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THE EFFECTIVENESS OF THE PROTISTA COURSE TEACHING MODULE IS BASED ON THE RESULTS OF THE PERONOSPORA MANSHRICA LABORATORY TEST ON SOYBEAN SEED (GLYCINE MAX)

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Abstract

The purpose of this research is the development of a module for the protist course in the Biology Education Study Program (S1) FKIP Mulawarman University which is carried out by following the instructional design stages with the ADDIE approach, which consists of 5 stages: Analyze, Design, Develop, Implement, and Evaluate. The data on the feasibility of the module teaching materials were obtained from the validation results by the Protista material experts and teaching materials experts. Meanwhile, the practicality test of the module was carried out by the respondent students of the Biology Education Study Program, FKIP, Mulawarman University. To see the effectiveness of the teaching module, pretest and posttest were carried out. The results showed that the percentage of the feasibility of the module material by material expert validators was ***85.65*** *% with very valid criteria (decent) with slight improvements. The percentage of module eligibility by learning module development experts (teaching materials) is* ***86, 70%*** *with very valid criteria (adequate). The results of the practicality of the material aspects of Class A and Class B are* ***84.6%*** *very practical and the learning aspect is* ***83.2%*** *very practical. Based on the results of the normalized gain test analysis, it shows that the average value of the N-Gain index for class A is* ***79.08%*** *including the* ***Effective category,*** *while the average N-Gain index for class B is* ***78.07%*** *including the Effective category****.*** *Meanwhile for the category of obtaining the average N-gain Score for class A is* ***0.79 including the high category*** *and for the category, the average acquisition of the N-gain Score for class B is* ***0.82 which is also included in the high category****. The results of this study indicate that the module teaching materials are very feasible and very practical to be used by students or lecturers in protist lecture activities on the material "Fungus: characteristics; classification: class Phycomycetes Oomycetes)"*

Keywords: Development, Teaching Module, Protista, Manshurica Peronospora, soybean

The soybean plant is one type of agricultural crop that is being developed in the province of East Kalimantan. This is because soybean yields from 2015 to 2016 have increased from 1,128 tons to 1,519 tons or an increase of 34.66%. The increase in soybean production was due to an increase in harvested area from 23.31% and an increase in productivity to 1.35% per hectare. The districts/cities in East Kalimantan Province that we were able to produce soybeans throughout 2016 were Berau District (1,011 tons), West Kutai (74 tons), Paser (137 tons), Kutai Kartanegara (154 tons), and East Kutai (46 tons). The increase in soybean

production in East Kalimantan was not able to meet the consumption needs of the people of East Kalimantan. Based on statistical data , soybean consumption needs in 2018 are estimated to reach 140,679 tons. (http://www.antarakaltim.com/berita/31201/Kaltim soybean production increased by 34.66%) .

Until now, the center of soybean cultivation is in the East Kutai area, precisely in the District of Kaubun. Meanwhile, in other areas in West Kutai, the community no longer cultivates soybeans because the selling price is lower than the operational costs incurred. Most of the soybean seeds planted in the East Kutai area are local parent and a small portion are seeds originating from Surabaya (Grobogan variety). The import of soybean seeds from Surabaya ranges from October to December 2016. Soybean seeds originating from the Surabaya area have a *high risk* of contracting OPTK A2 Group II *Peronospora manshurica* . This is because OPTK A2 is endemic in East Java (Surabaya) and *pest free area* for East Kalimantan (Samarinda). The import of soybean seeds in 2016 was soybean seeds that were trafficked from Surabaya from PT. Sang Hyang Seri. The number of soybean carrier media for the purpose of seed is the latest local agricultural service project and was reported to have entered the working area of SKP Class I Samarinda.

In the last 3 years, the most trafficked soybean carrier media and has been equipped with a health certificate from the area of origin in Surabaya is generally intended for consumption as raw material for making tempeh and tofu. Soybean carrier media for consumption has a moderate level of risk
(*middle risk*). Soybeans that are trafficked are local and ex-imported products

SKP Class I Samarinda as part of the UPT Agricultural Quarantine Agency has taken a role to minimize the chance of spreading OPTK A2 Group II *P. manshurica* carried on soybean seeds . The officer is obliged to carry out quarantine measures through sampling activities for every domestic activity entering soybeans that are not equipped with a health certificate from the area of origin reported for the purpose of consuming raw materials or as seeds. In addition, periodic monitoring activities are carried out by taking samples of each reported soybean import and having been equipped with a health certificate from the area of origin for further testing in the laboratory. Strengthening understanding and testing skills of *P. manshurica* in the laboratory is also one of the supports in monitoring the spread of OPTK A2. This study will examine the effectiveness of the course model developed with the ADDIE model.

METHOD

This research is development research sourced from the results of laboratory research conducted adapting the development model that refers to the ADDIE model by Branch (2009), which consists of 5 stages, namely: Analyze, Design, Development, Implement, and Evaluate (Evaluation). The product of this research is material in the form of a module which is compiled based on the results of detection research conducted by researchers. Laboratory research was conducted at the Agricultural Quarantine Laboratory Class I Samarinda. This research was conducted at the Agricultural Quarantine Station Laboratory. Class I Samarinda and Biology FKIP Mulawarman University Biology undergraduate students from September to December 2021. Develop, Implement, and Evaluate. Endang (2012: 200) describes the steps of this development research which are shown in the following figure:

