



Identification of learning difficulties and factors causing learning difficulties in online lectures on basic biology concepts

Dwi Purbowati¹, Erlinda Rahma Dewi^{2*}

¹ Madrasah Ibtidaiyah Teacher Education, Fakultas Ilmu Tarbiyah, Universitas Islam Negeri Raden Mas Said Surakarta, Indonesia

² Mathematic Education, Fakultas Ilmu Tarbiyah, Universitas Islam Negeri Raden Mas Said Surakarta, Indonesia

*Corresponding author: erlinda.dewi@staff.uinsaid.ac.id

ARTICLE INFO	ABSTRACT
<p>Article history Received: 09 September 2023 Revised: 11 September 2023 Accepted: 18 October 2023</p> <p>Keywords: Basic concepts of Biology Learning difficulties Online lectures</p>	<p>This study aims to identifying learning difficulties from reviewing material and factors causing learning difficulties faced by Madrasah Ibtidaiyah Teacher Education study program in online lectures basic concepts of biology. The research participants were 80 third-semester in 2021/2022 academic year. The research method used quantitative. The data collection technique in this study is a survey technique. The research instrument is a questionnaires were made to collect student data regarding learning difficulties in basic concepts of biology and the factors that cause student learning difficulties. Questionnaires were given to students via a google form. The data analyzed by descriptive statistics and used as reference data to determine the learning difficulties faced by students in the form of subject matter, internal and external factors causing learning difficulties. The results showed: a) In online lectures on basic concepts of biology, the material that students consider the most difficult is genetics, b) Internal factors that cause learning difficulties are lack of preparation before lectures, too much memorization, lack of self-motivation, physical tiredness, and laziness to read the material, c) External factors that cause students' learning difficulties in basic biology concepts lectures, namely lectures resources and materials, lecture facilities, lecture strategies, lecture environment, and lecture hours.</p>

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INTRODUCTION

The pandemic caused by the coronavirus has changed the way of life in the world. In almost all sectors and almost all countries in the world, Indonesia is no exception. The Indonesian government makes policies to break the chain of transmission. One of the policies in the education sector is the online learning and the semi-online learning. The policy of online learning and semi-online learning, requires educators, in this case, teachers and lecturers, to adjust the learning process. Adjustments are made at all levels of education (Early Childhood Education to college). This made educators have to find ways for learning activities to be carried out properly and for learning materials to be delivered even whether online or semi-online. Likewise with lectures at the Madrasah Ibtidaiyah Teacher Education study program. Online lectures are carried out using strategies or methods that are adapted to the material, it is hoped that the quality of lectures is as good as compared to face-to-face lectures. However, in the course of lecture activities, students experience difficulties in online learning. Previous studies stated that online lectures during the pandemic were deemed less effective due to a lack of dosage innovation, choice of learning strategies, and lack of learning resources (Anggrella, Rahmasiwi, & Purbowati, 2021). Requires a supplement so that lectures continue to run well (Purbowati & Adawiyah, 2021)

In the course of lecture activities, lecturers and students encounter difficulties that are part of the learning journey. These difficulties are experienced in almost all courses with different problems, one of which is in the basic concepts of Biology. In today's modern era, science, especially natural sciences positioned to be the backbone of a country that has an impact on progress in various aspects of life (Emmanuel & Frank, 2016). Plus, it's diverse the concepts discussed in science have important role in everyday human life, especially in the 21st century (Bennett & Hogarth, 2009). One of the benefits, identifying various components which is closely related to health lifestyle (Emmanuel & Frank, 2016). Other benefits are seen when someone can connecting things in everyday life with concepts science knowledge, especially the concepts studied in biology. Biology is a branch of science learn things related to life. On the last two decades, biology has experienced this exponential growth (Chu, 2008). Many kinds of The science studied from Biology is increasingly applied to solve various human problems various problems such as health problems, agriculture, animal husbandry and other vital fields (Chu, 2008; Reece et al., 2011). Because various benefits provided, Biology becomes the most popular choice among other sciences disciplined by some students. In the basic concept of Biology Science is a course that aims to provide students with basic Biological Science knowledge, specifically regarding the structure and function of living things (Situmorang, 2020).

