

# The Use of Digital Learning Media by Undergraduate Students in Presentations and Discussions on Genetics Courses: A Qualitative Study

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**Abstract.** Genetics is compulsory in all biology and biology education curricula in Indonesia - and even the world. Understanding genetic concepts is essential in understanding and underpinning understanding in other branches of biology. So, the success of genetics learning becomes crucial to the success of the Biology and Biology Education undergraduate curriculum. There are many methods applied in genetics courses, and all use learning media to carry out their activities. This study revealed the PowerPoint-based presentation used by students in the Department of Biology, Universitas Negeri Malang, in Genetics 1st Course, the academic year 2022/2023. The analysis was carried out qualitatively on all digital learning media presented by students in presentations and group discussions. From the results of the analysis, it was found that the entire group of students gave their presentations using Microsoft's PowerPoint application. However, during the presentation, there are variations; some students present it with a slide show (including transitions and animations), and some only show the primary PowerPoint display (not in a slide show). While some others display a PDF version of PowerPoint. Based on the content of the PowerPoint presented, almost all groups of students put very long descriptions in their PowerPoint slides; only one group presented their power points systematically, balanced between facts and pictures or schematics. Further investigation showed that the group of students who presented their PowerPoint with long descriptions raised questions already contained in the PowerPoint itself. This study concludes that the preparation of PowerPoint, which is not good, is proven to be less able to deliver messages accurately, which raises questions from the audience (which is substantially already mentioned in the PowerPoint). On the other hand, using pictures and schematics in slides is beneficial for the recipient of the message in understanding the concepts explained through PowerPoint.

**Keywords:** genetics courses, digital learning media, presentation and discussion.

## INTRODUCTION

Genetics is a very important knowledge to understand currently. Understanding genetics is important for both consumers and producers of science (Mussard and Reiss 2022). Understanding genetics becomes even more important for students majoring in biology or biology education. Duncan et al. (2011) exemplify that understanding genetics allows young people to make informed decisions about contemporary scientific issues such as genetic screening and genetically modified foods. Also, Mussard



and Reiss (2022) added that understanding genetics allows biologists to understand fundamental ideas like biological inheritance and evolution. An understanding of genetics plays a substantial role in explaining phenomena in students' lives and facilitates progression onto university courses.

The increasing importance of genetics in our daily lives requires greater attention to the study of genetics in our educational system (Hott, et al., 2002). Genetics is a subject that is inseparable from the biology curriculum. Genetics is compulsory in all biology and biology education curricula in Indonesia - and even the world. Understanding genetic concepts is essential in understanding and underpinning understanding in other branches of Biology. So, the success of genetics learning becomes crucial to the success of the Biology and Biology Education undergraduate curriculum.

However, studies suggest genetics is difficult to learn (Duncan and Reiser, 2007; Nursantari, 2012; Osman, BouJaoude, and Hamdan, 2017; Choden and Kijkuakul, 2020; Mussard and Reiss, 2022). From the results of these studies, to maximize the learning of genetics, especially with the difficulties involved, every step of genetics learning needs to be best prepared, including the use of learning media and discussion processes that follow every genetic learning activity.

Learning genetics, especially in undergraduate (S1) has the characteristics of a more abstract discussion, so this material becomes difficult to understand (Sumampouw and Rengkuan, 2018). This is in line with the report of Nursantari (2012) that genetics experiences high problems and even ranks first in conceptual errors in students. Therefore, the study of genetic material is an excellent study or research. Problems arise because learning about genetics uses more printed books or teaching materials while printed books or teaching materials only present still mages. Students have difficulty learning the concepts in this course, such as the Structure and Reproduction of Genetic Material. Indeed, in the teaching materials when explaining the concept of Reproduction of Genetic Material there is a picture with arrow directions on its components, and the process is depicted through still images so that it seems as if the process machine is running according to its stages. However, students still find it difficult to understand genetic concepts in these teaching materials.

Sumampouw and Rengkuan (2018) suggest that reviewing the learning process for genetics courses is still felt that there is a deficiency in terms of the learning media used by lecturers. It is a fact that until now genetics lecturers still use printed books or teaching materials in genetics learning. Even though in learning genetics several important competencies must be mastered by students. If the learning media (printed books and



teaching materials) do not support and are not able to convey information properly, students will have difficulty following the lesson and have difficulty understanding the concepts conveyed by the lecturer.

