

## DEVELOPMENT OF E-BOOKS INTEGRATED WITH HABITS OF MIND AND ISLAMIC CHARACTERS IN IMPROVING ALGEBRAIC THINKING SKILLS OF PROSPECTIVE ELEMENTARY SCHOOL TEACHERS

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### Abstract

Algebraic thinking skills are important for students because algebraic thinking will promote ways to interpret mathematics. The results of preliminary research on the algebraic thinking ability of PGMI students showed an average problem solving of 18.46, mathematical modelling of 18.26, reasoning ability of 5.54, analytical thinking of 8.8 and generalization of 17, with a maximum value of 20. These results indicate that for indicators of analytical thinking and reasoning students are still low. This study aims to develop an e-book of algebraic thinking skills integrated with habits of mind and Islamic characters for prospective elementary school teachers. This type of research is development research using the ADDIE model (Analysis, Design, Development, Implementation and Evaluation). The developed e-book was validated by several experts including media experts, material experts and Islamic experts to ensure the quality of the e-book produced before the field trial. Product trials were conducted on 230 PGMI students. Based on the results of the study, it is known that the feasibility of the algebraic thinking ability e-book integrated with habits of mind and Islamic characters is categorized as very good, with a value of 4.77 from a maximum scale of 5 while practicality obtained a score of 4.11 in the good category.

**Keywords:** algebraic thinking skills, e-book, habits of mind, islamic character, learning media

### Abstrak

Kemampuan berpikir aljabar penting bagi mahasiswa karena melalui berpikir aljabar akan mempromosikan cara untuk menafsirkan matematika. Hasil penelitian pendahuluan pada kemampuan berpikir aljabar mahasiswa PGMI menunjukkan rata-rata pemecahan masalah sebesar 18,46, pemodelan matematis sebesar 18,26, kemampuan penalaran sebesar 5,54, berpikir analitis sebesar 8,8 dan generalisasi sebesar 17, dengan nilai maksimal sebesar 20. Hasil ini menunjukkan bahwa untuk indikator berpikir analitis dan penalaran mahasiswa masih rendah. Penelitian ini bertujuan untuk mengembangkan e-book kemampuan berpikir aljabar terintegrasi habits of mind dan karakter islami untuk calon guru SD. Jenis penelitian ini merupakan penelitian pengembangan dengan menggunakan model ADDIE (*Analysis, Design, Development, Implementation and Evaluation*). E-book hasil pengembangan divalidasi oleh beberapa ahli meliputi ahli media, ahli materi dan ahli keislaman untuk memastikan kualitas ebook yang dihasilkan sebelum dilakukan uji coba lapangan. Uji coba produk dilakukan terhadap 230 mahasiswa PGMI. Berdasarkan hasil penelitian diketahui kelayakan e-book kemampuan berpikir aljabar terintegrasi habits of mind dan karakter keislaman terkategori sangat baik, dengan nilai 4,75 dari skala maksimal 5 sedangkan kepraktisan memperoleh skor 4,11 dengan kategori baik.

**Kata kunci:** kemampuan berpikir aljabar, e-book, habits of mind, Islamic character, media pembelajaran

### INTRODUCTION

Algebraic thinking skills are important for students because algebraic thinking promotes ways to interpret mathematics (Kieran, 2004). It expands students' thinking by encouraging them to interact and engage with the generalisations and relationships inherent in mathematics (Booker & Windsor, 2010). Therefore, students need to be equipped with

algebraic thinking skills (Aringga et al., 2020). Especially for prospective elementary school teachers, who in the future will teach mathematics in elementary schools.

However, unfortunately, based on the results of preliminary research on algebraic thinking ability in PGMI IAIN Ponorogo students, the average problem solving was 18.46, mathematical modelling was 18.26, reasoning ability was 5.54, analytical thinking was 8.8 and generalisation was 17, with a maximum score of 20. These results show that for the indicators of analytical thinking and reasoning students are still low (Wilujeng, 2023).

It should be realised that PGMI students come from different school backgrounds such as SMA, MA and SMK. This difference is because the curriculum and target material in these types of schools are also different and indirectly affect their mathematical abilities. The results of research on algebraic thinking ability based on school origin show that students from SMA, SMK and MA have the same good problem solving and mathematical modelling skills (Wilujeng, 2023). However, on the indicators of reasoning ability and analytical thinking, students from SMK and MA have not been able to reason and think analytically well. They are still confused to understand the problem. This further encourages researchers to improve their algebraic thinking skills.

