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DEVELOPMENT OF COASTAL ABRASION-BASED MODULES INTEGRATED IN CHEMICAL MATERIALS

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Abstract

Indonesia is an archipelago surrounded by the coast. The coastal abrasion happened in many places in Indonesia, including the Aceh province. This research was conducted to find out how the school community perceives coastal abrasion, especially on corrosion. The study captures the student's perspectives by assessing a module-based disaster mitigation that is integrated in chemistry lessons in SMA Negeri 1 Peukan Bada, a school that is located in the coastal area in the Aceh Besar District. This study revealed that the integrated module has been effective in strengthening the students' understanding of coastal abrasion. It found that 87.5% of students acknowledge the process and the importance of the prevention efforts to avoid more abrasion in the coastal area. The study also indicated that 79.2% of students recognise that the school will face a serious problem if the school community responds to the efforts in preventing abrasion that occurred around the school environment. It needs more serious efforts from the school community to reduce the impact from the coastal abrasion and make the school a safer place for students.

Keywords: Student Knowledge, Abrasion, disaster mitigation module, Chemistry

1. Introduction

Indonesia is well known as a maritime country because it has large sea waters and the second longest coastline in the world. Indonesia is located between two oceans and two continents. Indonesia consists of 17,499 islands with an area of 5.9 million square kilometers and a coastline of ±81,000 square kilometers (Pusat Hidrografi dan

Oceanografi, 2004). Preservation and utilization in coastal areas or preservation of marine ecosystems can cause damage in coastal areas, such as abrasion. Therefore, beaches in Indonesia often cause abrasion, including in Aceh Province. Schools located on the coast of Aceh are frequently damaged by abrasion. There are as many as ± 404 schools located on the coast of

Aceh.

Abrasion is a process of eroding the shore caused by the tides of the sea that can damage the shoreline. Damage to the beach is caused by two factors, namely natural symptoms and human activities. Human actions can cause abrasion such as sand collection on the beach used for building materials. In addition, such as the felling of trees on the beach is also the cause of the occurrence of beach abrasion quickly (Suryani, 2014).

Integrated chemistry learning has a close approach in learning and can integrate chemistry with other sciences (Lantz, 2009). Based on our previous study, there is a correlation between the occurrence of corrosion caused by abrasion around SMAN 1 Peukan Bada. Aceh Besar regency is one of the districts located in Aceh in the northern and western waters of Aceh. Aceh has a coastline of 344 km with an area of sea waters reaching 2,796 km² and has 21 small islands (Muchlisin, 2012). Integrated chemical learning is designed so that students can improve knowledge, develop behaviors and skills to be applied in daily life both in school and their environment. In order to support students' knowledge, teachers are required to use instructional media, like modules.

Modules are one of learning media that is presented systematically as an infrastructure used for teaching materials, making it easy for students to understand and learn without teachers (Mutmainah, 2016). A good learning module must

have criteria that are understood by learners simply. Teachers are required to be more creative and innovative in developing learning modules (Puspita, et al., 2021). and Hence, they will not find any difficulties in reading, because it help them to grab information that has been listed, Besides that, the module also contain interesting images to increase the interest of asking users when reading, and the knowledge and information presented in the book must be in accordance with both of the prevailing curriculum and the rules of the times (Kusuma, 2018).

A few students assume that modules are equated with books. Basically, one of their similarities is based on presentations that aim to attract students in learning. In fact, the material provided in the module is very textual, so it reduces levels of interest when read by students (Yusro & Sasono, 2016). According to the issues, the usual module must be developed before it is used as alternative and supporting learning media. The development of modules is very important because it is an alternative way that can help the learning process of students. Thus, they will get useful knowledge and information in order to increase either their interest or knowledge.

This study was conducted to find out how the state of schools around the coast is affected by abrasion that causes corrosion. Besides that, this research also aims to find out the influence on the development of coastal abrasion disaster

mitigation-based modules integrated in chemicals. If this research is compared to previous study which only discussed abrasion in general, while this study discusses abrasion involving school communities located on the beach.

Corrosion is another name for rusting. Corrosion erosion is a type of corrosion due to mechanical processes of relative movement between the flow of gases or corrosive liquids with metals. Rough and sharp parts that will be susceptible to corrosion. Corrosion erosion can also be caused due to impingement corrosion that is due to very heavy fluid and can erode the protective film on the metal that causes metal corrosion (Handoko, 2012)

Based on the problem and research objectives, this study has several research questions: (1) how is the response of teachers and students to face abrasion?; (2) how is the knowledge of the school community around the beach regarding abrasion?; and (3) how are their efforts to overcome and avoid abrasion?

2. Method

The study uses quantitative methods to analyze student responses. Research using quantitative methods is done by analyzing numerical data (numbers) and using statistical calculation (Reza, et al., 2021). This research is a kind of case study that is called an observational case study. Observation is a technique of

collecting data obtained through an observation, and accompanied by recording of a target object and the observed state (Fatoni, 2011).

