

# AP 6

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# Development of Disaster Geography Teaching Materials Due to Microorganisms for Geography Education Undergraduate Students

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## ABSTRACT

From the perspective of geography, the concept of biological disaster, especially concerning human health, can be viewed from the distribution and environmental conditions. Distribution is caused by the dynamics of the mobility of humans and certain animals. While the environment plays a role in conditions that allow viruses or bacteria to survive longer. The purpose of the study was to compile the contents of disaster materials caused by microorganisms with the perspective of geographical studies and to determine the feasibility of material for disasters caused by viruses in the perspective of geographical studies to be prepared as teaching materials in the form of handouts. The research method uses a modified R&D from Borg and Gall. The research flow that will be carried out includes needs analysis, initial product development, expert validation, limited trials, and product revisions. The instruments measured include the perspective of geography, case examples, language, pictures, layout, instructional, task, and motivation. Descriptive analysis by describing the data that has been processed using tables and graphs as well as explanations of the data in collaboration with concepts and previous research. The results show that the content and structure of the material, the handout teaching materials are from the perspective of geographical studies. Contents have presented the distribution of disease facts at international and national levels, as well as physical and human environmental factors as the cause of the distribution. Handout teaching materials deserve to be tested in learning because the feasibility level is high. This is because the measured variables show 80% to 87%. Based on the conclusion, this research provides suggestions that the content still needs improvement in the aspect of disaster risk. In addition, limited trials are needed face-to-face in class.

**Keywords:** teaching, materials, microorganism, disaster, geography, feasibility

## 1. INTRODUCTION

The Disaster Geography course has long been developed as material in the undergraduate geography education program. In general, these materials are based on geosphere phenomena, as material objects for geography. Geosphere phenomena that cause disaster vulnerability include the lithosphere, pedosphere, hydrosphere, atmosphere, biosphere, and anthroposphere. The lithosphere triggers volcanic eruptions, earthquakes, tsunamis. The pedosphere is one of the triggers of landslides. The hydrosphere triggers floods, and so the atmosphere triggers floods and storms. For the anthroposphere in general, it is a disaster due to social conflict. For biosphere disasters, including pest outbreaks that threaten crops.

From a geographic perspective, the concept of biological disasters, especially those concerning human health, can be viewed from the distribution and environmental conditions. Distribution is caused by the dynamics of the mobility of humans or certain animals. While the environment plays a role in conditions that allow viruses or bacteria to survive longer.

In the world of health, the existence of microorganism outbreaks that cause human casualties is widely known as an extraordinary event (*Kejadian Luar Biasa / KLB*) or a pandemic. An outbreak occurs in a certain area, while a pandemic occurs on a broader regional scale such as throughout the country or the world. This situation can be compared to a disaster following the concept of Law of the Republic of Indonesia Number 24 of 2007 concerning

Disaster Management [1]. A disaster is an event or series of events that threatens and disrupts people's lives and livelihoods which are caused, either by natural factors and/or non-natural factors as well as human factors, resulting in human casualties, environmental damage, property losses, and psychological impacts.

The absence of teaching materials and materials that discuss disasters caused by microorganisms in a geographic perspective is more because the geosphere phenomena studied so far are mostly in the physical and human aspects. Biological disaster aspects that have been studied are more on multi-celled creatures as pests to plants. Meanwhile, microorganisms in the form of viruses or bacteria are still very rarely studied by geographers. The covid-19 pandemic incident made us aware of the need for a rather in-depth study related to this health disaster.

For the study of geography education, the development of teaching materials related to disasters still focuses on hydro-climatology and geology. Teaching materials that discuss disasters caused by biology specifically related to human health have not been found. Based on this background, this study aims to be as follows. First, compiling content on disasters caused by microorganisms following the perspective of geographic studies. Second, knowing the feasibility of teaching materials for disaster handouts due to limited microorganisms to be tested.

2. METHODS

The procedure used is a modification of Borg and Gall (1983) [2]. The method includes the following five steps. (1) Analyzing the needs of the product to be developed, (2) developing the initial product, (3) expert validation and revision, (4) small-scale trials and productrevisions, and (5) large-scale trials and final products. This research only reaches Step 4.

Analysis of product needs was carried out on respondents consisting of geography education lecturers, geography teachers, and undergraduate geography education students. The instrument used is an ordinal measure with a Likert scale. The instruments include: (a) geographic perspective, (b) case examples, (c) language, (d) pictures, (e) layout, (f) assignments, (g) material flow, and (h) motivating. Handout validation was carried out by experts who were lecturers with expertise in educational technology and expertise in health geography. The sample of the small-scale trial was the 5th semester of S1 Geography Education students who were conducted online.

