Problems in learning biology for senior high schools in Lombok Island

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Abstract. This survey was aimed to assess the student’s difficulties in senior high school for learning particular topics in Biology and the problems in the learning process. The survey was conducted in senior high school all around the Lombok island by using questionnaire and surveyed 568 students and 24 biology teachers which then analyzed by using qualitative and quantitative statistics. This survey revealed the difficult topics are bacteria and viruses (18.64%), endocrine system (10.63%), cell structure (8.81%), genetics (8.41%), and nervous system (8.28%). The student’s major problems in learning the topics are the use of the scientific name, the complexity of the topics, and the students learning habits. The survey also revealed the teacher’s problems in the teaching process in the planning stage (23.27%), implementation stage (48.63%) and evaluation stage (28.10%).

Keywords: problem, learning, biology, education, Lombok

1. Introduction
The education performance analysis result of Nusa Tenggara Barat province in 2016 shows a good result compared to the average score of national exams for the high school in a science major. There are 3 districts with the average score above 61.00, Mataram, Sumbawa, and Sumbawa Barat, 2 districts with an average score below 47.00, Bima and Dompu, also 5 districts with a score between the two, Kota Bima, Lombok Utara, Lombok Timur, Lombok Barat dan Lombok Tengah [1]. As stated by [1] specifically on high school science majors the average score of the national exam is still under the national standard score. Only the City of Mataram has an average National Examination in Science major above the national average. For the high school level majoring in sciences, in the Indonesian language subject only the City of Mataram has an average score of the National Examination above the national average. In English subjects, Mataram City and West Sumbawa Regency have an average score above the national average. In Mathematics, there are 5 Regencies/Cities that have an average score higher than the national average, they are the City of Mataram, West Lombok Regency, West Sumbawa Regency, North Lombok, and Central Lombok. In Physics there are 3 districts/cities that have an average score above the national average, they are Mataram City, Sumbawa Regency, and West Sumbawa Regency. While in Chemistry and Biology
subjects only Mataram City has an average value above the national average. Some researchers have conducted research to find out students difficulties in learning biology. These researchers include [2 – 3]. Some concepts and topics in biology that are considered difficult by students include protein synthesis, respiration and photosynthesis, cell division (mitosis and meiosis), hormone regulation, oxygen transport, nervous system, and genetic manipulation. Furthermore [4] have found other topics in biology that are considered difficult by students, including genes and chromosomes, hormonal systems, and genetics. Students who experience difficulties in learning concepts and topics in biology will have an impact on the enthusiasm and acquisition of biology learning outcomes.

The results of other studies show several reasons presented by students related to their difficulties in learning biology. These reasons include biological material presented in an abstract form [2], using textbooks in the learning process by using examples that are by students to understand, the overload of material charged by the curriculum [5], classroom management that does not support students to enjoy learning biology [6 – 7], biology lessons that rely too much on the power of memory, style and methods of teaching teachers that are not in accordance with the material being taught [7].

The low acquisition of learning in biology subjects in high school as stated by [1] must be the concern of teachers, principals, policy makers, researchers, and other relevant parties in West Nusa Tenggara Province. To overcome this problem must be able to reveal deeper factors that led to the acquisition of low student learning outcomes. In addition, finding effective learning methods and pleasing students in learning biology is another alternative that can be used to improve the quality of biology learning in schools. Styles and teaching methods that are appropriate according to [8] can influence students' perspectives on the way they learn biology. This will provide a significant contribution in conducting classroom management activities. Biology teachers who are competent in carrying out classroom management activities can carry out more effective learning activities so that they can help students improve their learning outcomes even better.

This study was conducted to identify topics in high school biology subjects that are considered difficult by students, to know the factors that caused students to experience difficulties in learning biology, find teaching methods that are suitable to use in biology learning activities, and identify obstacles faced by teachers in delivering learning biology in high school. Research activities will be carried out in State High Schools in Lombok Island except for State High Schools in Mataram City.

The results of this study are expected to give the advantage to biology teachers, principals, policy makers, and other relevant parties that trying to improve the quality of biology learning of state high schools in Lombok Island. The improvement of the quality of this learning is expected to have an impact on the motivation and enthusiasm of students learning so that it can increase their learning achievement. Improvements in situations and conditions like this are believed to be appropriate efforts to overcome the problems faced by teachers and students of State High Schools in Lombok Island.