The study was conducted at SMA Negeri 1 Peukan bada, Aceh besar in 2021. The population in the study was high school student 1 Peukan bada. The sample was third year students in SMA Negeri 1 Peukan Bada.

3. Result and Discussion

a. Result

The data collection technique used is a questionnaire. Questionnaire is a collection of information by delivering a number of statements to be answered by respondents in accordance with their knowledge. Questionnaire is a data collection technique that is done by sharing a set of written questions to respondents to answer them.

Table 1. School Community Questionnaire Score

Answer Options	Score
S (Agree)	4
TS (Disagree)	3
SS (Strongly agree)	2
STS (Strongly disagree)	1

The instrument used in the study was a questionnaire to dig up information about school community knowledge about corrosion caused by

abrasion. The questionnaire caused in this study consisted of 15 statements representing indicators of an aspect of assessment. Based on the results of the questionnaire that has been filled by respondents, each respondent's answers vary widely so that it is necessary to calculate the average value of the entire statement.

b. Discussion

This research was conducted at SMA Negeri 1 Peukan Bada, Aceh Besar Regency. This research was conducted to find out the development of coastal abrasion disaster mitigation-based modules integrated in chemicals.

3.1 Knowledge of teachers and school students against abrasion and corrosion.

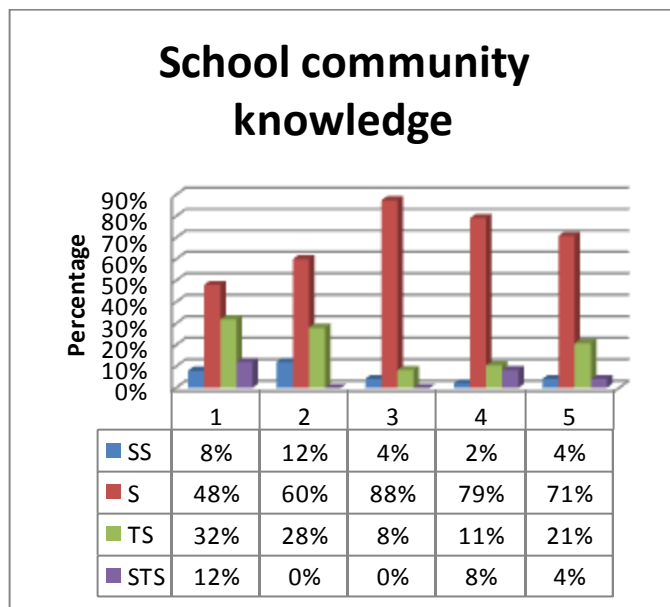


Figure 1. The percentage of teachers and students knowledge

Knowledge of teachers and students in schools is one of the factors used to determine the response to abrasion and corrosion around the

school environment. Based on the analysis of data obtained from teachers and school students, the highest percentage reached 88% agree, while the lowest percentage reached 8% disapprove. It states that the knowledge of teachers and school students against the occurrence of abrasion and corrosion has a high level of knowledge.

Knowledge of teachers and students has a higher and more accurate level of knowledge, so guidance is needed for disaster mitigation modules as a reference to add insight into abrasion and corrosion. The module covers several things related to abrasion and corrosion so that students can develop the knowledge gained from the results of the module and can apply appropriate ways to counter corrosion around the school environment.

Knowledge is the result that occurs after a person sensing a particular object. Knowledge determines a person's actions. Education is carried out to conduct learning to discuss several things related to facts that occur in the environment. Knowledge and education are very important to prevent and minimize the impact of disasters (Notoatmodjo, 2007).

3.2 Response of teachers and students when facing abrasion

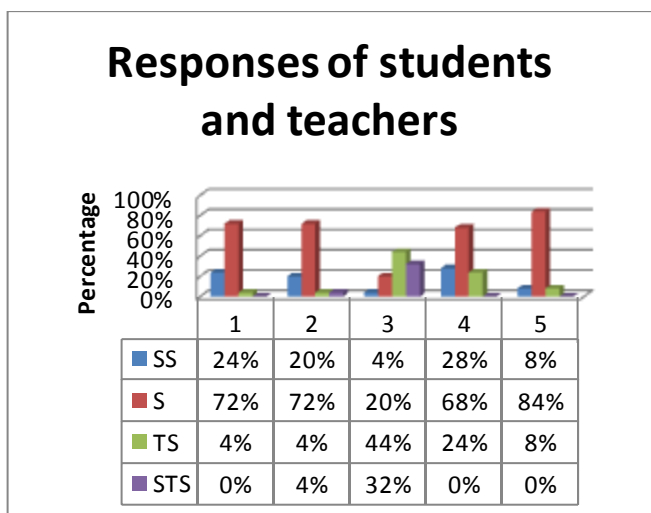


Figure 2. The percentage of teacher and student responses regarding abrasion

Based on the analysis of the data above states that the response of teachers and students when facing beach abrasion has an average result with the highest percentage reaching 84% agreeing teacher and student response to efforts and countermeasures and prevention of abrasion and corrosion. While the average result with a percentage of 4% disapprove of teachers and students who do not respond or do not participate in efforts to counter and prevent abrasion and corrosion that occurs around the school environment.

