A NEW APPROACH TO ELEMENTARY LEARNING: AN INTERACTIVE DIGITAL MODULE FOR CRITICAL THINKING WITH ARTICULATE STORYLINE

Yuli Mulyawati*), Elly Sukmanasa, R. Teti Rostikawati, Nurafifah Deas Maharani, Aisyah Nur Azizah

Universitas Pakuan, Bogor, Indonesia

*)*e-mail korespondensi: yuli_mulyawati@unpak.ac.id*

***Riwayat Artikel** : diterima: 3 Desember 2024; direvisi: 6 Desember 2024; disetujui: 11 Desember 2024*

Abstract.

This research aims to develop an interactive digital module based on Articulate Storyline to improve the critical thinking skills of elementary school students. A research and development (R&D) approach with the ADDIE model is used in the development of this module, which includes the stages of needs analysis, interactive module design, development, implementation and evaluation. The research was conducted in fifth grader at one of state elementary school, Bogor City. The results of the expert validation show the feasibility of the material (90%), media (87%) and language (85%), which fall into the category of "very feasible". The effectiveness test through pre-test and post-test showed significant improvements in the aspects of analysis (N-Gain 0.63), Evaluation (N-Gain 0.75), creativity (N-Gain 0.80), and problem solving (N-Gain 0.79). Student responses to the module have been overwhelmingly positive, with an approval rate of 92% for interactivity and 90% for ease of use. This module has been shown to be effective in improving critical thinking skills through interactive features such as simulations, quizzes, and multimedia elements. In conclusion, Articulate Storyline-based modules support 21st century learning by integrating interactive technology to create a satisfying and meaningful learning experience. This research makes an important contribution to the development of innovative learning media to improve students' critical thinking skills at the elementary school level.

Keywords: interactive digital modules; articulate storyline; critical thinking; elementary school.

PENDEKATAN BARU DALAM PEMBELAJARAN SD: MODUL DIGITAL INTERAKTIF UNTUK BERFIKIR KRITIS DENGAN ARTICULATE STORYLINE

Abstrak. Penelitian ini bertujuan untuk mengembangkan modul digital interaktif berbasis Articulate Storyline untuk meningkatkan kemampuan berpikir kritis siswa SD. Pendekatan penelitian dan pengembangan (R&D) dengan model ADDIE digunakan dalam pengembangan modul ini, yang meliputi tahapan analisis kebutuhan, desain modul interaktif, pengembangan, implementasi dan evaluasi. Penelitian dilakukan di kelas lima pada salah satu sekolah dasar negeri kota Bogor. Hasil validasi ahli menunjukkan kelayakan materi (90%), media (87%) dan bahasa (85%), yang termasuk dalam kategori "sangat layak". Uji efektivitas melalui pre-test dan post-test menunjukkan peningkatan yang signifikan pada aspek analisis (N-Gain 0,63), Evaluasi (N-Gain 0,75), kreativitas (N-Gain 0,80), dan pemecahan masalah (N-Gain 0,79). Tanggapan siswa terhadap modul ini sangat positif, dengan tingkat persetujuan 92% untuk interaktivitas dan 90% untuk kemudahan penggunaan. Modul ini telah terbukti efektif dalam meningkatkan keterampilan berpikir kritis melalui fitur interaktif seperti simulasi, kuis, dan elemen multimedia. Kesimpulannya, modul berbasis Articulate Storyline mendukung pembelajaran abad ke-21 dengan mengintegrasikan teknologi interaktif untuk menciptakan pengalaman belajar yang memuaskan dan bermakna. Penelitian ini memberikan kontribusi penting bagi pengembangan media pembelajaran yang inovatif untuk meningkatkan kemampuan berpikir kritis siswa di tingkat sekolah dasar.

Kata Kunci: modul digital interaktif; articulate storyline; berpikir kritis; sekolah dasar

I. INTRODUCTION

In the digital era, elementary school learning needs innovation to accommodate the needs of 21st century learning that emphasizes critical thinking skills, collaboration, communication, and creativity. One of the biggest challenges in the education system is the lack of effective use of interactive learning media to improve students' critical thinking skills at the elementary level. According to Team and Unesco (2023), Most primary schools in developing countries have not yet harnessed the potential of technology to fully improve student learning outcomes.