2. Research method
2.1. Survey Area and Data Collection
Research activities were carried out in state high schools in Lombok Island, except for state high schools in the city of Mataram. State high schools that used as a place to collect data were spread in West Lombok Regency, Central Lombok Regency, East Lombok Regency, and North Lombok Regency. The method used in data collection was the survey method. The survey was conducted on students and teachers of the high school in biology subjects on the island of Lombok who teach in grade 12. The number of schools surveyed consisted of 24 schools. The sampling technique was choosing the students to be surveyed randomly which consisted 30% of the overall amount of students in grade 12. Complete data related to the number of schools, the number of students and biology teachers surveyed are presented in Table 1.
Table 1. Number of schools, students and biology teachers surveyed.

| No. | Districts     | Number of schools | Number of teachers | Number of students |
|-----|---------------|-------------------|--------------------|--------------------|
| 1.  | Lombok Barat  | 6                 | 6                  | 111                |
| 2.  | Lombok Tengah | 7                 | 7                  | 158                |
| 3.  | Lombok Timur  | 9                 | 9                  | 260                |
| 4.  | Lombok Utara  | 2                 | 2                  | 39                 |
|     | **Total**     | **24**            | **24**             | **568**            |

Collecting data during the survey was using a questionnaire. The questionnaire used consisted of two types (student questionnaire and biology teacher questionnaire). The teacher questionnaire consisted of things that must be done by the teacher in carrying out learning activities (planning, implementing and evaluating learning) in accordance with the standard learning process in accordance with the Minister of Culture Education Regulation 2016. The questionnaire given to students consists of 2 parts. Part 1 questionnaire consisted of student demographic information (school origin, class, and student gender). Part 2 questionnaire consisted of a list of topics of high school biology subject matter and each student was asked to choose topics that are considered difficult and provide reasons that cause students to experience difficulties in learning these topics. In addition, students were asked to provide a suggestion to improve the quality of biology learning, especially related to biology learning that is fun and effective that must be done by the teacher.

Before the questionnaire was given to carry out data collection activities, the questionnaire was validated by 2 experts in the field of biology learning. The revision of the questionnaire was carried out in accordance with the suggestions from the validator. All questionnaires were given directly to students and teachers. Before students and teachers fill out the questionnaire, first they were given an explanation related to the purpose of filling out the questionnaire to give students and teachers freedom to respond without having to experience pressure. Also conveyed that filling out this questionnaire is intended to improve the quality of biology learning carried out in high schools in Lombok Island.

2.2. Data analysis

Data analysis research was conducted qualitatively and quantitatively. Responses from student questionnaires related to topics in the learning of biology were analyzed quantitatively. Statistical descriptions were needed to determine the frequency of biological topics that students find difficult in percentage form. Meanwhile, the questionnaire related to the reasons that caused difficulties and suggestions for effective and enjoyable biological learning methods for students was analyzed qualitatively. Analysis of questionnaire data provided by the biology teacher related to planning activities, implementation of learning, and evaluation activities carried out quantitatively, while other information related to the obstacles faced by biology teachers in carrying out learning activities carried out qualitatively.

3. Result and Discussions

3.1. Difficulties biology topics for students

High school biology material presented in this study refers to the Regulation of the Minister of Education Year 2016. In general the material consists of the scope of biology, biodiversity, classification of living things, ecosystems, cell biology, plant structure, animal structure, motion system, circulatory system, digestive system, respiratory system, excretory system, coordination system, system hormones, reproductive systems, growth and development, metabolism, genetics, evolution, and biotechnology. All materials are delivered gradually from grade 10, 11, and grade 12.
Based on this, further research is carried out to identify topics in high school biology lessons that are considered difficult by students. The result of the study conducted in high schools of Lombok is shown in figure 4.

![Graph](image)

**Figure 1.** The results of research conducted in high schools of Lombok Island – (a) Topics in grade 10, (b) Topics in grade 11, (c) Topics in grade 12, (d) Overall topics in high school.

