EDUMATIKA: *Jurnal Riset Pendidikan Matematika* *e-ISSN 2620-8911*
Volume 7, Issue 1, May 2024 *p-ISSN 2620-8903*

Developing Mathematics Learning Media Using Macromedia Flash 8 to Improve Students' Mathematical Concepts Understanding

Putri Dwi Sartika[1, a)], Nur Fauziyah[1]

Universitas Muhammadiyah Gresik
101 Sumatera Street, Randuagung, Kebomas, Gresik, East Java, Indonesia, 61121

[a)] dwisarti09@gmail.com

Abstract. The use of appropriate learning media can help students understand abstract concepts and make learning more meaningful and joyful. This study aims to produce learning media based on Macromedia Flash 8 to improve students' mathematical concepts understanding. The development research used follows the ADDIE model, namely Analyze, Design, Development, Implementation, and Evaluation. The trial of product prototype involved 27 seventh-grade students of a junior high school in Gresik, East Java. Data were collected using a validation questionnaire of media and material aspects, student response questionnaire, and a mathematical concepts understanding test. Data were analyzed using quantitative and qualitative methods. The results of the study showed that the learning media was in the very feasible category in terms of material and media aspects. While practicality was obtained from student responses with a good category. In addition, effectiveness was determined based on an increase in mathematical concepts understanding with a moderate category. Thus, the Macromedia Flash 8-based learning media that was developed can be used widely, especially on the topic of algebraic forms.

Keywords: Mathematics Learning Media; Macromedia Flash 8; Mathematics Concept Understanding; Research and Development

Abstrak. Penggunaan media pembelajaran yang tepat dapat membantu siswa memahami konsep yang abstrak serta membuat pembelajaran menjadi lebih bermakna dan menyenangkan. Penelitian ini bertujuan untuk menghasilkan media pembelajaran berbasis *Macromedia Flash 8* untuk meningkatkan pemahaman konsep matematika siswa. Penelitian pengembangan yang digunakan mengikuti model ADDIE yaitu *Analyze, Design, Development, Implementation,* dan *Evaluation*. Uji coba rancangan produk melibatkan 27 siswa kelas VII SMP di Gresik, Jawa Timur. Data dikumpulkan menggunakan angket validasi aspek media dan materi, angket respon siswa, dan tes pemahaman konsep matematika. Data dianalisis menggunakan metode kuantitatif dan kualitatif. Hasil penelitian menunjukkan bahwa media pembelajaran berada pada kategori sangat layak pada aspek materi dan media. Sedangkan kepraktisan diperoleh dari respon siswa dengan kategori baik. Selain itu, efektifitas ditentukan berdasarkan peningkatan pemahaman konsep matematika dengan kategori sedang. Dengan demikian media pembelajaran berbasis Macromedia Flash 8 yang dikembangkan dapat digunakan secara lebih luas khususnya pada topik bentuk aljabar.

Kata kunci: Macromedia Flash 8; Media Pembelajaran Matematika; Pemahaman Konsep Matematika; Penelitian dan Pengembangan

Available online at journal homepage:
http://ejournal.iainkerinci.ac.id/index.php/edumatika
Email: edumatika@iainkerinci.ac.id
DOI: https://doi.org/10.32939/ejrpm.v7i1.3707

EDUMATIKA: *Jurnal Riset Pendidikan Matematika* *e-ISSN 2620-8911*
Volume 7, Issue 1, May 2024 *p-ISSN 2620-8903*

INTRODUCTION

Mathematics is one of the subjects that has an important role in the intellectual development and thinking ability of students. In learning mathematics, students must first understand mathematical concepts to solve problems and apply learning to the real world (Meidianti et al., 2022). Good mathematical concept understanding skills are needed to be able to understand and apply mathematical principles in everyday life and in a broader academic context. Students who are able to understand the basic concepts of mathematics learning will find it easier to proceed to the next stage in continuity due to one concept will always be related to other concepts (Azizah et al., 2024).

The ability to receive, absorb, and understand information obtained from a series of events or events that can be seen or heard will be stored in the mind and can be used in everyday life can be called concept understanding (Susanti et al., 2021). Understanding mathematical concepts allows students to perform calculations that are useful in a broader context or problem and distinguish many interconnected concepts (Apriyanti et al., 2023). By understanding mathematical concepts, students are able to fulfill the indicators of concept understanding, they are interpreting, exemplifying, classifying, summarizing, concluding, comparing, and explaining (Anderson & Krathwohl, 2010). With an understanding of the concept students can solve a mathematical problem, because mathematical problems are built from concepts that are relevant to this understanding (Gohae, 2023).

