



Assessing Genetics Learning Media Effectiveness: Students Perspectives

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Abstract. research evaluates the effectiveness of learning media in the field of genetics, a discipline marked by rapid technological advancements and the need for interactive digital media in education. Employing a descriptive and quantitative research design, the study uses questionnaires and interviews to collect data, which are then analyzed quantitatively. Focusing on prospective biology teacher students at a university in Pekanbaru-Riau, the study involves purposive sampling. Findings indicate that 51% of students find genetics challenging. The study reveals that learning media is frequently used (65%) in genetics lectures, highlighting the subject's abstract nature and the necessity for interactive media to facilitate understanding. The research aims to enhance comprehension of abstract genetic concepts and improve learning outcomes by precisely selecting and applying learning media tailored to student characteristics and the subject matter.

Keywords: Biology, Education, Genetics, Interactive, Media.

1 Introduction

Many studies show that students have difficulty learning how to solve complex problems in many disciplines. For example in biology, students often eliminate important information or remember misinformation and/or apply information incorrectly to a problem [1]. At the college level, particularly in genetics courses, students often grapple with challenging materials and frequently encounter misconceptions during the biology learning process. References [2] found that genetics is a difficult concept. In addition, many find this topic less interesting and not connected with future specialties. Among them are the substance of genetic material, reproduction of genetic material, genetic changes and mutations, genetics in populations and genetic engineering. In the material, it has a high level of abstraction because the object cannot be seen directly but needs help. High levels of abstraction often make this material misunderstood by both educators and learners [3].

Genetics is a field of biological science that is rapidly developing, so that in its delivery, appropriate technological development is required, so as to support lectures the teaching and learning process is inseparable from interactive digital media. Several genetic-related issues are already or are expected to be widely relevant policy issues: gene technology in food production or disease treatment, genetic testing in animals and humans, and the study of human ancestors through the genetic tools of populations. Nevertheless, genetic teaching has been slow to keep up with the interests of the new society of genetic literacy [4].

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One of the improvements in the quality of learning is to use the right media. Based on [5] learning by utilizing technology significantly improves the quality of its implementation and learning achievement. The application of new technologies, such as computer multimedia and the internet, can make learners achieve learning achievements to realize the improvement of teaching quality. Changing learning patterns to be more innovative requires special knowledge and management so that learning can be useful for learners and effective in its management.

The changing times require teachers to change. The teacher must continue to improve his professional abilities through various efforts [6]. This ability improvement must be done so that teachers can continue to provide effective learning in the classroom. Teachers in the 21st century have even greater demands. In addition to being able to collaborate with other teachers, teachers are also required to be able to utilize knowledge, technology and information in carrying out their work.

Professional teachers become one of the goals in college teacher education, so to achieve it prospective teachers are expected to be able to apply pedagogy in the learning process. References [7] revealed that students' perception of teacher pedagogical competence is one of the important aspects in improving learning motivation and student learning outcomes, because teachers' pedagogical competencies directly touch learners' learning management activities. This study was conducted to assessing the implementation of genetic lectures and learning media used in learning activities.

2 Method

This study using a descriptive and quantitative design. The sample was selected through purposive sampling. The subjects in this study are prospective biology teacher students who are and have participated in genetics lectures at the University in Pekanbaru-Riau. A total of 110 students participated in this study. Data collection using a combination of closed and open-ended questionnaires and interviews list. Online questionnaires were distributed using Google Forms. The collected data were analyzed using quantitative methods, as presented at table 1:

Table 1. Data collection technique.

<i>N</i>	<i>Collection</i>	<i>Instruments</i>	<i>Collected Data</i>	<i>Goal</i>
<i>o</i>	<i>Technique</i>			
<i>s</i>				
1	Observation	Questionnaire	1. Perception of genetic lectures 2. Learning media perception	Students
2	Interview	Open Interview List	1. Lecture perception 2. Learning media perception	Students

3 Results and Discussion

3.1 Students Perception of Lectures

The perception of students towards the implementation of lectures is netted based on the acquisition of questionnaire data and supported by interviews. Based on questionnaire data (Figure 1) students argue that ecology is the group that has the highest average for students' interest in studying it. Furthermore, 22% stated that genetics is an interesting lecture. In Figure it can be known that the lowest percentage is the field of zoology with a percentage of 6%, and microbiology 9%, as presented at fig. 1.

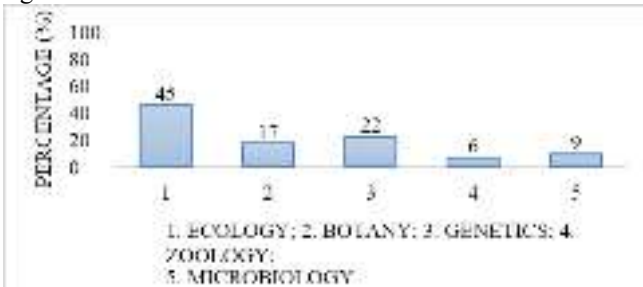


Fig. 1. Perception of student interest in biological science group

Based on the difficulty of the material or study material (Figure 2), genetics is a study group that is difficult for students with a percentage of 51%. Next is the microbiology group with a percentage of 19%. The lowest percentage gain for the perception of material difficulty is zoology at 5%. The acquisition of data that Genetics is a study group that is considered difficult and interesting by lecturers in teaching, as presented at fig.2.

