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DEVELOPMENT OF INTERACTIVE LEARNING MEDIA BASED ON ARTICULATE STORYLINE 3 TO IMPROVE MATHEMATICAL PROBLEM-SOLVING SKILLS AMONG SEVENTH-GRADE STUDENTS AT SMP NEGERI 7 PERCUT SEI TUAN

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Abstract

This development research produced an interactive learning media based on Articulate Storyline 3 for the social arithmetic material of seventh grade students at SMP Negeri 7 Percut Sei Tuan using the 4D model (Define, Design, Develop, Disseminate). The results showed that the media was very valid with a percentage of 92% from material and media experts, and very practical based on teacher (100%) and student (97.13%) responses. In addition, this media was proven to be effective in improving students' mathematical problem-solving abilities as indicated by an N-Gain value of 0.73 (high category) through an increase in the average score from 35.22 in the pre-test to 65.26 in the post-test. This media was considered easy to operate, interesting, interactive, and able to motivate students to be active in learning so that it could improve students' mathematical problem-solving abilities. Thus, the Articulate Storyline 3 media on social arithmetic material was proven to be valid, practical, and effective in supporting the improvement of mathematical problem-solving, and could be an innovative alternative in improving the quality of enjoyable mathematics learning according to the demands of the 21st century.

***Keywords**: Learning Media, Articulate Storyline 3, Student's Mathematical Solving*

Abstrak

Penelitian pengembangan ini menghasilkan media pembelajaran interaktif berbasis Articulate Storyline 3 pada materi aritmetika sosial untuk siswa kelas VII di SMP Negeri 7 Percut Sei Tuan dengan menggunakan model 4D (Define, Design, Develop, Disseminate). Hasil penelitian menunjukkan bahwa media yang dikembangkan memiliki tingkat kevalidan yang sangat tinggi dengan persentase sebesar 92% berdasarkan penilaian ahli materi dan ahli media, serta sangat praktis berdasarkan respons guru (100%) dan respons siswa (97,13%). Selain itu, media ini terbukti efektif dalam meningkatkan kemampuan pemecahan masalah matematis siswa yang ditunjukkan oleh nilai N-Gain sebesar 0,73 (kategori tinggi), melalui peningkatan rata-rata skor dari 35,22 pada pretest menjadi 65,26 pada posttest. Media ini dinilai mudah dioperasikan, menarik, interaktif, serta mampu memotivasi siswa untuk aktif dalam pembelajaran sehingga dapat meningkatkan kemampuan pemecahan masalah matematis mereka. Dengan demikian, media pembelajaran berbasis Articulate Storyline 3 pada materi aritmetika sosial terbukti valid, praktis, dan efektif dalam mendukung peningkatan kemampuan pemecahan masalah matematis siswa, serta dapat menjadi alternatif inovatif dalam meningkatkan kualitas pembelajaran matematika yang menyenangkan sesuai dengan tuntutan abad ke-21.

Kata kunci: Media Pembelajaran, Articulate Storyline 3, Kemampuan Pemecahan Masalah Matematis Siswa.

INTRODUCTION

In the 21st century, advancements in information and communication technology have accelerated rapidly worldwide, particularly in the education sector, where technology can

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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 Desstya 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).

Observations indicate that only about 17.39% of seventh-grade students possess mathematical problem-solving skills. Furthermore, an interview with a mathematics teacher at SMP Negeri 7 Percut Sei Tuan revealed that teachers still face challenges in teaching Social Arithmetic, particularly when it comes to helping students solve problems. Furthermore, the learning media used so far have been dominated by simple PowerPoint presentations, which are not yet optimal in supporting the conceptual understanding that builds students' problem-solving skills. Teachers stated the need to develop interactive learning media based on Articulate Storyline 3 to help build students' problem-solving skills through interactive problems that can be presented to hone their problem-solving abilities.

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.

