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Development of E-Module Materials on Plants Structure and Tissue Function Based on Discovery Learning for High School Students

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Abstract

The use of printed teaching materials in schools is less attractive to students and students' interest and motivation to learn is relatively below average, hence, the basic competencies set have not been achieved. Advances in science and technology can be used to procure more varied teaching materials such as E-modules. The purpose of this study is to analyze the feasibility, practicality and effectiveness of E-modules in the learning process. The research design used is development (R&D) using the ADDIE model with the stages of analysis, design, development, implementation, and evaluation. Eligibility of the E-module is determined based on the validation of material experts and media experts. The practicality of the E-module is determined based on student responses and teacher responses. The effectiveness of the E-module is determined based on the interest and motivation of students to learn. The results showed that the material expert validation value was 87% (very feasible) and the media expert validation value was 93% (very feasible). The results of the practicality of the E-module are that the teacher thinks it is very practical, on the small scale test all students think it is practical, on the large scale test 49% of students think it is very practical and 51% of students think it is practical. The results of the effectiveness of the e-module on a small scale test are 40% of students think it is very effective and 60% of students think it is effective, on a large scale test 66% of students think it is very effective and 34% of students think it is effective. Conclusion, E-module structure and function of plant tissue based on discovery learning is feasible, practical, and effective to be used as a learning medium.

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INTRODUCTION

Learning motivation is one of the factors that determine effectiveness in learning. Learning motivation is the entire driving force in students that creates and ensures the continuity of learning activities and provides direction to learning deeds so that the goals desired by the education subject can be achieved (Sardiman, 2016). Students will study harder if they are motivated by high learning motivation. According to Yusuf (2013) learning motivation can arise due to internal and external factors. In connection with these factors, teachers play a very important role in increasing learning motivation. The use of learning media and knowledge of interesting teaching methods is included in the skills of making variations in order to create a positive attitude and increase learning motivation in students.

The role of teaching materials is very important in the learning process. A learning topic requires several teaching substances in accordance with the specified competency standards. Good teaching substances make the learning process more interesting (Ramdhani & Muhammadiyah, 2015). According to Supriyatin (2015), the use of teaching materials in the form of textbooks is less attractive to students so it is necessary to develop textbooks into digital form. Advances in information and communication technology can be used to make print modules into electronic modules or what are called E-modules. According to Permatasari *et.al.* (2017), the advantages of E-modules compared to ordinary print modules are that E-modules are more interactive and allow the appearance of images, audio, video, and animation.

Based on interviews results with teachers of SMA N 1 Bojong, it is known that the average student motivation and interest in learning is still lacking. This can be seen from some students who are less active in the learning process, do not complete assignments well and the average value of students is still much below the minimum mastery criteria. The teaching materials used in schools are less varied, which only relying on printed books provided by the library so that students' reading interest is low. Low interest and motivation to learn and the use of learning media that are not supportive have an impact on not achieving basic competencies in the material taught, especially in KD 3.3, namely analyzing the relationship between cell structure in plant tissue and organ function in plants and KD 4.3, which is presenting data from observations of tissue structure and organs in plants. Based on the results of direct interviews with teachers of SMA Negeri 1 Bojong, it is also known that the learning model used is still conventional.

Based on the description above, it is necessary to develop an E-module material on the structure and function of tissue in plants for high school students. The e-module designed based on Pageflip, consists of cover, foreword, table of contents, material map, introduction, material, and evaluation. This e-module will later be tested on high school students using the discovery learning model. The purpose of this research was to analyze the feasibility, practicality and effectiveness of the E-module on the structure and function of plant tissue based on discovery learning for high school students. The e-module is expected to be feasible, practical, and effective to be used as additional teaching substances for the student learning process.

RESEARCH METHOD

The research was carried out at SMAN 1 Bojong in the odd semester of the 2022/2023 academic year. The research population was all students of class XI SMA Negeri 1 Bojong and the sample of the research product trial was 15 students of class XII MIPA 1 for small-scale trials and 35 students of class XI MIPA 2 for large-scale trials. The sampling technique used was random sampling technique. In this study, the data used were data on the feasibility, practicality and effectiveness of the E-module which was analyzed with quantitative descriptions. Data and data collection techniques are presented in Table 1.