Changes and developments that occurred during this period where there were major changes in various fields including the field of information and technology had a significant influence on the field of education including higher education. This influence can be seen in the application of technology in learning. Advances in technology allow today's lecturers to provide various kinds of learning media that facilitate and motivate students in learning. Learning media in the form of multimedia is one of the products of technological progress that has a high potential to increase effectiveness and innovation in the learning process. Some research results report that there are special characteristics that are more effective in learning multimedia designs so that they can suit the needs of students. Several characteristics of learning multimedia designs have been formulated and proven to be successful in demonstrating the superiority of multimedia in improving learning outcomes (Butcher, 2006; Mayer, 2005).

In 2018, APJII (Association of Indonesian Internet Service Providers) released the results of its survey which explained that the penetration of internet users in Indonesia reached 64.8%. That is a high number as a basis for student media literacy. Buckingham (2005) defines media literacy as "the ability to access, understand, and create communications in a variety of contexts". Media literacy in this study refers to the ability of audiences who are literate about the media and mass media messages in the context of mass communication" (Tamburaka, 2013). Media literacy is a series of perspectives that we actively use to expose ourselves to the media to interpret the meaning of the messages (media) we encounter. We construct our perspective from knowledge structures. To build knowledge structures, we need tools and raw materials. Meanwhile, the raw material is information that we get from the media and from the real world (Potter, 2001). Taking control is at the heart of media literacy. Becoming media literate gives us a clearer perspective on the boundaries between the real world and the world generated by the media (Potter 2001).

Students through the media can learn to recognize outside life as well as get socialization of sovereign values in society according to the reality photographed by the media. When teenagers deal with the media, they show their dynamic character. Teenagers are basically always curious, easily influenced, and tend to take media content for granted (The Habibie Center, 2008).



On the other hand, teenagers are familiar with technology, are not afraid of dealing with new things, and tend to be idealistic (Sheila, 2010). Adolescents are a culturally distinct and significant group, as a market segment, as a sub-culture, and who are leading the way in the use of new media. Adolescence is the point where an individual tries to build an identity, form a social group, and negotiate the cultural meaning that they have. Among all, the media is the central part (Osgerby, 2004). From this statement, it can be said that youth are potential commodification objects for media producers who have intergenerational marketing objectives.

The purpose of each learning activity is to help achieve educational goals. Learning is a process of teaching and learning activities, in which two parties are involved with each other, namely the teacher as an educator and students as students. Hamalik (2011) adds that learning is the process of guiding student learning activities. Learning means renewal towards individual development so that life becomes better. Learning is the modification or reinforcement of behavior through experience.

Yuliansih et al. (2011), explained that the learning process is the core of the process of formal and informal education, in which interactions occur between various learning components. These components are teachers, content or subject matter, and students. The interaction between the three components includes facilities and infrastructure, learning methods, learning media, learning models, and structuring the learning environment so that it can support the achievement of the planned learning process. Surachmad (2003), argues that "Teaching and learning activities require appropriate methods and have tools in the teaching and learning process. The use of tools in the teaching and learning process aims to improve learning achievement. So, to improve student learning outcomes need support from learning tools or media.

The importance of learning media is directly felt by teachers and students. This is reinforced by the study of Soebroto, et al. (2009), which states that learning with visual media in the classroom influences student interest and learning outcomes. Therefore, this study wants to see how the use of learning media in students participating in the Genetics 1 course at the Department of Biology, State University of Malang, and what is the relationship between the use of this media and student learning performance, which in this case is measured from discussion activities.

## **RESEARCH METHOD**

The study was conducted with 37 second-year Biology Department students enrolled in the Genetics 1 course at Universitas Negeri Malang (UM), Indonesia. The module consisted of 16 weeks total, 9 weeks of



presentations and discussion sessions with daily lectures followed by a Mid-semester written exam, 4 weeks of project-based learning activity, and a Final Exam. The study in this research was carried out in 9 weeks of presentation and discussion sessions consisting of 18 groups of presenters.

A qualitative method explanatory design was employed to study the use of learning media by undergraduate students in presentations and discussions. The analysis was carried out qualitatively on all digital learning media presented by students in presentations and group discussions. The type and the quality of presentation media are then identified, classified, and analyzed before being presented (desk evaluation). Further analysis was also carried out at the time of the presentation. This analysis includes the suitability of the presentation method and how students optimize their presentation material to deliver the concept of genetics in front of the class. This analysis is carried out through direct observation in class when students are making presentations. Finally, a short classical interview was conducted regarding the selection of presentation media and its presentation performance.

