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Development of Scaffolding-Based Algebra Textbooks to Support the Learning Independence of Junior High School Students in Grade VII

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Abstract
Algebraic material often makes it difficult for junior high school grade VII students because of the transition from arithmetic concrete thinking to the use of abstract variable symbols. This research aims to develop *scaffolding-based* mathematics textbooks on algebraic materials that meet valid and practical criteria to support student learning independence. This *research and development* (R&D) applies the ADDIE (*Analysis, Design, Development, Implementation, Evaluation) model*. The feasibility of the product was tested through an expert validation process, response questionnaire, observation of learning implementation, and interviews limited to field trial subjects consisting of 23 students of Class VII-C SMP Al Huda Kediri and one mathematics teacher. The results of the study show that the textbook draft received a very positive assessment. Based on the accumulated assessments from three expert validators, this product achieved a validity percentage of 93.33% with the Very Valid criterion. From the practical aspect, the student response questionnaire achieved an average of 82.42% and the teacher response questionnaire of 87.50%, both of which were in the Very Practical criterion. Observation and interview data confirmed that the flow of reducing assistance (*fading*) from *Let's* Observe, *Let's Complete*, to *I Can* help students understand the flow of problem work in a more structured way. The results of this field trial support the validity and practicality of using textbooks in the classroom, although its effectiveness in increasing student learning independence quantitatively still requires further experimental tests.

Keywords: textbooks, algebra, scaffolding, learning independence, ADDIE model.

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Introduction

The transition period from elementary school (SD) to junior high school (SMP) is quite a difficult time for students, especially when meeting mathematics. During six years in elementary school, students are familiar with concrete numbers or arithmetic, but once they enter grade VII of junior high school, students must encounter letter symbols such as x and y or what are referred to as variables (Wahyuni et al., 2023). The shift of thinking from concrete to abstract in algebra material is what often makes students experience *learning obstacles* because of their cognition and not being ready (Valenzeo & Sumiaty, 2024). Of course, this is not a good thing because algebra is an important foundation or can be said to be a "language" for advanced material to calculus in high school (SMA) later, even strong algebraic skills are directly proportional to students' *problem-solving abilities* in the future which determines success in learning mathematics (Fauziah & Purwanto, 2026). In

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addition, the Independent Curriculum from the Ministry of Education and Culture now also demands the reasoning *of Higher Order Thinking Skills* (HOTS) and student independence in learning.

The problem today is that the reality on the ground is often not as beautiful as the theory in the book. Many students are trapped in the "waiting mentality" of formulas from teachers because they are used to learning to memorize procedures without understanding the essence of the symbols (Sitompul & Effendi, 2021). This causes a domino effect that is quite influential, when students are asked to explore on their own, students tend to be passive and very easy to give up. The main research *gap* in this study lies in the limitations of supporting teaching materials in schools today which tend to be rigid, difficult for students to understand and have a fairly drastic jump in difficulty level without adequate cognitive transitions (Aninditaningrum et al., 2024) and (Julanda et al., 2023). The example of the questions given is quite simple, but once you enter the practice section, the questions given are suddenly more difficult. This is what makes students' motivation immediately decrease and leads to math anxiety because of the fear of making mistakes when trying on their own.

This is where *scaffolding* or the provision of gradual assistance that is slowly reduced (*fading*) based on Vygotsky's *Zone of Proximal Development* (ZPD) theory is present as a crucial solution to maintain the learning rhythm of students (Erawati & Astarini, 2023). Through this structured assistance, students are guided cognitively to be able to move from initial abilities to independent problem-solving. In this study, learning independence is explicitly defined as the ability of students to *self-regulate (self-regulated learning*) in monitoring, directing, and evaluating their own thought process without relying entirely on the teacher's instructions. Although the use *of scaffolding* in algebra teaching materials has been widely discussed, previous research has generally only provided help separately or simply in the form of a brief *hint* at the end of the chapter without an *explicit fading* mechanism.