Articulate Storyline 3 is a technology-based interactive learning tool used to create instructional materials in a format that combines text, images, quizzes, and interactive navigation, thereby enhancing student engagement in the learning process (Azzahra and Nurharini 2024). Articulate Storyline 3 was selected as an interactive medium capable of providing quizzes, exercises, and feedback to foster independent critical thinking skills, which are essential in the classroom teaching and learning process (Heliawati, Lidiawati, and Pursitasari 2022).

Based on this explanation, this study aims to develop and test the validity, practicality, and effectiveness of an interactive learning medium based on Articulate Storyline 3 for seventh-grade social arithmetic material in relation to mathematical problem-solving skills. This study is expected to contribute to the development of more engaging, innovative, and effective mathematics learning media, as well as support the improvement of learning quality-one that is not monotonous and does not focus solely on the teacher but also involves students in the learning process.

METHODS

This study was conducted at SMP Negeri 7 Percut Sei Tuan in Deli Serdang Regency, North Sumatra, during the second semester of the 2025/2026 academic year. The research design used was Research and Development (R&D), as outlined by Rusmayana (2021) The development model applied was the 4D model (*Define, Design, Develop, and Disseminate*), focusing on the development of Articulate Storyline 3-based learning media to enhance mathematical problem-solving skills in social arithmetic for seventh-grade students at SMP Negeri 7 Percut Sei Tuan, involving a total of 27 students. The stages of the 4D model *Define, Design, Develop, and Disseminate* are presented in the following figure:

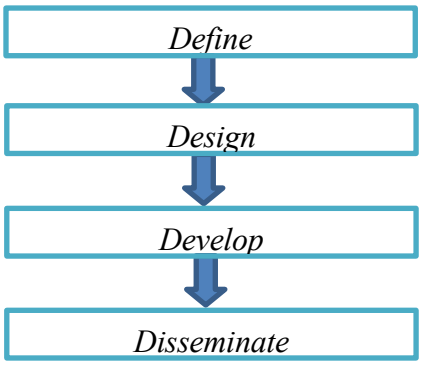


Figure 1. 4D Model Design

Research Instruments

The instruments used in this study included instruments to measure the validity, practicality, and effectiveness of the learning media. The validity instrument was used to evaluate the quality of the Articulate StoryLine 3 media through validation by subject matter and media experts. The practicality instrument was used to understand the level of media use in learning, which was obtained from teacher and student response questionnaires. Meanwhile, the effectiveness instrument was used to measure the extent to which the media improved mathematical problem-solving skills, which was conducted through an essay test consisting of 5 questions, each comprising 4 parts aligned with Polya's problem-solving indicators (as cited in Raudho et al., 2020): understanding the problem, devising a plan, carrying out the plan, and looking back.

Data Analysis Techniques

a) Validity Analysis

The validation sheet contains statements and scores used to obtain evaluations from experts who assess whether the instructional materials used are valid. This validity analysis is conducted using the following techniques:

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

Notes:

P = Validity percentage

X = Total validator score

Xi = Total ideal score

Validation results for which the validity percentage has been determined can be categorized according to the validation criteria presented in the table below:

Table 1. Validity categories

Persentase	Category
$81\% - 100\%$	Highly Valid
$61\% - 80\%$	Valid
$41\% - 60\%$	Moderately Valid
$21\% - 40\%$	Less Valid
$0\% - 20\%$	Not Valid

SUMBER: DAMAYANTI ET AL (2018)

b) Practicality Analysis

The results were obtained from the teacher and student questionnaires administered following the pilot test of the Articulate Storyline learning media. Data analysis was conducted using a Likert scale and then analyzed using the Guttman scale (Sugiono, 2016), as follows:

Table 2. Guttman Scale Rating Categories

Skor	Descrption
Skor 0	Agree / Yes
Skor 1	Disagree / No

Sumber: (Sugiono, 2016).

Next, this practicality analysis was conducted using the following formula:

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

Notes:

$P =$ Practicality percentage

$\sum X =$ Total expert responses for a single aspect

$\sum Xi =$ Maximum possible responses for a single

Each score received is then grouped into the corresponding practicality percentage category, as presented in the table below.

