The analysis of senior high school student’s prior knowledge in coastal area to the abrasion

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Abstract. As an archipelago country, Indonesia has many beach lines which are the fourth-longest in the world, and in fact, the coastal areas had damaged by some natural phenomena, such as abrasion. One of the available strategies which would give an understanding of abrasion is integrating this disaster knowledge in a certain lesson at school. Physics is one of the subjects which is suitable to give understanding about abrasion. This is because physics includes various disaster phenomena. The effort to do this is achieved by an e-book. Developing a physics e-book with abrasion theme, it is necessary to analyse the student’s knowledge about abrasion. This study used the descriptive method, and the subjects are those who live near a coastal area, Senior High School 1 Nan Sabaris students. Samples were selected by random sampling techniques. The student’s prior knowledge was tested by a questionnaire that consisted of eleven questions. From the analysis, it can be said that student’s prior knowledge about abrasion can be categorized as a low level, in the C rate (Enough). This result shows that the physics e-book using abrasion theme need to be developed.

1. Introduction
Indonesia is one of the archipelago countries whose ocean is wider than the acreage, it is proved by its coastline that reaches 104,000 km [1]. But, in 2011 the length of coastline in Indonesia decreased to 99,093 km [2]. Increasing population growth along with the rapid development activities such as settlements, fisheries, ports, tourism objects in the coastal areas put ecological pressure on ecosystems, coastal resources and ocean resources. Because the coastal area is the transitional area that is very vulnerable to be affected by the changes of land and sea.

West Sumatra is a province in Indonesia which located along the western coast of central Sumatra and the Bukit Barisan plateau in the east. Population density based on the results of recapitulation of districts/cities in the province reached 4,773.81 people / km² with the population growth reaching 6.88% [3]. The population growth was followed by the exploitation of coastal areas which were used as residential and industrial areas, which later became one of the causes of the vulnerability of this area to environmental damage such as abrasion disasters. Abrasion disasters can harm the facilities and infrastructures of the coastal area [4].

Various efforts have been made by the government to reduce this risk. One of the efforts is to make Government Regulation which explains that to reduce the impact caused by natural disasters, it is necessary to have disaster mitigation that can be carried out by local governments in the formal, non-formal and informal education. One of the available strategies which would give an understanding of
abrasion is integrating this disaster knowledge in a certain lesson at schools. One of the subjects that can be integrated with natural disasters is physics because the main purpose of Physics is to explain reasonably the phenomena that occur in the [5]. Based on the mandate of the curriculum and the applicable regulations, a local context has to be integrated into the learning material through learning resources. The local context about abrasion disasters can be integrated into learning resources in the form of teaching materials.

The application of technological advances in today’s learning can be in the form of information and communication technology (ICT) processes and products to solve education and learning problems [6]. One of the uses of ICT in learning is developing the teaching materials in electronic forms, such as electronic books (e-books). The advantages of the e-book are the ease to be carried everywhere, easily accessible, and more economical to be duplicated and distributed [7].

In each stage of the development of the e-book, an initial analysis is needed. The development research requires many stages, of which the first stage is preliminary research, which is an analysis that seeks out the initial needs, the reference needs, and the theory [8]. For these reasons, to develop physics e-book with abrasion theme, it is necessary to analyse knowledge from students about abrasion. One of the preliminary analyses that need to be done in developing teaching materials is the analysis of students [9]. At this stage, the characters of students who are targeted by the users of the product being developed are analysed. The characteristics include the prior knowledge, attitudes, feelings of students, and student preferences about the product being developed. In this study, the variable studied was only prior knowledge. The student's prior knowledge is knowledge had by students which related to the learning topic [10]. Because the product to be developed is an integrated physics abrasion e-book, the prior knowledge that needs to be done is the prior knowledge of abrasion disasters.

2. Research Method
This research used a quantitative descriptive method. Descriptive is one of the research methods that used to describe the information, characteristic or status of the research object [11]. The data collection technique used is the questionnaire technique. The questionnaire technique is one of data collection techniques that uses an instrument containing some written questions [12]. The questionnaire used was an open questionnaire, namely an open questionnaire that did not provide answers to those given, so the respondents had the freedom to answer them.