The main *novelty* of this developed textbook lies in the design of a systematic and adaptive mentoring path that is directly integrated into the flow of daily material presentation through three consistent *scaffolding* stages . The first stage is *Ayo Kita Amati* which provides full *scaffolding* through problem modeling and early understanding guidance in its entirety. The second stage is *Let's Complete* which implements a gradual reduction in assistance (*partial scaffolding/fading*) through trigger questions and rumpang filling. The third stage is *Aku Bisa* which is in the form of unassisted independent exercise (*zero scaffolding*) to confirm students' cognitive independence.

The real contribution of the development of this book is to be a teacher supporter for differentiated learning in the classroom with different abilities of students (Handayani et al., 2025), breaking the chain of waiting mentality, as well as being a strong mental supporter to face mathematics at a higher level. Based on the description of the background, this study focuses on answering three main questions, namely how the process of developing scaffolding-based algebra textbooks to support the learning independence of Grade VII junior high school students, how *the validity* of the textbooks developed, and how the *practicality of* scaffolding-based *algebra textbooks* according to assessors and users.

Method

This research is a research *and development* (R&D) that aims to produce and test the quality of scaffolding-based algebra textbooks to support the independent learning of Grade VII junior high school students. The development framework used is the ADDIE (*Analysis, Design, Development, Implementation, Evaluation*) model by Branch (2009). This model was chosen because it provides a systematic and flexible framework for designing, developing, and evaluating learning designs according to the needs of students (Annajmi

et al., 2026; Cahyadi, 2019). In this study, the ADDIE framework was used specifically to guide the design process to product refinement, while the evaluation of product quality was limited to the indicators of *validity* and practicality, without testing the experimental effectiveness of quantitative learning independence.

The subjects of this study consist of expert subjects and field user subjects. The expert subject involved three validators who helped provide assessments to measure the validity of the product, namely two mathematics education lecturers and one senior mathematics teacher. Third, validators evaluate all aspects of the textbook holistically (material, media, and language) without separating the role of validators per field. The field user subjects consisted of 23 students of Class VII-C and one mathematics teacher at Al Huda Kediri Junior High School who used textbooks during the learning process. The selection of Class VII-C was carried out using *a purposive sampling technique* based on the consideration of the teaching teacher, where the class had a diversity of initial cognitive ability levels and varying levels of learning dependence. Before the implementation of the research, ethical consent was obtained through the provision of *informed consent* to the school, teachers, and parents/guardians of students as a form of protection for the rights of underage participants.

The development procedure is carried out following the five main stages of ADDIE which are interconnected (Branch, 2009). In the analysis stage, the researcher collects information regarding the analysis of student needs and problems, analysis of the curriculum and algebraic materials, and the analysis of student characteristics (Harlinda & Suratmi, 2024). In the design stage, the researcher designed the form of content, display, interactivity, learning objectives, and a three-stage "Mentoring Path" flow (*Let's* Observe, *Let's Complete*, and *I Can*). In the development stage, the textbook draft begins to be produced—including writing materials, *scaffolding*, making illustrations, and adjusting the layout of the components—along with the preparation of data collection instruments that are then validated by expert validators. At the implementation stage, product trials were carried out in the field in algebra learning for Class VII-C for four meetings (8 Lesson Hours) taught by classroom mathematics teachers (Muslich, 2016). The reduction of assistance (*fading*) during implementation was monitored through observation sheets and student response questionnaires during the learning process. At the evaluation stage, the researcher reviewed whether the developed product could be a solution based on the validation and response data that had been collected.

The research data was collected using expert validation questionnaire instruments, teacher and student practical response questionnaires, learning observation sheets, and semi-structured interview guidelines. The expert validation questionnaire consists of 15 statements that measure aspects of content, *scaffolding presentation*, linguistics, and graphography using a Likert scale of 1–5. The teacher practicality questionnaire (10 items) and the student practicality questionnaire (12 items) measure the ease of use, readability, and carrying capacity of the material on students' learning independence on a Likert scale of 1–4. The instruments have been declared conceptually valid by the validator before use. Data analysis techniques are grouped into two main types, namely quantitative data and qualitative data (Sugiyono, 2022). Quantitative data is sourced from expert validation questionnaires (to determine the validity of textbooks) and student and teacher response questionnaires (to determine the practicality of textbooks). The data on the percentage of textbook validity is calculated using the following percentage average formula:

$$Persentase\ Validitas = \frac{Jumlah\ Skor\ yang\ Diperoleh}{Skor\ Maksimal} \times 100\%$$

The results of the calculation of the validity percentage were then categorized using the criteria shown in Table 1 (Sugiyono, 2013).