Facts show that the use of interactive digital modules can increase students' motivation to learn. Research from Setiawan (2021) This shows that digital modules based on multimedia technology can increase student learning outcomes by 23%. However, a national survey from the Ministry of Education and Culture (2021) found that only about 25% of teachers in Indonesia use digital interactive media in learning, mainly due to limited access and technical skills.

Articulate Storyline is one of the media development platforms that offers interactive features to facilitate competency-based learning. A study by Rofiah *et al.*, (2024) said that the use of Storyline Articulate in learning increased student engagement by 30% compared to conventional methods. According to the Central Statistics Agency (2022)

Volume 16, Nomor 02, Desember 2024, Hal. 97 -102
e-ISSN: 2460-2175

About 63% of elementary school students in Indonesia have access to digital devices, but only 15% are exposed to interactive modules as an introductory medium. A study by Widodo, et al. (2020) found that students who learned using digital modules based on Articulate Storyline showed an improvement in critical thinking skills of up to 25%, compared to traditional methods. According to the Busemeyer *et al.*, (2023), students exposed to technology-based learning showed a higher level of analytical ability, with an average increase in PISA scores of 10%.

Although some studies have shown the effectiveness of digital media in learning, there is still a gap in the development of modules specifically designed to improve the critical thinking skills of primary school students. Most of the digital modules available today still focus on delivering material without supporting interactivity and in-depth exploration.

At the primary school level, critical thinking skills are an important foundation for developing analytical, evaluation, and problem-solving skills in different contexts. However, several studies and the results of interviews and observations at partner schools, at one of state elementary school in Bogor City, show that students' critical thinking skills in elementary schools are still at the basic level, especially because learning methods are less diverse and have not utilized technology optimally. Traditional static learning modules are often unable to capture students' attention and encourage their active involvement in the learning process.

Interactive digital modules have emerged as one of the potential solutions. Articulate Storyline, as one of the interactive learning content development software, offers various features that allow the creation of learning modules that are dynamic, engaging, and according to the needs of students. However, research on the effectiveness of interactive digital modules that use special articulated storylines to improve students' critical thinking skills in primary schools is still limited. Therefore, this study aims to develop an interactive digital module using Articulate Storyline that can improve the critical thinking skills of elementary school students.

The innovation of this research is the development of a digital module based on Articulate Storyline, which is specifically designed to improve the critical thinking skills of elementary school students through a problem-based approach and interactive tasks, the integration of automatic assessment elements that provide direct feedback to students, using interactive multimedia features that support visual, Audio, Audio Visual and kinesthetic learning at the same time.

Based on the research background, the formulation is how to design and develop interactive digital modules using Articulate Storyline that are effective in improving students' critical thinking skills in elementary school?

This study aims to develop and test the effectiveness of interactive digital modules based on Articulate Storyline in improving the critical thinking skills of elementary school students. This module is designed to support the development of critical thinking skills among elementary school students, with an emphasis on the integration of technology in daily learning, as well as adaptation to the needs of students with various backgrounds and abilities, including children with special needs (ABK). In addition, this study also aims to evaluate the ease of module implementation in elementary school classrooms and provide recommendations for the development of technology-based curriculum in Indonesia.

By utilizing technologies that are already familiar among students and teachers, this research can help improve students' critical thinking skills, which are indispensable in facing global challenges and rapid technological developments. The development of critical thinking skills at the elementary level is an important foundation for learning at a higher level and also for the development of better life skills (Irwan *et al*., 2024; Shavkatovna, 2021; Hidayati, *et al.*, 2021).

This research also has the opportunity to enrich inclusive education practices in Indonesia. With modules designed according to the needs of all students, including ABK, it is hoped that it can increase diversity and equality in education. Storyline Articulate offers an easily accessible platform that allows the development of learning media that can adapt to learners' skills and learning pace (Viola & Waldi, 2023).

This study provides insight into how the use of storyline-based articulation modules can be adapted to the learning strategies of elementary school teachers. This will help improve digital teacher literacy which can support the effectiveness of technology-based learning (Toma & Reinita, 2023). By improving teachers' ability to use technology to teach critical thinking, Indonesian education can move towards more progressive learning and respond to student needs.