However, despite its popularity Biology, based on various studies, does revealed that many students often experience difficulties in learning it (Hasibuan & Djulia, 2017; Kusumawati, 2015), especially with online learning which has stopped laboratory activities. These findings are in line with the facts that many students think of science as subjects that are difficult to learn (Ogunkola & Samuel, 2011). The condition is not only that found at the university level, but also at the secondary school level (Emmanuel & Frank, 2016). This condition cannot be separated from the nature of science where studying science can be becomes complicated because it emphasizes on integrating, organizing, synthesizing, too such as analyzing information or concepts (Ziegler & Montplaisir, 2014). The study of learning difficulties has been studied by researchers from around the world (Çimer, 2012; Emmanuel & Frank, 2016; Tekkaya, Ozkan, & Sungur, 2001; Topçu & Şahin-Pekmez, 2009). Research conducted by Çimer (2012) reported that there were five topics that had been considered the most difficult to learn Class XI student in Rize district Türkiye in Biology subjects. Those topics are the material cycle, the endocrine system, aerobic respiration, cell division, as well genes and chromosomes. Another study in Türkiye also reported the SMP students in Izmir experience difficulties in studying Genetics (Topçu & Şahin-Pekmez, 2009). Research conducted by Tekkaya et al. (2001) informed middle school students in Türkiye looks at hormonal, gene and chromosomes, mitosis and meiosis, nervousness systems, and Mendelian genetics as that topic hard to learn. Besides that, students identify cells and organelles as well ecology as an easy topic.

In addition, lesson topics such as the respiratory system and circulatory system in humans too reported as a considered topic most difficult to learn in junior high school students in Techiman North District, Ghana (Emmanuel & Frank, 2016). Etobro & Fabinu (2017) who conducted research in high schools students in Lagos States, Nigeria too reported that students often experience difficulties study the five main topics in Biology subjects. These topics are nutritional cycling nature, ecological management, conservation natural resources, pests and diseases in agricultural plants, and

reproductive systems on plants. In Indonesia, studies about Muspikawijaya, Iswari, & Marianti (2017) reported that high school students in East Luwu Regency is experiencing difficulties understand the concept of cells metabolism.

Students who experience learning difficulties can be demonstrated through conditions, namely;; (1) Students cannot achieve the results or achievements they should, which can be seen from the size of the level of intelligence, ability, and talent, (2) Students do not achieve the minimum level of success/mastery of the material that has been determined by certain educators (criterion reference) in certain subjects and time limits, (3) Students do not succeed in achieving the mastery level of prerequisite material for the next level of material. These students can be classified as immature or slow learners, so they must become repeaters (Makmun, 2016).

Learning difficulties are not only related to intelligence. The United States Office of Education (USOE) defines learning difficulties as a disorder of basic psychological processes, occurring both in understanding and using written language or teachings (Abdurrahman, 2010). Learning difficulties, namely the state of not being able to learn properly because in the learning process there are certain disturbances or obstacles, causing students to not be able to achieve learning outcomes as expected (Haqiqi, 2018). Learning difficulties are things that cause failure or disruption in the learning process of students (Winarti, 2021).

The difficulty of students in learning the basic concepts of biological science is also influenced by the characteristics of the material in it. Various causes have been reported to be the reason why many students experience difficulties in study Biology. Based on student responses and teacher interviews collected by Tekkaya et al. (2001), biology learning resources difficulties caused by terminology, textbooks, teaching methods, curriculum, abstract and interdisciplinary draft. In another research report, Etobro & Fabinu (2017) reports on teaching strategies, student attitudes, lack of learning resources, along with students' study habits are causes of students' difficulty learning some topics in Biology. On the other had, Çimer (2012) shows five main reasons why Biology hard to learn. These reasons are nature of the topic, teacher's teaching style, students' learning methods and habits, negative students' feelings and attitudes on several things biology topics, and lack of learning resource. Another report from Muspikawijaya et al. (2017) also reported that students learning difficulties in Biology subjects are caused by low learning intensity, teachers centralized teaching strategies and facilities and lack of supporting learning infrastructure Biology learning process.

There are several factors that influence/cause learning difficulties. According to previous research, there are internal and external factors as the cause of students' learning difficulties. Internal factors include attention, habits in studying, motivation, and interest (Aunurrahman, 2019). While learning resources, learning media, and learning methods are external factors. Based on other researchers, internal factors that cause learning difficulties are affective factors, cognitive factors, and psychomotor factors, while external factors are family environment, school environment, and community environment (Darmawan, 2019). Other literature states that internal factors include: psychological factors, interests, intelligence, biology, attention, talent, health, and emotions. External factors include the environment which includes family economic factors, home atmosphere factors, school environmental factors, and the community (Narti, 2017). Based on the literature that has been mentioned, the researcher uses some of them as indicators of research instruments to determine the factors that cause student learning difficulties, namely lack of self-preparation, too much memorization, lack of motivation, physically tired, and lazy to read the material as indicators of internal factors. Indicators for external factors are sources and lecture materials, lecture facilities, lecture strategies, and lecture hours.