Improving algebraic thinking skills can be done in various ways. One of them is by familiarising students to solve algebraic problems (Anderson et al., 2001). Through this activity can make students become reliable problem solvers in life because they are able to model problems, generalise and solve problems creatively. This habit can be done by providing learning media that is easily accessible to students. Through this learning media, a teacher can provide educational services to students so that they can learn independently (Ramadhani & Aristiawan, 2023).

One of the considerations in providing learning media is the practicality of using the media. Various studies have shown that effective media to improve learning effectiveness is media that provides opportunities for students to learn anywhere and anytime (Hendriawan & Septian, 2019; Nurmala et al., 2019; Putrawansyah & Sardianto, 2016). One form of media that fulfils these prerequisites is e-books.

The improvement of algebraic thinking ability is inseparable from the character possessed by students, namely the tendency of intelligent behaviour as a student to solve problems that are not known to have a quick solution (Dwirahayu et al., 2018). The tendency

of intelligent behaviour is called habits of mind (HOM) (Costa & Kallick, 2008). This habit must be repeated so that it forms the concept of meaningful learning. This habit will form the profile of IAIN Ponorogo's professional graduates.

IAIN Ponorogo has a vision as a centre for the study and development of superior Islamic knowledge in order to create a civil society. The realisation of this vision can be done through a learning process that is integrated with Islamic characters. Islamic character in this study is the provision of stimulus in the form of verses of the Qur'an and hadith related to the duties of students as students and prospective educators. This can encourage students to have Islamic character and realise civil society.

Improving algebraic thinking skills integrated with Habits of mind and Islamic characters can be realised in the form of e-books to help PGMI students in learning algebra. The reason e-books are chosen is because e-books can be accessed and downloaded for free, can be stored in portable devices, computers and smartphones, can be read anytime and anywhere (Wahyudi, 2019).

This study aims to determine the e-book integrated habits of mind and Islamic character in improving the algebraic thinking ability of prospective SD / MI teachers and to determine the level of student response to the e-book integrated habits of mind and Islamic character in improving the algebraic thinking ability of prospective SD / MI teachers.

## **METHODS**

This study is a research and development. The development method used in this research uses the ADDIE model (Analysis, Design, Development, Implementation and Evaluation). The following is an figure that shows the use of the ADDIE model in the development of e-books

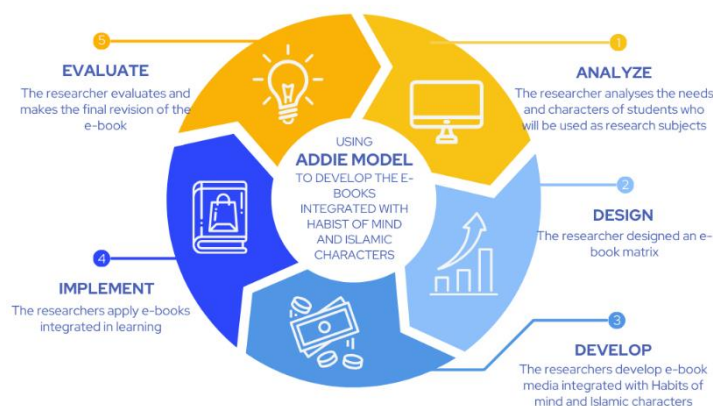


Figure 1. ADDIE Model to develop e-book for Algebraic Thinking Ability Integrated Habits of mind and Islamic Character

At the Analysis stage, researchers analyzed the needs and characters of students who would be used as research subjects. At the Design stage, researchers designed an e-book design of algebraic thinking skills integrated with habits of mind and Islamic characters.

At the Development stage, researchers develop e-books of algebraic thinking skills integrated with habits of mind (be persistent, control impulsivity, listen to other people's opinions with empathy, think flexibly, metacognition, work carefully and precisely, ask questions and pose problems effectively, apply past knowledge in new situations, think and communicate clearly and precisely, utilize the senses, create innovation, be enthusiastic in responding, dare to be responsible in taking risks, be humorous, think interdependently, learn continuously.) and Islamic characters (characters that originate from Islamic teachings or Islamic characters related to habits of mind) in accordance with the design that has been planned at the design stage. The development results were then validated by experts representing media experts, mathematics experts, and Islamic experts. After going through several revisions according to the validator's suggestions, the developed e-book entered the implementation stage.

At the Implementation Stage, researchers apply the e-book of algebraic thinking skills integrated with habits of mind and Islamic characters. At this stage, researchers conducted field tests on 230 students divided into 6 classes. At the Evaluation Stage, researchers conducted an evaluation and made the final revision of the e-book integrated habits of mind

and Islamic characters in improving the algebraic thinking skills of prospective SD / MI teachers.