In Indonesia, the level of concept understanding ability is still relatively low. The PISA 2022 results show that Indonesian students' math scores fell by 12 points when compared to the PISA 2018 results. Indonesian students scored 365 in math, while the OECD average was 472 (Pranoto et al., 2023). In PISA 2022, the main domain in mathematics is literacy. About half of the main assessment is devoted to mathematical literacy questions designed to measure students' capacity to formulate, apply, and interpret mathematics in various contexts. These results indicate that the understanding of mathematical concepts is still low, students are still not optimal in answering questions about understanding mathematical concepts (Damayanti & Rufiana, 2020). Some students still had difficultyin communicating known statements into mathematical models, seen from the analysis of one of the indocators of students' ability to present concepts (Suraji et al., 2018).

Students' lack of interest in learning math where students think that math is the most difficult and scary subject. Algebraic material is imagine as abstract material and contains symbols or letters. Thus the need for learning media development to help students in getting a meaningful learning experience. Learning media is needed as a communication tool between teachers and students to clarify abstract concepts (Suseno et al., 2020). In this research, Macromedia Flash 8 was

EDUMATIKA: *Jurnal Riset Pendidikan Matematika* *e-ISSN 2620-8911*
Volume 7, Issue 1, May 2024 *p-ISSN 2620-8903*

chosen for learning media, because this application can provoke student stimulus to know the real form of abstract mathematical concepts (Maclinton & Adrian, 2022). The use of learning media with Macromedia Flash 8 can display abstract mathematical concepts to be real with static visualization and dynamic visualization (Nusvia, 2020).

Macromedia Flash 8 is an object-oriented animation program, vector-based image design, and website creation software (Wardhana et al., 2021). A previous research stated that Macromedia Flash 8 as a learning media help students be able to think in connecting between concepts and the real world, as well as the presentation of the material displayed to be more interesting to students and make learning more fun (Amalia et al., 2020). While, other research stated Macromedia Flash 8 as learning media can represent concept ideas in the material, so that students are able to understand the material presented and make learning in the classroom more enjoyable (Amru & Yuwarningsih, 2023).

Therefore, the use of Macromedia Flash 8 can be used as an alternative solution to improve students' mathematical concept understanding skills, especially in algebra topics. So, through this research, it is expected to produce a product in the form of learning media using Macromedia Flash 8 to improve the ability to understand mathematical concepts while measuring the increase in the ability to understand mathematical concepts through the use of the resulting product.

METHOD

This study employs a Research and Development (R&D) approach aimed at producing a specific product and assessing its effectiveness. The product developed in this research is learning media based on Macromedia Flash 8. The development process follows the ADDIE model, which consists of five systematic stages: analysis, design, development, implementation, and evaluation. Each stage is designed to ensure that the resulting product is valid, practical, and effective for use in mathematics classroom.

In the analysis stage, a needs assessment was conducted to identify the requirements of students. Based on these findings, the design stage involved creating a prototype of the learning media tailored to meet those needs. The development stage focused on refining the media, including validation by experts to ensure the quality and relevance of the product. In the implementation stage, the media was tested with students, providing valuable feedback on usability and functionality. The evaluation stage then assessed the effectiveness of the media in enhancing students' understanding of mathematical concepts.

EDUMATIKA: *Jurnal Riset Pendidikan Matematika* *e-ISSN 2620-8911*
Volume 7, Issue 1, May 2024 *p-ISSN 2620-8903*

The product trial involved 27 seventh-grade students from a private junior high school in Gresik, East Java. Data collection instruments included validation questionnaires to evaluate media quality, student response questionnaires to measure engagement and satisfaction, and mathematical concept understanding tests to assess learning outcomes. The collected data, both quantitative and qualitative, provided insights into the validity, practicality, and effectiveness of the learning media developed in this study.

Product Validity

The validity of the media aspect was assessed based on six key aspects: simplicity, integration, emphasis, balance, form, and color. Simplicity refers to the ease of operating the media, while integration ensures that instructions for use are clear and understandable. Emphasis evaluates whether the media effectively communicates information, and balance focuses on the appropriateness of text size on each page according to standards. Form considers the layout of animations, images, and text, whereas color assesses the suitability of the background and overall visual display.

Meanwhile, the validity of the material aspect was evaluated based on three dimensions: format, content, and language. Format assesses the harmony of color, text, and image displays within the algebra material, while content examines the alignment of the material with specific learning objectives. Language evaluates the clarity, simplicity, and comprehensibility of the language used, ensuring it is accessible to students.