The next step of this study is to analyze the post-presentation discussion. We limit the discussion analysis to post-presentation discussions to see how the choice of instructional media and presentation performance relates to the quality of class discussions. There were two discussion sessions, which were held right after the presentation and discussion after the explanation from the lecturer. The second discussion was intentionally not included in the analysis of this study because it was considered to have no direct relationship with the quality of the learning media chosen by students. As the first step, a short classical interview was conducted regarding the performance of the post-presentation classical discussion. The type and the quality of presentation media are then linked to the questions asked by the audience in the courses.

The following is a sequential qualitative method explanatory research design that describes the steps in this study.



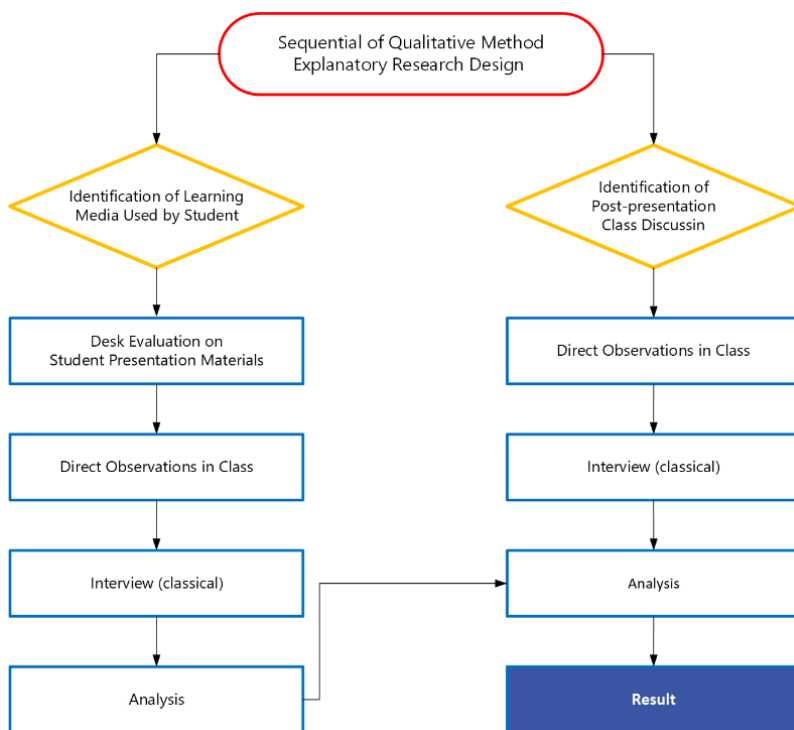


Figure 1. The Sequential Flowchart of The Qualitative Method Explanatory Research Design used in This Study

## RESULT

Based on the results of the learning media evaluation desk submitted by students before the presentation, it was found that all student groups used the PowerPoint platform in developing their presentation media. There are a total of 18 PowerPoint-based media presentations that have been developed by students. However, during the presentation, there are variations; some students present it with a slide show (including transitions and animations), and some only show the primary PowerPoint display (not in a slide show). Based on the content of the PowerPoint presented, almost all groups of students put very long descriptions in their PowerPoint slides. Only several groups presented their PowerPoint systematically, balanced between facts and pictures or schematics, adding context to each explanation. Some other presentation lack context. The presenter too focuses on delivering points in their presentations so that sometimes they forget to convey the context of the material presented. While some others



display a PDF version of PowerPoint. The details of the data obtained are presented in the following charts 1-4.

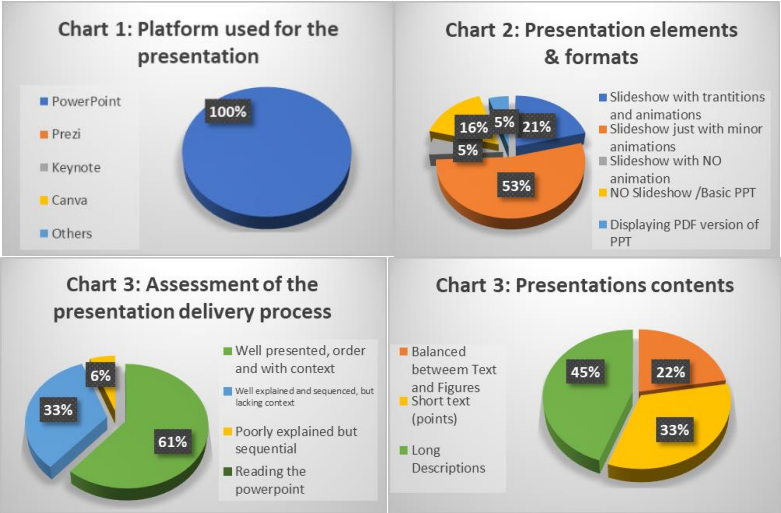


Figure 2. Data on Learning Media Used in Student Presentations

Based on the results of direct observations in class, during the 18 presentations, 108 questions were raised during the post-presentation group discussion sessions. Occurs between 5-8 initial questions in each meeting with an average of 6 questions per topic. The questions that arise are varied. Starting from questions that reconfirm what the presenter has said, to substantive questions that ask for the application or context of the material presented. Even though there were also questions that only asked for explanations because the questioner did not clearly receive the information during the presentation.