The data used in this study are data on the feasibility and practicality of the media. Media feasibility data is obtained through expert assessment which includes presentation components, namely the quality of letters, images and background, and language components consisting of conformity with the creed of language, readability, sentence effectiveness, communicative. Meanwhile, the practicality of the media is obtained based on the results of field tests to students.

### RESULTS AND DISCUSSION

The following is a matrix for developing an algebraic thinking skills e-book integrated with Habits of mind and Islamic characterization.

	REASONING	MATHEMATICAL MODELLING	PROBLEM SOLVING	ANALYTICAL THINKING	GENERALISATION
NUMBER SYSTEM, INTEGERS AND THEIR OPERATIONS	managing impulsivity persisting				
LEAST COMMON MULTIPLE AND GREATEST COMMON FACTOR			thinking and communicating with clarity and precision striving for accuracy		
FRACTIONAL AND RATIONAL NUMBERS				thinking about thinking (metacognition) questioning and problem posing	
ARITHMETIC ROWS AND SEQUENCES		thinking flexibly			applying past knowledge to new situations
GEOMETRIC ROWS AND SERIES		persisting			taking responsible risks
SOCIAL ARITHMETIC			gathering data through all sense	thinking interdependently	
SINGLE INTEREST AND COMPOUND INTEREST	creating, imagining, innovating		remaining open and continuous learning thinking and communicating with clarity and precision taking responsible risks		
LINEAR EQUATIONS AND LINEAR INEQUALITIES					
SPLDV DAN SPPLDV		applying past knowledge to new situations	questioning and problem posing	managing impulsivity	
MATRICES AND APPLICATION	striving for accuracy		gathering data through all sense		

Figure 2. E-book Development Matrix for Algebraic Thinking Ability Integrated Habits of mind and Islamic Character

The figure above is a matrix for developing e-books integrated with Habits of mind and Islamic characters in improving the algebraic thinking skills of prospective SD / MI teachers. In the matrix, it is known that there are 9 subject matters in algebra material, 5 indicators of algebraic thinking skills and 13 Habits of mind characters.

The subject matter in the e-book includes 1) Number system, integers and their operations; 2) Least common multiple and greatest common factor, 3) Fractional and rational numbers; 4) Arithmetic ranks and sequences; 5) Geometric ranks and sequences; 6) Social arithmetic; 7) Single interest and compound interest, 8) SPLDV and SPLTV, and 9) Matrix and application. While the indicators of algebraic thinking skills used are reasoning, mathematical modelling, problem solving, analytical thinking, and generalization.

The habits of mind integrated in the e-book is 13 out of a total of 16. This integration considers the suitability between the character of the material, indicators of algebraic thinking skills and Habits of mind. So that not all Habits of mind can be integrated into the e-book. This integration considers the suitability between the character of the material, indicators of algebraic thinking ability and habits of mind. So not all habits of mind can be integrated into the ebook.

The feasibility of the e-book developed is reflected in the results of validation conducted by media experts. Based on the validation results, the feasibility score of the e-book developed is as follows

**Table 1. Feasibility Score**

Indicator	Score
Font quality,	5
Images quality	4.25
Background quality	5
Conformity with the creed of language	5
Readability	4.5
Sentence effectiveness	4.5
Communicative	5
Average	4,75

Based on the table above, the average validation score is 4.75. The value is categorized as very good. In addition to quantitative assessment, the validator also provided input to improve the e-book developed. The following are the specifications of the e-book that has been developed,

1) Video feature

Researchers added a video feature in the e-book that contains videos about working on problems. This video is expected to deepen the explanation so that it is better understood by users (Rochim et al., 2021). The following is an example of a video display in the e-book

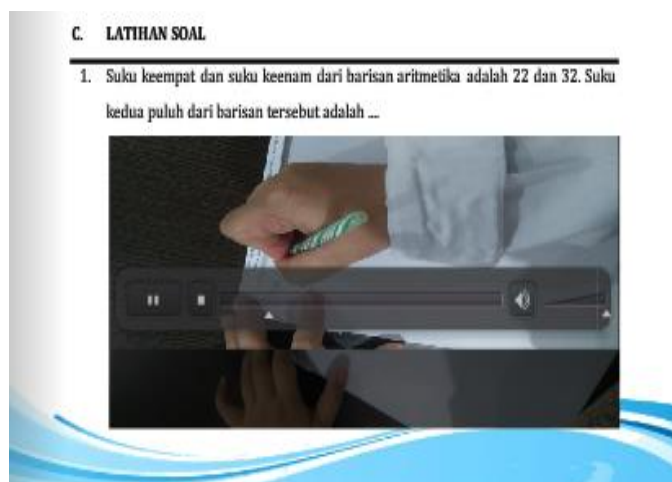


Figure 3. Example of Video Display in the E-book

## 2) Bookmark feature

The bookmark feature is used to save certain pages that are considered important by the user (Mutia, 2016). So that when the user wants to return to the page, the user can go to the desired page directly through the bookmark feature. The following is an example of a display using the bookmark feature.



