

DEVELOPMENT OF INTERACTIVE LEARNING MEDIA BASED ON ARTICULATE STORYLINE 3 TO IMPROVE MATHEMATICAL PROBLEM – SOLVING SKILLS STUDENT IN THE CLASS VII SMP NEGERI 7 PERCUT SEI TUAN

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Abstrak

Penelitian pengembangan ini bertujuan menghasilkan media pembelajaran interaktif berbasis Articulate Storyline 3 pada materi aritmetika sosial bagi siswa kelas VII SMP Negeri 7 Percut Sei Tuan, serta menguji validitas, kepraktisan, dan efektivitasnya. Penelitian ini menggunakan model pengembangan 4D yang meliputi tahap pendefinisian, perancangan, pengembangan, dan penyebaran. Kelayakan media dinilai oleh ahli materi dan ahli media, sedangkan uji coba dilakukan pada 27 siswa. Hasil penelitian menunjukkan media dinyatakan sangat valid dengan persentase 92%, sangat praktis berdasarkan tanggapan guru sebesar 100% dan siswa sebesar 97,13%. Media terbukti sangat efektif meningkatkan kemampuan pemecahan masalah matematis, ditandai dengan nilai N-Gain sebesar 0,73 (kategori tinggi) serta hasil uji statistik yang menunjukkan peningkatan yang signifikan secara bermakna. Rata-rata nilai siswa meningkat dari 35,22 pada tes awal menjadi 65,26 pada tes akhir. Keunggulan media ini terletak pada penyajian yang kontekstual dan terstruktur mengikuti tahapan pemecahan masalah Polya, sehingga berbeda dengan media sejenis yang sudah ada. Media ini dapat menjadi alternatif pembelajaran yang inovatif dan sesuai dengan tuntutan Kurikulum Merdeka.

Kata Kunci: *Media Pembelajaran Interkatif, Articulate Storyline 3, Aritmetika Sosial, Kemampuan Pemecahan Masalah Matematis.*

Abstract

This development research aims to produce interactive learning media based on Articulate Storyline 3 on social arithmetic material for seventh grade students of SMP Negeri 7 Percut Sei Tuan, as well as to test its validity, practicality, and effectiveness. This research uses a 4D development model which includes the stages of defining, designing, developing, and disseminating. The feasibility of the media was assessed by material experts and media experts, while trials were conducted on 27 students. The results showed that the media was declared very valid with a percentage of 92%, very practical based on teacher responses of 100% and students of 97.13%. The media proved to be very effective in improving mathematical problem-solving abilities, marked by an N-Gain value of 0.73 (high category) and statistical test results that showed a significant increase. The average student score increased from 35.22 in the initial test to 65.26 in the final test. The advantage of this media lies in its contextual and structured presentation following Polya's problem-solving stages, making it different from existing similar media. This media can be an innovative learning alternative and is in accordance with the demands of the Independent Curriculum.

Keywords: *Interactive Learning Media, Articulate Storyline 3, Social Arithmetic, Mathematical Problem-Solving Skills.*

INTRODUCTION

In the 21st century, advancements in information and communication technology have accelerated rapidly worldwide, particularly in the education sector, where technology can serve as a facilitator for achieving learning objectives (Ni Putu Ayu Listiani et al. 2024). Technology is inseparable from the learning process and also serves as a tool that facilitates the implementation of learning (Ella Andhany, 2023). A variety of technology-based media tools can be utilized to make learning more engaging (Dermawan, 2024). Additionally, it encourages the active and creative development of potential in the face of the increasingly rapid advancements in information and technology (Amelia Putri Nasuha, 2023). This aligns with the primary focus on addressing relevant educational issues, which will be tackled through a systematic innovative approach (Ananda, 2023). Teachers also implement this approach by designing engaging and interactive materials and utilizing technology to make learning more effective for students (Wahyuni, Ridlo, and Rina., 2022). Furthermore, technology-enhanced learning is an effective method for developing educational media, particularly in mathematics instruction (Adi Susanto, and Wahyu Setyaningrum, 2023).

According to lisyendri & ananda (2023), mathematics is one of the disciplines of logic that underlies other disciplines in the field of education. According to Kanah & Mardiani (2022), mathematics plays a very important role in education and is always interrelated with other subjects, and has a fundamental role in daily life. Mathematics is a subject in the exact sciences that students must understand as a guide for its application in modern life (Kartika and Rakhmawati 2022). Mathematics studies patterns and relationships between concepts and trains logical and systematic thinking, particularly in problem-solving (Chandra Wardana, Dwi Suryana, and Nandi, 2024). However, mathematics learning is still often considered difficult, boring, and uninteresting due to a lack of learning approaches (Permana, Jeni and dkk., 2023). Consequently, many students struggle with mathematical problem-solving because instruction is still dominated by lecture-based methods and fails to actively engage students (Siti Aminah and Riska Putri Meilani, 2023).