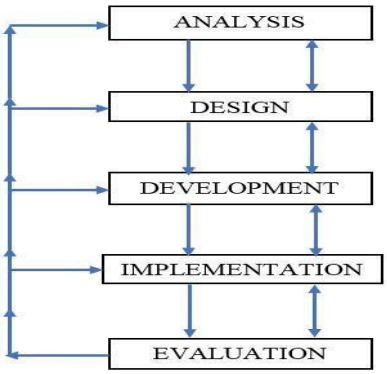


Figure 1 Research Steps

DISCUSSION

a) Practical Test for Lecturers of Subjects

Practicality was carried out by Lecturers in charge of protist courses at the Faculty of Biology, Mulawarman University, Samarinda by Akhmad and Didimus Tanah Boleng. Based on the results of the analysis, the following data were obtained:

Table 2. Data on Practical Results of Material and Learning Aspects Lecturer of Courses

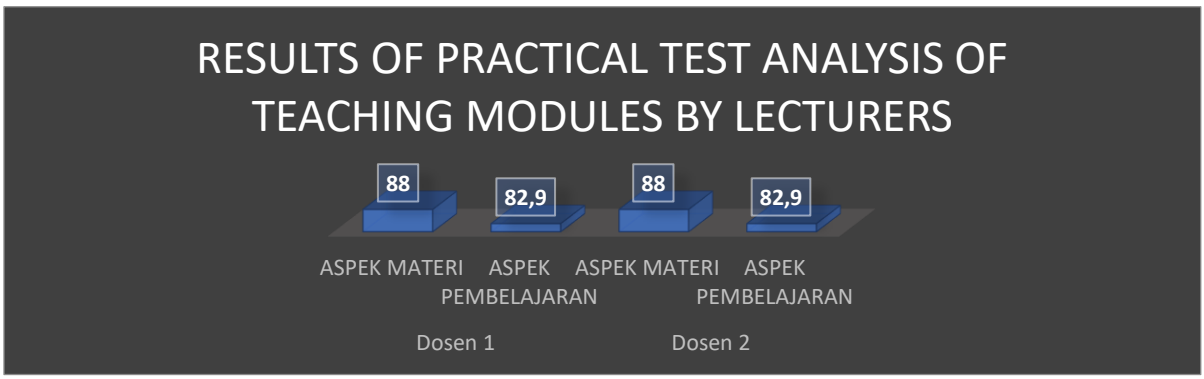
LECTURER	INDICATOR	PERCENTAGE OF SCORE (%)
Lecturer 1	MATERIAL ASPECT	88
	ASPECT OF LEARNING	82.9
Lecturer 2	MATERIAL ASPECT	88
	ASPECT OF LEARNING	82.9

Primary Data (Research Results, 2021)

The recap of the practicality test results is then tabulated based on 5 assessment criteria, namely a score of 1 (very impractical), a score of 2 (less practical), a score of 3 (pretty practical), a score of 4 (practical) and a score of 5 (very practical). The tabulation results are converted into the average total score using the following formula:

$$P = \frac{F}{N} \times 100\%$$

P = Percentage Figures from questionnaire data F = Number of respondents' answers, *N* = Number of highest scores



From the picture above, it is found that the protist lecturers assess the teaching module from the material aspect and the learning aspect with a very practical value of 88% for the value of the material aspect and the learning aspect of 82.9%. So it can be concluded that the developed teaching module is able to meet the indicators of material aspects and learning aspects.

b) Practical Recap of Teaching Module by students

The practicality of the teaching module was obtained from a student response questionnaire to the teaching module that had been developed. The results of the recap of the practicality test of material aspects and aspects of learning devices on the development of learning modules based on the *Cooperative Script* (*CS*) model **.** Based on the results of the analysis, the following data were obtained:

Table 5 Data on Practical Results of Material and Learning Aspects for Class A and Class B

No	Description	Average of Maximum Student Questionnaire Responses	Percentage of Earnings (%)
1	Learning Aspect	3536	83.2
2	Content Aspect	3597	84.6
Criteria			**Very Practical**

Primary Data (Research Results, 2021)

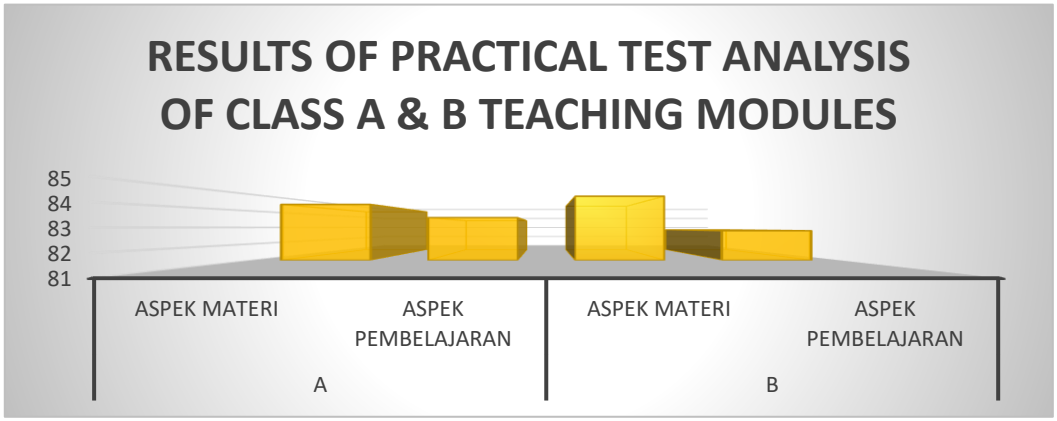


Figure 4. Percentage of Student Response Assessment

Figure 4. shows the percentage of student questionnaire responses with a material aspect value of 84.6%, and an average learning aspect of 83.2% in a very practical category.