The research also has the potential to contribute to Indonesia's education policy, which focuses on integrating technology into learning and developing a curriculum that is more adaptable to the times. The results of this study can be the basis for the development of digital modules that are more widely used in Indonesia, especially in elementary schools, to support the achievement of the national goal of a more inclusive and quality national education (Sunarni & Karyono, 2023; Nurrita, 2018).

II. RESEARCH METHOD

This research uses a Research and Development (R&D) approach with the ADDIE model to develop an interactive digital module based on the Articulate Storyline that aims to improve students' critical thinking skills in elementary school. This research was carried out in Class V of SDN Bhayangkari, Bogor City.

Volume 16, Nomor 02, Desember 2024, Hal. 97 -102
e-ISSN: 2460-2175

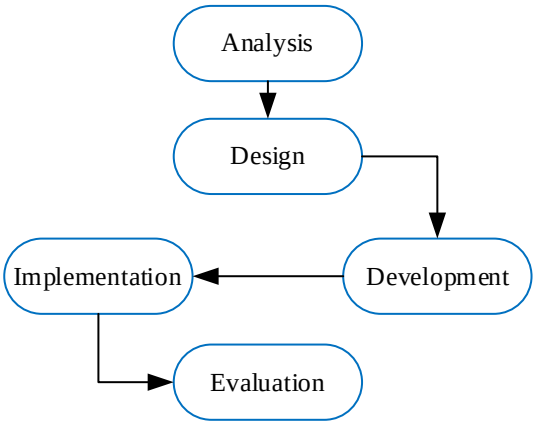

Figure 1. Research Flow Chart

The stage of this research initially by analysis the needs. Identify learning needs to improve critical thinking skills of fifth grader students. Then, review the curriculum and relevant materials for the development of articulate storyline-based modules. After analysis, the next stage is design. In this stage, modules were designed with interactive elements such as quizzes, simulations, and problem-solving tasks. Designing visual and multimedia performances to increase student motivation.

The third stage is development. In this stage, modules were designed using articulate storylines with content suitable for class V. Then, the modules were developed by limited testing for students to ensure the functionality and effectiveness of the modules. In these stages, there are the validation of module by several steps, for instance: 1) feasibility study that conduct a needs analysis through interviews and questionnaires for teachers and students in elementary schools. 2) module development by construct the prototype modules using Articulate Storyline software. 3) expert validation which invite material experts, learning media experts, teachers to validate modules and linguists. 4) limited trials that module trials are conducted in small classes (15 students). Data were obtained through observations, questionnaires and critical thinking tests before and after using the module. 5) expanded trial which is the trial is extended to some schools with 50-100 students.

After the modules is valid and reliable, the module was implemented in class V at SDN Bhayangkari, Bogor City, with teacher supervision and teaching as implementation stages. Students are given interactive assignments designed to practice critical thinking skills. Then, the learning activity were evaluated as evaluation stages to measuring the improvement of students' critical thinking skills through pre-test and posttest. Collect feedback from students and teachers to assess the effectiveness of the module and make revisions if necessary.

This research uses a Research and Development (R&D) approach with ADDIE modified as needed. The instruments used include: 1) questionnaire which is measuring students' and teachers' perceptions of the module. Contains a likert scale (1–5) that evaluates the ease of use, visual appeal, material relevance, and level of interactivity. 2) critical thinking test that consists of 10-15 case study-based questions. Regarding to indicators of critical thinking skills, such as analysis, evaluation, and synthesis (Ennis, 2011). 3) observation which is taken by observation sheet to record student activities when using modules in learning. The aspects observed include participation, problem solving, and collaboration. 4) structured interview which is conducted to teachers and students to get qualitative input regarding the strengths and weaknesses of the module. 5) expert validation was assessed by expert validation instruments include the feasibility of the module's content, display, and technicalities.