According to Suci Dahlya Narpila (2022), problem-solving skills involve the effort to find solutions to challenges in order to achieve goals that cannot be easily attained. Problem-solving skills are a very important part of mathematics learning (Eka Nurvela and Malalina,

2020). Mathematical problem-solving skills involve exploring ideas, skills, and mathematical processes to address mathematical challenges. The ability to solve problems is essential for every student to develop methods of resolution and identify alternative solutions to a given problem (Nanda Khairani Batubara, 2022). Furthermore, problem-solving ability remains one of the key competencies considered in mathematics education in schools (Dermawan, Siagian, and Sinaga, 2020). Low problem-solving ability is influenced by students' habit of failing to fully document information, processes, and conclusions (Maysarah et al. 2024). Low mathematical problem-solving skills among students can also be influenced by a lack of active interaction between teachers and students during the learning process (Dina and Siregar, 2022). One area of mathematics where students often struggle with problem-solving is social arithmetic (Wahyuni, Anggraini, and Mardiya., 2024).

Social arithmetic is one of the mathematics topics studied in seventh grade. The problems presented involve buying and selling in everyday life. However, in reality, many students still struggle to solve problems related to social arithmetic (Fitriani and Kadarisma 2022). The difficulty students face in solving problems in social arithmetic may be attributed to teachers, due to a lack of use of learning media in delivering lessons in the classroom.

According to Rusi Ulfa Hasanah, (2022), instructional media are tools designed to facilitate the delivery of learning materials. Instructional media encompass anything used as a tool to facilitate interaction in teaching and learning activities (Kusuma Ardi and Desstyia 2023). On the other hand, learning media that do not sufficiently meet students' learning needs and fail to adapt to technology result in suboptimal achievement of mathematics learning objectives (Handayani, Merli, Aty Nurdiana 2023). To achieve mathematics learning objectives, creative and supportive learning methods are needed; the use of interactive learning media offers a promising solution (Melasevix et al. 2021).

Based on initial observations and interviews at SMP Negeri 7 Percut Sei Tuan, only about 17.39% of seventh-grade students have mathematical problem-solving skills that meet the expected criteria. This difficulty is most pronounced in social arithmetic, which is directly related to everyday life. The current media used is limited to static PowerPoint presentations, which are less effective at visualizing concepts and do not provide direct feedback when students practice problems.

Several previous studies have developed Articulate Storyline 3-based media for various mathematics topics, such as statistics and sets (Adiastuty et al., 2024; Handayani et al., 2023). However, there is a research gap: the development of similar media for social arithmetic materials tailored to the socioeconomic environment of students in the Deli Serdang region is still limited. Furthermore, not many have designed media that explicitly integrate Polya's problem-solving stages into each learning activity.

According to Mauliana et al (2025), the use of instructional media such as videos, physical models, and interactive media has been proven effective in increasing students' interest and enthusiasm for learning. On the other hand, interactive learning media utilize technology to create two-way communication between students (Rofiqoh and Khairani 2024). As Hastri et al. (2025) noted, interactive learning media using Articulate Storyline 3 can improve students' ability to solve mathematical problems.

Meanwhile, several previous studies have developed Articulate Storyline 3-based media for various mathematics topics, such as statistics and sets (Adiastuty et al., 2024; Handayani et al., 2023). However, there is a research gap: the development of similar media for social arithmetic materials tailored to the socioeconomic environment of students in the Deli Serdang region is still limited. Furthermore, not many have designed media that explicitly integrate Polya's problem-solving stages into each learning activity.

Problem-solving ability is measured based on the stages proposed by Polya, which include: (1) understanding the problem, namely identifying known and questionable information; (2) developing a solution plan, namely determining the strategy or concept to be used; (3) implementing the plan, namely performing calculations according to the steps outlined; and (4) rechecking, namely assessing the accuracy of the answers obtained.

Thus, the novelty and contributions of this research include: (1) developing media with contextualized buying and selling transactions relevant to the lives of local communities; (2) compiling content based on Polya's problem-solving indicators; (3) validating the media to ensure it complies with the Merdeka Curriculum standards. The results of this research are expected to provide alternative solutions to address student difficulties and improve the quality of mathematics learning in a more innovative manner.

