differences. The presentation of material that is structured, contextual, and supported by digital media allows students to have a more interesting and meaningful learning experience.

The findings were strengthened by the results of statistical tests that showed a significance value of less than 0.05. These results indicate that there is a significant difference between students' learning outcomes before and after the use of e-books. Thus, the research hypothesis that the development of Islamic Religious Education and Ethics teaching materials based on the values of Wasathiyah Islam tolerance can improve student learning outcomes is acceptable. The improvement in learning outcomes obtained by students shows that the integration of Islamic Wasathiyah values into digital teaching materials is able to support the achievement of learning goals more optimally.

The results of this study are in line with various previous studies that show that the use of digital technology in learning can increase the effectiveness of the teaching and learning process. The use of digital teaching materials provides easy access to learning materials, increases students' learning independence, and creates a more interactive learning atmosphere. Therefore, the e-book Islamic Religious Education and Ethics based on the values of Wasathiyah Islam tolerance can be used as an alternative teaching material that is effective in supporting learning while instilling the values of religious moderation in students.

Discussion

The first finding reveals a substantial mismatch between the characteristics of contemporary learners and the instructional resources currently utilized in Islamic Religious Education (PAI) classrooms. The dominance of printed textbooks (90%) and the limited use of internet-based materials (10%) indicate that PAI learning remains largely dependent on conventional pedagogical approaches, despite the increasing digitalization of students' daily lives. More importantly, the unanimous agreement among teachers (100%) regarding the need for technology-integrated teaching materials demonstrates a growing awareness of the limitations of existing instructional resources. This finding can be interpreted through the lens of learner-centered education, which emphasizes the importance of aligning instructional design with students' cognitive, social, and technological characteristics. Contemporary students belong to a generation that is accustomed to

interactive digital environments, instant access to information, and multimedia-based learning experiences. Consequently, teaching materials that rely predominantly on static textual content may reduce student engagement and limit opportunities for meaningful learning. The findings also suggest that the challenge facing Islamic Religious Education is not merely technological but pedagogical in nature. The issue lies in the inability of existing materials to bridge religious knowledge with students' lived experiences in a digital society. Therefore, the demand for innovative teaching materials reflects a broader educational transformation in which religious education must evolve from a content-transmission model toward a more interactive, contextual, and learner-responsive approach. This result is consistent with studies indicating that digital learning environments significantly influence student engagement and learning effectiveness when instructional resources are aligned with learners' technological habits and preferences (Bond et al., 2020; Crompton & Burke, 2018).

The second finding demonstrates that the development of an Android-based e-book integrating Islamic wasathiyah values represents an innovative response to both technological and socio-religious challenges in contemporary education. Unlike conventional teaching materials that primarily emphasize cognitive knowledge acquisition, the developed e-book seeks to integrate cognitive, affective, and moral dimensions of learning through the incorporation of Islamic values of moderation, balance, justice, and tolerance. This integration is particularly significant because educational technology is often criticized for prioritizing technical efficiency while neglecting character formation and value education. The findings indicate that the developed e-book addresses this limitation by positioning technology as a medium for moral and character development rather than merely as a tool for content delivery. From a theoretical perspective, this approach aligns with constructivist learning theory, which emphasizes that meaningful learning occurs when learners actively connect new knowledge with personal values and social realities. Furthermore, the integration of wasathiyah principles into digital learning materials responds to contemporary concerns regarding religious intolerance, polarization, and the spread of extremist narratives through online platforms. Previous studies have demonstrated that the internalization of wasathiyah values in educational settings contributes significantly to the development of inclusive religious attitudes and strengthens students' commitment to social harmony and religious moderation (Ichsan et al., 2024; Rahim et al., 2025). Consequently, the innovation proposed in this study extends beyond technological advancement by demonstrating how digital learning resources can simultaneously function as instruments for promoting religious moderation.

The third finding, which indicates very high feasibility scores for content (90.8%) and technology aspects (81.7%), as well as very high practicality ratings from teachers (90.83%) and students (94.7%), provides strong evidence regarding the quality and acceptability of the developed product. These results suggest that the e-book successfully meets both pedagogical and technological requirements necessary for implementation in school settings. The high feasibility score in the content dimension indicates that the integration of Islamic wasathiyah values was conducted systematically and appropriately within the framework of Islamic Religious Education and Ethics learning objectives. Meanwhile, the favorable technology assessment reflects the effectiveness of the application design in facilitating accessibility, usability, and user engagement. Particularly noteworthy is the high practicality score assigned by students, which suggests that the digital format aligns closely with learners' preferences and learning habits. This finding reinforces the argument

that educational technologies are more likely to be adopted when they provide clear advantages over traditional instructional resources while remaining easy to use. Similar findings have been reported in studies grounded in the Technology Acceptance Model, which emphasize that perceived usefulness and perceived ease of use are among the strongest predictors of technology adoption in educational contexts (Scherer et al., 2019; Al-Emran et al., 2020). Therefore, the positive responses from both teachers and students indicate that the developed e-book possesses not only theoretical relevance but also practical viability for broader implementation in Islamic Religious Education.