Table 1. Textbook Validity Assessment Criteria Based on Average Validity Score

Yes	Module Validity (%)	Criteria
1	81 − 100 %	Highly Valid
2	61 − 80 %	Valid
3	41 − 60 %	Quite Valid
4	21 − 40 %	Less Valid
5	0 − 20 %	Invalid

The product is categorized as suitable for use if the results reach the average of the minimum criteria of "Quite Valid" (≥ 41%) or it would be better if more than 81% are included in the "Very Valid" category (Fadjri & Nurchayati, 2022). Meanwhile, textbook practicality data is calculated using the following percentage formula:

$$\text{Persentase Kepraktisan} = \frac{\text{Jumlah Skor yang Diperoleh}}{\text{Skor Maksimal}} \times 100\%$$

The percentage of practicality achievement is then categorized using the criteria shown in Table 2.

Table 2. Textbook Practicality Assessment Criteria Based on Average Practicality Score

Yes	Module Practicality (%)	Criteria
1	≥ 81%	Very Practical
2	61 − 80 %	Practical
3	41 − 60 %	Quite Practical
4	≤ 40%	Impractical

Textbook products are declared practical and ready to be used in field learning if the results of achieving a minimum user response percentage meet the criteria of "Practical" (≥ 61%).

The qualitative data obtained from observation sheets on learning implementation, comments/suggestions for improvement from validators, and interviews were analyzed descriptively through the stages of data reduction, data presentation, and conclusion drawn. The results of this qualitative analysis are used as the main reference to revise and improve the draft of textbook products.

Results and Discussion

The main result of this study is in the form of scaffolding-based mathematics textbooks on algebraic materials. The product development process is carried out following the five stages of the ADDIE (*Analysis, Design, Development, Implementation, Evaluation*) model in a systematic, measurable, and empirical evidence-based manner in the field.

At the analysis stage, needs analysis is carried out through classroom observation, curriculum document analysis, and preliminary interviews with mathematics teachers. The monitoring results showed that the main cognitive obstacle of Grade VII students of Al Huda Kediri Junior High School when transitioning from elementary arithmetic to junior high school algebra was the difficulty of distinguishing the operational functions of numbers and variable symbols (x and y). This condition triggers *learning obstacles* which have an impact on decreasing motivation and the tendency of students to become passive when solving problems independently. Based on the analysis of the Independent Curriculum, algebra material is in the Learning Outcomes (CP) of algebraic elements which are derived into five Learning Objectives (ATP), namely Introduction to Algebra, Basic

Algebraic Operations, Algebraic Simplification and Substitution, Modeling of Daily Problems, and Independent Character Formation. The results of the analysis of 23 students in Grade VII-C showed a diversity of early cognitive abilities and varying levels of learning dependence, thus requiring adaptive supporting teaching materials.

Furthermore, at the design stage, the structure of the textbook content is divided into four main chapters based on the ATP that has been designed, namely Chapter 1 (Getting to Know the **World** of Algebra), Chapter 2 (Properties of Algebraic Operations), Chapter 3 (Algebraic Form Calculation Operations), and Chapter 4 (Application and Evaluation). Each chapter is designed using *a scaffolding* framework based on three main levels to accompany students' flow of thinking. The first level is Full Assistance (*Let's Observe It*) in the form of an example of a concrete problem along with modeling and solving it in its entirety. The second level is Partial Assistance or *Fading* (*Let's Complete*) in the form of *guided prompts* that ask students to complete the solution thought flow. The third level is Independent Practice (*I Can*) in the form of problem-solving exercises without instructions to confirm students' understanding. The material is also equipped with contextual visual illustrations and Competency Test Sheets and Self-Evaluation escalated by HOTS (*Higher Order Thinking Skills*).