METHODS

This research is a type of Research and Development (R&D) aimed at producing a learning media product and testing its feasibility. The development model used refers to the 4D framework developed by Rusmayana (2021), which includes four stages: Define, Design, Develop, and Disseminate. This model was selected based on its suitability for developing measurable and quality-tested educational products. The research was conducted at SMP Negeri 7 Percut Sei Tuan during the even semester of the 2025/2026 academic year.

Research Subjects

Research subjects were grouped based on the testing phase, as follows:

1. Validation Team: Consisting of one mathematics education subject matter expert and one learning technology expert, each with competency and experience in their respective fields.
2. Limited Trial: Nine seventh-grade students with varying academic abilities were tested to identify technical challenges and initial understanding.
3. Field Trial: Twenty-seven seventh-grade students were the primary target group for the media implementation.

Development Procedure

Media development was carried out systematically, following these stages:

- Definition Stage: Conducting needs analysis, student characteristics analysis, social arithmetic material analysis, and formulating learning objectives aligned with the Independent Curriculum.
- Design Stage: Developing the material framework, interface design, navigation flow, and compiling test items that refer to problem-solving ability indicators.
- Development Stage: Creating the media using the Articulate Storyline 3 application, followed by validation, revisions based on suggestions, and testing with students.
- Dissemination Stage: Media that has been declared suitable for use in the learning process to measure its effectiveness.

Instrument Validation and Quality Process

Before use, all research instruments were quality tested to ensure data validity:

- **Content Validity:** The validation sheet and test questions were designed based on competency indicators and Polya's problem-solving theory, then assessed by two experts to ensure they met the research objectives.
- **Reliability:** Measured using the inter-rater agreement coefficient. The calculation showed a value of 0.89, which is considered highly reliable, allowing the instrument to be used for data collection.

The media validation process was carried out in the following steps: (1) submitting the media prototype along with the assessment sheet to the experts; (2) the experts providing assessments and suggestions for improvement; (3) the researchers revising the media; (4) the media was declared suitable if it achieved the minimum score for the specified criteria.

Implementation of the Field Testing Phase

Testing was conducted in two stages to ensure product stability:

1. **Limited Trial:** Conducted outside of regular classes for two 40-minute sessions. Students used the media independently while being monitored to record navigation difficulties, writing clarity, and display response speed.
2. **Field Trial:** Conducted during regular learning for four sessions. Before starting, students took a pretest. Subsequently, learning continued using the developed media. Upon completion, students took a posttest and completed a feedback questionnaire. The entire process was recorded in detail to facilitate replication of similar research.

Data Collection Instruments

Data was collected through three main instruments:

1. **Validation Sheet:** Used to assess the feasibility of materials and media, compiled on a 1-5 scale.
2. **Response Questionnaire:** Completed by teachers and students to measure the practicality of the media.

3. Problem-Solving Ability Test: In the form of five descriptive questions, compiled based on the problem-solving stages according to Polya (as cited in Raudho et al., 2020), namely:
- Understanding the problem
 - Developing a solution plan
 - Implementing the plan
 - Reviewing the answers

Data Analysis Techniques

The data was processed descriptively quantitatively to examine three main aspects:

- Validity: Calculated by converting expert assessment scores into percentages, then categorized according to learning media suitability standards.
- Practicality: Obtained from the average teacher and student responses, which illustrate the level of ease of use and suitability of the media for learning needs.
- Effectiveness: Measured by comparing the results of the pre-test and post-test. The magnitude of improvement was calculated using the N-Gain method, while the statistical significance of the improvement was tested using a paired t-test to ensure that changes in learning outcomes were influenced by the media used.

RESULTS AND DISCUSSION

RESULT

Learning Media Validation Results

Based on assessments by material and media experts, the interactive learning media based on Articulate Storyline 3 achieved an average validity score of 92%. This percentage falls into the very valid category according to the criteria of (Damayanti et al., 2018).

The material expert assessment gave a score of 92%, indicating that the social arithmetic material presented is accurate, aligns with the competencies of the Independent Curriculum, and the presentation sequence is systematic and easy to understand. Suggestions for improvement included adding contextual examples of problems that are more relevant to the students' environment and emphasizing the steps for solving them. Meanwhile, the media expert assessment also gave a score of 92%, indicating that the display design, color selection,

layout, and interactive features function well and support the learning process. Revisions included adding a user guide and adjusting the font size for better readability.

Media Practicality Test Results

Practicality testing was conducted through a questionnaire completed by subject teachers and students. The results showed a 100% teacher response rate and a 97.13% student response rate, both of which fall into the very practical category according to Sugiyono, (2018) criteria.