Biology is seen by most students as a difficult subject because, in addition to a lot of memorization, it requires work in the laboratory, biology is also presented using Latin to name animals, plants, and organs that exist in living things. This can be circumvented if biology is taught interestingly, then biology becomes a subject that challenges curiosity and is exciting for students. In the biology learning process, students are required to have a complete concept and then understand the application of the concept. Learners must experience directly or be in direct contact with the process of the concept being studied so that the learner has a complete concept. In Indonesia, a study of biology learning difficulties has been done several times. But when analyzing research reports that have been published publicly online, trends and characteristics research on student learning difficulties Indonesia is different from other countries country. research that sheds light on difficult-to-study topics is still hard to find. Example from

research efforts in Indonesia mapping out difficult concepts is Mardin's (2017) research examining learning difficulties in class XII high school students High School in Palopo City. Several others research is reporting characteristics of the subject matter so that the subject becomes difficult to learn (Fauzi & Fariantika, 2018) and common factors that cause students difficulty learning biology (Andriani, Indrowati, & Sugiharto, 2021). For the rest, most of the research on more difficulty learning biology focuses on the causes of students' experiences difficulty in only one topic/concept (Muspikawijaya et al., 2017). Based on the information submitted, that is It is necessary to carry out an experimental research to map topics that are considered difficult by student. By providing a questionnaire via Google Form to map Difficult topics that they learn in basic biological science concepts courses and the internal and external factors that cause them. In more detail this research designed to answer the following questions; 1) Which topic in the basic concepts of biology course is considered the most difficult by students?; 2) What internal factors cause students' learning difficulties in basic biological science concepts courses; 3)What external factors cause students' learning difficulties in basic biological science concepts courses?

Aspects that differentiate this research from previous research. First, the respondents of this study were first-year undergraduate students from the PGMI study program who took courses in basic concepts of biological sciences. in previous research, the research respondents were middle school students. Second, this research aims to identify topics/material in 1 semester. In previous research, research was carried out on material during high school. Third, this research asks questions respondents to determine what material is considered difficult, causing learning difficulties and the factors that cause it. In previous research, respondents were asked to rank what material they considered difficult.

METHODS

Research Design

This research uses survey research design. A quantitative approach is used as a research method in determining which topics considered the most difficult by student. This research is carried out in the Madrasah Ibtidaiyah Teacher Education study program third semester of state university located in Sukoharjo, Central Java, Indonesia. This research is implemented from January to April 2022. The research procedure used is by compiling a research questionnaire instrument in the form of a list of closed statements and open statements. Then distributed via Google form to respondents.

Population and Samples

The research was conducted in third level undergraduate Madrasah Ibtidaiyah Teacher Education study program. The total participants involved in this research were research subjects 80 students.

Instrument

The instrument use in this research are questionnaires. The instruments used in this research are questionnaire about the presentation of the material studied. At first, the questionnaire asks for information about student identity. Then a questionnaire presents a selection of orienting material students to choose any topic considered the most difficult. After being presented with a choice of causes of learning difficulties in the form of internal and external factors in learning basic concepts of biological sciences. Questionnaires were given to students via a google form. Instruments as follows:

Table 1.

Research instrumen

	Lecture material	Answer choices				
		VD	D	N	E	VE
1.	Cells as structural and functional units of living things					
2.	Cell reproduction and cell metabolism					
3.	Basics of classification and diversity of living things					
4.	Classification of higher plants (angiosperms and gymnosperms)					
5.	Classification of vertebrates and invertebrates					
6.	Various functions in plants (Structure, reproduction and transportation of plants)					

	Lecture material	Answer choices				
		VD	D	N	E	VE
7.	Various functions in plants (Growth, development and photosynthesis)					
8.	Various functions in animals (Digestion, respiration, circulation and homeostasis)					
9.	Various functions in animals (reproductive, nervous, endocrine, and locomotor)					
10.	Living things and the environment (environmental components, land biomes, water biomes), ecology and population dynamics					
11.	Maintaining body and environmental health					
12.	Genetics					
	External factors of learning difficulties					
<input type="checkbox"/>	Lecture strategy					
	Lecture facilities					
	Lecture environment					
	Resources and lecture materials					
	Lecture hours					
	Other:....					
	Internal factors of learning difficulties					
<input type="checkbox"/>	Lack of motivation					
	Physically tired					
	Lazy to read material					
	Too much memorization					
	Lack of self-preparation before lectures					
	Other:...					