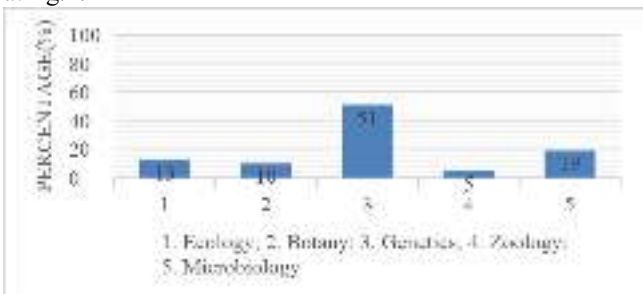


Fig. 2. Student perception of the difficulty of biological science

In general, students stated that they are always interesting and eager to attend lectures (Figure 3). Students' perception of the spirit in attending lectures is that 60% of students say the answer always. There are still students who answer rarely. There are students who think it is rare to be interested in attending lectures. Student responses based on questionnaires are supported by their answers through open-ended questions, which are summarized as follows: A lot of the material taught can be found in everyday life, in the surrounding environment. Lecture materials require interaction between learners. Many assumptions that in studying the material there are concepts that impress students with the natural sciences. Through learning that is relevant to life makes humans more grateful to their creator, as presented at fig.3.

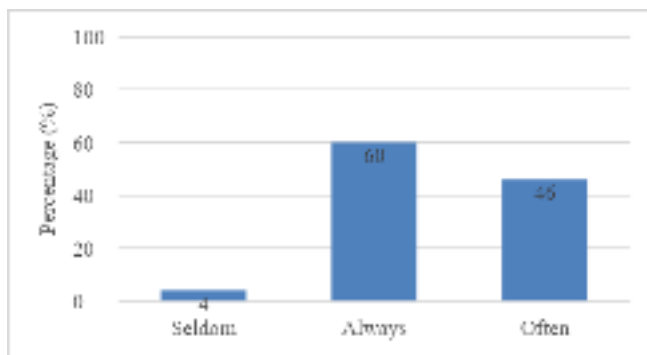


Fig. 3. Perception of student interest in attending lectures

3.2 Genetics Lecture Material Content

The content of genetic lecture material is known based on lesson plan, and teaching books used in lectures. In lesson plan there are 11 study materials that will be taught in lectures. In general, students consider topics or teaching materials difficult to learn. Materials that are considered difficult include inheritance of traits, genetic material, gene expression, interactions between genes, gender, and cross-moving. Furthermore, from the results of interviews to several students, the books used are not diverse, the presentation of lectures is not always accompanied by interesting images / animations, making it difficult to understand very abstract concepts.

The implementation of lectures planned at lesson plan is generally a group presentation at each meeting. However, when implementation is not always given the reinforcement of the presented material, and advanced tasks. Based on interviews, there are also no practicum activities in lectures both offline and online. From the implementation, students who have high competence can understand the material presented, but it is difficult for students who are in the competencies below.

Based on the results of the review of lecture assignments and interviews, at the end of the meeting students were assigned to make a model related to genetic teaching materials, in accordance with the acquisition of group materials. The collection of assignments is carried out during the final semester exam.

3.3 Student Perception of Learning Media

This data networking is done by looking at student responses to learning carried out by lecturers. Genetic learning is abstract, so the media needs to learn it. The media used is expected to be interactive.

The results showed that the use of media in learning activities in general students answered on a frequent scale (Figure 4). Similar answers are also found in the responses of media variations used in learning activities (Figure 5). However, the category is rarely still much on the variety of media in lecture activities. These results show that in lecture activities, teaching lecturers have often used learning media and tried to use variations of lecture media as presented at fig. 4, fig. 5, and fig. 6.

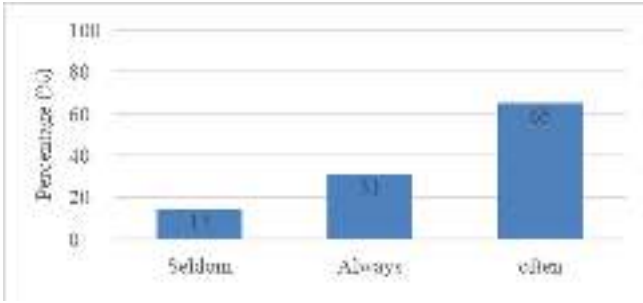


Fig. 4. Perception of the use of learning media in lectures

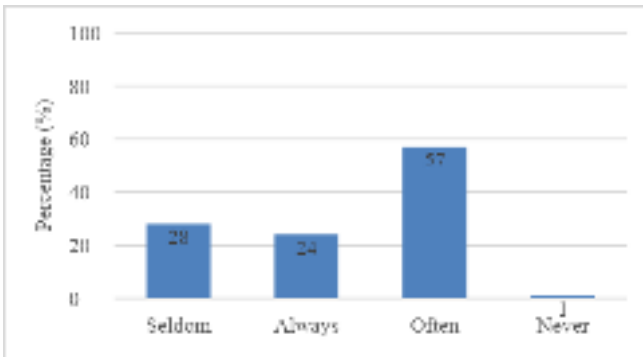


Fig. 5. Student perception of variations in learning media in lectures

The type of media used in genetics lectures can be obtained from questionnaire results (Figure 6).