1. **Teaching Module Effectiveness Test**

Analysis of the effectiveness of the teaching module developed using data obtained from the pretest and posttest scores of class A and class B. Analysis of the pretest and posttest scores of students in the form of *gain score analysis* and posttest comparison with the criteria for the Assessment categories A (80-100), B (70-100). 79), C(60-69) , D(50-59) and E(<50).

However, before performing the Normalized Gain Score analysis, first the Normality Test analysis and the Paired Sample T Test analysis were carried out (paired samples). Before the t test is carried out, the normality test (appendix 7) and the homogeneity test must be carried out , if the results of the analysis of the normality test for the pretest and posttest values for class A and class B are normally distributed, proceed to the parametric statistical test, namely the Paired Sample T Test (Sugiono, 2011) which is then proceed to the N-Gain Test. If the results of the analysis of the normality test of the pretest and posttest values of Class A and Class B are not normally distributed, it will proceed to the Nonparametric statistical analysis, namely the Wilcoxon Test as an alternative to the Paired Sample T Test (paired sample). Analysis of normality test, Wilcoxon test or Paired Sample T Test (paired sample) was carried out with the help of SPSS version 24 program.

- **Normality UI**

Table 6. Normality test

Tests of Normality

		Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	Class	Statistics	df	Sig.	Statistics	df	Sig.
Student Learning Outcomes	Class A Pretest	.291	36	.000	.738	36	.000
	Class A Posttest	.233	36	.000	.883	36	.001
	Pretest Class B	.196	34	.002	.814	34	.000
	Posttest Class B	.248	34	.000	.860	34	.000

a. Lilliefors Significance Correction

The basis for decision making for the Kolmogorov-Smirnov and Shapiro-Wilk normality tests:

1. If the significance value (sig) > 0.05, the student learning outcomes data is said to be normally distributed
2. If the significance value (sig) < 0.05, the student learning outcomes data is said to be not normally distributed

Based on the results of the analysis of the normality test through the SPSS program, it was found that both the Kolmogorov-Smirnov normality test and the Shapiro-Wilk normality test, the pretest-posttest scores for class A and class B both showed a significance value (sig) < 0.05, so it can be concluded that the distribution of data Student learning outcomes in the pretest-posttest class A and Class B are distributed NOT NORMALLY so that it cannot be continued with the T-test with parametric statistical analysis but must be continued with the non-parametric statistical T-test using the Wilcoxon test. The Wilcoxon test aims to determine whether there is a difference in the average pretest and post-the data for class A and class B (Appendix 8) The Wilcoxon test is a part of nonparametric statistics which does not require

research data to be normally distributed in its analysis. The Wilcoxon test is also an alternative to the paired-sample test (paired sample) if the research data is not normally distributed.

- **Wilcoxon test**

Table 7. WILCOXON TEST RESULTS CLASS A

Wilcoxon Signed Ranks Test

Ranks

		N	Mean Rank	Sum of Ranks
Class A Posttest - Class A Pretest	Negative Ranks	0 [a]	.00	.00
	Positive Ranks	36 [b]	18.50	666.00
	Ties	0 [c]		
	Total	36		

a. Posttest Class A < Pretest Class A
b. Class A Posttest > Class A Pretest
c. Posttest Class A = Pretest Class A

Test Statistics [a]

	Class A Posttest - Class A Pretest
Z	-5,241 [b]
asymp. Sig. (2-tailed)	.000

a. Wilcoxon Signed Ranks Test
b. Based on negative ranks.

OUTPUT RESULTS:

1. The negative rank or the difference (negative) between the learning outcomes of the Protista courses for the Pretest and Posttest is 0 both in the N, Mean Rank and Sum of Rank scores. This 0 value indicates no decrease (reduction) from the pretest value to the posttest value.
2. Positive rank or difference (positive) between learning outcomes for Protista courses for Pretest and Posttest. The output results contained 36 positive data (N), which means that 36 students experienced an increase in learning outcomes from pretest scores to posttest scores. The Mean Rank or the average increase is 18.50, while the number of positive rankings or Sum of Rank is 666.00.
3. Ties is the similarity of pretest and posttest scores. The output results show that the ties value is 0 so it can be said that there is no equal value between the pretest and posttest.

Table.8. WILCOXON CLASS B TEST RESULTS

Ranks

		N	Mean Rank	Sum of Ranks
Posttest Class B - Pretest Class B	Negative Ranks	0 [a]	.00	.00
	Positive Ranks	34 [b]	17.50	595.00
	Ties	0 [c]		
	Total	34		

a. Posttest Class B < Pretest Class B
b. Posttest Class B > Pretest Class B
c. Posttest Class B = Pretest Class B

Test Statistics [a]

	Posttest Class B Pretest Class B
Z	-5,097 [b]
asymp. Sig. (2-tailed)	.000

a. Wilcoxon Signed Ranks Test
b. Based on negative ranks.

RESULTS

1. The negative rank or the difference (negative) between the learning outcomes of the Protista course for the Pretest and Posttest is 0 both in the N, Mean Rank and Sum of Rank scores. This 0 value indicates no decrease (reduction) from the pretest value to the posttest value.
2. Positive rank or difference (positive) between learning outcomes for Protista courses for Pretest and Posttest. The output results contained 36 positive data (N), which means that 36 students experienced an increase in learning outcomes from pretest scores to posttest scores. The mean rank or average increase is 17.50, while the number of positive rankings or Sum of Rank is 595.00 .
3. Ties is the similarity of pretest and posttest scores. The output results show that the ties value is 0 so it can be said that there is no equal value between the pretest and posttest.