Information: VD : Very difficult, D: Difficult, N: Enough, E: Easy, VE: Very easy

Data Analysis Techniques

The data was analyzed using descriptive statistics and used as reference data to determine the learning difficulties faced by students in the material, internal and external factors causing learning difficulties

RESULT AND DISCUSSION

Based on the data analysis conducted in this study, several findings were obtained, namely as follows. First, the results of the analysis of learning difficulties for students of Madrasah Ibtidaiyah Teacher Education study program in lecturing the basic concepts of biological are seen from the material that is considered difficult and very difficult.

The data in [Table 2](#) was taken in January-April 2022, using data collection techniques, namely surveys. The questionnaire research instrument regarding difficulties in learning basic biological science concepts and factors that cause students' learning difficulties was distributed via Google form. The results obtained can be seen in [Table 2](#).

Table 2.

Percentage of Main Materials that are Considered Difficult and Very Difficult by Students

No.	Material Study	Ranking	Percentage
1.	Cell as the structural and functional unit of living things	10	7.50%
2.	Cell reproduction and cell metabolism	6	13.75%
3.	The basics of classification and diversity of living things	8	11.25%
4.	Classification of higher plants (angiosperms and gymnosperms)	4	16.25%
5.	Classification of vertebrates and invertebrates	11	7.50%
6.	Various functions in plants (Structure, reproduction, and transportation of plants)	5	16.25%
7.	Various functions in plants (Growth, development, and photosynthesis)	7	12.50%
8.	Various functions in animals (digestion, respiration, circulation, and homeostasis)	3	18.75%
9.	Various functions in animals (reproductive, nervous, endocrine, and locomotor)	2	21.25%

No.	Material Study	Ranking	Percentage
10.	Living things and the environment (environmental components, terrestrial biomes, aquatic bio,mes), ecology, and population dynamics	9	8.75%
11.	Maintenance of the health of the body and the environment	12	6.25%
12.	Genetics	1	22.50%

Based on [table 2](#) of 12 materials presented during 1 semester, the material that is considered difficult and very difficult is the genetic material. Genetics itself is a branch of biology that refers to the study of genes, besides that it also studies the inheritance of traits and the expression of hereditary traits that are controlled by gene factors (Cummings, Klug, Spencer, Palladino, & Killian, 2019). Furthermore, the study of genetics is very broad, covering the genetic material studied from its structure, reproduction, expression, change, recombination, it's engineering, and presence in populations (Snustad & Simmons, 2015). The sciences of genetics play an important role in human life, especially in the world of health, agriculture, and medicine. So broad and complex that learning difficulties are very likely to occur (Nusantari, 2011).

Genetic material is a tiring and boring material (Nusantari, 2011). In previous studies, it was said that genetic material is a material that is known to be difficult to understand because the concept is abstract for students and far from everyday life, so it is difficult for them to construct genetics as a whole and combine concepts (Witzig et al., 2013). Findings that point to Genetics as the most difficult biology topics in line with several previous research reports, such as in Mardin (2017). Genetic material is one of the materials that is difficult to understand middle school is also reported by research from several other countries (Çimer, 2012; Tekkaya et al., 2001; Topçu & Şahin-Pekmez, 2009). Apart from that, Topçu & Şahin-Pekmez (2009) also conducted research on students' difficulties in learning various things Genetic concepts and reports that most students can only memorize concepts but having difficulty understanding the concept. This makes genetics a material that is prone to misconceptions. Scientific misconceptions are inaccurate thoughts/ideas (Andrews et al., 2012). The results of previous studies indicate the occurrence of misconceptions about genetic material in the sub-discussion of protein synthesis, and the structure of gene organization (Murni, 2013). The two concepts become very complex because, in the organizational structure of genes, things are discussed regarding the structure of RNA and DNA, gene expression, and gene function, while the mechanism of protein synthesis is a complex process related to RNA and DNA.