The analysis was carried out descriptively by describing the data that had been processed using tables

and graphics with Excel software. The percentage of the number of criteria from the respondents indicates the level of feasibility for use in small-scale learning. The data processing weight obtained is grouped into five classes of feasibility handouts for preparation as teaching materials on a small scale and a basis for large-scale trials. Table 1 presents this.

Table 1. Handout criteria for eligibility for preparation as teaching materials

No.	score	%	criteria
1	8 - 11	33 - 47	Very low
2	12 - 15	48 - 65	Low
3	16 - 19	66 - 80	Moderate
4	20- 23	81 - 96	High
5	24	97 - 100	Very high

3. RESULTS AND DISCUSSION

Analysis of teaching material needs is made following the demands of competencies that must be mastered by students. These competencies are arranged based on the needs in the real life of the community. The current corona event that is felt by the public has made them realize that biological disasters due to viruses have not been widely developed as teaching materials.

For the question of the need to develop material for biological disasters due to viruses, 36 respondents or 94.4% agreed that it needed to be developed. Based on this, it shows that biological disasters due to viruses are a necessity that must be present in disaster geography studies. This material can later complement the material for disasters due to hydro-climate, geology, and social issues.

Given that there are many types of virus hosts that can cause disasters, the next question is whether the material being developed includes all viruses or only part of it. Answer Concerning this, it shows that 94.4% agreed that all types of viruses need to be studied. These results determine the existence of 3 studies on the dangers of microorganisms that cause the diseases discussed, namely dengue fever, tuberculosis, and corona.

The next question is related to the existence of virus-induced disaster material in the study of disaster geography. There are 80.6% of respondents who agree that in geography studies there have not been many studies on disasters due to viruses. in disaster geography studies have not discussed biological disasters due to viruses.

Product development is carried out based on the concept of a geographic study structure. Disaster geography is a response to geosphere phenomena that cause danger in the earth's surface. Figure 1 illustrates the

relationship between the concept of biological disasters in geography.

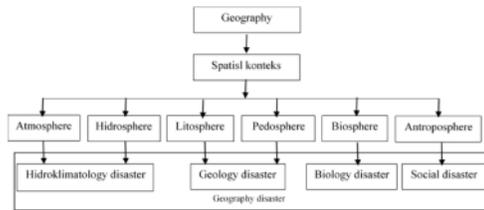


Figure 1. The relationship between the concept of biological disasters in geography

Furthermore, the product is validated. The validation results after a single revision of teaching materials show a score of 87% of health geography material experts and 91% of educational technology experts. This score has shown the feasibility of high teaching materials, meaning that it is feasible to be tested.

Field trials produce answers to questions that are indicative of learning outcomes. Problem 1 is included in the type of low-level thinking skills. Questions 2 and 3 fall into the types of high-order thinking skills.

The results of the answers to work on the questions show that 80% of students with a value of > 80 are dominant in question 1 of low-level thinking skills. For questions on the type of high-order thinking skills, only 47% and 33% were fulfilled. This shows that student learning outcomes are still dominant in solving low-level thinking problems rather than high-level thinking problems. If it is related to this handout teaching material, it can be stated that the handout teaching material has not been able to encourage students to think at high levels. Figure 2 presents the learning outcomes.

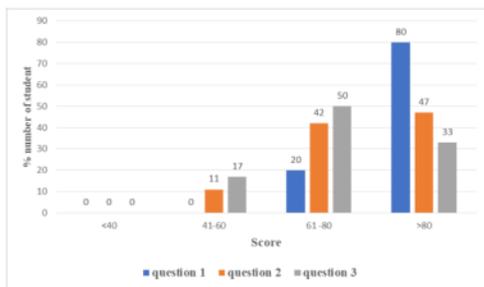


Figure 2. Learning outcomes are based on the percentage (%) of the number of students at a certain grade-level achievement. Problem 1 is the type of low-level thinking problem and question 2 and 3 types of high-order thinking problem

Within the limitations of this handout teaching material, many things that can be presumed have not been able to encourage students think at high levels. However, when viewed from the feasibility level of the handout teaching materials, the handout teaching materials have a high level of feasibility. This can be seen from the high percentage of 46%. Meanwhile, very high is only 17% lower than moderate, which is 26%. Likewise, there are still those who have a low to a very low opinion of 11%. The achievement of feasibility is very high, indicating that the teaching material still has weaknesses. Figure 3 presents the feasibility level of handout teaching materials to be tested.

The high feasibility level can be seen from the calculation of the total score which shows 80% - 87% for the eight instruments. Figure 4 presents the percent of the total instrument score.