The validation process employed a descriptive analysis of responses collected through a questionnaire. Each item was rated on a Likert scale with scores ranging from 1 (strongly disagree) to 5 (strongly agree). The validity level (V) was determined by calculating the percentage of the obtained score relative to the ideal score. A product is considered valid if the average validity score for media and material aspects exceeds 61%, classifying it as feasible or highly feasible for use.

Product Practicality

The student response questionnaire was designed to evaluate three key aspects of the learning media: presentation, content, and language. The presentation aspect was assessed through eight questions, such as whether any menu in the learning media was difficult to understand. The content aspect was evaluated using four questions, including whether the explanation of the material in the media was easy to comprehend. Lastly, the language aspect was assessed through three questions, such as whether the language used in the learning media was clear and simple for students.

The student response questionnaire was also analyzed descriptively. Each item on the student response questionnaire was analyzed using the Guttman scale, 1 for the respondent's answer "Yes" and 0 for the respondent's answer "No". The level of practicality (P) was determined based on the

EDUMATIKA: *Jurnal Riset Pendidikan Matematika* *e-ISSN 2620-8911*
Volume 7, Issue 1, May 2024 *p-ISSN 2620-8903*

percentage of the score obtained against the ideal score. Interpretation of the percentage criteria for practicality as shown in Table 1.

The analysis of the student response questionnaire was conducted descriptively, using the Guttman scale. Each questionnaire item was scored as 1 for a "Yes" response and 0 for a "No" response. This scoring method allowed for straightforward interpretation of student feedback regarding the usability and accessibility of the developed learning media. This analysis provided a quantitative basis for evaluating the practicality and usability of the media from the students' perspectives. The level of practicality (P) of the learning media was determined by calculating the percentage of the obtained score relative to the ideal score. The interpretation of the practicality percentage followed specific criteria, as outlined in Table 1.

Table 1. The Practical Criteria Based on the Percentage of Student Response

The Level of Practicality	**Criteria**
$85\% \leq P$	Very Practical
$70\% \leq P < 85\%$	Practical
$50\% \leq P < 70\%$	Less Practical
$P < 50\%$	Not Practical

Product Effectiveness

The effectiveness of the learning media was assessed based on students' achievement in completing the learning outcomes test. The test results were analyzed using an assessment rubric aligned with seven indicators of conceptual understanding as proposed by Anderson and Krathwohl (2010). Both the pretest and posttest consisted of seven questions, each designed to represent one of these indicators. This approach ensured comprehensive measurement of students' mathematical concept understanding.

The seven indicators of conceptual understanding include interpreting (transforming visual representations into other forms of information), exemplifying (providing illustrations of concepts), classifying (grouping concepts into categories), summarizing (abstracting main or general points), inferring (drawing conclusions from provided information), comparing (analyzing similarities or differences between two ideas or objects), and explaining (presenting information derived from concept analysis). These indicators served as the foundation for evaluating the depth and breadth of students' understanding of mathematical concepts.

To analyze the effectiveness of the media, researchers employed the N-Gain test formula, which measures the normalized gain between pretest and posttest scores. The criteria for interpreting the normalized gain are presented in Table 2. This analysis provided insights into the degree of improvement in students' conceptual understanding facilitated by the learning media.

EDUMATIKA: *Jurnal Riset Pendidikan Matematika* *e-ISSN 2620-8911*
Volume 7, Issue 1, May 2024 *p-ISSN 2620-8903*

Table 2. The Criteria of N-Gain Value

Normalized Gain Value (g)	Category
$g \geq 0,7$	High
$0,7 > g \geq 0,3$	Medium
$g < 0,3$	Low

RESULTS AND DISCUSSION

Analysis Stage

The analysis stage at least analyzes student needs, analyzes the curriculum, and formulates learning objectives (Putra & Syarifuddin, 2018). In the analysis of student needs, it was found that students need learning media other than books to help visualize mathematical concepts in the learning process in the classroom. The teaching materials or media used have not had a significant influence on each student's learning outcomes because each student has different learning needs and abilities (Novelza et al., 2024). In addition, it was also found that students' understanding of mathematical concepts tends to be low, which causes students to have difficulty in solving problems. This finding is quite common in various other studies (Hikmah et al., 2023). Meanwhile, in the curriculum analysis, there was no discrepancy between the learning tools and the formulation of learning objectives in the curriculum. The formulation of the learning objectives is to expressing contextual problems in algebraic form; identifying elements of algebraic forms; and grouping algebraic forms based on coefficients, constants, variables, and terms.