Entering the development stage, all initial draft drafts (*Prototype I*) are compiled using the Canva app with priority for a clean and interactive layout. Visualization of material presentation and integration of three *scaffolding grooves* is presented in the following series of product displays from Figure 1 to Figure 5.

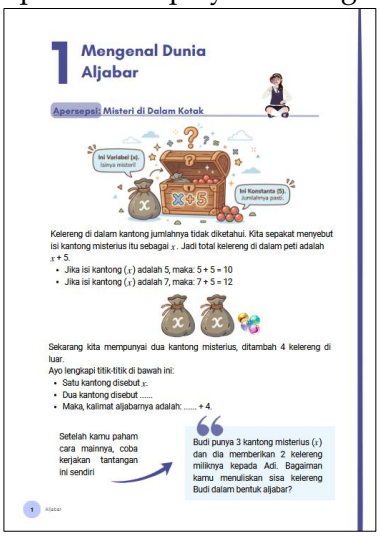


Figure 1. Presentation of Materials

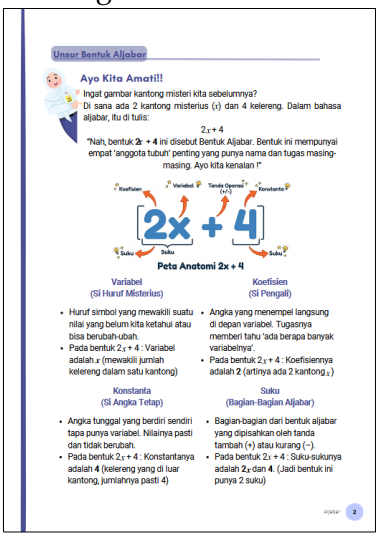


Figure 2. Let's take a look.



Figure 3. Let's get it done and I can do it.

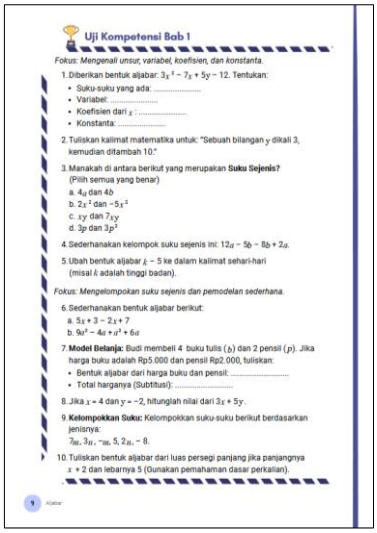


Figure 4. Competency Test

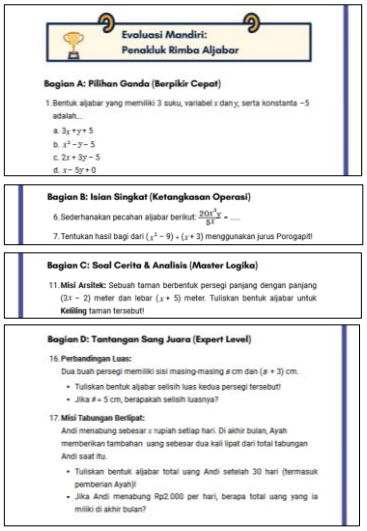


Figure 5. Self-Evaluation

After the textbook draft is completed, the product is tested for validity by three expert validators consisting of two mathematics education lecturers and one senior mathematics teacher. Third, validators provide an integrated assessment of material, media, and language aspects along with qualitative revision notes. Some of the main improvements based on validator input include improving the clarity of variable symbols in *the Let's Complete* flow, adjusting the background color contrast so as not to disguise the instruction text, and simplifying the instruction sentences in the *I Can section* to make it easier for junior high school students to understand.