The results of the research in Figure 1 show that topics in biology that students find difficult are bacteria and viruses (18.64%), hormonal systems (10.63%), cell structure and function (8.81%), genetics and inheritance (8.41%), and coordination system (8.28%). However, if it is reviewed based on the material taught in grade 10, 11, and class 12 the results show different variations. In class 10 learning, most students (74.12%) experienced difficulties in studying bacteria and viruses. In grade 11 biology learning topics that are considered difficult by students consist of the hormone system (21.35%). Then followed successively by cell structure and function (17.70%), coordination system (16.64%), circulatory system (11.48%), and animal structure (8.45%). Another topic is not really
difficult to learn. Unlike grade 10 and grade 11, the topic of biology learning in grade 12 have relatively large and even level of difficulty except on the topic of growth and development. Topics related to genetics and inheritance were considered to be the most difficult by most students (33.57%), followed by metabolism (22.26%), biotechnology (20.49%), and evolution (19.43%).

The results presented in this study corroborate the results of research conducted by [9] and the results of research conducted by [10]. The results of research conducted by [9] showed that students experience difficulties in studying Archaea bacteria and Eubacteria. This difficulties happened due to the failure of the students in understanding the terminology, understand the concept, and write a scientific name. Meanwhile, in research conducted by [10], student difficulties in studying viruses were in the students’ inability to explain virus replication and its to distinguish the body structure of viruses from the body structures of other living things.

The results found in this study are similar to the results of research conducted by [11]. [11] found five topics in biology learning that were considered difficult by high school students in Turkey. The five topics were the material cycle, the endocrine system and hormones, aerobic respiration, cell biology, and genetics. Cell biology topics that are considered difficult are related to cell division, while genetics material which is considered difficult was related to genes and chromosomes. The difference between the results of this study only occurs in the material cycle and topics related to bacteria and viruses. This happened because the material related to bacteria and viruses is not studied in high school students in Turkey. The results of other studies conducted by [4] provide information showed that the endocrine and hormonal systems, cell division, and genetics were material that students find difficult on biology. The difficulty occurred because most of the material is considered abstract by students and is very complex.

The results of other studies that corroborate the results of this study are those carried out by [12] which stated that high school students of grade 11 in SMA Negeri 1 Matauli Pandan have difficulty in studying hormone systems. Difficulties of students in the cognitive aspects are in the moderate category on the questions that are at the level of C1, while the levels of C2 to C6 belong to the category of experiencing very high difficulties. Students who experience difficulties in the cognitive aspects may be caused by the existence of basic concepts that have not been mastered which are used as prerequisites to study further material.

3.2. Reason for students have difficulties to learn in biology
The results of further analysis of this study found that the factors that caused high school students in Lombok Island experience difficulties in learning biology are that the material taught is abstract, relies on memorized power, uses Latin language, contains very complex knowledge, practice activities are not adequate, the material taught is not related to everyday life, the teacher's teaching style is monotonous, the delivery of material is not complete, the level of discussion is less in-depth, boring, academic atmosphere that is less supportive.

The three main factors (Table 2) are grouped into factor 1 which consists of the teacher's teaching style that is monotonous (A7), the delivery of the material presented by the teacher is not complete (A8), the level of discussion of the material presented by the teacher is less profound (A9). Factor 2 consists of biological material that is presented relying on memorized power and the material taught are not related to everyday life. Factor 3 consists of a learning environment that is not conducive (students play during learning activities, classroom management is not optimal). The factors causing these difficulties are then classified into teacher teaching styles (factor 1), material content (factor 2), and academic atmosphere (factor 3).
Table 2. The main component variables causing students difficulties using the rotation method$^a$.

| Component | 1 | 2   | 3    |
|-----------|---|-----|------|
| A9        | .687 | .076 | .004 |
| A8        | .650 | -.167 | .020 |
| A7        | .617 | .035 | -.037 |
| A6        | .127 | .765 | .128 |
| A2        | -.152 | .687 | -.16 |
| A12       | -.031 | -.025 | .979 |

$^a$Rotation converged in 4 iterations.

