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The Influence of Local Potential-Based Comic Media on Environmental Literacy and Students' Conceptual Understanding

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Abstract: This research aims to determine (1) the influence of local potential-based comic media on environmental literacy and students' conceptual understanding in high schools in West Sumbawa Regency and (2) the differences in environmental literacy and conceptual understanding of students in the two experimental classes. The research follows a Pre-Experimental design with a one-group pre-test and post-test design. The population includes all high school students in West Sumbawa Regency, with a sample of 38 students from Class XI at SMA 1 Taliwang and SMA 2 Taliwang. Research instruments include questionnaires and tests, where the questionnaire measures students' environmental literacy, and the test evaluates students' conceptual understanding. Data analysis employs N-Gain and t-test. N-Gain is utilized to assess the impact of local potential-based comic media on environmental literacy and conceptual understanding, while the t-test is applied to identify differences in environmental literacy and conceptual understanding between the experimental classes. The research findings indicate that implementing local potential-based comic media significantly influences environmental literacy and conceptual understanding in both experimental classes, with an N-Gain value of 0.5 in the moderate category. Further analysis reveals no significant differences in conceptual understanding and environmental literacy between the two experimental schools (Sig > 0.05).

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Introduction

Learning is a process to achieve educational goals involving various elements such as educators, students, facilities, equipment, and others (Lyesmaya & Saepuloh, 2015). The learning process occurs progressively, moving from simple to complex. To make learning more meaningful, instructional media such as storybooks or other light reading materials can assist learning (Zaini, 2015). Additionally, the choice of instructional media should be appropriate and tailored to the student's educational levels, ensuring easy comprehension of the subject matter (Enawaty & Sari, 2010). Media plays a strategic role in the learning process and holds a significant position in its utilization (Rizal & Maharani, 2015). Rizal and Maharani (2015) further explain that instructional media serves as a tool to enhance student learning motivation, emphasizing the importance of engaging and appealing media. Comic or illustrated books are examples of instructional media that can boost students' learning motivation.

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Comics are a learning resource that conveys coherent and enjoyable messages (Handayani, 2010). They construct a storyline by utilizing space in a medium to arrange non-moving images, forming a narrative (Enawaty & Sari, 2010). Enawaty & Sari (2010) stress that school-used comics should educate and motivate students. One subject suitable for comic-based instructional media is coral reefs. Coral reefs, a prominent natural resource of West Nusa Tenggara Province (Sukri et al., 2017), are recognized as highly complex, productive, distinctive ecosystems with diverse high-biodiversity inhabitants. Coral reefs play vital roles in marine ecosystems and the well-being of communities, especially shallow-sea fishermen (Ayyub et al., 2018). Additionally, coral reefs serve as coastal protectors from erosion and degradation, providing bioactive substances crucial in medicine and pharmacy (Santoso, 2010). Packaging coral reef ecosystem material into comic-based instructional media is essential to provide insight and conceptual understanding to students about coral reefs and enhance their environmental literacy.

Environmental literacy, the study of the relationship between humans and the environment, is also known as 'environmental awareness.' Through environmental literacy, students understand the environment, enabling them to maintain balance and sustainability (Deswari, 2015). Comic-based instructional media rooted in local potential is believed to enhance environmental literacy and students' conceptual understanding of coral reefs. However, there is currently limited literature on this subject. This research aims to describe the results of implementing local potential-based comic media in revealing environmental literacy and conceptual understanding among students.

Research Method

This study adopts a Pre-experimental research design. While incorporating a control group, it is essential to note that this setup may not fully function to control external variables that could influence the experiment's implementation (Sugiyono, 2015). The research design employs a one-group pre-test and post-test design to assess the effects or influences before and after the treatment. The detailed research design is presented in Table 1.

Table 1. Research Design

Class	Pre-Test	Treatment	Post-Test
SMA 1 Taliwang	P1	X1	P2
SMA 2 Taliwang	P1	X2	P2

Description:
X1, X2 : Learning using comic media
P1 : Pre-test of conceptual understanding and environmental literacy
P2 : Post-test of conceptual understanding and environmental literacy

The research sample comprises two high schools in West Sumbawa Regency: SMA Negeri 1 Taliwang (Experimental Class 1) and SMA Negeri 2 Taliwang (Experimental Class 2). The sample was selected using the random sampling technique implemented during the academic year 2019/2020. This study employed questionnaires and test instruments. The questionnaire was utilized to assess students' environmental literacy, while the test was used to measure students' conceptual understanding. The Environmental Literacy questionnaire comprised 25 statements, including 20 positive and five negative statements. The questionnaire provided four response options: 1 = strongly disagree, 2 = disagree, 3 = agree, and 4 = strongly agree. Scores were then categorized on a nominal scale to measure N-gain.