The data analysis carried out is divided into quantitative data analysis and qualitative data analysis. Quantitative data analysis taken by questionnaires and critical thinking tests that were analyzed by using descriptive and inferential statistical tests (t-dependent tests or rating tests drawn by Wilcoxon) to determine significant differences before and after the intervention. The reliability and validity test by the tool was tested for reliability with cronbach alpha and validity using factor analysis. The Qualitative data analysis was taken from observations data and interviews that were analyzed using thematic analysis techniques. Key codes have been developed based on field findings, such as technical barriers, student responses, and learning management.

The use of this method allows researchers to understand not only the effectiveness of the module in improving critical thinking skills, but also how teachers and students respond to technology in learning. The combination of quantitative and qualitative data provides a comprehensive overview of the implementation of interactive digital modules based on the Articulate Storyline.

III. RESULTS AND DISCUSSION

The study uses a Research and Development (R&D) methodology that aims to develop an interactive digital module based on the Articulate Storyline to train students' critical thinking skills as a new approach to learning in primary school.

A. Validity of Material, Media, and Language Eligibility

The validity test was carried out by three experts (material, media, and language) with the following results:

TABLE 1. Feasibility Test Results

Validity aspect	Due Diligence	Category
Material	90%	Highly Worthy
Media	87%	Highly Worthy
Language	85%	Highly Worthy

The validation results show that this digital module has an excellent or very feasible level of feasibility in all aspects.

B. Effectiveness Test

The product trial was carried out on 30 students with pretest and posttest methods to measure the improvement of critical thinking skills. Here are the results of the pretest and posttest:

TABLE 2. Effectiveness Test Results

Volume 16, Nomor 02, Desember 2024, Hal. 97 -102
e-ISSN: 2460-2175

Aspects	Pre-Test (%)	Post Test (%)	N-Gain
Analyze	60%	85%	0.63 (Moderate)
Evaluation	58%	82%	0.57 (Medium)
Interpretation	62%	88%	0.68 (Medium)
Total	60%	85%	0.63 (Moderate)

The data showed a significant improvement in students' critical thinking skills after using the interactive digital module.

A questionnaire was given to assess students' responses to the use of the module. Result:

TABLE 3. Student Responses to the Use of Modules

Statement	Approval percentage (%)
Engaging and interactive modules	92%
Helps understand the material	88%
Increase motivation to learn	90%

TABLE 4. Improvement of Students' Critical Thinking Skills

Critical thinking indicators	Module activity description	Skor pre test (%)	Post test score (%)	N-Gain (%)	Kriteria N-Gain
Analysis	Identify important information from modules through interactive activities such as drag-and-drop.	45	80	63	Keep
Evaluation	Evaluate the arguments from the case studies in the module by choosing an answer based on evidence.	40	85	75	Tall
Creativeness	Formulate alternative solutions to the problems simulated in the module.	50	90	80	Tall
Troubleshooting	Complete scenario-based challenges with logical steps.	42	88	79	Tall

Based on the data above, it shows an increase in the level of critical thinking of students seen from the pre-test and post-test that have been carried out where the results indicate that the analysis with N-Gain 63 is in the medium criterion, the evaluation with N-Gain 75 with the High criterion, the Creativity with the N-Gain 80 High criterion and the Problem Solving with the N-Gain 79 with the High criterion.

Meanwhile, based on the results of the questionnaire distributed to students, it shows:

TABLE 5. Student Responses to the Interactive Digital Module

Assessment aspects	Positive response (%)	Negative response rate (%)	Note
Visual display	95	5	Students love eye-catching designs and colors.
Module Interactivity	92	8	Interactive features such as quizzes and simulations are considered useful.
Ease of Use	90	10	The modules are easily accessible, but some students need initial guidance.
Material relevance	94	6	The material is in line with the needs of learning and critical learning.

The use of interactive digital modules based on Articulate Storyline in elementary school learning offers a new approach to encourage students' critical thinking skills. The results show that the use of this module has a significant impact on improving students' ability to analyze, evaluate, and synthesize at various learning levels.

The use of interactive digital modules based on Articulate Storyline has been proven to be effective in improving the critical thinking skills of elementary school students based on the data mentioned above with material aspects 90% achievable, media 87% achievable, language 85% achievable. According to Mayer (2020), the use of interactive digital media can increase the attractiveness of learning and student engagement. Fitriani *et al.*, (2023) found that a technology-based approach helps improve higher-order thinking skills in elementary school students. The results of the validity test show that the designed material is very relevant to the needs of students. The increase in the N-Gain score of 0.63 indicates the effectiveness of the module in improving critical thinking skills. The high level of student approval of this module shows that the interactive digital module is able to create a fun and meaningful learning experience.