Based on the results of the Wilcoxon test in tables 4.7 and 4.8 above, it shows that the output value of "Test Statistic" above is known as the Asymp.sig value. 2 (tailed) is worth 0.000. Because the value of 0.000 is smaller than 0.05 (test P (0.00) < (0.05)). So it can be concluded that the hypothesis H0 is accepted, that is, there are differences in the results of the pretest and posttest students of class A and B in the Fungi material Protista course.

- **N-Gain Test Class A and B Course Protista**

The N-Gain test in this study was carried out with the help of the SPSS Version 24 program. The results of the SPSS version 24 output analysis for the complete N-Gain value can be seen **in Appendix 10.** The results of the analysis are then summarized in the following table:

Table 9 Test of N-Gain Class A and B for Protist Course

Case Processing Summary

		Cases					
		Valid		Missing		Total	
	Class	N	Percent	N	Percent	N	Percent
NGain_Percent	Class A	36	100.0%	0	0.0%	36	100.0%
	Class B	34	100.0%	0	0.0%	34	100.0%

Source: SPSS Outpus

Table 10. Results of N-Gain Analysis for Class Adan B

N-GAIN ANALYSIS RESULTS CLASS A AND CLASS B PROTISTA COURSES					
NO.	**Class A**		**NO.**	**Class B**	
	N-Gain (%)	Gain Score		**N-Gain (%)**	Gain Score
1	77.78	0.78	1	80.00	0.80
2	70.00	0.70	2	69.44	0.69
3	67.61	0.68	3	64.52	0.65
4	76.92	0.77	4	80.77	0.81
5	72.50	0.73	5	65.28	0.65
6	77.78	0.78	6	79.49	0.79
7	80.00	0.80	7	76.92	0.77
8	77.78	0.78	8	84.62	0.85
9	81.25	0.81	9	80.00	0.80
10	77.78	0.78	10	79.49	0.79
11	86.11	0.86	11	86.11	0.86
12	78.87	0.79	12	66.67	0.67
13	80.00	0.80	13	76.47	0.76
14	77.78	0.78	14	77.78	0.78
15	80.00	0.80	15	80.00	0.80
16	80.00	0.80	16	80.00	0.80

N-GAIN ANALYSIS RESULTS CLASS A AND CLASS B PROTISTA COURSES					
NO.	**Class A**		**NO.**	**Class B**	
	N-Gain (%)	Gain Score		**N-Gain (%)**	Gain Score
17	82.50	0.83	17	82.50	0.83
18	80.00	0.80	18	76.92	0.77
19	86.11	0.86	19	83.87	0.84
20	77.78	0.78	20	77.78	0.78
21	81.25	0.81	21	80.00	0.80
22	78.87	0.79	22	78.87	0.79
23	78.67	0.79	23	75.38	0.75
24	68.75	0.69	24	69.33	0.69
25	77.78	0.78	25	74.19	0.74
26	73.33	0.73	26	72.50	0.73
27	81.25	0.81	27	80.00	0.80
28	84.62	0.85	28	86.67	0.87
29	86.11	0.86	29	86.11	0.86
30	81.25	0.81	30	80.00	0.80
31	80.00	0.80	31	80.00	0.80
32	80.00	0.80	32	81.25	0.81
33	81.25	0.81	33	76.92	0.77
34	77.78	0.78	34	84.62	0.85
35	86.11	0.86			
36	81.54	0.82			
Average	**79.08**	**0.79**	**Average**	**78.07**	**0.82**
Minimum	**67.61**		**Minimum**	**64.52**	
Maximum	**86.11**		**Maximum**	**86.67**	

(Primary Research Data 2019)

Based on the results of the normalized gain test analysis, it shows that the average value of the N-Gain index for class A is 79.08% including the **Effective category,** while the average N-Gain index for class B is 78.07% including the **Effective category.** Meanwhile for the category of obtaining the average N-gain Score for class A is **0.79 including the high category** and for the category, the average acquisition of the N-gain Score for class B is **0.82 which is also included in the high category.**

DISCUSSION

This study aims to determine the validity of the teaching module for protist courses based on the results of the laboratory test for the detection of *Peronospora Manchuria* in soybean seeds, the practicality of the module, and the effectiveness of the module by referring

to the ADDIE development model by Branch (2009), which consists of 5 stages, namely: Analysis, Design, Develop, Implement, and Evaluate (Evaluation). The researcher chose the ADDIE development model because, in terms of the development flow, the *ADDIE* development model has a flexible and not rigid development path. In the development process from one stage to the next, a revision process can be carried out.

Improving cognitive learning outcomes requires teaching modules and the application of learning models that allow a learning atmosphere that optimizes students to work independently, and collaborate with other friends in small groups. The average cognitive learning outcomes of students in the biology education study program at Mulawarman University in protist subjects, there is a tendency to decrease and increase slightly in the last three academic years. The average value of cognitive learning outcomes for the last three academic years, respectively: 2012/2013, 2013/2014, 2014/2015 was 75.9; 64.6; 73.1 (Academic Information System, FKIP Mulawarman University, 2016). Cognitive learning outcomes of students in the protist course still show a sufficient average number (Didimus, 2016).