Design Stage

The design stage carried out 3 steps including the preparation of benchmark reference tests, device selection, and product design design. Preparation of reference tests as a benchmark obtained from the analysis stage so that the material design in product design can be appropriate. The selection of learning devices consists of teaching modules, students' worksheets, learning media using Macromedia Flash 8, and pretest and posttest instruments. The specifications of the learning media developed are seen from the competencies and indicators on the learning material, namely algebraic topic. In designing the product design in the form of an opening page (Figure 1), directions for use (Figure 2), learning objectives (Figure 3), trigger questions (Figure 4), main topic (Figure 5), and quiz menus (Figure 6).

EDUMATIKA: Jurnal Riset Pendidikan Matematika *e-ISSN 2620-8911*
Volume 7, Issue 1, May 2024 *p-ISSN 2620-8903*

Figure 1. Opening Page

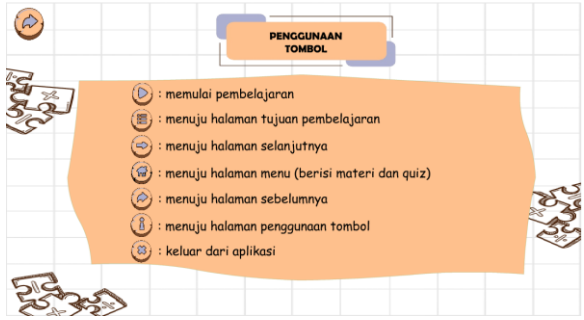

Figure 2. Directions for Use

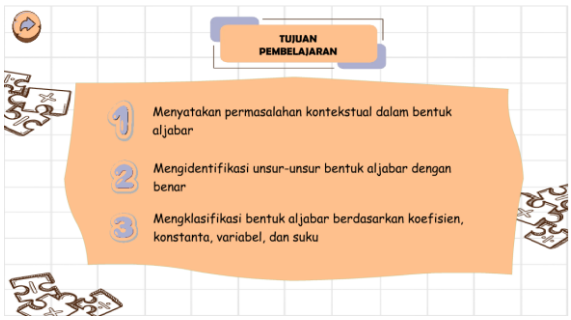

Figure 3. Learning Objectives

Figure 4. Trigger Question

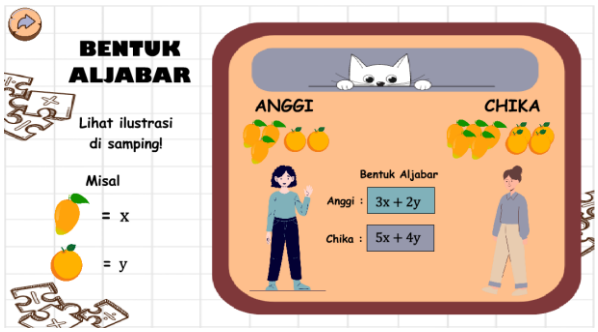

Figure 5. Main Topic

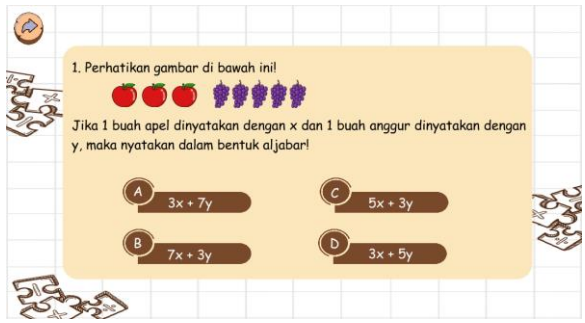

Figure 6. Some Quizes

Development Stage

The development stage is carried out expert assessment and development test. Expert assessment activities that aim to validate Macromedia Flash 8-based learning media, where the expert assessment is validated by two validators, namely media experts and material experts. From the expert assessment there are revisions obtained from two validators.

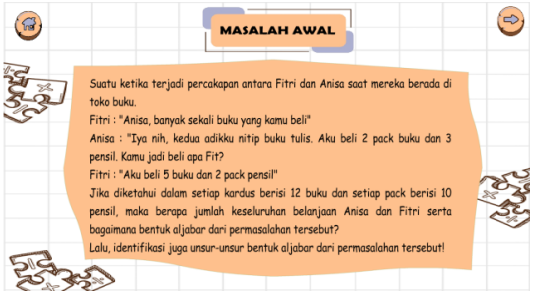

Figure 7. The Problem Display Before Revision

Figure 8. The Problem Display After Revision

EDUMATIKA: *Jurnal Riset Pendidikan Matematika* *e-ISSN 2620-8911*
Volume 7, Issue 1, May 2024 *p-ISSN 2620-8903*

Figure 7 and Figure 8 show the initial design of the problem form before revision and after revision. Where material experts provide suggestions so that the problems made can be more complex.