Figure 4. Example of bookmark feature

The picture above is an example of a page that has been given a bookmark feature. Pages that have been bookmarked will display an icon located on the right. When the icon is clicked, the page will automatically move to that page.

## 3) Search feature

The search feature can be used by users to move to another page by entering certain keywords (Praptama & Ferdiansyah, 2018). Here is an example of how to use the search feature

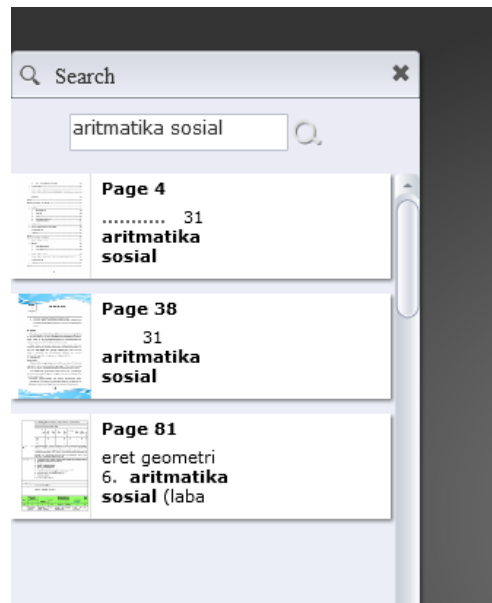


Figure 5. Example of search feature

Student responses to the development of e-books integrated with habits of mind and Islamic characters in improving algebraic thinking skills include affective aspects, interactive aspects, efficiency aspects and creative aspects. Based on the survey results, it can be described as follows

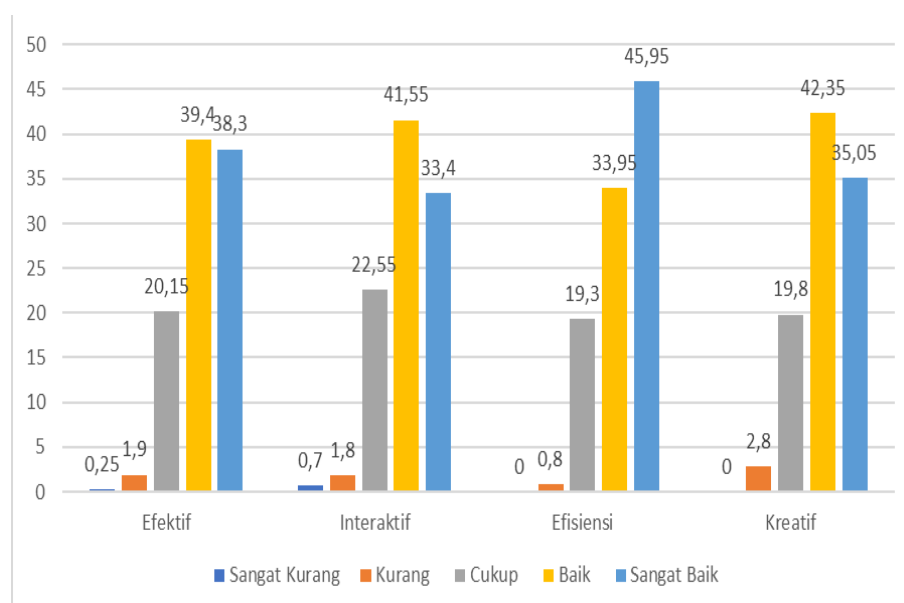


Figure 6. Student response



Based on the Figure 6, it can be seen that the majority of practicality scores are at the moderate level and above. The following graph shows student responses to the practicality of the e-book. The indicator that received the most good and excellent scores of 79.90 was efficiency. The effective indicator received a good and excellent score of 77.7 while the creative indicator received a score of 77.4. The last indicator that received excellent and good scores was the interactive indicator, which was 74.95.

So it can be said that overall the average value of the practicality of developing e-books integrated with habits of mind and Islamic characters in improving algebraic thinking skills is categorized as good with a score of 4.11.

## CONCLUSION

Based on the development research that has been carried out, the results obtained are 1) The feasibility of the e-book Integration of Algebraic Thinking Skills Based on Habits of Mind and Islamic characterization is categorized as very good, with a value of 4.75 from a maximum scale of 5; 2) The practicality of the Habits of Mind-Based Algebraic Thinking Ability Integration e-book and Islamic characterization is categorized as good, with a value of 4.11 from a maximum scale of 5.

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