Identification of problems and potentials is carried out in classes A and B of Semester VII S1 students of FIKP Biology, Mulawarman University, Academic Year 2021-2022. Analysis of problems and potentials on campus is carried out by collecting information using an instrument in the form of an observation response questionnaire and unstructured interviews with Biology lecturers, Head of Study Programs, and students in the 2 (two) classes. The results of observations and identification of problems and potentials of lecturers and students in 2 (two) classes, namely as follows: Learning in the Protista course is carried out through lectures, practicums, and presentations, with the criteria for the Assessment category: A (80-100), B (70 -79), C(60-69), D(50-59) and E(<50) However, the understanding of fungal material protists is not optimal because there is no teaching module used. 64.70% of students do not know about Fungi: characteristics; and their classification. 88, 23% of students stated that they were happy if the Protista lecture material on fungi was presented using teaching modules from various learning sources. 94.11% of students stated that learning by using modules is more detailed and interesting because they can show how things work, pictures, or fungal material. According to the course supervisor, other teaching materials need to be made in the form of a module on the material to support the learning process activities that are adjusted to the course syllabus and lesson plans.

Based on the needs analysis of the identification of problems faced by lecturers and students at the Undergraduate Student of FIKP Biology, Mulawarman University Academic Year 2020-2021, the researchers saw several potentials that could be raised to solve these problems, one of which was by implementing a module development based on the detection of the fungus *Peronospora Manchuria* on seeds. soybeans for learning in the Phycomycetes (oomycete) fungi sub-material for the protist course to improve student cognitive learning outcomes.

The researcher produced a protist course teaching module product based on the results of the laboratory test of *Peronospora Manchuria* on soybean seeds. It had various stages of research referring to the ADDIE model by Branch (2009), consisting of 5 stages including 1) Analyze, 2) Design, 3) Develop, 4) Implement, and 5) Evaluate. After making the teaching

module, the researcher tested the validity of the learning media. The validity test of the learning media was validated by material experts, and module device development experts.

1. Validity
   a. Protist Course Material

Material validity and learning is an activity carried out by researchers with the aim of obtaining a valid quality module material so that it can be used by lecturers and students in the teaching and learning process or lectures.

The development of the teaching module based on the results of the laboratory test for the detection of *Perenospora Manchuria* on soybean seeds is a teaching module for the protist course on the fungus class Phycomycetes (Oomycota). The teaching module was first validated by a protist material expert before the trial phase was carried out in lectures. The validation of the teaching module was carried out by the lecturer of the protist subject of the Faculty of Teacher Training and Education, Unmul. The validation of the teaching module was carried out for 2 months with one correction or suggestion from the experts. Validation by material experts aims to obtain information, suggestions, and criticisms so that the developed module becomes a product that is suitable for use in lectures. From the validation results can be seen in table 4.1. The validation score contains the maximum score for each question item in the validation sheet is 5 and the minimum score is 1.

As for the value of the validation test of the material content and learning aspects carried out, the value of the material content aspect was 84.6% and the learning aspect was **86.7** % with a very feasible (valid) category for use in lectures. Material validation results can be seen in table 4.1 . The results of this study indicate that from several elements of module validation, namely from the material aspect, and the learning aspect, it has been fulfilled and deserves to be tested with a little revision.

   b. Learning Tool Development

The teaching modules developed are validated first by Learning Device Development experts, before the implementation stage is carried out in lectures. The development of the teaching module based on the results of the laboratory test for the detection of *Perenospora manshurica* on soybean seeds is a teaching module for the protist course on the fungus class Phycomycetes (Oomycota). The module is first validated by the Development of the teaching module before the trial phase is carried out in lectures. The validation of the module was carried out by the lecturer of Learning Device Development at the Faculty of Teacher Training and Education, Unmul. The validation of the module was carried out for 2 months with one improvement or suggestion from the experts. Validation by experts. Device development aims to obtain information, suggestions, and criticisms so that the developed module becomes a product that is suitable for use in lectures. From the validation results can be seen in table 4.1. The validation score contains the maximum score for each question item in the validation sheet is 5 and the minimum score is 1.

The value of the validation test for the development of teaching modules that was carried out, obtained a value of **86.7** % with a very valid category for use in lectures. The results of the validation of the teaching module can be seen in table 4.1. The results of this study indicate that several elements of the validation of the teaching module, namely from the aspect of the module display per item, have been met very well in terms of the overall appearance of the module.

The results of this study are in line with the theory put forward by Blake (2020), saying that the validity of learning media is good if the development of learning media is in accordance with the needs. Researchers in this study have designed learning modules in such a way that are developed according to the needs of teachers and students both in terms of material content, cover and attractive appearance of the module to the ease of students accessing the content of the material. The same thing was also stated by Primiani (2018) the development of research modules is one of the activities that can expand and deepen material that is more applicable. In addition, the use of the module will also get a more contextual picture of the subject matter. This is important considering contextual learning can help students find creative ideas in the learning process through discovery, reinforcement and connectedness in the real world that students directly experience. Likewise, the results of research by Aziz T (2020), stated that the *Handout* can complement the material presented by the lecturer in the classroom, both the material in the textbook used and the material given orally. *Handouts* are also used to make it easier for students to obtain information in the learning process (Prastowo, 2011; Amanda, Gofur, & Ibrohim, 2016).

From the test of the validity of the protist teaching module that has been described, the researchers proceeded to the practicality test stage by the protist course lecturer and seventh semester students who had taken the fungus protist class.