This study was conducted on June 2019. The subjects are the students who live near the coastal area, the population of students in Senior High School 1 Nan Sabaris, Padang Pariaman Regency, West Sumatra Province. The samples are a portion of the members of the population that are considered representative, which are 33 students. Samples were selected by random sampling technique. This technique took out the samples randomly without regard to the strata in the population [12].

The student's prior knowledge questionnaire to the abrasion that was used as an instrument in this research consisted of four indicators and was developed into eleven questions to measure the rate of the students knowledge. The result of this questionnaire research is qualitative data. It consists of Very Good rate, Good rate, Enough rate, and Less rate [12]. Then the results of these data analysis are converted into quantitative data, namely in the form of assessment scores, with Very Good: 4, Good: 3, Enough: 2, and Less: 1.

Score analysis was determined by dividing the total scores with the maximum scores. In percentage it is expressed by equation 1:

\[ P = \frac{A}{B} \times 100\% \]  

With:
\[ P \] = Percentage
\[ A \] = Scores obtained
\[ B \] = Ideal scores
The categories of the analysis are shown in Table 1.

| Interval Score  | Category  |
|-----------------|-----------|
| 75%-100%        | Very Good |
| 50%-74.99%      | Good      |
| 25%-49.99%      | Enough    |
| 0-24.99%        | Less      |

### 3. Results and Discussion

This research resulted the data of students prior knowledge who live near the coastal areas to the abrasion disaster. The knowledge of the abrasion disaster will be contained in the physics e-books that will be developed. Based on the corresponding questionnaire consisted four different indicators, namely knowledge of abrasion, cause of abrasion, the disaster risk and disaster management, the student’s prior knowledge can be described through Figure 1 as follows.

**Graph of Student's Knowledge about Abrasion Analysis**

![Figure 1. The Results of the Knowledge Abrasion Analysis for Each Indicators](image)

As can be seen in Figure 1, the level of knowledge of students is categorized into four levels, they are Very Good, Good, Enough, and Less. The average score for the indicator number 1 (five question variables testing knowledge about abrasion) is 39.70%, that for indicator number 2 (two question variables testing knowledge about the causes of abrasion) is 33.71%, that for indicator number 3 (two question variables testing about the disaster risk) is 30.30%, that for the last indicator (two question variables testing the disaster management) is 37.12%. The result showed that all indicators are classified in C rate (Enough). While the percentage of the average is 35.21%. This result is relevant to the result of the research done by Aulyana and Fauzi that showed that the response attitudes of the students to the abrasion disaster was in less category [4].

The students prior knowledge is very important to give an information about how extent the students understanding the natural disaster phenomena which is a part of physics learning [10]. This information will be used for the next research. In order to mitigate the disaster so many efforts could be done, integrating the disasters into a learning material for example. This is relevant to the Rahmawati, Fauzi and Syafriani research about the implementation of the learning materials integrated one of natural disasters could improve the preparedness of the students to the disasters [14]. Another
research that integrated the disaster into the learning material is the effect and contribution of integrated students worksheet coastal abrasion materials to the student’s competence, and it showed that the contribution was very strong [15].

Based on that data, it appears that students do not have sufficient knowledge about abrasion, which can be one of the threats for them as coastal communities. Therefore, the sufficient knowledge is necessary, as it would affect them in preventing and reducing the risk of abrasion, especially for students who live in disaster-prone areas. Knowledge of this disaster will be integrated into the learning of Physics through e-books.

4. Conclusion
The results of the research showed that there was still a lack of knowledge of students about abrasion disasters. The rate of prior knowledge of the students in Senior High School 1 Nan Sabaris analyzed was categorized as a low rate (in Enough category), with the percentage was 35.21%. So, it shows that it is necessary to develop the physics e-book using abrasion theme to improve the knowledge of the students who live near the coastal areas.

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