At the implementation stage, field trials were carried out in class VII-C SMP Al Huda Kediri for four meetings (8 JP) on algebraic material taught by the classroom mathematics teacher, while the researcher acted as an *observer*. During learning, the application of three *scaffolding flows* has been proven to help teachers condition the classroom efficiently. The implementation of *fading* was observed from changes in student behavior, where at the beginning of the meeting students relied heavily on the *Let's Observe flow*, but at the third and fourth meetings students began to actively complete the *Let's Complete* flow in pairs and were able to do the *Aku Can part* confidently without having to wait for a formula from the teacher.

The final estuary of this process is the evaluation stage which is carried out comprehensively through quantitative analysis of data, expert validation questionnaires and practicality response questionnaires, as well as qualitative analysis of observation and interview notes. The results of quantitative analysis of product validity by expert validators are summarized in Table 3.

Table 3. Validity or Eligibility Level

No.	Aspects	Total Score	Max Score	Introduce yourself	Criteria
1	Material Eligibility	69	75	92%	Highly Valid
2	Language Qualifications	56	60	93,33%	Highly Valid
3	Media Eligibility & Design	71	75	94,66%	Highly Valid
Quantity		**196**	**210**	**93,33%**	**Highly Valid**

Based on Table 3, the textbook draft obtained an average validity percentage of 93.33% which is included in the Very Valid criterion. Furthermore, the results of the questionnaire of students' responses to the practicality of using textbooks were processed objectively without excessive rounding and presented in Table 4.

Table 4. Students' Response to the Level of Media Practicality

No.	Aspects	Total Score	Max Score	Percentage	Criteria
1	Learning Independence	446	552	80,80%	Practical
2	Ease of Use	303	368	82,33%	Very Practical
3	Attraction	161	184	87,50%	Very Practical
Quantity		910	1.104	82,42%	**Very Practical**

Based on Table 4, the aspect of perception of learning independence reached a percentage of 80.80% which was correctly classified as Practical (≤ 80%), while the aspects of ease of use and attractiveness were in the Very Practical criteria. Overall, the students' practicality response reached an average of 82.42% (Very Practical). This perception score confirms that *scaffolding* flows provide students with comfort and confidence when solving algebraic problems, but are not interpreted as evidence of experimental tests of increasing the level of learning independence. The initial evaluation of practicality from the educator's perspective was measured through a questionnaire of the response of one teaching mathematics teacher as *preliminary teacher feedback* presented in Table 5.

Table 5. Teachers' Responses to the Level of Media Practicality

No.	Aspects	Total Score	Max Score	Percentage	Criteria
1	Ease of Use	10	12	83,33%	Very Practical
2	Learning Support (*Scaffolding*)	10	12	83,33%	Very Practical
3	Language & Visual Qualifications	8	8	100,00%	Very Practical
Quantity		28	32	87,50%	**Very Practical**

Table 5 shows that the teacher's response obtained an overall percentage of 87.50% with the Very Practical criterion. These results reinforce the evidence that the draft textbook developed is concise, solutive, and practical to help teachers teach differentiation-based algebraic material in the classroom.

The results of the expert assessment which reached 93.33% with the Very Valid criterion, as well as the practical response from students (82.42%) and teachers (87.50%) who were both at the **Very Practical criterion, showed that the draft of this** scaffolding-based *mathematics textbook* has material, visual, and instructional feasibility quality which is considered very positive by experts and users. These results confirm that the textbook design has met the standards for the development of algebraic teaching materials for Grade VII junior high school students. The three-stage structure of mentoring—ranging from *Let's Observe* (full help), *Let's Complete* (partial help), to *Aku Bisa* (independent exercise)—was responded positively by students because it helped create an unsurprising learning flow when faced with abstract algebraic material. A student perception score of 80.80% on the aspect of learning independence shows that students feel helped and more confident when processing from example to independent practice. However, the results of this questionnaire percentage are appropriately positioned as a description of the user's

subjective perception of practicality on the carrying capacity of the textbook, not as quantitative experimental evidence of an increase in the level of learning independence or proof of the absolute release of students' dependence on teachers.