Table 1. Data and Data Collection Techniques

Data	Techniques	Instrument	Analysis	Source	Time
E-module eligibility data	Question naire	Validation Questionnaire	Media feasibility analysis	Media expert and materials expert	At the validatio n stage
E-module practicality data	Question naire	Teacher feedback questionnaire & student response questionnaire	Practical data analysis	Biology teacher, students of class XII MIPA 1 and XI MIPA 2 SMAN 1 Bojong	At the trial stage
E-module Effectiveness Data	Question naire	Questionnaire of student interest and motivation	Effectiveness data analysis	Class XII MIPA 1 and XI MIPA 2 SMAN 1 Bojong	At the trial stage

The data on feasibility, practicality and effectiveness of E-module were analyzed using the Sugiyono (2016) formula as follows:

$$P = \frac{f}{N} \text{x } 100\ \%$$

Description:
P = percentage of score obtained
f = total score obtained
N = maximum score

RESULTS & DISCUSSION

The result of product development in this study is an E-module material on the structure and function of plant tissue based on discovery learning for high school students. The e-module developed is in the form of a pageflip that can be accessed easily via a link. The developed e-module consists of front cover, foreword, table of contents, introduction, material map, materials, evaluation questions, bibliography, and answer keys.

1. E-Module Eligibility

Based on analysis results of the E-module validation instrument by material experts and media experts, it is known that the developed E-module is very suitable to be used for the learning process. The percentage results obtained from the two experts are already above 81.25%. The feasibility results of E-modules by experts are presented in Table 2.

Table 2. E-Module Eligibility Results by Experts

Validator	Total Score	Score Percentage	Category
Material Expert	66	87%	Very Feasible
Media Expert	100	93%	Very Feasible

Material experts argue that the breadth of material in the E-module is very good, all components in the complete E-module and the developed E-module have used standard terms. The presentation of images and descriptions in the E-module is appropriate and the E-module developed in accordance with the KD and the characteristics of the material. In line with what was stated by Daryanto (2013) that a good E-module has the characteristics of self-instruction in which there is material that is in accordance with basic competencies and learning objectives. According to media experts, the E-module cover design, especially the module title color, is very good because it contrasts with the background color. The illustration of the contents of the E-module is very good at being able to reveal the meaning of the object, the shape is accurate and proportional to reality.

2. E-Module Practicality

Based on the questionnaire analysis results of teacher responses to E-module, it is recognized that the E-module developed is very practical to use for the learning process. The percentage of scores obtained from the responses of the two teachers was above 80%. Based on analysis results of the teacher's response to the E-module on each indicator, it is believed that the two teachers strongly agree that the material contained in the E-module helps students achieve the lesson objectives, the display of the cover page and the combination of images and text in the E-module attract attention. The language, concepts and content of the E-module material are in accordance with the student's ability level. This is supported by Rahdiyanta (2012) who argues that a good E-module uses simple language.

Based on questionnaire analysis results of student responses to the E-module on the small-scale test and the large-scale test, the E-module developed is practically used for the learning process. In the large-scale test 49% of students gave a very practical assessment. The results of student responses to the practicality of e-modules are presented in Table 3.

Table 3. E-Module Practical Results

Criteria	Small Scale		Large Scale	
	Total Students	Percentage	Total Sudents	Percentage
Very Practical	0	0%	17	49%
Practical	15	100%	18	51%
Practical enough	0	0%	0	0%
Less Practical	0	0%	0	0%
Not Practical	0	0%	0	0%

The results of student responses to E-module on each indicator in the small-scale test are presented in Table 4.

Table 4. Results of Student Responses to E-Modules on Each Indicator (Small Scale)

No.	Statement	SS	S	TS	STS
		%			
1.	I like using E-module.	0	100	0	0
2.	This E-Module is the first time for me.	0	20	80	0
3.	Images/illustrations are clear and easy to understand.	0	100	0	0
4.	Attractive (redaction, font size, pictures, image location and color).	7	93	0	0
5.	Practical and easy to use.	7	86	7	0
6.	The questions are interesting and challenging to solve.	0	40	60	0
7.	The material does not need to be re-presented by the teacher because I already understand.	0	20	80	0
8.	Explanation of material in the E-module is easy to understand.	0	87	13	0
9.	The presentation of material in the E-module encourages me to discuss with other friends.	7	33	60	0
10.	The language used in this E-module is easy to understand.	0	93	7	0

In Table 4 all students agree that they are happy to use the E-module, the pictures in the E-module are clear and easy to understand. On page 6 of the E-module there is a picture of the apical meristem network so that students can easily see and understand the structure of the apical meristem network. The majority of 86% of students agree that the E-module is practical and easy to use. This is because the E-modules developed are link-based so that students can access the E-modules easily without the help of supporting applications. There are 60% of students think that at least they do not agree if the material presented is able to encourage students to discuss with their friends while discussion is one of the skills that must exist in the E-module in order to help students achieve learning goals (Parmin, 2012). This is because in the small-scale test students only read and then assessed the E-module through a student response questionnaire without any teaching and learning activities.