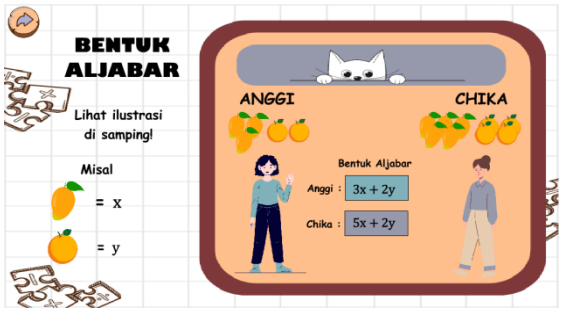

Figure 9. Algebraic Form Before Revision

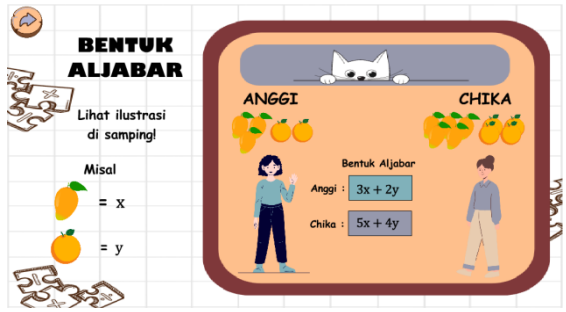

Figure 10. Algebraic Form After Revision

Figure 9 and Figure 10 show the initial design of the algebraic form before revision and after revision. Where the material expert provides corrections to the writing of algebraic forms that are not the same as the number of pictures of Chika's fruit.

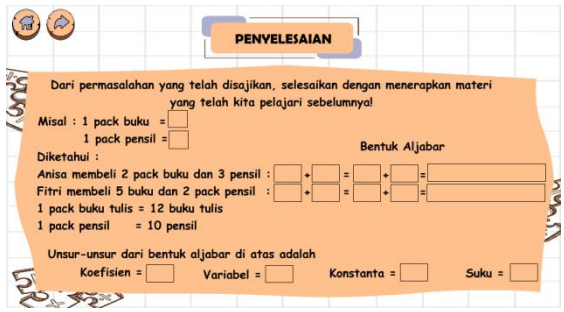

Figure 11. Form of Completion Before Revision

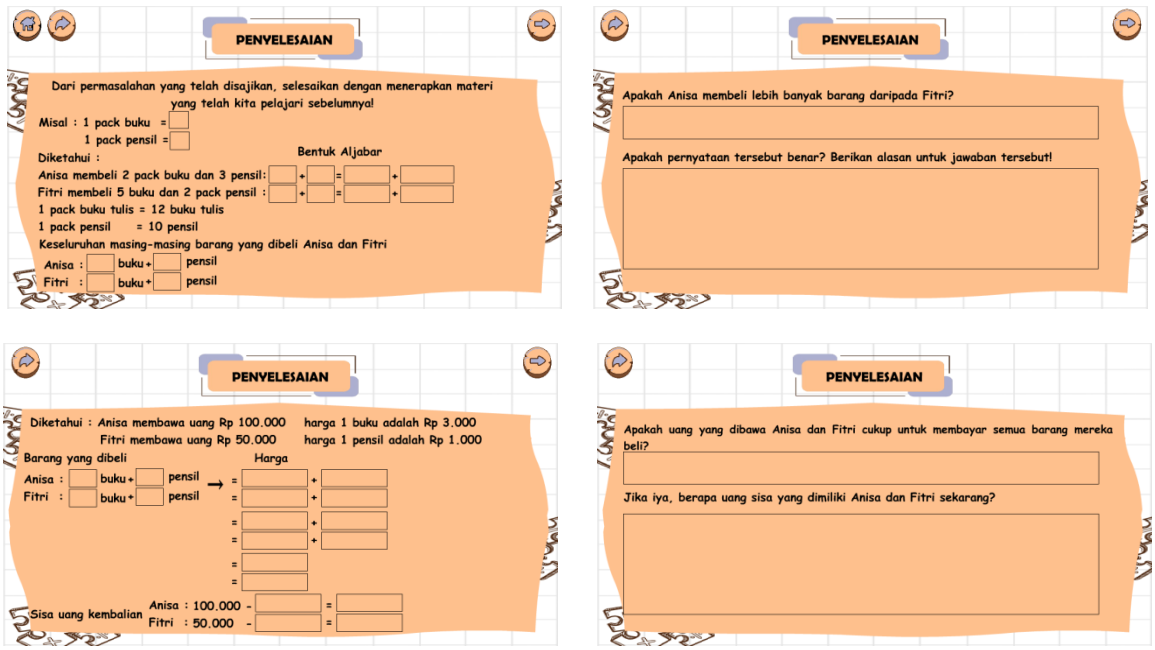

Figure 12. Form of Completion After Revision

EDUMATIKA: *Jurnal Riset Pendidikan Matematika* *e-ISSN 2620-8911*
Volume 7, Issue 1, May 2024 *p-ISSN 2620-8903*