Articulate Storyline-based modules support student engagement through interactive features such as quizzes, problem-based scenarios, and simulations. Research by Septianita *et al.*, (2023) confirms that a problem-based approach combined with interactive technology can improve critical thinking skills by up to 40% compared to traditional methods.

This module supports the implementation of 21st century learning that emphasizes the mastery of critical thinking skills. Adiwidjaja (2021) stated that interactive digital media can significantly increase student learning motivation. Wilson, (2023) found that technology-based digital learning facilitates the development of critical thinking skills. This module allows for the adaptation of learning to the individual needs of students. This is in line with the research

Volume 16, Nomor 02, Desember 2024, Hal. 97 -102
e-ISSN: 2460-2175

of Bang & Flynn, (2023) which shows that personalized learning media can improve motivation and learning outcomes. Articulate Storyline allows the integration of various multimedia elements, such as videos, images, and animations, so that students can better understand the concepts. According to Izhar *et al.,* (2022), this integration can reduce teaching time by up to 20% without reducing the quality of learning.

Safira *et al.,* (2021) emphasized the importance of interactive design in digital modules to attract students' attention. This Articulate Storyline-based module has been proven to be effective in improving students' critical thinking skills. This is in line with research by Shé, (2021) which found that interactive media can improve student engagement and learning outcomes. Azrillia *et al* (2024) showed that Articulate Storyline is an effective tool in supporting competency-based learning. The digital module approach is effective in improving students' critical thinking skills. Most students respond positively, especially on the visual representation and interactivity aspects of the modules, which are believed to increase their motivation to learn. This module supports critical learning according to the literature, such as in

IV. CONCLUSION

Based on the results of the research that has been carried out, the research developed an interactive digital module based on Articulate Storyline to improve the critical thinking skills of elementary school students. This module has been shown to be effective in improving critical thinking skills through interactive features such as simulations, quizzes, and multimedia elements. In conclusion, Articulate Storyline-based modules support 21st century learning by integrating interactive technology to create a satisfying and meaningful learning experience. This research makes an important contribution to the development of innovative learning media to improve students' critical thinking skills at the elementary school level. One of the main challenges is the ability of teachers to use the Articulate Storyline software. An intensive training program is needed to ensure that teachers can make optimal use of this module. This research makes an important contribution to the field of elementary education, especially in developing learning media by providing innovative and relevant learning models for the 21st century, improving student competencies where this module not only improves cognitive abilities but also promotes digital literacy in students, educational support policies through the results of the study can be used as a basis to develop supportive education policies teaching and learning. based on technology.

REFERENCES

Adiwidjaja, S. (2021). Game-based tools for enhancing cognitive development in children with autism spectrum disorder. *Journal of Special Needs Education Research*, *33*(2), 231–248.

Azrillia, W., Oktaviyanthi, R., Khotimah, K., & Garcia, M. L. B. (2024). Feasibility test of articulate storyline 3 learning media based on local wisdom for optimizing students' algebraic thinking skills. *Jurnal Penelitian Pendidikan*, *27*(1), 1-15.

Bang, H. J. Li L., & Flynn, K. (2023). Efficacy of an adaptive game-based math learning app to support personalized learning and improve early elementary school students' learning. *Early Childhood Education Journal*, *51*(4), 717-732.

Busemeyer, M. R., Gandenberger, M., Knotz, C., & Tober, T. (2023). Preferred policy responses to technological change: Survey evidence from OECD countries. *Socio-Economic Review*, *21*(1), 593-615.

Ennis, R. H. (2011). The nature of critical thinking: an outline of critical thinking dispositions and abilities. Retrieved : https://education.illinois.edu/docs/default-source/faculty-documents/robert ennis/thenatureofcriticalthinking_51711_000.pdf

Fitriani, E., Roemintoyo, R., & Sarwanto, S. Android-based digital mathematics learning media for elementary school students: preliminary study. *In Social, Humanities, And Educational Studies (SHES): Conference Series*, *6*(2), 117-123.