Table 3. Practicality Categories

Percentage	Category
$81\% - 100\%$	Very Practical
$61\% - 80\%$	Practical
$41\% - 60\%$	Fairly Practical
$21\% - 40\%$	Not Very Practical
$0\% - 20\%$	Not Practical

Sumber: (Sugiyono, 2018)

c) Effectiveness Analysis

The effectiveness of the developed instructional media can be assessed based on students' test scores. Improvements in students' creative thinking skills were analyzed using the N-Gain calculation, which is computed using the following formula:

$$NGain = \frac{posttest - pretest}{skor\ maksimal - pretest}$$

Thus, its effectiveness can be categorized as follows:

Table 4. Effectiveness Categories

N-gain Range	Category	Criteria
$g > 0{,}7$	High	Very Effective
$0{,}3 \leq g \leq 0{,}7$	Moderate	Effective
$g < 0{,}7$	Low	Less Effective

Sumber: (Puspita D, Eka, et al., 2019)

RESULTS AND DISCUSSION

This study focuses on students' ability to solve mathematical problems in the context of social arithmetic. This development study produced an interactive learning medium based on Articulate Storyline, designed to improve problem-solving skills through contextual content, an engaging interface, and interactive activities and quizzes. The development of this medium utilized the 4D model (Define, Design, Develop, and Disseminate), and the results of each development stage are presented below.

Define Stage (definition)

The definition phase was conducted through initial observations at SMP Negeri 7 Percut Sei Tuan to identify learning issues. This phase included an analysis of learning needs, student characteristics, social arithmetic content, task analysis, and the formulation of learning

objectives based on students' mathematical problem-solving abilities. All results from this definition process are summarized in Table 5.

Table 5. Components of the analysis results from the Define phase in the development of learning media.

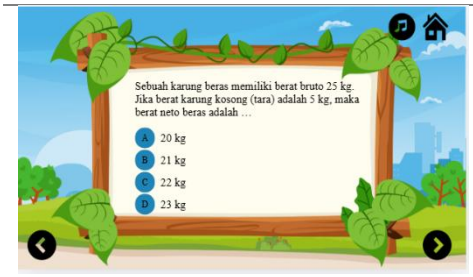
Components	Activity Outcomes
Front-End Analysis	Observations at SMP Negeri 7 Percut Sei Tuan indicate that students' mathematical problem-solving skills remain low due to teacher-centered instruction and a lack of interactive learning materials.
Student Analysis	Survey results show that students need interactive learning materials to improve their problem-solving skills in social arithmetic.
Concept Analysis	The topic of social arithmetic was chosen because it is relevant to daily life and can improve mathematical problem-solving skills in accordance with the Merdeka Curriculum.
Task Analysis	Learning activities focused on solving social arithmetic problems through problem-solving strategies and interactive quizzes related to daily life, both individually and in groups.
Learning Objective Analysis	The learning objectives were formulated based on the indicators of social arithmetic material, namely calculating purchase and selling prices, profits and losses along with their percentages, determining discounts, taxes, and final prices of goods, as well as solving contextual social arithmetic problems.

Design Phase

Based on the analysis phase, the Articulate Storyline 3 interactive learning media was designed for social arithmetic content with an engaging interface and easy navigation, and includes content, interactive exercises, and assessments to improve students' mathematical problem-solving skills. The design is presented in Table 6.

Table 6. Design components and results of the analysis of the design phase in the development of learning media

Media Components	**Learning Activities**	**Indicators of Students' Mathematical Problem-Sovng Skills**
Home page and Instructions for the learning materials.   	Presents an opening animation, instructions for using the media, and the learning objectives.	Showing an initial interest in the Articulate Storyline 3 learning tool
 	Students are encouraged to review the material on social arithmetic that they have already learned.	Students are expected to be able to read and understand the material presented in the media.