Figure 11 and Figure 12 show the initial design of the settlement form before and after revision. Where the material expert gave advice that the solution was made more complex in accordance with the revised problem form.

The results of the assessment carried out by the validators of material experts and media experts is presented in Table 3.

Table 4. The Validation Results

Aspects of Validity	Score Percentage	Interpretation
Material	96,67 %	Valid
Media	89,09 %	Valid

The average validity score from material experts, which reached 96.67%, indicates that the content, format, and language used in the learning media are highly appropriate and aligned with learning objectives. The format aspect demonstrates excellent visual harmony, with well-integrated colors, text, and image displays to support the delivery of algebraic material. The content has been validated to ensure its alignment with learning objectives and curriculum standards, making it relevant for educational use. Furthermore, the language used in the media is clear, simple, and easy to understand, facilitating accessibility and comprehension for students.

Meanwhile, the average validity score from media experts, which was 89.09%, reflects that the design and functionality of the learning media are of high quality, with minor revisions needed for further improvement. The media is easy to operate, with clear and comprehensible usage instructions. It effectively communicates information, with proper text size, layout, and visual balance contributing to a comfortable user experience. The arrangement of animations, images, and text is well-structured, while the background and color schemes enhance the overall visual appeal without compromising clarity. These results confirm that the learning media is highly feasible and was predicted effective for use in mathematics classroom (Putra et al., 2018).

Implementation Stage

The implementation stage involved testing the product that had previously been validated for feasibility. At this stage, researchers administered a pretest to evaluate students' initial understanding of algebraic concepts. Following the pretest, the learning process was conducted using the developed learning media based on Macromedia Flash 8. Upon completing the learning process, students were asked to complete a questionnaire to provide feedback and suggestions regarding the learning media. The results of the student response questionnaire are summarized in Table 5.

EDUMATIKA: *Jurnal Riset Pendidikan Matematika* *e-ISSN 2620-8911*
Volume 7, Issue 1, May 2024 *p-ISSN 2620-8903*

Table 5. The Results of Student Response Questionnaire

Total Score	Presentase Score	Description
378	83,60 %	Practical

The practicality of the learning media, with an average score of 83.60%, falls into the "practical" category, indicating that the media is highly usable in the educational context. The student response questionnaire assessed three key aspects of the media: presentation, content, and language. The presentation aspect was evaluated through eight questions, including whether any menu or interface in the learning media was difficult to understand. The high score suggests that students found the media easy to navigate and user-friendly.

The content aspect, assessed through four questions, focused on whether the explanation of the material was clear and easy to comprehend. The positive response indicates that the media successfully conveyed the intended algebraic concepts in a manner that students could easily grasp. Lastly, the language aspect was evaluated using three questions to determine if the language used in the media was simple and understandable for students. The favorable responses confirm that the language was appropriate for the target audience. Overall, the media is considered practical and effective for use in the learning process, with a few minor areas for improvement. The results of student responses showed that students were so interested and enjoyed using Macromedia Flash 8 as a learning resource for math subjects (Wardhana et al., 2021).

Evaluation Stage

The effectiveness of the field trial was determined by comparing pretest results at the beginning of the meeting with posttest results at the end of the meeting. The effectiveness was measured using the N-Gain formula, which provided a value reflecting the improvement in students' conceptual understanding. The results of this analysis are presented in Table 6, offering a quantitative assessment of the learning media's impact on students' learning outcomes.

Table 6. The Test Results and N-Gain Value

Parameter	Total Score	Value (Interpretation)
Pretest	769	-
Posttest	1987	-
N-Gain	-	0,63 (Medium)

An N-Gain value of 0.63, falling within the medium criteria, indicates that the learning media had a moderate effect on improving students' conceptual understanding. The seven indicators of conceptual understanding were evaluated through the pretest and posttest, which focused on skills such as interpreting, exemplifying, classifying, summarizing, inferring, comparing, and explaining.

