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Development of Web-Based Komsa Media to Facilitate Logical Thinking and Reading Habits At Elementary School Level

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Abstract: Science lessons often involve conceptual material that requires visualization to facilitate students' understanding. In the fifth grade science learning process, it was found that students had difficulty understanding the subject, lacked enthusiasm for reading, and the learning media used were monotonous and uninteresting. Consequently, this affected students' logical thinking abilities. The purpose of this research is to determine the feasibility and effectiveness of the Science Comic (KOMSA) media as a tool to facilitate the logical thinking abilities and reading habits of fifth-grade students in elementary school, specifically on the topic of the water cycle. This study is a developmental research using the 4D approach (define, design, develop, disseminate) with a one-group pretest-posttest design technique conducted at Pangudiluhur Ambarawa Elementary School. The discussion results obtained an average percentage of 87%. The trial results indicated that the learning media falls into the category of high effectiveness with a percentage of 77.18%. Therefore, the Science Comic (KOMSA) as a learning media is deemed suitable and effective for facilitating logical thinking abilities and reading habits.

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Introduction

Advances in science and technology are considered to have a significant impact, especially on the learning process in the era of the industrial revolution 4.0. The development of learning processes certainly varies for each subject, adapting to the nature or concept of the particular subject. The more abstract a subject is, the more challenging it becomes to teach its concept to students. One such subject is science, which encompasses numerous conceptual materials that require visualization to facilitate students' understanding. In the process of learning science, emphasis is placed on providing direct experiences to develop students' competencies with the hope of fostering thinking skills, scientific attitude, and an understanding of the universe.

The success in delivering science lessons is inseparable from the role of educators in delivering material and selecting appropriate learning media according to the needs. Learning media in education and the teaching and learning process are crucial and plays an important role in the development of students in school so that the knowledge and material they receive from a teacher can be absorbed effectively. In line with research conducted by Anggit

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Grahito et al. (2017), it is stated that the use of teaching media is more effective in improving students' learning outcomes.

Based on a survey conducted by the Program for International Student Assessment (PISA) released by the Organization for Economic Co-operation and Development (OECD) in 2019, Indonesia ranks 62nd out of 70 countries, making it is one of the 10 countries with lowest literacy rates. One media that can be used to support the literacy improvement movement and visualize science material is comic media. The attractive appearance and easily understandable language have made comics a frequently used tool in classrooms for decades. Reading comics involves complex writing, and using comics will help students become critical text readers.

As we know, comic media has undergone various kinds of developments alongside technological advancements. Comics, initially in print, are now comics presented in web format. According to research conducted by the Asosiasi Penyelenggara Jasa Internet Indonesia (APJII) (*Indonesian Internet Service Providers Association*) in collaboration with the Pusat Kajian Komunikasi (PusKaKom) (*Center for Communication Studies*) at the University of Indonesia (UI), the number of internet users in Indonesia reached 88 million people by the end of 2014. Web-based learning is part of utilizing the internet in the field of education and involves learning activities that make use of websites accessible through the internet network.

Based on the results of observations and interviews conducted by the researcher with fifth-grade students on May 11, 2022, the researcher found that:

1. Students find it difficult to understand the subject of science.
2. There is a lack of enthusiasm for reading among the students.
3. The learning media used is monotonous and less engaging.
4. The average learning outcomes of students are low.

Methods

This research employs an experimental research method using a one-group pretest-posttest design with data collection techniques involving test sheets, interviews, observations and documentation. This study includes 37 students as respondents. The following is a table of the treatment used in this research:

Pretest	Treatment	*Posttest*
X_1	O	X_2

Table 1. Treatment

The variables examined in this research are science comics (KOMSA), logical thinking, and reading habit. According to Gusmanto and Tara (2019), the framework for science comics (KOMSA) includes visual appearance, content, language feasibility, and efficiency. This research uses the 4D model approach as follows:

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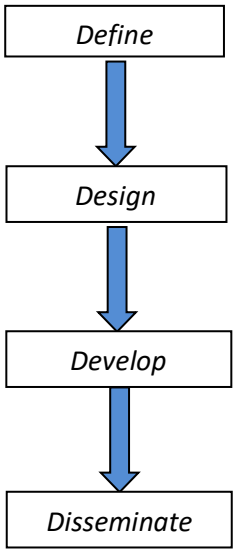

Figure 1. Chart of 4D Development Research Model

Before conducting hypothesis testing, the existing data undergo normality and homogeneity tests using the Komologrov-Smirnov test and homogeneity test. This is done to demonstrate that the data is normally distributed and homogeneous. Subsequently, a t-test is conducted using a paired sample t-test using SPSS version 21 to determine the influence of the pre-post test within a specific group.