	Students are encouraged to read and understand the sample questions and their solutions for each topic.	Able to understand how to solve problems and expected to be able to plan solutions related to the material
	Students are invited to take an interactive quiz that includes navigation buttons and consists of 10 questions, and the answers are displayed.	Be able to develop mathematical problem-solving skills by working on problems related to social arithmetic in everyday life.
		

Development Phase

Next, following the design phase, the media that has been produced is reviewed by media and content experts to evaluate the quality of its content, appearance, and functionality before it is implemented in learning activities. The development design revision table is shown in Table 7.

Before Revisi	Suggestions	After Revision
	The “Tools” button does not explain what the tools are for. The “Profile” tool changes the developer profile.	
	Tools or color buttons that are still monotonous	

Results on Media Validation

At this stage, the researchers focused on ensuring the quality of the content, presentation, and interactivity of the Articulate Storyline 3-based learning media for social arithmetic. The review was conducted prior to the media's use in instruction and involved two experts: one who evaluated the media's presentation and another who assessed the material's alignment with the Merdeka Curriculum.

The results of the experts' evaluations were used as a basis for refining and improving the media, serving as a reference for these improvements before entering the phase of testing the media's practicality and effectiveness to ensure it is ready for use in instruction and to help enhance seventh-grade students' mathematical problem-solving skills. The results of the validity test are shown in Table 8 below:

Table 8. Results of the validity test by media and content experts

Expert	Evaluation Aspect	Statement Item	Score Obtained	Max Score	Precentage	Criteria
Media	Media Presentation	12	54	60	**92** %	**Highly Valid**
	Media Program	8	38	40		
	Total Score		92	100		
Content	Content Coverage	10	48	50	**92** %	**Highly Valid**
	Presentation Techniques	5	21	25		
	Total Score		**69**	**75**		

Based on the validity results in Table 7, the Articulate Storyline 3 interactive learning media received a "Highly Valid" rating. The media's visual presentation received a 92% score (92 out of 100), indicating that the design, colors, images, and fonts are engaging and aligned with the learning objectives. The media program also received a score of 38 out of 40, indicating that the media is easy to access and use.

Content expert validation also showed the "Highly Valid" category with a 92% percentage and a score of 48 out of 50, meaning the content aligns with the social arithmetic learning competencies. Additionally, the presentation technique received a score of 21 out of 25, indicating that the material is organized logically, structured, and easy to understand. Thus, the developed learning media is deemed highly valid and suitable for use, although it

still requires minor improvements to the interactive quizzes to better support students' mathematical problem-solving skills.

Results on Media Practicality

To assess the practicality of the instructional media in terms of ease of use and relevance to users, a practicality test was conducted using a questionnaire completed by teachers and students. The results of the practicality test are presented in Table 9.

Table 9. Results of the Media Practicality Test

Respondent	Item Question	Score Obtaided	Score Max	Percentage	Criteria
Teachers	18	18	18	**100**%	**Very Practical**
Student	16	15,54	16	**97, 13 %**	**Very Practical**

Based on the results in Table 8, the Articulate Storyline 3 educational media for social arithmetic falls into the "Very Practical" category. This is evidenced by the teacher's evaluation, which received a 100% score of 18 out of 18, and the students' evaluation, which received a 97.13% score of 15.54 out of 16. These results indicate that the media is easy to use, engaging, and effective in supporting the learning process.

Results on Media Effectiveness

The effectiveness of the developed media was then analyzed using the N-Gain test to examine changes in student learning outcomes before and after using the media. A summary of the calculation results is presented in Table 10.

Table 10. Results of the effectiveness test based on the N-Gain analysis

Assessment	Score Average	Maximum Score	*N-Gain*	Criteria
Pre-test	35,22	80		
Post-tes	65,259	80	0,73	**High / Very Effective**

The results of the effectiveness test indicate that the Articulate Storyline 3 interactive learning medium is effective in improving student learning outcomes. This is evident from the increase in the average pretest score from 35.22 to 65.26 on the posttest, with an N-gain score of 0.73, which falls into the high category according to Richard Hake. These results indicate that the developed medium is highly effective in improving students' mathematical problem-solving skills.