In the large-scale test, the results of student responses to E-module on each indicator are presented in Table 5.

Table 5. Results of Student Responses to E-Modules on Each Indicator (Large Scale)

No.	Statement	SS	S	TS	STS
		%			
1.	I like using E-module.	40	57	3	0
2.	This E-Module is the first time for me.	29	40	31	0
3.	Images/illustrations are clear and easy to understand.	57	43	0	0
4.	Attractive (redaction, font size, pictures, image location and color).	57	43	0	0
5.	Practical and easy to use.	46	54	0	0
6.	The questions are interesting and challenging to solve.	29	71	0	0
7.	The material does not need to be re-presented by the teacher because I already understand.	6	28	60	6
8.	Explanation of material in the E-module is easy to understand.	51	46	3	0
9.	The presentation of material in the E-module encourages me to discuss with other friends.	49	49	2	0
10.	The language used in this E-module is easy to understand.	49	49	2	0

Based on Table 5, it is known that all students agree and strongly agree that the developed E-module is interesting, the pictures/illustrations are clear and easy to understand. On page 25 of the E-module there is a cross-sectional image of dicot and monocot roots, therefore students can easily understand the difference between the two structures. There are 51% of students strongly agree if the delivery of material in the E-module is easy to understand. The presentation of the material in the developed E-module is in sequence, for example, it can be seen on page 5 of the E-module, where there is an explanation of various meristem networks based on origin first and then followed by position. All students agree and strongly agree on the practicality and convenience of the E-module. The state of the E-module structure and function of plant tissue can be opened using a link so that it is practical and easy to use without the need for supporting applications. The results of this study are supported by Daryanto (2013) who suggests that one of the characteristics of the E-module is user friendly, which means it is easy to use.

3. E-Module Effectiveness

Based on questionnaire analysis results of students' interest and learning motivation towards the E-module on the small-scale test and the large-scale test, the developed E-module is effectively used for the learning process. On the small-scale test all students gave an effective and very effective assessment as well as on the large-scale test. The results of the effectiveness of the E-module are presented in Table 6.

Table 6. E-Module Effectiveness Results

Criteria	Small Scale		Large Scale	
	Total Students	Percentage	Total Students	Percentage
Very effective	6	40%	23	66%
Effective	9	60%	12	34%
Less effective	0	0%	0	0%
Ineffective	0	0%	0	0%

Based on analysis results of students' learning interest in the E-module on each indicator on large-scale test, all students agree and strongly agree that they are always present on time when the lesson begins. On the attention indicator, all students disagreed and strongly disagreed if they did not have a textbook. This shows that students' attention to learning is good. In accordance with the opinion expressed by Maria (2015), that students with good attention to learning will automatically pay attention to certain objects, one of which is by taking notes on the material. On the indicator of desire/awareness, the majority 80% of students strongly agree that the lesson will provide new knowledge for themselves. It is difficult for students to understand new knowledge if there is no encouragement of interest in learning in them (Purwaningsih et.al, 2010). Based on the results of the analysis of student interest in each indicator, it is known that most students' interest in learning is increasing.

Based on analysis results of students' learning motivation for the E-module on each indicator in the large-scale test, on the tenacious indicator all students agree and strongly agree that they have tried and believed to be able to understand the contents of the material structure and function of plant tissue. On the indicator of interest, all students agree that they always listen well when the lesson takes place and most students do not agree that they often sleep during lessons. This can be seen when the teacher is explaining the material on the structure and function of plant tissue in the classroom, there are no students sleeping but all students sit neatly paying attention to the teacher's explanation well. Students who have a good interest in learning will be manifested in the form of activities, one of which is the tendency to pay attention and remember a lesson (Slameto, 2015). In the achievement indicators 95% students have tried to get the highest score in the lesson and on the independent indicators the majority of students are satisfied with what they have done. Based on analysis results of student learning motivation on each indicator, it is revealed that the majority of students' learning motivation increases.

CONCLUSION

Based on the results of research and discussion, it can be concluded that the E-Module material on the structure and function of plant tissue based on discovery learning for high school students is feasible, practical, and effective to use in the learning process.

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