Further investigation showed that the group of students who presented their PowerPoint with long descriptions raised questions already contained in the PowerPoint itself. Often the information conveyed in the form of a long description is received incompletely by the audience. This then resulted in the emergence of questions that only asked back the material that had actually been presented in the presentation. Sometimes the presenter responds to this question by showing the slide again and re-reading the explanation given. It is less efficient. Some others responded by answering with a brief explanation, which was then followed by further, more substantive questions. These findings indicate that the quality of instructional media directly influences the learning process (discussion) in

class. In some cases, the lecturer must intervene, to promote a better discussion.

While the group of students who presented quality PowerPoints showed that the questions that emerged were more substantive and meaningful. Presentations that present context well, are delivered in a good sequence, and contain clear and substantial information are responded to by questions that are substantive and applicable. In its continuation, the discussion became livelier, and more material was discussed, and students' understanding of genetics concepts was also better.

Below are some screenshots of student presentations. It can be seen that there are differences in the screenshots, where some contain full text, and others contain pictures and schematics.

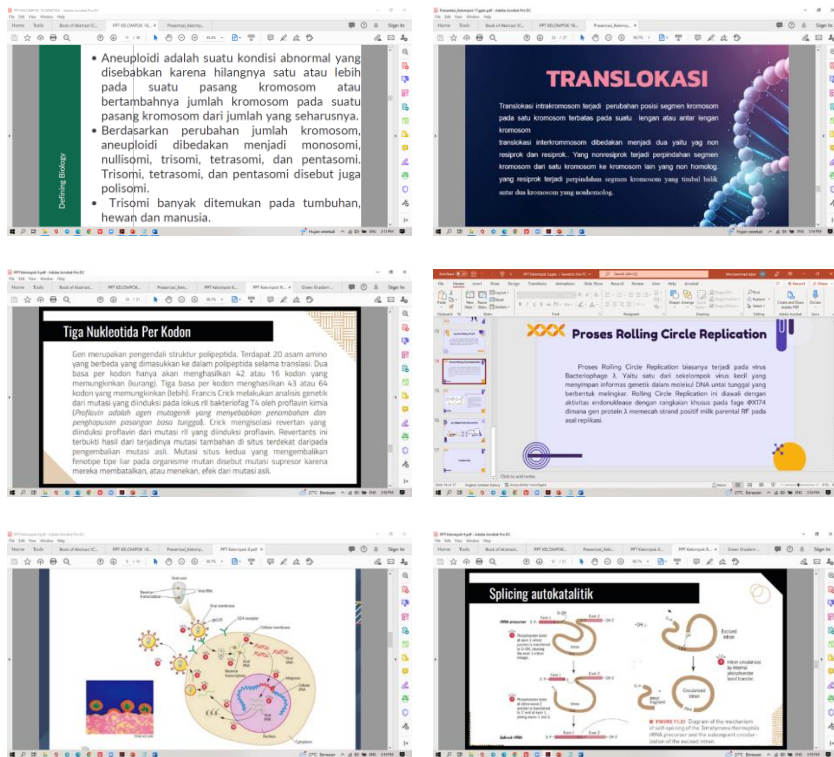


Figure 3. Some Sample Screenshots of The Presentations Presented by Students





## **DISCUSSION AND REFLECTION**

### **Digital Learning Media Selection and Implementation**

The use of learning media in the learning process in this modern era is a necessity. It can be said that all learning models involve learning media in their presentations. Furthermore, learning media is also used in pre-learning and as an evaluation tool. The position of learning media is getting bigger in proportion, especially in today's digital era. Currently, a teacher has a lot of options for the learning media that will be used. Research on the development of instructional media is still being carried out in educational institutions, starting from offline-based to very advanced and online-based. The problem is not how to make instructional media, but how to choose and implement it.