Nevertheless, the existence of a measurable flow of help in this textbook is theoretically in line with the view of Erawati and Astarini (2023) who affirm that the provision of gradual assistance is crucial to maintain the learning rhythm of students so that they do not give up easily when entering abstract mathematical concepts. The findings of this positive response are also in line with the study of Aulia et al. (2020) which states that *scaffolding techniques* have the potential to encourage students' active thinking rather than just passive recipients of information in the classroom.

In previous studies, *scaffolding* is generally presented orally directly by the teacher in front of the class or in the form of generic instructional guidance, so its implementation is highly dependent on the availability and allocation of time of the teacher when accompanying students one by one (Bakker et al., 2016). Meanwhile, in *scaffolding-based* textbooks developed by Aliyah et al. (2025), the assistance provided tends to be limited to providing static formats such as "known" and "asked" columns without a systematic *fading* scheme. Such structural assistance is not optimal in training the process of independent thinking because students tend to only memorize data filling patterns without understanding the reasoning behind solving algebraic problems.

In contrast to previous models, *novelty* as well as the main contribution of the textbooks developed in this study lies in the integration of written *scaffolding fading* flows that are designed in a structured manner directly in the textbook. Through *the Let's* Observe, *Ayo Complete*, and *I Can* scheme, the function of reducing aid is gradually transferred to print media. This provides practical benefits as a supporting medium for teachers in facilitating differentiated learning in classrooms that have a diversity of student learning speeds.

In addition to the positive results obtained, this study has several methodological limitations that need to be observed in interpreting the findings. First, the evaluation of the practicality of the new field involved a sample limited to one trial class (23 students) and one teaching teacher in one school, so the results could not be generalized widely to a more diverse population. Second, a high practicality score has the potential to be influenced by the *novelty effect* (the effect of media novelty in the eyes of students) and subjective response bias (*self-report bias*) on filling out questionnaires. Third, this study is designed as a development research (R&D) that focuses on the validity and practicality of the product, so that it does not measure initial data (*baseline data*) or control experimental tests to measure the causal impact of textbooks on the improvement of learning outcomes or the level of student learning independence in a measurable manner. Therefore, follow-up research with a wider sample scale as well as longitudinal experimental tests is strongly recommended to test the effectiveness of these products quantitatively.

Conclusion

The process of developing *scaffolding-based mathematics textbooks* on algebraic materials was successfully completed following the five stages of the ADDIE (*Analysis, Design, Development, Implementation, Evaluation*) model. This product is specifically designed to bridge the cognitive barriers of Grade VII junior high school students in understanding algebraic variable symbols through a three-level mentoring flow, namely *Ayo Kita Amati* (full assistance), *Ayo Equipi* (partial assistance), and *Aku Bisa* (independent exercise). Judging from the level of validity, the textbook draft was declared **Very Valid** and suitable for use based on the results of the cumulative assessment of three expert validators who obtained an average percentage of 93.33% (including material feasibility of 92.00%, linguistics 93.33%, and media and design 94.66%). Meanwhile, from the level of practicality,

this textbook was considered **Very Practical** when tested in the field, with the average response of Class VII-C students reaching 82.42% (including the perception of learning independence of 80.80% [Practical criteria], ease of use 82.33%, and visual appeal of 87.50%) and the response of teachers' practicality reaching 87.50%. Searches during the limited trial confirmed positive responses from users, but these findings were limited to a description of the perception of practicality and readability of the product, so the effectiveness of textbooks in increasing students' learning independence causally-quantitatively still requires further testing through experimental research.

Based on the development process and findings during the field trials, the developer of the teaching material or researcher is further advised to enrich the variation of contextual illustrations that bridge the transition from arithmetic concrete material to abstract algebraic symbols so that textbook drafts can be more adaptive to student characteristics. In addition, given that this study is limited to validity and practicality tests within the R&D framework, it is further strongly recommended that researchers **conduct a formal** Effectiveness Test *through experimental quantitative research designs (such as* Quasi-Experiments with control groups and experiments) using a broader sample scale to measure the causal impact of the use of this textbook on improvement learning outcomes and the level of student learning independence in a measurable manner.