In genetic material, the highest level of difficulty in protein synthesis material is in the discussion of transcription, where this sub-material discusses the production of RNA molecules from DNA templates, while translation discusses the production of polypeptides or proteins from mRNA molecules, the second sub-material is the structure of gene organization (McDonald & Gomes, 2013). Another difficulty is also because students find it difficult to determine the structure, location, and function of genes due to their lack of understanding of differentiating levels of the organization, namely the cellular level and the molecular level (Boujemaa et al., 2010). If this misconception occurs, the objectives of science learning cannot be realized. As we know, one of the goals of science education is to make students learn concepts as a whole and then to make students able to apply the concepts they have learned to everyday life (Keleş & Kefeli, 2010).

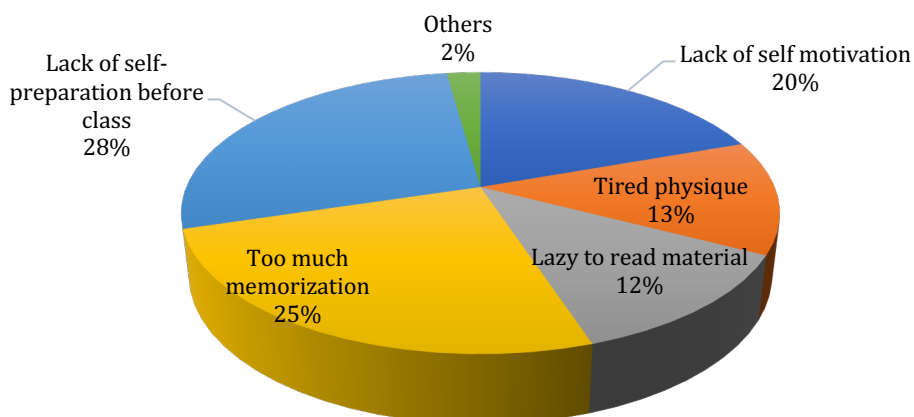
In contrast, the material for maintaining the health of the body and the environment occupies the easiest material according to students. This material is the opposite of genetic material. This material is relatively easy because it is directly related and is carried out by students every day. Especially during the COVID-19 pandemic that has occurred over the past few years, it is easier to get information about awareness of maintaining personal and environmental hygiene. Healthy and clean living behavior shows the lifestyle of a family that always maintains and pays attention to health (Proverawati & Rahmawati, 2012).

Furthermore, the factors that cause student learning difficulties in the basic concepts of biological science courses online during the covid 19 pandemic. Searching for internal factors that cause student learning difficulties in online lectures on the basic concepts of biology science, then the distribution of questionnaires to students is carried out, the results of which can be seen in [Table 3](#)

Table 3.**Internal Factors that Cause Learning Difficulties**

No.	Internal Factor	Percentage
1.	Lack of self-preparation before class	27.54%
2.	Self-motivation	25.36%
3.	Lack of self motivation	19.57%
4.	Tired physique	13.04%
5.	Lazy to read material	12.32%
6.	Other	2.17%

Internal factors that cause students to have difficulty landing earning in online lectures, the basic concepts of biology if stated in a pie chart will be presented as shown in [Figure 1](#).

**Figure 1.** Internal Factors of Learning Difficulties

Based on the data above, the internal factors that cause learning difficulties are lack of preparation before lectures, too much memorization, lack of self-motivation, being physically tired, and laziness to read the material. Learning difficulties are based on a learning condition that is disrupted by physical and psychological factors to achieve learning outcomes (Baharuddin, 2017). Lack of motivation to learn, and lack of learning ability will make students tend not to pay attention to learning (Aunurrahman, 2019).

Some concepts in studying biology require prerequisites to understand certain concepts. So motivation, reading material, memorization are crucial. If they did not master the prerequisite concepts beforehand Students will have difficulty understanding it concepts they are currently learning. Considering the many concepts studied on several topics in learning Biology, students through and through introduced to new information, theories, new techniques, concepts, and terminology (Almroth, 2015; Tekkaya et al., 2001). Furthermore, the external factors that cause student learning difficulties in the basic concepts of biological courses online. To obtain information on external factors that cause student learning difficulties in online lectures on the basic concepts of biology science, then the distribution of questionnaires to students is carried out, the results of which can be seen in [Table 4](#).