The moderate N-Gain suggests that while the learning media was effective in enhancing students' ability to interpret visual representations, provide examples, classify concepts, and summarize key points, there is still room for further improvement. The media also facilitated

EDUMATIKA: *Jurnal Riset Pendidikan Matematika* *e-ISSN 2620-8911*
Volume 7, Issue 1, May 2024 *p-ISSN 2620-8903*

students in making inferences, comparing ideas, and explaining concepts, but the improvement in these areas was not as significant as in others. Overall, the medium N-Gain value reflects a reasonable level of success in improving students' conceptual understanding, though further refinement of the media may help achieve higher levels of conceptual mastery (Kania & Arifin, 2020).

CONCLUSION

The Macromedia Flash 8-based learning media developed to improve students' understanding of mathematical concepts has been deemed valid, practical, and effective for use in the educational process. The interactive nature of the media, featuring solutions, materials, and quizzes accompanied by images, engages students and aids their comprehension of algebraic concepts. The validation and practicality of the media were confirmed through assessments by experts in both content and media design, as well as positive feedback from students. These evaluations indicate that the media is highly feasible for use in the classroom, requiring only minor revisions. The practicality was further supported by students' responses, which highlighted the media's ease of use and its ability to effectively engage them in the learning process.

In terms of effectiveness, the learning media demonstrated moderate success in improving students' conceptual understanding of mathematics. While the media facilitated improvements in various areas such as interpretation, exemplification, classification, and summarization of mathematical concepts, the overall impact on students' understanding was not exceptionally high, indicating potential for further enhancement. The results suggest that while the media is effective, additional refinements could lead to greater improvements in student learning outcomes. Moving forward, it is recommended that the learning media be adapted for use on Android platforms, which would provide students with more flexible access, allowing them to engage with the material independently and at their convenience. This adaptation could expand the reach of the media, making it accessible to a broader range of learners and further enhancing its educational value.

REFERENCES

Amalia, A. R., Purwati, H., & Nursyahidah, F. (2020). Pengembangan Media Pembelajaran berbasis PMRI Untuk Meningkatkan kemampuan Berpikir Kritis Siswa SMP. *Imajiner: Jurnal Matematika dan Pendidikan Matematika, 2(4),* 321-328. https://doi.org/10.26877/imajiner.v2i4.5883

Amru, G. A. M., & Yuwarningsih, D., A. (2023). Pengembangan Media Pembelajaran Matematika Pokok Bahasan Lingkaran Berbasis Macromedia Flash 8. *Matrix : Jurnal Pendidikan Matematika.*, *1*(2), 21-35. https://doi.org/10.62522/mjpm.v1i2.25

Anderson, L. W., & Krathwohl, D. R. (2010). *Kerangka Landasan untuk Pembelajaran, Pengajaran dan Asesmen: Revisi Taksonomi Pendidikan Bloom*. Pustaka Pelajar.

EDUMATIKA: *Jurnal Riset Pendidikan Matematika* *e-ISSN 2620-8911*
Volume 7, Issue 1, May 2024 *p-ISSN 2620-8903*

Apriyanti, E., Asrin, A., & Fauzi, A. (2023). Model Pembelajaran Realistic Mathematics Education Dalam Meningkatkan Pemahaman Konsep Matematika Siswa Sekolah Dasar. *Jurnal Educatio FKIP UNMA*, *9*(4), 1978–1986. https://doi.org/10.31949/educatio.v9i4.5940

Azizah, L. N., Rahmawati, P., Purnanto, A. W., & Ulfa, W. W. (2024). Meningkatkan Pemahaman Konsep Matematika Siswa Sekolah Dasar melalui Pembelajaran Role Playing Berbantuan Uang Lipat (Uang Nilai Tempat). *Mitra PGMI: Jurnal Kependidikan MI*, *10*(1), 1–11. https://doi.org/10.46963/mpgmi.v10i1.1361

Damayanti, I., & Rufiana, I. S. (2020). Analisis Pemahaman Konsep Matematika pada Materi Bangun Ruang Kubus dan Balok Ditinjau dari Motivasi Belajar. *JURNAL EDUPEDIA*, *4*(2), 173. https://doi.org/10.24269/ed.v4i2.555

Gohae, N. K. W. (2023). Pengembangan Modul Pembelajaran Program Linear untuk Meningkatkan Kemampuan Pemahaman Konsep Matematika. *FAGURU: Jurnal Ilmiah Mahasiswa Keguruan*, *2*(1), 316-326. https://jurnal.uniraya.ac.id/index.php/faguru/article/view/671