References

Aliyah, R., Farida, & Gunawan, W. (2025). Development of student worksheets using question probing scaffolding with Perplexity AI to enhance creative thinking skills and mathematical problem-solving abilities. *Suska Journal of Mathematics Education*, *11*(2), 121–132.

Aninditaningrum, M., Firmansyah, D., & Adirakasiwi, A. G. (2024). The analysis of learning difficulties is reviewed from the motivation of learning. Journal of Educatio, 10(2), 659–672.

Annajmi, A., Kuswandi, D., Setyosari, P., & Praherdhoro, H. (2026). Integrating multiple representations and local cultural contexts into problem-based learning within a flipped classroom: A new framework for mathematics education. *Social Sciences & Humanities Open*, *13*, Article 102797.

Aulia, J., Fitraini, D., & Risnawati. (2020). The Effect of the Application of the Scaffolding Learning Model on the Ability to Understand Mathematical Concepts Based on Self Efficacy of Junior High School / MTs Students. Juring (Journal for Research in Mathematics Learning), 3(4), 367–374.

Bakker, A., Smit, J., & Wegerif, R. (2016). Scaffolding and dialogic teaching in mathematics education: Introduction and review. *ZDM Mathematics Education*, *47*(7), 1047–1065.

Branch, R. M. (2009). *Instructional design: The ADDIE approach*. Springer.

Cahyadi, R. A. H. (2019). Development of teaching materials based on the ADDIE model. *Halaqa: Islamic Education Journal*, 3(1), 35–42.

Erawati, N. K., & Astarini, M. H. (2023). The application of scaffolding is an effort to improve students' mathematics learning activities. Journal of Mathematics and Science Education (JEMS), 11(1), 7869460. Fadjeri, A., & Nurchayati, A. D. (2022). Validity testing in the development of ICT-based learning media. *Journal of Solar Education Education (JPSE),* 8(1), 26–33. Fauziah, N. F., & Purwanto, E. (2026). Students' Metacognitive Ability in Solving Three-Variable Linear Equation System Story Problems. *Mandalika Mathematics and Educations Journal*, *8*(1), 817–831.

Handayani, V. P., Sulalah, S., & Widodo, B. (2025). Mathematics learning uses a differentiation-based scaffolding method on student learning independence. Biormatics: Scientific Journal of the Faculty of Teacher Training and Education, 11(1), 63–75.

Harlinda, A., & Suratmi, S. (2024). Needs analysis as the first step of Articulate Storyline assisted learning media development. *Journal of Pendas Horizon*, 10(3), 614–625.

Julanda, R., Deswalantri, Medika, G. H., Rahmat, T., & Firmanti, P. (2023). The Effect of the Scaffolding Approach on Students' Understanding of Mathematical Concepts. EDUSAINS: Journal of Education and Science, 1(2), 81–90.

Muslich, M. (2016). Text Book Writing: The Basics of Comprehending, Writing, and Using Textbooks. Yogyakarta: Ar-Ruzz Media.

Sitompul, M. T., & Effendi, K. N. S. (2021). Analysis of Mistakes of Grade VII Students in Solving Algebraic Form Problems. Transformation: Journal of Mathematics and Mathematics Education, 5(2), 553–565.

Sugiyono. (2013). Quantitative, Qualitative, and R&D Research Methodology. Bandung: Alfabeta

Sugiyono. (2022). *Research and Development (R&D) Methods* (5th Edition). Alphabet.

Valenzeo, A. C., & Sumiaty, E. (2024). Learning Obstacles for Junior High School Students in Completing Algebraic Form Operations. *Journal of Mathematics Education: Judika Education*, *7* (1).

Wahyuni, R., Herman, T., & Fatimah, S. (2023). Letters in algebra as the transition from arithmetic thinking to algebraic thinking. *Mosharafa: Journal of Mathematics Education*, 12(3), 441–452.