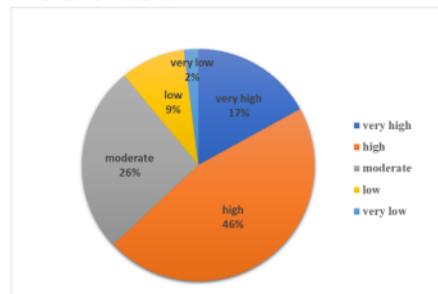


Figure 3. The level of eligibility is based on the student handout teaching materials to be tried out.

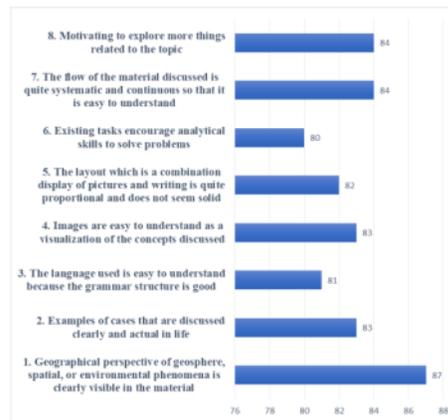


Figure 4. Presence (%) of Total Variable Score

The variable with the lowest percent value is the task that encourages the analytical ability to solve problems. Assignments in the form of questions are used to measure learning outcomes. The low-level thinking type test problem explains several definitions. Meanwhile, higher-thinking test questions are an act of analysis based on general problems and specific problems. The weakness

of the questions in this teaching material is that the validation is not specific and comprehensive. This is because the question validation is still limited to learning outcomes. But validation should be interpreted in the form of interpretation of the test results, the theoretical basis of thought which is the foundation of interpretation, and actions based on that interpretation [3]. This means that the existing questions have not arrived at the assessment of the action resulting from understanding the material. It is suspected that this is the reason students achieve low scores on problem-solving using high-order thinking type questions.

Other variables that are in the position after the test questions are problems with language, layout, and pictures, as well as case examples. In general, the language used has fulfilled the enhanced spelling. Language has followed the order of subjects, predicates, objects, and descriptions that are not too long. This makes for a pleasant sequence of words and sentences to read. At least the use of good language must meet the rules of grammar and sentences are not long [4].

For the layout, the writing and pictures do not fill the entire page. This is so that it doesn't seem crowded on every page. The side of each page has a relative space with an image inserted. The image is adjusted to the topic being discussed on that page. Images are intended to reinforce the existing explanation. Images are divided into visuals in the form of maps, flow charts, and illustration images.

There is always a case study on each topic. Case studies are based on existing research results and facts in an area. Case studies rely on the context of the facts that have been analyzed so that they will provide accurate information. Facts and analysis of cases are the best learning resources for understanding the material.

Based on the variables of layout, language, and pictures as well as case studies, it shows that this teaching material can improve learning outcomes. This is because these handout teaching materials have been developed based on the context of environmental conditions and media images, photos, data, maps, and the like. Student learning outcomes tend to increase [5].

Another variable, namely the material can provide motivation. The role of teaching materials to motivate students to explore material topics is an important part. This is because a high level of understanding of the material begins with interest built by motivation. Factors that influence student motivation towards teaching materials include interest in subject matter, level of difficulty, relevance to existing knowledge, and perceived usefulness [6].

Interest in the material will be related to the conditions felt by students. Likewise with relevance to knowledge and perceived usefulness. A current pandemic condition is an event that is quite felt for all the lives of students. This can be a major factor for students to want to understand the material related to this textbook. This handout teaching material is very meaningful because it is relevant to the theme of disaster and increases the perception of usefulness related to everyday life.

This teaching material fulfills learning efforts that follow the development of the paradigm of disaster management shifting from disaster management to disaster risk reduction management [7][8]. Risk reduction emphasizes the availability of information about potential disaster events and consequences. incurred, so that disaster risk can be calculated accurately even though the timing of the incident is still uncertain [9]. The assessment and risk management of the spread of microorganisms is full of uncertainties regarding the size, speed, and timing, as well as uncertainty regarding the vulnerability of human life, socio-economic conditions, and physical infrastructure [10].

#### 4. CONCLUSION

The results of this study conclude that in terms of the content and structure of the material, the handout teaching materials are following the perspective of geographic studies. In content, it has presented the distribution of disease facts at the international and national levels, as well as physical and human environmental factors as causes of distribution. Furthermore, the handout teaching material is feasible to be tested in learning because of its high feasibility level. This is because the measured variables show 80% to 87%. Based on the conclusion, this research suggests that in content there is still a need for improvement in disaster risk aspects. In addition, it needs limited trials face-to-face in class.

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