Hidayati, A. R., Fadly, W., & Ekapti, R. F. (2021). Analisis keterampilan berpikir kritis siswa pada pembelajaran IPA materi bioteknologi. *Jurnal Tadris IPA Indonesia*, *1*(1), 34-48.

Irwan, I., Arnadi, A., & Aslan, A. (2024). Developing critical thinking skills of primary school students through independent curriculum learning. *Indonesian Journal of Education (INJOE)*, *4*(3), 788-803.

Izhar, G., Wardani, K., & Nugraha, N. K. (2022). The development enviromental literacy media learning for elementary school student. *Journal of Innovation in Educational and Cultural Research*, *3*(3), 397-404.

Karchmer-Klein, R., & Konishi, H. (2023). A mixed-methods study of novice teachers' technology integration: Do they leverage their TPACK knowledge once entering the profession? *Journal of Research on Technology in Education*, *55*(3), 490-506.

Khasanah, K., Rahanra, N., & Susanty, L. (2021). Challenges of e-learning development and implementation in remote indonesia: educational development analysis. *International Research Journal of Management, IT and Social Sciences*, *8*(5), 497-505.

Mayer, R. E. (2020). *Multimedia Learning (3rd ed.)*. Cambridge University Press.

Nurrita, T. (2018). Pengembangan media pembelajaran untuk meningkatkan hasil belajar siswa. *Jurnal misykat*, *3*(1), 171-187.

Rofiah, N. H., Sinta, T. N. A., & Dewi, R. (2024). Development of articulate storyline media for enhancing learning outcomes in natural and social sciences among elementary school students. *Al-Bidayah: Jurnal Pendidikan Dasar Islam*, *16*(1), 19-40.

Safira, A. D., Sarifah, I., & Sekaringtyas, T. (2021). Pengembangan media pembelajaran interaktif berbasis web articulate storyline pada pembelajaran IPA di

kelas V sekolah dasar. *Prima Magistra: Jurnal Ilmiah Kependidikan*, *2*(2), 237-253.

Septianita, R., Suharini, E., Widiyatmoko, A., Marwoto, P., & Mulyono, S. E. (2023). Interactive modules containing problem-based learning with socioscientific issues on the water cycle material. *Jurnal Penelitian Pendidikan IPA*, *9*(5), 2462-2471.

Setiawan, A. (2021). Problem based learning (PBL) model for the 21st century generation. *In Social, Humanities, and Educational Studies (SHES): Conference Series*, *4*(6), 290-296.

Shavkatovna, S. R. (2021). Developing critical thinking in primary school students. *Conferencea*, 97-102.

Shé, C. N. (2021). *Students' engagement with technology-enhanced resources in first year non-specialist undergraduate mathematics modules*. National University of Ireland.

Sunarni, S., & Karyono, H. (2023). Persepsi guru terhadap implementasi kurikulum merdeka belajar di sekolah dasar. *Journal on Education*, *5*(2), 1613-1620.

Team, G. E. M. R., & Unesco. (2023). *Global education monitoring report: Technology in education: A tool on whose terms?* UNESCO Publishing.

Toma, A. A., & Reinita, R. (2023). Pengembangan media pembelajaran canva berbasis model problem based learning di kelas iv sekolah dasar. *Sekolah Dasar: Kajian Teori Dan Praktik Pendidikan*, *32*(2), 162-177.

Viola, F. O., & Waldi, A. (2023). Pengembangan media interaktif articulate storyline 3 berbasis problem based learning di kelas v sekolah dasar. *E-Jurnal Inovasi Pembelajaran Sekolah Dasar*, *11*(1), 78-88.

Widodo, S. F. A., Wibowo, Y. E., & Wagiran, W. (2020, December). Online learning readiness during the Covid-19 pandemic. *In Journal of physics: conference series*, *1700*(1), 012033. IOP Publishing.

Wilson, M. L. (2023). The impact of technology integration courses on preservice teacher attitudes and beliefs: A meta-analysis of teacher education research from 2007–2017. *Journal of Research on Technology in Education*, *55*(2), 252-280.