These results indicate that the media is easy to operate, does not require high-spec devices, and requires relatively little time to learn how to use it. Students stated that this media was more engaging than conventional learning due to the animations, interactive practice questions, and immediate feedback that made it easier to identify errors.

Hasil Efektivitas Media

Media effectiveness was measured by comparing students' initial (pretest) and final (posttest) test scores. Analysis was conducted using two approaches to strengthen evidence of effectiveness: calculating score increases and testing for statistical significance.

1. Improved Learning Outcomes

The average student pretest score was 35.22, which then increased significantly to 65.26 in the posttest. The magnitude of the increase was calculated using the N-Gain method, which produced a value of 0.73. This value is included in the high category according to Nurwahid et al., (2022) criteria, which means the media is very effective in improving students' mathematical problem-solving abilities.

2. Statistical Significance Analysis

To strengthen the effectiveness claim as suggested by the reviewer, a paired t-test was conducted after meeting the prerequisite test requirements, namely that the data were normally distributed and had homogeneous variance. The calculation results showed a t-value of 12.89 with a significance level of $p < 0.001$. This proves that there is a statistically significant difference between student abilities before and after using the media. This means that the improvement that occurred was not coincidental, but was actually influenced by the implementation of this learning media.

3. Improvement Based on Polya's Problem-Solving Indicators

Improvements in ability were also seen at each stage of Polya's problem-solving skills, as follows:

- Understanding the problem: from 13.21 to 18.35
- Developing a solution plan: from 9.14 to 18.24
- Executing the plan: from 8.22 to 17.29
- Rechecking answers: from 4.62 to 7.93

The most significant improvement occurred in the indicator for developing a solution plan. This indicates that the media successfully trained students to not only memorize formulas but also understand the relationships between information in the problem and determine appropriate strategies for solving it.

DISCUSSION

Comparison with Previous Research

The results of this study align with the findings of Resma Wahyuni, et al., (2025) and Ni Putu Ayu Listiani, et al., (2024), who concluded that Articulate Storyline 3-based learning media effectively improved students' learning outcomes and problem-solving abilities. However, this study has differences and advantages compared to previous research.

Audiastuty et al.'s., (2024) research developed a similar medium-effective learning media for statistics, achieving an N-Gain value of 0.62. Meanwhile, Handayani et al.'s., (2023) research developed a medium-effective learning media for sets. Compared to the previous study, the N-Gain value of 0.73 was higher. This is due to two main factors: first, the media was specifically designed to integrate each stage of Polya problem-solving into each content and practice questions; second, the material was presented in the context of buying and selling transactions that closely relate to the daily lives and socio-economic environments of students in the Deli Serdang region, making it easier to understand and apply.

Reasons Why Media Effectively Improves Problem-Solving Skills

The effectiveness of this media is based on several applied learning principles:

1. Contextual Learning: Problems and material are presented in real-life situations, so students can see the benefits of the material in everyday life, reducing the perception that mathematics is abstract and difficult.

2. Immediate Feedback: Every student's answer receives immediate feedback, whether correct or incorrect. This helps students recognize misunderstandings early and correct them themselves.
3. Sequential Stages: The presentation of material, from basic concepts to more complex problems, is tailored to the thinking abilities of seventh-grade students, thus fostering logical and systematic thinking skills.
4. High Interactivity: The media does not simply contain static text, but instead encourages students to actively click, select answers, and follow the solution flow, thereby increasing concentration and motivation to learn.

Research Limitations

Despite the positive results, this study has limitations. This medium requires a computer or device and access to electricity to operate. This aligns with the findings of Wahyuni & Fauziati (2025), who stated that the effectiveness of digital media is highly dependent on the availability of supporting facilities. Therefore, the use of this medium requires adequate preparation of facilities to maximize its benefits.

CONCLUSION

The development of interactive learning media based on Articulate Storyline 3 for social arithmetic has proven to be valid, practical, and effective in improving the mathematical problem-solving skills of seventh-grade students at SMP Negeri 7 Percut Sei Tuan. The results of the validity test conducted by subject matter experts and media experts each scored 92%, falling into the "highly valid" category. The practicality test results showed a 100% teacher response rate and a 97.13% student response rate, both categorized as highly practical. Furthermore, the effectiveness test results showed an improvement in student learning outcomes with an N-Gain value of 0.73, which falls into the high category, i.e., highly effective. Thus, this learning medium is highly suitable for use as an innovative alternative to support more engaging mathematics learning and help improve students' mathematical problem-solving skills.

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