Hikmah, A., Saragih, S., & Maimunah, M. (2023). Pengembangan Perangkat Pembelajaran Matematika Menggunakan Model Discovery Learning untuk Memfasilitasi Kemampuan Pemahaman Matematis Pada Materi Segi Empat dan Segitiga. *Jurnal Cendekia : Jurnal Pendidikan Matematika*, *7*(3), 2752–2764. https://doi.org/10.31004/cendekia.v7i3.1959

Kania, N., & Arifin, Z. (2020). Aplikasi Macromedia flash untuk Meningkatkan Pemahaman Konsep Matematika Siswa. *JNPM (Jurnal Nasional Pendidikan Matematika)*, *4*(1), 96. https://doi.org/10.33603/jnpm.v4i1.2872

Maclinton, D., & Andrian, D. (2022). Pengembangan Media Pembelajaran Prisma Berbasis Macromedia Flash Dengan Desain Pembelajaran Assure. *INOMATIKA*, *4*(1), 83–97. https://doi.org/10.35438/inomatika.v4i1.323

Meidianti, A., Kholifah, N., & Sari, N. I. (2022). Kemampuan Pemahaman Konsep Matematis Peserta Didik dalam Pembelajaran Matematika. Himpunan: Jurnal Ilmiah Mahasiswa Pendidikan Matematika, 2(2), 134-144. https://jim.unindra.ac.id/index.php/himpunan/article/view/6818

Novelza, I. D., Putra, A., & Anggraini, R. S. (2024). Analisis Kebutuhan Bahan Ajar Matematika Materi Teorema Pythagoras. MATH-EDU: Jurnal Ilmu Pendidikan Matematika, 9(1), 338-351. https://jurnal.unimor.ac.id/index.php/JIPM/article/download/4731/1763

Nusvia, F. (2020). Implementasi Macromedia Flash Dan Power Point Terhadap Kemampuan Pemecahan Masalah Dan Self-Regulated Learning Siswa Dalam Pembelajaran Matematika. *Pasundan Journal of Mathematics Education Jurnal Pendidikan Matematika*, *5*(2), 65-76. https://doi.org/10.23969/pjme.v5i2.2535

Putra, A., & Syarifuddin, H. (2018). Analisis kebutuhan pengembangan lembar kerja siswa berbasis penemuan terbimbing kelas viii sekolah menengah pertama. *JEMS: Jurnal Edukasi Matematika dan Sains*, *6*(1), 39-49. https://doi.org/10.25273/jems.v6i1.5327

Putra, A., Syarifuddin, H., & Zulfah, Z. (2018). Validitas lembar kerja peserta didik berbasis penemuan terbimbing dalam upaya meningkatkan pemahaman konsep dan kemampuan penalaran matematis. *Edumatika: Jurnal Riset Pendidikan Matematika*, *1*(2), 56-62. https://doi.org/10.32939/ejrpm.v1i2.302

Pranoto, I., Setya Budi, W., & Gunawan, H. (2023). *Hasil PISA 2022, Matematika Indonesia masih Stagnan*. Media Indonesia. https://mediaindonesia.com/opini/637150/hasil-pisa-2022-matematika-indonesia-masih-stagnan

Suraji, S., Maimunah, M., & Saragih, S. (2018). Analisis Kemampuan Pemahaman Konsep Matematis dan Kemampuan Pemecahan Masalah Matematis Siswa SMP pada Materi Sistem Persamaan Linear Dua Variabel (SPLDV). *Suska Journal of Mathematics Education*, *4*(1), 9. https://doi.org/10.24014/sjme.v4i1.5057

Susanti, N. K. E., Asrin, A., & Khair, B. N. (2021). Analisis Tingkat Pemahaman Konsep IPA Siswa Kelas V SDN Gugus V Kecamatan Cakranegara. *Jurnal Ilmiah Profesi Pendidikan*, *6*(4), 686–690. https://doi.org/10.29303/jipp.v6i4.317

EDUMATIKA: *Jurnal Riset Pendidikan Matematika* *e-ISSN 2620-8911*
Volume 7, Issue 1, May 2024 *p-ISSN 2620-8903*

Suseno, P. U., Ismail, Y., & Ismail, S. (2020). Pengembangan Media Pembelajaran Matematika Video Interaktif berbasis Multimedia. *Jambura Journal of Mathematics Education*, *1*(2), 59–74. https://doi.org/10.34312/jmathedu.v1i2.7272

Wardhana, K. E., Syafi'i, A. M., & Putra, F. P. (2021). Pengembangan Bahan Ajar Berbasis Macromedia Flash dalam Pembelajaran Matematika. *Borneo Journal of Science and Mathematics Education*, *1*(1), 57-67. https://journal.uinsi.ac.id/index.php/bjsme/article/view/5905