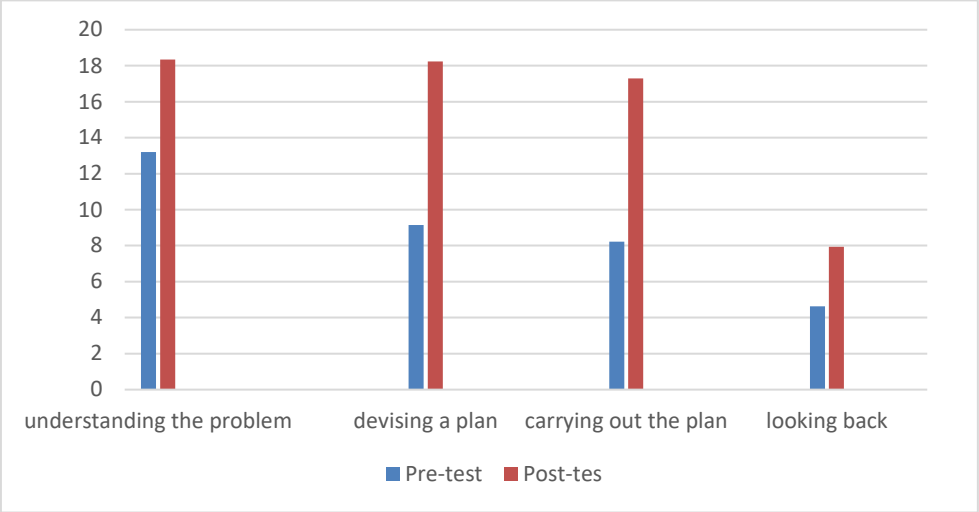


Figure 2. Distribution of mean pretest and posttest scores

Based on Problem Solving

As shown in Figure 2, all problem-solving indicators improved following the use of the instructional media. The "understanding the problem" indicator increased from 13.21 to 18.35, "devising a plan" from 9.14 to 18.24, "carrying out the plan" from 8.22 to 17.29, and "looking back" from 4.62 to 7.93. These results indicate that the learning media was able to help students understand the problem, devise a strategy, solve the problem, and review their answers (Nurwahid et al., 2022).

The results across all indicators show that Articulate Storyline 3-based learning media has a positive impact on students' mathematical problem-solving skills. This interactive media helps students understand problems, formulate strategies, solve problems, and review their answers through engaging visuals and interactive quizzes on social arithmetic material (Heliawati et al. (2022).

Although this study shows progress across all problem-solving indicators, there are several limitations related to the use of media that requires internet access. These limitations align with the findings reported by Wahyudi & Fauziati (2025), who state that the effectiveness of digital media in the learning process is often influenced by the availability of supporting facilities such as network connections and the devices students possess.

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.

REFERENCES

Adi Susanto, Wahyu Setyaningrum, Fadilla Camellia Nurhikmah Widi Asriani. 2023. "Trends in the Use of Technology to Improve Students' Mathematical Problem-Solving Skills." 12(3):167–86.

Adiastuty, Nuranita, Nunu Nurhayati, Muhamad Kafin, and Gani Ganya. 2024. "Development of Interactive Learning Media Based on Articulate Storyline 3 to Improve Mathematical Problem-Solving Skills in Statistics." 2682(1):143–54.

Agustin, Amelia Nada, and Ari Wibowo Kurniawan. 2021. "Development of Learning Media for Variations of Floor Gymnastics Games Using the Articulate Storyline Application." Sport Science and Health 3(6):369–80. doi: 10.17977/um062v3i62021p369-380.

Amelia Putri Nasuha, Ammamiarihta. 2023. "The Analysis of Mathematical Literacy Ability in PISA-Oriented Questions with Uncertainty and Data Content Based on Gender." 11(4):960–71.