Results and Discussion

This study has conducted an analysis of the need for web-based science comic media (KOMSA) to facilitate logical thinking skills and reading habits on the water cycle topic in fifth-grade elementary school, involving 37 students as respondents. Data were collected through interviews, questionnaire distribution, and test sheets. The interview results indicated that there were several topics that were difficult to understand due to their abstract nature, including the water cycle topic, and the learning media used were monotonous. This finding is supported by previous research stating that comic media is an alternative that can motivate and facilitate students in learning and understanding mathematical concepts (Farapatana et al., 2019: 2). The following are the learning media that have been developed:

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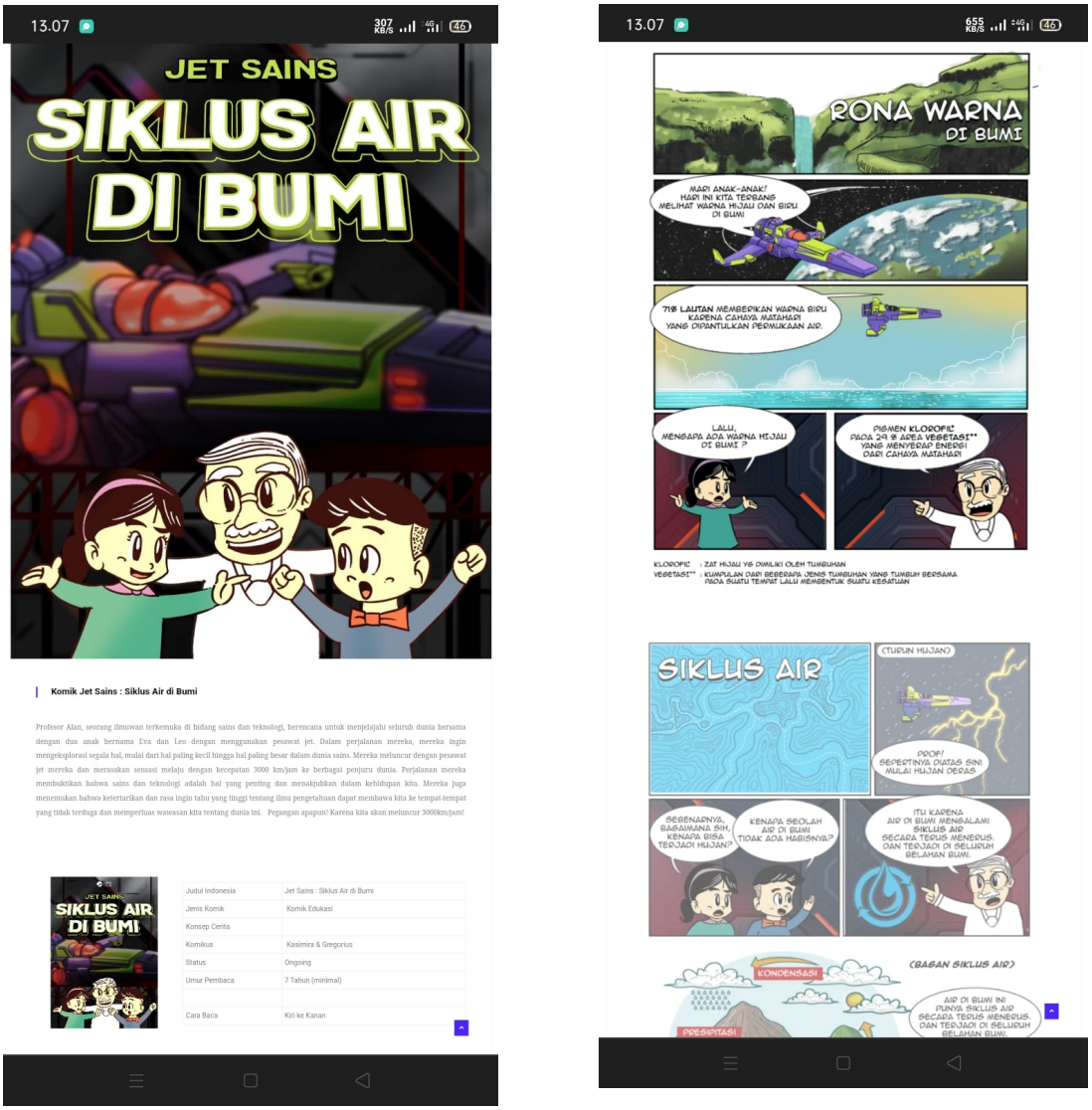