Learning media is an integral part of the learning process. Especially in the 21st Century, where the integration of technology and easy access to information is so high in the world of education, many learning media are available in the most efficient format, namely digital format. Learning media has a very important role in ensuring an optimal learning process and ultimately ensuring the achievement of learning objectives. The role of ICT-based learning media in the learning process is very large and important to be implemented by teaching staff, because it has an impact on increasing student learning motivation and as a teacher's assisting tool in explaining the subject matter to students. Using innovative ICT-based learning media teachers can communicate better and clearer, and the learning atmosphere is more enthusiastic, and the interactions that occur are multidirectional. (Wibisono & Yulianto, 2010) argues that learning media contain messages that can stimulate student learning and foster learning motivation so that students do not feel bored in participating in the learning process. Therefore, the role of learning media cannot be separated and becomes a unit in the teaching and learning process.

As the name implies, media means an intermediary, and in the context of learning, the selection of the right intermediary will greatly affect the process and results of the learning carried out. Furthermore, Silahuddin (2015) added that the media is a tool or means used to channel messages or information that the message's source wants to convey to the target or recipient of the message. Learning media is anything that can be used to channel messages from senders to recipients so that they can stimulate students' thoughts, feelings, concerns, and interests to learn (Baharun, 2016). In line with what was said, Rambe (2020) mentions that learning media is a teaching aid for teachers to convey teaching material, increase student creativity and increase student attention in the learning process. So that the selection and implementation of learning media are



vital to the success of the learning process, which will ultimately ensure the achievement of learning objectives.

The selection of the right learning media will support the learning process that is conducted. Lenggono (2019) emphasized that learning media has an important role in supporting the quality of the teaching and learning process. Especially in this 21st-century era, selecting media that is suitable for the character of students and using technology that is family to their life will very much help the effectiveness of the learning process. Added by Irsan et al. (2021) that the use of technology in learning can make it easier for students to understand study materials and improve the character of student discipline. The use of this kind of learning media has a positive impact on improving student learning outcomes.

### **How Learning Media Influence Student Discussion**

From the presentation of the data above, it can be seen how the quality of the PowerPoint presented by the group of presenters during the presentation affects the performance of the discussion. This can be explained by the fact that learning media influences student learning interests. In this case, an interesting PowerPoint makes students focus more on their friends' presentations so that during the question-and-answer session they are more enthusiastic about submitting questions and discussions. Nugrahani & Rupa (2007) revealed that the use of learning media at the teaching orientation stage will greatly help the effectiveness of the learning process and the delivery of messages and lesson content at that time. This is supported by Satria & Egok's (2020) statement that the use of instructional media in the learning process has an impact on increasing the interest and curiosity of students and arousing student learning motivation which has an impact on the stimulation of learning media applied by the teacher in class so that it has an impact on psychological development student learning. The use of learning media in the learning process is very important because learning media is a tool used by teachers to convey learning material that can make it easier for students to understand it quickly and well (Muhson, 2010). Learning media has a position as a vehicle for conveying information or messages by teachers to their students. Therefore, learning media in use has a role in streamlining and streamlining the implementation of learning.

Learning media can be interpreted as a communication tool teachers use in the learning process. Learning media has several functions including; a) educational function, learning media as a communication tool contains educational properties that affect the development of students, b) social function, learning media can provide information and experience of



social life to students, c) economic function, learning media has an economic value which is very effective in its application in the learning process, d) political function, learning media functions to build material and spiritual students, e) the function of art and culture, learning media provide information to students about developments in the arts and culture (Khalilullah, 2012). The functions of learning media as mentioned earlier certainly affect the interest and understanding of the students participating in Genetics 1 in participating in presentations and discussions. When students are interested, that's when the starting point for questions or discussions appears. And when students better understand the context and material presented in the presentation, it will increasingly encourage the emergence of substantive questions (not questions that are only confirmation).

Based on the previous description, it is very important to control the quality of student presentation media in presentation and discussion sessions. The quality of student presentations, not only the suitability of the presented concepts but also the format of delivery and attraction of the presentations- are the initial initiators for the next learning step, especially questions and discussion. A good presentation, substantive discussion, and well-guided, will produce a quality learning process which will finally encourage the maximum learning objectives.

## **CONCLUSION**

The result of this study suggests that the preparation of PowerPoint, which is not good, is proven to be less able to deliver messages accurately, which raises questions from the audience (which is substantially already mentioned in the PowerPoint). On the other hand, using pictures and schematics in slides is beneficial for the recipient of the message in understanding the concepts explained through PowerPoint. Indeed, many other factors can also contribute to determining the quality of student discussions, but in this study, it appears that the quality of the presentation of the material as indicated by the quality of the learning media has a strong relationship with the quality of the discussion. We suggest lecturers pay more attention to how their students choose and develop instructional media used as presentation material in classical discussions. Good presentation material will lead to quality discussions and ultimately lead to a better understanding of the material and achievement of learning objectives.



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