Ananda, Rusydi. 2023. Learning and Teaching. Edited by Epi Supriyani Siregar. Tasikmalaya: Perkumpulan Rumah Cemerlang Indonesia.

Angraini, Lilis Marina, and Yosi Cahyaningtyas Fitri. 2023. "The Effect of Interactive Multimedia-Based Learning on Students' Mathematical Problem Solving Ability." International Journal of Contemporary Studies in Education (IJ-CSE) 2(2):85–90. doi: 10.56855/ijcse.v2i2.310.

Azzahra, Aulia, and Atip Nurharini. 2024. "Interactive Articulate Storyline 3-Based Learning Media: Enhancing Student Engagement and Knowledge in Elementary Dance Arts Education." Indonesian Journal of Educational Research and Review 7(3):513–26. doi: 10.23887/ijerr.v7i3.78203.

Chandra Wardana, Lisa, Intan Dwi Suryana, and Muhamad Nandi. 2024. "Integrating Real-World Applications into Mathematics Education: Approaches and Outcomes." International Journal of Mathematics and Science Education 1 (May):19–25.

Dermawan, Dwi Ardy, and Alfitrah Ramadhan. 2024. "Mathematics Learning Through the Quizizz Game Platform to Improve Student Learning Outcomes." 4(2):381–90.

Dermawan, Dwi Ardy, Pargaulan Siagian, and Bornok Sinaga. 2020. "Analysis of Students' Mathematical Problem-Solving Ability in Terms of Student Learning Styles Using Problem-Based Learning Models." 337–44.

Desi Mauliana, Adrias Adrias, and Fadila Suciana. 2025. "The Role of Instructional Media in Mathematics Education in Elementary Schools." Bilangan: Scientific Journal of Mathematics, Earth Sciences, and Space Sciences 3(2):94–102. doi: 10.62383/bilangan.v3i2.469.

Dina, Nurul Rahma, and Tanti Jumaisyaroh Siregar. 2022. "Group Investigation and Rotation Trio Exchange Learning Model: The Impact on Students' Mathematical Problem-Solving Abilities." 5(1):79–90. doi: 10.24042/djm.

Eka Nurvela, Malalina, and Rika Firma Yenni. 2020. "Analysis of Mathematical Problem-Solving Abilities Among Seventh-Grade Students at State Junior High School 57 Palembang on Social Arithmetic Material." SIGMA (Suara Intelektual Gaya Matematika) 12(2):125–32.

Ella Andhany, Siti Maysarah. 2023. "Development of an Interactive Digital Learning Module Based on Mathematical Literacy." 12(3):3503–15.

Fariz, Regilsa, Nuriana Rachmani, and Dewi Nino. 2022. "Theoretical Study: Development of Interactive Learning Media Using Articulate Storyline 3 in the ICT-Assisted Preprospec Model to Improve Mathematical Problem-Solving Skills." 5:304–10.

Fitriani, Fany Nur, and Gida Kadarisma. 2022. "Analysis of Students' Difficulties in Solving Social Arithmetic Problems Among Seventh-Grade Students." Journal of Innovative Mathematics Education 5(1):187–94. doi: 10.22460/jpmi.v5i1.187-194.

Gafelina, Gafelina, and Ahmad Subagyo. 2025. "Development of Interactive Learning Media Based on Articulate Storyline for Science Instruction in Grade 5 Elementary School." EDUTECH: Journal of Technology-Assisted Educational Innovation 5(1):179–92. doi: 10.51878/edutech.v5i1.4813.

Handayani, Merli, Aty Nurdiana, Nurashri Partasiwi. 2023. "Development of an Android-Based Articulate Storyline 3 Interactive Learning Media on Sets to Facilitate Mathematical Problem-Solving Skills of Seventh-Grade Students at SMPN 17.1 Gedong Tataan." Student Journal of Education 5:147–52.