Figure 2. Web-based Science Comic Media (KOMSA)

Subsequently, the results of the questionnaire distribution are are as follows:

Table 2. Validity of Content and Media Experts

Validator	Point Total	Result	Feedback
Content Expert	90 points	Suitable for research use	Content needs further development. Embed assignments in the form of projects.
Content Expert	90 points	Suitable for research use	Enhance color contrast. Pay attention to the selection of font types and sizes.

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Add cases to the story.

This research employed a pre-post test, and the following diagram illustrates the outcomes of the conducted pre-post test:

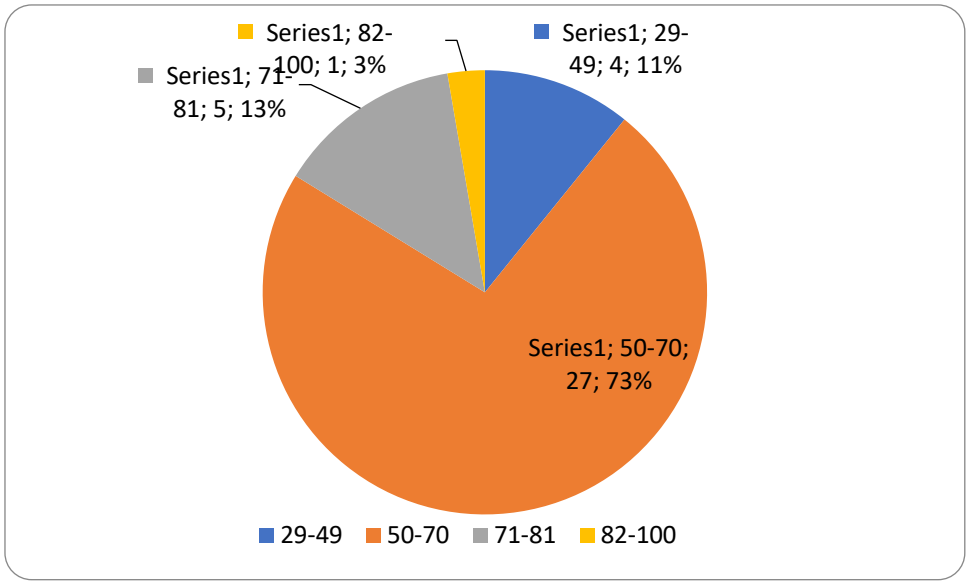

Figure 3. Pre-test Score Result

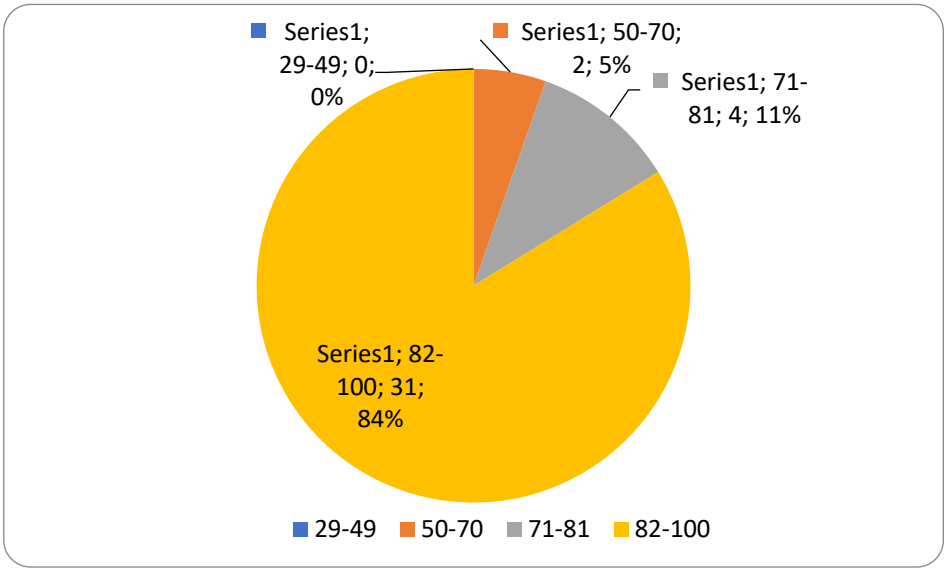

Figure 4. Post-test Score Result

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The table below shows the results of the Paired Sample T-test calculation:

Table 3. Paired Sample T-test

		Mean	N	Std. Deviation	Std. Error Mean
Pair 1	Pretest	60.73	37	13.401	2.203
	Posttest	90.32	37	12.166	2.000

		Paired Differences							
					95% Confidence Interval of the Difference				
		Mean	Std. Deviation	Std. Error Mean	Lower	Upper	T	Df	Sig.(2-tailed
Pair 1	Pretest – Posttest	-29.595	13.710	2.254	-34.166	-25.023	-13.130	36	.000

The mean calculation for the pretest was 60.73, and for the posttest, it was 90.32, indicating a narrower distribution and a lower error rate. Additionally, the significance value of 0.000 implies that the web-based Science Comic (KOMSA) is considered capable of enhancing reading habits and logical thinking, with an n-gain score of 77.18%, categorized as very high. This is reinforced by the findings of Darusalam (2015), revealing that web-based learning reduces a static learning environment, thereby creating an engaging, effective, interactive, and motivating learning process. The Likert scale calculation results are presented below.

Table 4. Likert Scale Calculation Results

No	Validator	Criteria	Validation Result
1.	Content Expert	104	90
		100%	87%
		Conclusion	Suitable for research use
		Advice	In the future, additional content can be added and aligned with the new curriculum.
2.	Media Expert	104	90
		100%	87%
		Conclusion	Suitable for research use
		Advice	In the future, it can be developed into a digital format (including sound and moving animations).

Based on the results of the feasibility test of web-based Science Comics (KOMSA), upon examining the content, visual design, navigation, and the language used, KOMSA demonstrates good quality as a supplementary learning media, with a calculated Linkert scale of 87%. This aligns with the assumption made by Musfiroh (2018), asserting that that comic media is expected to be able to assist students in understanding study material.

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Several aspects were improved in the development of the web-based Science Comic (KOMSA) media, namely: 1) Color contrast, 2) Selection of word colors, 3) Comic descriptions on the website, and 4) Correction of words.

Disccussion

The Science Comic (KOMSA) is considered a suitable learning media for use in the learning process. This is evidenced by the mean calculation for the pretest being 60.73 and for the posttest being 90.32, with a narrower distribution and lower error rate. Additionally, the significance value of 0.000 indicates that the web-based Science Comic (KOMSA) is perceived to effectively enhance reading habits and logical thinking, with an n-gain score of 77.18%, categorized as very high.

The feasibility test results for the web-based Science Comic (KOMSA) on the topic of the water cycle, when considering content, visual design, navigation, and language, indicate good quality and suitability for use as a supplementary media. The Likert scale calculation yields a score of 87%. The depth of the content in the Science Comic (KOMSA) meets the required basic competencies, and assignments in the form of projects can be completed by students. Furthermore, the web-based Science Comic (KOMSA) is considered capable of being used as a supplementary media for students' learning. The material on the water cycle in the Science Comic (KOMSA) is easy to understand, enjoyable to learn, promoting reading habits, and the schemas presented in the comic enable students to think logically.

Conclusion

Based on the needs analysis, the web-based Komik Sains (KOMSA) learning media is considered suitable as a supplementary tool to facilitate logical thinking and reading habits. In addition, the web-based Science Comic (KOMSA) learning media proves to be an effective medium for use at the elementary school level.

Recommendation

In light of this research, several recommendations for further development research include: First, researchers are expected to be able to address the identified shortcomings in the web-based Comic Science (KOMSA) learning media. Second, product testing should be conducted with reliable facilities and infrastructure, especially with stable and fast internet availability to enable quicker image buffering. Third and finally, further advanced research is encouraged, exploring different topics to facilitate logical thinking and reading habits in elementary school, especially in fifth-grade classrooms.

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