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The conceptual understanding test consisted of 25 multiple-choice questions. The data were converted into N-gain scores and classified into three categories, as presented in Table 2.

Table 2. Classification of N-gain Scores

No	Score	Categories
1	< 0,3	Low
2	0,3 ≥ n ≤ 0,7	Medium
3	≥ 0,7	High

Result and Discussion

The Influence of Comic Media on Environmental Literacy and Conceptual Understanding

To determine the impact of local-based comic media on the environmental literacy and conceptual understanding of students in the experimental group, an N-gain analysis was conducted. The results of the N-gain analysis for both research variables and the experimental class are presented in Table 3.

Table 3. Results of N-gain Analysis in Both Experimental Classes

Variable	N-gain		Categories
	SMAN 1 Taliwang	SMAN 2 Taliwang	
Conceptual Understanding	0.5	0.5	Medium
Environmental Literacy	0.4	0.5	Medium

Table 3 shows that the N-gain values for the conceptual understanding variable in each experimental school fall into the moderate category, with respective values of 0.5. Similarly, the Environmental literacy variable is also in the moderate category with values of 0.4 and 0.5. These N-gain values can serve as references to understand the influence of independent variables on the tested dependent variables (Sukri et al., 2020a). The research results indicate that implementing local-based comic media influences students' conceptual understanding and environmental literacy. The findings align with Sukri et al.'s (2020b) discovery that green education-based comic media can enhance students' understanding of coral reefs. This is further supported by subsequent findings that local-based comic media can enhance students' conservation attitudes towards coral reefs (Sukri et al., 2020c). Additionally, Marlina et al.'s (2020) study shows that comic media influences students' scientific literacy, a notion strengthened by Widiyanto et al.'s (2021) revelation that comic media influences an increase in students' environmental sensitivity. This research reinforces these findings, indicating the influence of comic media on students' conceptual understanding and environmental literacy. The influence of this coral comic media is presumed to be because it makes learning materials easier for students to comprehend, presented in visually appealing graphic formats (Purwanto & Widodo, 2022). Moreover, comic media makes learning enjoyable (Kristina et al., 2023) and sparks enthusiasm for students to engage in learning (Dwimarta et al., 2014).

Differences in environmental literacy and conceptual understanding of students in each experimental class

Prerequisite Test

Normality and homogeneity prerequisite analyses were conducted before hypothesis testing. The results of the prerequisite analysis are presented in Table 4.

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Table 4. Results of homogeneity and normality tests for each variable

Variabel	Homogeneity-test				Normality test		
	Levene Statistic	df1	df2	Sig.	Statistic	Df	Sig.
Environmental Literacy	1.137	1	36	.293	.257	21	.001
Conceptual Understanding	.313	1	36	.579	.169	21	.120

After the prerequisite analysis, hypothesis testing using the t-test was conducted to determine the differences in conceptual understanding and environmental literacy among students in both experimental classes. The results of the t-test analysis are presented in Table 5.

Table 5. Results of the t-test for each variable in the experimental classes.

Variabel		Levene's test for equality of variances		t-test for equality of means		
		F	Sig.	t	df	Sig. (2-tailed)
Environmental Literacy	Equal variances assumed Equal variances not assumed	1.137	.293	.830	36	.412
Conceptual Understanding	Equal variances assumed Equal variances not assumed	.313	.579	.781	36	.440

Table 5 indicates no significant difference in the Environmental Literacy scores and conceptual understanding scores among students in both experimental classes (Sig. > 0.05). This could be attributed to two factors, namely internal and external factors. Internally, both experimental classes likely possessed a sufficiently strong initial understanding of conceptual comprehension and Environmental Literacy, leading to the analysis showing no significant difference in scores between the experimental classes. Additionally, geographical conditions are an external factor contributing to the absence of differences in students' Environmental Literacy between the two experimental classes. This is because both experimental classes are located in proximity to the sea, providing students with an early understanding of how to preserve and protect the environment, especially coral reefs. A similar observation was reported by Sukri et al. (2020a), revealing that the geographical conditions of the school influence differences in students' attitudes towards coral reef conservation. The closer the school is to the sea, the more positive students' attitudes towards coral reef conservation, and vice versa.

Conclusion

The research results indicate that implementing local-based comic media influences students' environmental literacy and conceptual understanding in both experimental classes, with an N-gain value of 0.5 in the moderate category. Further analysis suggests that there is no significant difference in the conceptual understanding and environmental literacy of students in both experimental schools (Sig > 0.05).

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