2. Practicality of Teaching Module for Protista Course

Practicality is one of the most important points in the development of teaching modules. Practicality is one of the important assessments in the development process. Teaching modules can be said to be practical if they can be used anywhere, anytime without any time and circumstances. And the teaching module is very easy to run by lecturers and students in the lecture process. Teaching modules are said to be practical if the results of the questionnaire responses from lecturers and student responses in the practicality test show good criteria and the results from the practicality test of the teaching modules can be used by lecturers and students in lectures. Practicality is measured from the assessment of two response questionnaires, namely the lecturer response questionnaire and the student response questionnaire. The lecturer's response questionnaire consisted of 20 statements, comments and suggestions in response, as well as conclusions, and the student response questionnaire consisted of 20 student statements and responses. The lecturer response questionnaire was filled out by 2 lecturers in charge of the protist course, and the student response questionnaire was filled out by 85 students in the seventh semester of class Adan B.

a. Lecturer Response

The lecturer's response was obtained from the lecturer's response questionnaire given to the lecturer. From the lecturer response data in table 4.6, the average percentage is 88% for the material statement, and the learning statement is 82.9% with a very practical category. So that the protist course module based on the results of the laboratory test for the detection of *Peronospora Manchuria* in soybean seeds is very practical and easy to use.

b. Student Response

Student responses were obtained from student response questionnaires given to students after being tested in class. From the student response data in table 4.7, it is obtained that the average percentage is 84.6%, and the learning aspect is 83.2% in the very practical category.

So that the protist course module based on the results of the laboratory test for the detection of *Peronospora Manchuria* in soybean seeds is very practical and easy to use in protist lectures on the fungus class Phycomycetes (Omycota). The analysis of the practicality test of the teaching modules in this study was obtained from the questionnaire responses from lecturers and students to the teaching modules that had been developed and tested on students. The results of the recap of the practicality test of material aspects and aspects of learning devices on the development of teaching modules based on the *Cooperative Script* (*CS*) model to improve students' cognitive learning outcomes obtained the results of practicality analysis in the very practical category.

The results of this study are in line with the results of research proposed by Harlis (2019) which states that the level of practicality of textbooks through student response questionnaires is in the very practical category with an average value of 3.8. Teaching materials that can be used practically by students will be able to increase students' motivation and learning outcomes. This theory is also supported by (Pambudiono, A., Suarsini, E., & Amin, M. 2016) Practical textbooks will be able to improve students' understanding of the subject matter. Prabowo (2016) argues that the practicality of a learning media can be measured based on the ease of use in learning activities and with the aim of developing the learning media. According to the researcher, the use and application of the development of the *Cooperative Script* (*CS)* model of a biology learning module on fungi, characteristics, classification, and a class of Phycomycetes (oomycote) very practical, this can be seen when the learning process takes place both lecturers and students can access learning materials faster that require further exploration through the material links listed in the learning module. so that it provides a sense of comfort for students and lecturers in developing knowledge related to learning materials both in the form of images and video displays.

Research on the development of the *Cooperative Script* (*CS*) protist teaching module on fungi, characteristics, classification, and class of Phycomycetes (oomycote) was carried out on Biology undergraduate students. Technically, the researcher's data collection was assisted by a lecturer in the Protista course in the field of biology. Researchers and lecturers who support the Biological Protista course use tools developed in carrying out learning in classes A and B which are then given an evaluation in the form of a posttest using a learning outcome test instrument to measure the increase in student learning outcomes which is also carried out before learning begins or before applying the learning tools used. has been developed in the form of a pretest. This pretest serves as the initial benchmark for researchers in analyzing the test for improving student learning outcomes.

3. Teaching Module Effectiveness

The effectiveness of the developed teaching module uses data obtained from the pretest and post-test scores. Analysis of the pre-test and post-test scores of students in the form of gain score analysis and post-test comparison with the value of the criteria for the assessment category: A (80-100), B(70-79), C(60-69), D(50 -59) and E(<50). Before performing the analysis of the Normalized Gain Score, the analysis of the Normality Test and the analysis of the Paired Sample T-Test (paired samples) were first carried out. If the results of the analysis of the normality test of the pretest and post-test values of class A and class B are normally distributed, then proceed to the parametric statistical test, namely the Paired Sample T-Test

(paired sample) which is then continued to the N-Gain Test. However, if the results of the analysis of the normality test of the pretest and posttest values of Class A and Class B are not normally distributed, the researcher proceeds to the Nonparametric statistical analysis, namely the Wilcoxon Test as an alternative to the Paired Sample T-Test (paired sample). Analysis of normality test, Wilcoxon test, or Paired Sample T-Test (paired sample) was carried out with the help of the SPSS version 24 program.

Table 4.6 data obtained based on the results of the analysis of the normality test through the SPSS program found that both the Kolmogorov-Smirnov normality test and the Shapiro-Wilk normality test, the pretest-posttest values for class A and class B both showed a significance value (sig) < 0.05 so that it can be concluded that the distribution of student formative learning outcomes data in the pretest-posttest class A and Class B is NOT NORMALLY distributed so that it cannot be continued with the T-test with parametric statistical analysis but must be continued with the non-parametric statistical T-test using the Wilcoxon test. The Wilcoxon test aims to determine whether there is a difference in the average pretest and posttest data for class A and class B. The Wilcoxon test is part of nonparametric statistics which does not require research data to be normally distributed in its analysis. The Wilcoxon test is also an alternative to the paired sample t-test (paired sample) if the research data is not normally distributed.

Based on the Wilcoxon test results in tables 4.7 and 4.8 above, it shows that the output value of the "Test Statistic" above is known as the Asymp. sig value. 2 (tailed) is worth 0.000. Because the value of 0.000 is smaller than 0.05 (test P (0.00) < (0.05)). So it can be concluded that hypothesis H0 is accepted, that is, there are differences in the results of the pretest and post-test students of classes A and B in the Fungi material Protista course.