The fourth finding confirms the effectiveness of the developed e-book in improving students' learning outcomes, as reflected by the increase in mean scores from 79.50 on the pretest to 90.17 on the posttest and the highly significant statistical result ($p < 0.0001$). This improvement suggests that the integration of digital learning resources with Islamic wasathiyah values creates a learning environment that supports deeper understanding, higher engagement, and more meaningful knowledge construction. The effectiveness of the intervention can be attributed to several interconnected factors. First, the interactive and accessible nature of the e-book likely increased students' motivation and attention during learning activities. Second, the contextual presentation of tolerance and respect-for-differences content may have facilitated stronger cognitive connections between theoretical concepts and students' social experiences. Third, the incorporation of wasathiyah values may have encouraged reflective learning processes, enabling students to internalize moral concepts more effectively than through traditional instructional approaches. Previous research has similarly demonstrated that digital learning interventions can significantly improve academic achievement when instructional content is relevant, interactive, and aligned with students' learning preferences (Sung et al., 2016; Zheng et al., 2016). Furthermore, studies on religious moderation education have shown that learning experiences integrating moderation values contribute not only to cognitive gains but also to the development of tolerant attitudes and social responsibility among students (Ahmad, 2021; Suryana et al., 2026). Therefore, this study contributes to the growing literature on technology-enhanced Islamic education by providing empirical evidence that digitally mediated learning resources grounded in wasathiyah principles can simultaneously strengthen learning outcomes and character development.

Theoretically, the findings strengthen the relevance of constructivist learning theory and value-based Islamic education in the design of technology-enhanced PAI learning. The improvement in students' learning outcomes after using the Android-based e-book suggests that meaningful learning occurs when students are not only exposed to religious concepts, but are also provided with contextual, interactive, and digitally accessible resources that help them connect the content with their social realities. These findings extend existing theory by showing that digital learning materials can mediate the internalization of wasathiyah values through the integration of cognitive understanding, reflective engagement, and moral reasoning. Therefore, the study refines the view that educational technology should not be treated merely as a delivery tool, but as a pedagogical environment that can support both academic achievement and religious moderation.

Pedagogically, the findings imply that teachers need to move beyond text-dominated instruction and design learning experiences that are more interactive, contextual, and responsive to students' digital behavior. The e-book can be used to improve engagement by combining accessible content, visual presentation, reflection activities, and value-based learning tasks that encourage students to understand tolerance, respect differences, and evaluate their online interactions critically.

Such practices may also support students' emotional well-being by promoting inclusive classroom dialogue, reducing prejudice, and helping learners build healthier digital identities. At the policy level, the findings suggest the need for stronger institutional support for digital PAI resources that integrate religious moderation, media literacy, and mental-health-sensitive education. Schools, curriculum developers, and education authorities should consider policies that encourage the production of validated digital teaching materials, teacher training in value-based technology integration, and guidance for responsible social media behavior among students.

The novelty and contribution of this study are reflected in its integration of Android-based learning, Islamic wasathiyah values, and empirical product evaluation within one research and development framework. The study contributes new evidence that a digital PAI e-book can be feasible, practical, and effective for improving learning outcomes while also supporting the internalization of moderation values. Nevertheless, several limitations should be acknowledged. The study was conducted in selected junior high schools in Semarang City, used a limited implementation period, and primarily measured short-term learning outcomes rather than long-term changes in students' attitudes, online behaviors, or social interactions. In addition, the product was designed for Android users, which may limit access for students using other platforms. Future studies should involve broader samples across different regions, employ control-group or longitudinal designs, examine the specific digital features that most strongly influence learning and value internalization, and explore the integration of adaptive learning, artificial intelligence, and cross-platform applications to strengthen the broader impact of technology-enhanced religious moderation education.

Conclusion

This study demonstrates that the development of an Android-based Islamic wasathiyah e-book provides a relevant and effective response to the limitations of conventional teaching materials in Islamic Religious Education. The findings confirm that PAI learning in junior high schools still relies heavily on printed resources, whereas teachers and students require more flexible, interactive, and value-oriented digital learning materials. Through the Research and Development process, this study produced an Android-based e-book that integrates Islamic wasathiyah values into tolerance and respect-for-differences materials. The product was found to be feasible based on expert validation, practical based on teacher and student responses, and effective in improving students' learning outcomes. More importantly, the study shows that digital teaching materials can function not only as instructional media for delivering content but also as pedagogical tools for strengthening religious moderation, moral reflection, and character development. Theoretically, this study extends the discussion on technology-enhanced Islamic education by demonstrating that digital learning can be integrated with value-based education in a structured and empirically tested manner. Pedagogically, the e-book offers teachers an alternative medium for creating more contextual, engaging, and student-centered PAI learning experiences. However, this study is limited by its specific geographical context, relatively limited implementation period, and focus on short-term learning outcomes. Future studies should involve broader samples, apply stronger experimental designs with control groups, and examine the long-term impact of digital wasathiyah-based learning materials on students' attitudes, social behavior, and religious moderation practices. Further research may also explore cross-platform development, adaptive learning features, and artificial intelligence integration to enhance accessibility, personalization, and sustainability in Islamic education.

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