Handayani, N. P. Y., I. G. N. Pujawan, and I. G. P. Sudiarta. 2020. "Development of an Interactive Social Arithmetic Learning Media Based on Articulate Storyline 3 Using a Scientific Approach for Seventh-Grade Junior High School Students." Indonesian Journal of Mathematics Education and Learning 9(1):38–44.

Heliawati, Leny, Linda Lidiawati, and Indarini Dwi Pursitasari. 2022. "Articulate Storyline 3 Multimedia Based on Gamification to Improve Critical Thinking Skills and Self-Regulated Learning." International Journal of Evaluation and Research in Education 11(3):1435–44. doi: 10.11591/ijere.v11i3.22168.

Kanah, Imas, and Dian Mardiani. 2022. "Students' Communication Skills and Independent Learning Through Problem-Based Learning and Discovery Learning." Plusminus: Journal of Mathematics Education 2(2):255–64. doi: 10.31980/plusminus.v2i2.1825.

Kartika, Yuni, and Fibri Rakhmawati. 2022. "Improving Students' Mathematical Critical Thinking Skills Using the Inquiry Learning Model." 06(03):2515–25.

Kusuma Ardi, Sinta Devi, and Anatri Desstya. 2023. "Snake and Ladder Learning Media to Improve Students' Numeracy Learning Motivation in Elementary School." Bulletin of Learning Materials Development 5(1). doi: 10.23917/bppp.v5i1.22934.

Lisyendri, Egry, and Rusydi Ananda. 2023. "The Effectiveness of the Cooperative Integrated Reading and Composition (CIRC) Model in Improving Students' Mathematical Literacy Skills." 7(1):235–45.

Maysarah, Siti, Dian Armanto, Izwita Dewi, and Sahat Saragih. 2024. "Analysis of Numeracy Literacy Skills in Elementary School Students." 13(1):52–64.

Mbadhi, Kuran, Melkyanus B. U. Kaleka, and An Nisaa Al Mumin Liu. 2020. "The Implementation of Constructivist Learning Models to Improve Students' Understanding of Physics Concepts on Vibration and Wave Materials in the Second Semester of Seventh Grade at MTSN 2 Wolowaru." Journal of Science Education Research 4(2):55–59. doi: 10.21831/jser.v4i2.35715.

Melasevix, Elzra, Haidar Ali Asnawi, Jam Jalani Nur Alami, Ika Hidayatul Masynuah, Ridho Arianto Nanda Putra, and Darmadi Darmadi. 2021. "The Application of Contextual Learning in Improving Mathematical Problem-Solving Skills at MTs Ma'arif Bandar." Journal of Education and Counseling (JPDK) 3(2):117–21. doi: 10.31004/jpdk.v3i2.1828.

Mercado, Maria Crisella Dela Cruz, Krizzel B. Calaguas, Zhairel Mae O. Vitug, Abigail B. Castro, Mary Grace M. Yumang, Romalyn S. Gaspar, and Rona G. Nucum. 2025. "Utilizing Bland and Interactive PowerPoint during Mathematics Class: Physical Education Students' Perceptions." Brillo Journal 4(1):27–38. doi: 10.56773/bj.v4i1.58.

Nabiilah, Nur, and Heru Subrata. 2021. "Development of Articulate Storyline 3-Based Interactive Media for Javanese Language Instruction on the Topic of 'Unggah-Ungguh Basa' for Grade 4 Students at MI Darunnajah." Jurnal PGSD Unesa 9(7):2802–15.

Nanda Khairani Batubara, Reflina. 2022. "Analysis of Students' Mathematical Problem-Solving Skills in the Linear Programming Topic Based on Intelligence Quotient Levels." 11(2):180–92.

Ni Putu Ayu Listiani, Harry Soeprianto, Nilza Humaira Salsabila, and Sri Subarinah. 2024. "The Effectiveness of Articulate Storyline 3-Based Interactive Learning Media on the Mathematics Learning Outcomes of 11th-Grade High School Students." Journal of Science Education 14(3):682–92. doi: 10.37630/jpm.v14i3.1761.