Table 4.**External Factors that Cause Learning Difficulties.**

No.	Internal Factor	Respondent	Percentage
1.	Resources and study materials	37	30,08 %
2.	Lecture facilities	30	24,39 %
3.	Lecture strategy	26	21,14%
4.	Lecture environment	17	13,82%
5.	Class hours	11	8,94%
6.	Others	2	1,63%

External factors that cause students to have difficulty learning in online lectures, the basic concepts of biology if stated in a pie chart will be presented as shown in Figure 2.

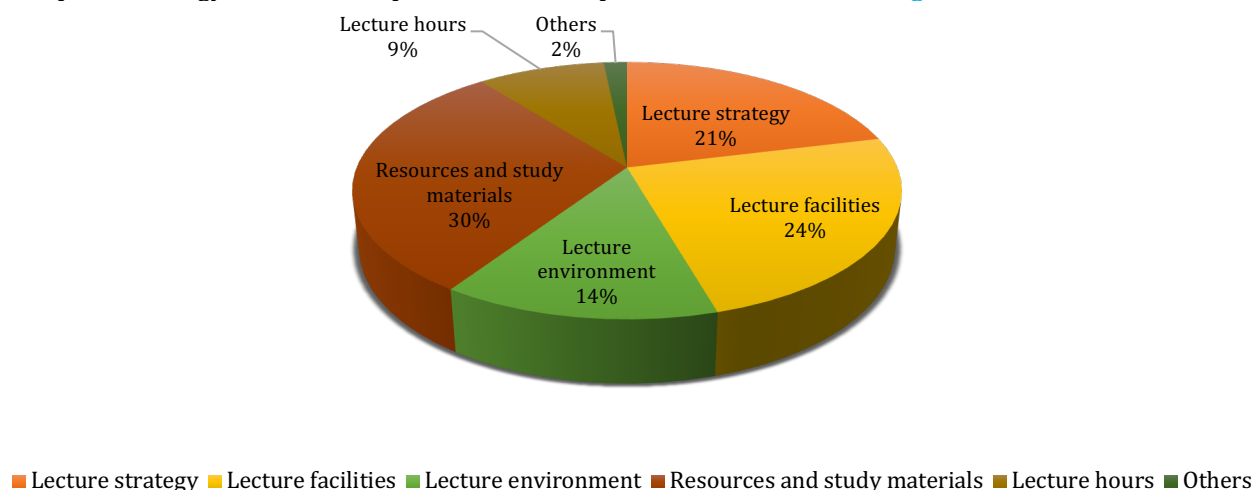


Figure 2. External Factors of Learning Difficulties

Based on Figure 2, external factors that are quite large are learning difficulties, namely lecture materials and resources, lecture facilities, lecture strategies, lecture environment, and lecture hours. External factors are the surrounding environment and also components that are directly related to learning, both of which affect the quality of learning (Sugihartono, Fathiyah, Harahap, Setiawati, & Nurhayati, 2007). Lectures during the COVID-19 pandemic cannot be limited as they were before the pandemic. Not surprisingly lack of learning resources is an obstacle for students in science learning especially in practical activities (Anggrella et al., 2021). This matter supported by other research that explains that during the Covid-19 pandemic activities practicum is increasingly ineffective, because lack of student books/references in preparing practical reports (Hariyanti, Mun'im, & Hidayat, 2020). The existence of lecture resources and materials can overcome student learning difficulties in lectures (Seruni, Munawaroh, Kurniadewi, & Nurjayadi, 2019). The methods and strategies used aim to maximize learning for students. Should use methods that focus on scientific attitude skills. A scientific attitude is important in learning science, because in science not only emphasizes student cognitive, but also the affective aspect to coaching 21st century skills. 21st century skills can be empowered through scientific learning models Setiawan (2019).

CONCLUSION

Based on the results and discussions described above, the following conclusions can be drawn: a) In the basic concepts of biology, the material that students consider the most difficult is genetics, b) Internal factors that cause learning difficulties are lack of preparation before lectures, too much memorization, lack of self-motivation, physical tiredness, and laziness to read the material, c) External factors that cause students' learning difficulties in basic biology concepts lectures, namely lectures resources and materials, lecture facilities, lecture strategies, lecture environment, and lecture hours. Suggestions that can be given for further research are that it is necessary to research student learning difficulties in other subjects to help lecturers and students overcome learning difficulties. The need for further research on methods/strategies to achieve the competence of each course. Lecturers can make plans to minimize negative external factors related to learning difficulties.

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