The researcher took the next step by analyzing the effectiveness of the application of the Protista learning module through statistical analysis techniques using the SPSS version 24 statistical application. Based on the parametric statistical test of the normalized gain test (N-gain) through the pretest and posttest scores of students, it was found that there was a difference in the average score. pretest and post-test student learning outcomes in class A and class B which were used as research locations after the *Cooperative Script* (*CS*) model learning module was applied to the fungus material, characteristics, classification, and Phycomycetes (oomycote) class. The pretest value is the value obtained before being given treatment, in this case, is the treatment in the learning process using the developed module. While the post-test value is the value obtained after being given treatment using the developed module. The results of the Again test data analysis are then tabulated in the form of a bar chart and can be seen in Figure 4.7 below:

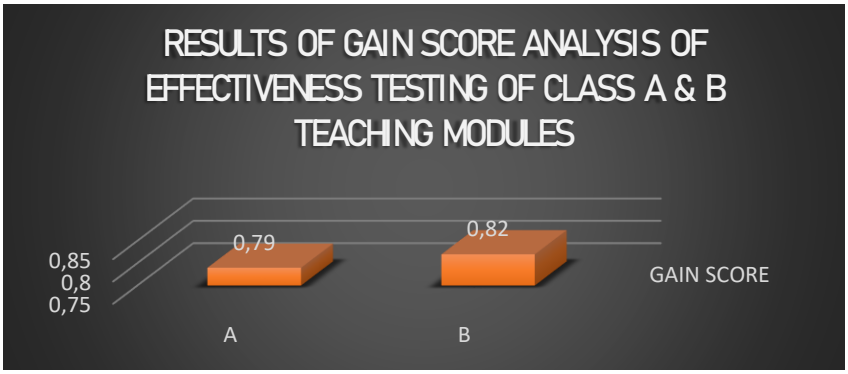


Figure 11 Results of Gain Score Analysis of Class A and B . Effectiveness Tests

Based on the results of the research data analysis, it was found that there was a difference in the maximum and minimum values of the pretest and post-test results of class A and class B which indicated that there was an increase in post-test scores after the modules or teaching materials that had been developed were applied. Categorically, the learning modules developed are in an **effective category** to be applied in biology learning on fungi, characteristics, classifications, and classes of Phycomycetes (oomycote) both in class A and class B. Meanwhile, the results of the gain index test are normalized for learning outcomes for class A and class B. Bis is included in **the high-level category**. Based on the results of the analysis, it can be assumed that the application of the learning modules that have been developed by researchers can be properly applied in learning using the *Cooperative Script* (*CS*) model on fungi, characteristics, classifications, and classes of Phycomycetes (oomycote) to improve student learning outcomes, whether applied classed by researchers and applied by lecturers of the Protista course.

Research that is relevant to this research is: (1) According to Nurul (2021), the results of the study show that scientific-based teaching materials get a media feasibility score of 89% in the "very feasible" category, while the feasibility of the material it gets a score of 86% as well. in the "very decent" category. *Flipchart* media got a media feasibility score of 89% in the "very feasible" category, while material feasibility it was 93% in the "very feasible" category. The response of students to scientific-based teaching materials is 83.62% with a very feasible category, while for *flipchart media* students get a response of 85.04% with a very feasible category. (2) According to Harlis (2019) regarding the development of Algae Textbooks in the Monera and Protista Taxonomy Course for Biology Education Students, the results showed that the algae textbook developed for the Monera and Protista taxonomy course was declared valid. The validity of the algae textbook seen from the validation of the material is in the valid category with an average assessment of 3.2. Meanwhile, the media validation is in the valid category with an average rating of 3.33. For the practical value of algae textbooks, it is in the very practical category with an average value of 3.8.

According to (Suhardjono, 2012; Suhardjono, 2008), generally, textbooks have several characteristics or characteristics such as (1) using a systematic structure and sequence of contents, (2) explaining the instructional goals to be achieved, (3) motivating students to learn, (4) anticipating student learning difficulties so as to provide guidance for students to study the material, (5) providing sufficient training for students, (6) providing summaries, (7) generally oriented to individual students, (8) usually teaching materials is "independent".

Based on this, in this study, the researchers made a protest teaching module by loading the criteria for teaching materials as mentioned in the theory above. The teaching module that has been developed consists of an introduction, content, and closing section. In the introductory section, the components of the Study Program Graduates Learning Outcomes (CPL-PRODI) are charged to the courses and instructions for using the module, while the content section discusses the learning process by describing the lecture material in a complete and systematic manner equipped with interesting pictures with contrasting image coloring so that the module display becomes more attractive. The modules developed by the researcher are arranged in

such a way as to make it easier for students to understand the material to be studied. The researcher also summarizes the main points of discussion in detail, concisely and clearly. In addition to discussing lecture material, the content section of this module or teaching material also contains components of student evaluation materials that are equipped with answer keys to make it easier for lecturers to carry out the next assessment process. An attractive design of teaching modules with material reviews that are conceptually and structured can provide convenience for users of the teaching modules that have been developed. a development model that is structured according to the concepts and characteristics of the material to be taught in learning activities, through a series of scientific activities that can train creative, critical and collaborative thinking skills so as to improve learning outcomes better in accordance with learning objectives.

CONCLUSION

The overall quarantine action service that has been carried out by SKP Class I Samarinda on soybean carrier media with the intended consumption is effective because it is in accordance with the service time of moderate risk, which is less than 3 days but has not been able to provide treatment to free OPTK A2 *P. Manchuria*. Anticipation of risks carried out on soybeans that have been detected by OPTK A2 *P. Manchuria* is to carry out a further germination test using TTZ (*Triphenyl Tetrazolium Chloride*). *Anticipate* and carry out monitoring activities on soybean cultivation land to anticipate the risk of its spread.