Nurwahid, Mohammad, Hendro Permadi, and Hery Susanto. 2022. "Students' Mathematical Problem-Solving Process Based on Polya's Stages in Quadrilaterals, Examined from the Perspective of Adversity Quotient." JNPM (National Journal of Mathematics Education) 6(4):639. doi: 10.33603/jnpm.v6i4.6967.

Oktaviandi, Jefri, and Masniladevi. 2025. "Development of Articulate Storyline 3 Interactive Multimedia Based on the PBL Model in Pancasila Education Instruction for Fifth-Grade Elementary School Students." Jurnal Pendidikan Tambusai 9:2838–47.

Permana, Jeni, Muhamad, et al. 2023. "Fun Mathematics Learning in Elementary School Through Games." Journal of Mathematics Education 2(3):41–60.

Raudho, Ziadatul, Tutut Handayani, and Syutaridho. 2020. "Analysis of Problem-Solving Skills in Pythagorean Problems." Suska Journal of Mathematics Education 6(2):101–10.

Resma Wahyuni, Firdaus L.N, Riki Apriyandi Putra, Mariani Natalina Linggasari, Putri Adita Wulandara, Mellani Fadilah. 2025. "Development of Interactive Learning Media Using Articulate Storyline 3 to Facilitate Students' Mathematical Problem-Solving Skills in High School Statistics." Journal of Educational Sciences 9(2):876–85.

Rofiqoh, Ainur, and Ismi Khairani. 2024. "The Role of Interactive Media in Improving Students' Learning Motivation in SKI Subjects at Madrasah Ibtidaiyah." 9(1):63–71.

Rusi Ulfa Hasanah, Tanti Jumaisyaroh Siregar. 2022. "Profile of Prospective Mathematics Teachers' Abilities in Developing Instructional Materials During Microteaching." 29(1):92–107. doi: https://dx.doi.org/10.30829/tar.v29i1.1367 ARTICLE.

Rusmayana. 2021. The ADDIE Learning Model Integrating Pedati at SMK PGRI Karisma Bangsa as a Substitute for Field Work Practice During the Covid-19 Pandemic. Bandung.

Sakinah, Anastasia Putri, Nurlaeli, Miftahul Husni. 2025. "Development of Baamboozle Educational Game-Based Interactive Media for Indonesian Language Lessons in Grade VI at Mi Tarbiiyah Islamiyah Palembang." Journal of Elementary Education 10.

Siti Aminah, Riska Putri Meilani, Muhammad Ali Shodiqin. 2023. "The Effect of Lecture and Cooperative Learning Models on Mathematical Problem-Solving Skills in Elementary School." Journal of Educational and Language Research 4(1):88–100.

Suci Dahlya Narpila, Siti Fatimah Sihotan. 2022. "Improving Problem-Solving Skills Through the Calculator-Assisted Inquiry Learning Model." Mathematics Education Innovation 4(2):76–85. doi: 10.31851/indiktika.v4i1.7625.

Wahyuni, Indah, Sherly Shela Anggraini, and Raudatul Mardiya. 2024. "Analysis of Students' Difficulties in Solving Social Arithmetic Problems." Academy of Education Journal 15(1):169–75. doi: 10.47200/aoej.v15i1.2087.

Wahyuni, Sri, Zainur Rasyid Ridlo, and Dwi Nova Rina. 2022. "Development of Interactive Learning Media Based on Articulate Storyline to Enhance Critical Thinking Skills of Junior High School Students on the Solar System." Journal of Science & Science Education 6(2):99–110. doi: 10.24815/jipi.v6i2.24624.

Wulandari, Amelia Putri, Annisa Anastasia Salsabila, Karina Cahyani, Tsani Shofiah Nurazizah, and Zakiah Ulfiah. 2023. "The Importance of Learning Media in the Teaching and Learning Process." Journal on Education 5(2):3928–36. doi: 10.31004/joe.v5i2.1074.