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The results of other studies conducted by [13] state that not a few of the topics studied in biology are events that cannot be seen directly by the eyes. Because the concepts learned are abstract and not a bit of a biology teacher who delivers learning just rely on textbooks. Learning that relies on textbooks and many Latin names that students have to memorize and the material being studied are not related to everyday life resulting in students having difficulties in studying biology. Another factor that caused students to experience difficulties in studying biology is the teaching style of teachers who are not student oriented. Most teachers convey teacher-centered learning (teacher oriented) not student-centered (student oriented). Teacher-centered methods in learning biology do not help students in relating material learned with events found in everyday life. Teachers only convey learning material theoretically and abstract knowledge, lacking in providing examples related to daily life. In other words, it can be said that students do not understand why they study these topics because they have nothing to do with the reality experienced in everyday life. The difference between reality and material delivered in the classroom makes students must be forced to study harder to understand topics in biology. Conditions like this lead to a decrease in student learning motivation and can foster a negative attitude towards students biology lessons [14]. In addition, in conveying the learning activities mostly referring to the material in the textbooks, students are asked to read and learn the important things in the textbook. Learning like this according to [15] can cause a decrease in productivity of teaching and learning activities and reduce students' enthusiasm for learning activities. Such conditions will be worsened if the teacher's knowledge of the concept or the material being taught has limitations. Students become less confident with the explanation given by the teacher so they tend not to listen to the teacher's explanation during the learning activities.

Student learning habits are also one of the reasons that cause students to experience difficulties in learning topics in biology. Not a few students who study biology on a regular basis, do not review and re-study the material that has been delivered by the teacher and does not complete the tasks and questions presented in the learning activities. Some students are not interested in the way the teacher teaches so that they have a tendency not to listen to the teacher's explanation. As a result, not a few students who do not study biology well [11].
Another reason that causes students to experience difficulties in learning biology is the limitations of learning facilities and infrastructure as well as limited learning time. Schools that do not have biology laboratories and only study biology by relying on theories do not carry out practical activities and experiments to strengthen the concept of the topics presented by the teacher. Biology learning is delivered teacher-centered, causing students to become bored in learning biology and less interested in learning more deeply. The results of other studies state that the limitations of learning time lead teachers to deliver learning material quickly, incompletely and do not have enough time to compare concepts learned in biology with concepts learned in other subjects such as chemistry and physics. The learning delivered by the teacher only pursues the material demanded by the curriculum so that it is lacking in conducting experimental activities that please students [11]. Conditions like this cause academic atmosphere in biology learning activities become not conducive to carrying out optimal learning activities. Students do not focus on learning biology, playing around when learning activities. This phenomenon makes it difficult for teachers to conduct classroom management activities.

3.3. Teacher problems in the implementation of teaching biology
It has been revealed in this study that the role of the teacher in delivering biology learning in high school is one of the important factors that cause students to experience difficulties in learning biology. This is supported by the results of the study shown in Figure 2. The results of the study in Figure 2 provide information that high school biology teachers on Lombok Island still experience problems in implementing learning activities made in the form of a Lesson plan. In general, it can be said that most teachers (48.63%) experience problems in carrying out learning activities, 28.10% have problems in conducting assessment activities, and 23.27% experience problems during planning for class activities.

![Figure 2. Problems teachers in implementation of learning biology.](image)

Based on figure 2 the ability of teachers to carry out in learning process has many problems compared to the of planning and evaluating process. In research conducted by [15] reports that the learning process carried out by biology teachers are not effective. This is due to the lack of fun and unattractive material presentation by the teacher. Therefore, it reduces the student's motivation in learning biology. Meanwhile in another study conducted by [16] reveals the teachers in high school for biology in Makassar had weakness in carrying out the assessment process. Teacher's competence in planning and implementing learning activities have a very high category and is different from the teacher's competence in carrying out learning assessment activities. However, the research conducted by [17] shows that high school biology teachers in Mandailingnatal have lower skills in carrying out the learning process and assessment activities. Based on the results of this study and the results of other related studies, indicate that the biology teachers cannot fully carry out the learning activities, because they still have many problems in planning activities, implementation of learning, and assessment activities.
4. Conclusion
Based on the results, it can be concluded that (1) topics in biology that are difficult by students are bacteria and viruses (18.64%), hormone systems (10.63%), cell structure and function (8.81%), genetics (8.41%), and nervous system (8.28%), (2) Factors that cause students to difficulties in learning biology include teacher teaching styles, biological material content, and academic atmosphere, and (3) High school biology teachers (48.63%) on Lombok Island that problems in learning process, 28.10% in assessment activities, and 23.27% in planning of learning.

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