The response of teachers and students will be increasing with high knowledge and broad insights. High knowledge then gives a positive response to the occurrence of abrasion caused by several natural and human factors. Disaster mitigation modules related to the prevention of abrasion and corrosion with these modules can know how to prevent abrasion and corrosion

around the school. It states that teachers and students respond and participate when facing abrasion.

Response is the behavior of a person who is influenced by the presence of stimuli and responses from environmental factors. While the student's response is the reaction or behavior of students in participating in learning activities. The response can be seen if it involves the five senses to pay attention or observe the object of observation. There are several factors that can affect the response, namely experience, individual values and the learning process. Therefore, the need for reading resources in learning so that it can encourage and help students in understanding learning materials (Arini, 2019)

3.3 Efforts of the school community in overcoming abrasion to avoid corrosion

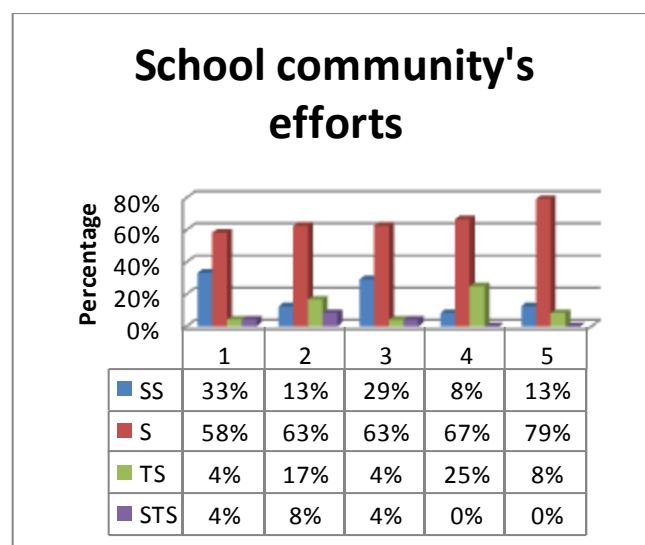


Figure 3. The percentage of teachers and school students effort to overcome and avoid abrasion

Based on the analysis of data on the efforts of teachers and school students in overcoming abrasion to avoid corrosion, the data obtained percentage reached 79% agreed while the percentage reached 4% disapprove. It states that the efforts of the school community in overcoming abrasion to avoid corrosion have a high percentage value.

A high percentage are affected by disaster mitigation modules as a guide to knowledge materials on how to prevent and countermeasures that are carried out as an early stage of prevention around the school environment. Disaster mitigation modules can add extensive knowledge and insight into abrasion and corrosion.

Efforts that can be made about abrasion are planting mangrove trees on the beach while corrosion can be done in prevention by making metal guides (stainless steel) and coating the metal with chrome (chromium plating), repainting around the school that is corroded. While efforts to prevent abrasion that can be done are planting mangrove trees on the beach, filling sand, erecting the walls of beach protective buildings along the coastline, and waves breaker (Apriyanti, 2021).

3.4 Effectiveness of modules

Modules are used as teaching materials in the learning process. This module can be applied in schools to help the teaching and learning process can be seen from some of the data above showing the effectiveness of the module. The

module as a teaching material provides extensive knowledge and insight into abrasion and corrosion disaster mitigation modules containing abrasion, corrosion, and prevention factors. This module can improve students' thinking skills to be more creative and active in the learning process. The development of disaster mitigation modules is able to increase students' knowledge of theoretical theory innovations contained in the discussion, but students are easier to understand.

The module that has been developed explained about the factors that affect abrasion, prevention and overcoming abrasion as well as factors that affect corrosion, prevention and overcoming corrosion so as to increase student knowledge. Based on the school community response data that has been collected stated that this module is worth using as teaching materials that help learners in the learning process.

Learning modules are developed to facilitate use by teachers and students so that learning is meaningful, interesting and useful for student life and can increase the creativity of learners in learning. The effectiveness of modules can be seen from the achievement of a learning goal by using products developed for the learning process. The module's effectiveness test is an experiment to find out the feasibility that exists in development research (Muhidin, 2009).

E. Conclusion

Based on the results and discussion, it can be concluded that the influence of the

development of coastal abrasion-based modules integrated in chemicals can increase the knowledge of the school community on the occurrence of abrasion and know how to prevent corrosion. The school community has also made efforts to combat abrasion to avoid corrosion.

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