Fig. 6. Student perception of the type of learning media in lectures

Students answer media that is often used in lectures is a power point of 67.8%. Student responses are supported by assignments given by lecturers, namely about making media using power points. This assignment is carried out in groups on each material in the lecture.

Based on the findings of this studies that have been carried out, it can be seen genetics is one of the groups of biological and material studies that are considered

difficult by students. Material that is considered difficult is material that contains abstract concepts and is micro. Material content in Genetics lectures is generally studied through presentations and teaching materials. The presentation of lecture materials is generally carried out in turn from each student group. The media used in lectures is through powerpoint. The presentation of content is supported by questions related to the material, but not at every lecture meeting. The media has been used frequently at lecture meetings. The media used has not varied in each lecture material, and not interactive yet. Understanding the material is not thorough for all students, because the learning media is less varied which causes students to lack understanding of genetic lecture materials. Genetics is considered attractive and convenient for students who follow it.

Lectures will run well if between lecturers and students show good interaction during the lecture. Media becomes one of the determinants of lecture success because it helps in presenting complicated lecture materials. The use of the right learning media will make lecturers successful in teaching, and students in understanding good materials and values. The success of the lecture is also determined by the accuracy of the selection and use of learning media based on student characteristics and the material taught.

Based on this study conducted can be obtained an overview of the implementation of genetic lectures. Based on the findings and data analysis, efforts are needed to improve lectures for a better understanding of lecture materials by prospective teachers and lecturers in teaching material concepts. This improvement can be made by: Developing interactive learning media that is used to help students better understand abstract genetic lecture material. The learning media developed not only contains material content, but is presented with innovative questions and animations that can be used directly by students. So that prospective biology teachers will be supplied with interactive media innovations to improve the quality of learning better.

Many studies show that students have difficulty learning how to solve complex problems in many disciplines. For example, in biology, students often eliminate important information or remember misinformation and/or apply information incorrectly to a problem [1]. The material is considered to have a high level of abstraction because the object cannot be seen directly but needs help. High levels of abstraction often make this material misunderstood by both educators and learners [8].

Genetics is a field of biological science that is rapidly developing, so in its delivery it is also required to use appropriate technological developments. Teachers need to have a deep understanding of the components of technological knowledge, pedagogy, and content into teaching. According to [9] a teacher with knowledge of pedagogy can understand how learners build knowledge and acquire skills, develop habits of thinking and a positive disposition to learning.

The use of media in learning is one of the determinants of improving the quality of learning in accordance with the material taught. Learning by utilizing technology significantly improves the quality of learning and learning achievement [10]. The application of new technologies, such as computer multimedia and the internet, can make students achieve learning achievements to realize improved teaching quality. Changes in learning patterns to be more innovative require special knowledge and management so that learning can be useful for students and effective in its management.

Multimedia is information presented with the help of computers in some form. The use of text, images, animation, video and sound is combined so that the information

presented can help students to imagine concepts better [11] While interactive multimedia is the use of multimedia and ICT that allows interaction between media and students [12]. The use of multimedia has indeed attempted to present various forms of information in images, sound and video. However, multimedia like this has not been able to provide interaction that can make the learning process more meaningful.

Learning with interactive multimedia can help students understand the subject matter [13]. Interactive multimedia helps students to give a better picture of concepts that are abstract and difficult to imagine. However, there may also be material that cannot be explained well with interactive multimedia.

Interactive multimedia is not just a medium that displays text and images. Interactive multimedia is a two-way media that allows interaction between media and [12]. Making interactive multimedia actually does not require complex programming languages and is difficult to learn. Microsoft PowerPoint, which is currently widely used by teachers, can also be an alternative to making interactive multimedia. The results of the study [14] showed that interactive multimedia developed from Microsoft PowerPoint was proven to increase students' interest in learning. Various abstract concepts that exist in biological material require media assistance to explain it. Technological advances should be used to design a medium that can help explain abstract concepts better.

4 conclusion

Based on the research that has been done, it can be concluded that the genetic lectures carried out are considered good. The media used has not varied in each lecture material, so improvements are needed to the media used. This improvement aims to increase students' understanding of abstract genetic material concepts and improve learning outcomes. Efforts that can be made are to develop interactive learning media that students can use to explore the material through concepts and problems related to the material. This improvement effort is carried out to better prepare prospective biology teacher students to teach abstract biological concepts, especially genetics.

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