REFERENCES

Alim Sumarno. (2012). Difference between Research and Development. Surabaya State University

Arsyad, A. (2011). Learning Media. Jakarta: Rajawali Press.

Arikunto, S. 2009. Research Procedures an Approach Practice. Revised Edition 6. Jakarta : Rineka Cipta

Alvina Putri Purnama Sari, Mohamad Amin, Betty Lukiat. 2017. Textbooks of Biotechnology Based on Bioinformatics with the Addie Model (Journal of Education: Theory, Research, and Development Volume: 2 Number: June 6, 2017

Ani Ardiana Susanti.2019. Viability Test of the Fungus Peronosproa manshurica on Imported Soybeans and Its Pathogenicity Against Three Soybean Varieties. Postgraduate Agroecotechnology Masters Study Program at Jambi University.

Annisa Kartika Nurjanah. 2016. Development of Biology Modules Based on Guided Inquiry Laboratory Models on Biotechnological Materials (JOURNAL INKUIRI ISSN: 2252-7893, Vol 5, No. 3, 2016 (pages 26-39).

Amirhud Dalimunthe, Marwan Affandi, Eka Dodi Suryanto. 2021. Development of Addie's Model Digital Engineering Practicum Module. Journal of ICT in Education, Vol. 8 No. June 1, 2021.

Aziz Tanama. 2020. Development of the Microbiology Handout Based on Research Results of Mold Antagonism Antagonist Against Pathogenic Molds in Plants Dragon Fruit (Hylocereus Sp.). Biology Education Master's Degree Study Program, FMIPA, University Malang Country, Indonesia.

Blake H, Bermingham F, Johnson G, & Tabner A. (2020). Mitigating the psychological impact of covid-19 on healthcare workers: A digital learning package. International Journal of

Environmental Research and Public Health, num 17. Recuperado el 16 de Agosto del 2020. *International Journal of Environmental Research and Public Health* , *17* (2997), 1–15. https://www.mdpi.com/1660 4601/17/9/2997 .

Branch, R. M. (2009). Instructional Design: the ADDIE Approach. New York: Springer Science & Business Media

Budiyono, A., Rusdiana, D., & Kholida, S. I. (2015). Argument Based Science Inquiry (ABSI) Learning in Physics. In the 2015 National Symposium on Science Innovation and Learning (SNIPS 2015) (pp. 205-208). Bandung, Indonesia

Daryanto, (2013). Effective Learning Innovation. Bandung: Yrma Widya. Daryanto. 2001. Learning Media. Bandung: One Nusa, 2001

Ministry of National Education. 2017. Practical Guide, Preparation of e-Module 2017 Jakarta: Directorate General of Primary and Secondary Education.

Dick, W., Carey, L., & Carey, J.O.(2006) The Systematic design of Introction (4th Ed). New York York : Haper Collins College Publishers.

Didymus Tanah Boleng. 2016. The Effect of Cooperative Script Learning Model on Protist Learning Outcomes of Biology Education Students at Mulawarman University. JINoP (Journal of Learning Innovation), Volume 2, Number 1, May 2016 P-ISSN 2443-1591 E-ISSN 2460-0873.

Hariani, S. 2009. *Development of Seed Germination Module Contextual Based* . (Desertation). Malang: Program Postgraduate State University of Malang.

Harris, (2019). Development of Algae Textbooks on Monera and Protista Taxonomy Courses for Biology Education Students. Biology Education Study Program, FKIP Jambi University.

Ministry of Education and Culture. (2014). Standard National Higher Education. Jakarta

Ministry of Research, Technology and Higher Education. (2016). Law of the Republic of Indonesia Number 12 of 2012 concerning the National Education System (Revised 2008). Retrieved May 25, 2020, from http://risbang.ristekdikti.go.id/regulation/uu -12-2012.

Martin Artiyono Primary. 2016. Development of Biotechnology Course Textbooks at the University of Jember. Journal of Education: Theory, Research, and Development Volume: 1 Number: October 10, 2016 Pages: 1987—1992

Endang Mulyatiningsih. 2012. Applied Research in Education and Engineering. Yogyakarta: UNY Press

Naumova, E.S., Obtemperanskaya, M.S., 1988. Modes of survival of the causal agent of Peronospora disease of soyadean, Peronospora manshurica (Naum) Syd., in the intervegetative period. Mycology Phytopathologiya 22(6) : 500-502

Ngadimun, D.H. 2013. Preparation of Textbooks. Bandar Lampung: Presented at the Training for Preparation of Textbooks for Lecturers of FISIP Unila

Nugraha A.W. 2015. Isolation of Mercury (Hg) Heavy Metal Chelating Gene from Indigenous Bacteria in Liquid Waste Agar for Materials for Development of Introduction to Biotechnology Textbooks at the Department of Biology Education, University of Malang. Malang: University of Malang

Parmin et al. 2012. Development of Science Teaching and Learning Strategy Course Modules Based on Learning Research Results. Journal of Indonesian Science Education JPII 1 (1) (2012) 8-15

Pathak, V., K., Mathur, S., B., and Neergaard, P., 1978. Detection of Peronospora manshurica (Naum) Syd. in Seeds of Soybean. Glycine max. Eppo Bulletin. 8(1):21-28.

Prabowo, CA, Ibrohim, & Saptasari, M. (2016). Development of Virtual Laboratory-Based Inquiry Learning Module. *Journal of Education - Theory, Research, And Development* , *1* (6), 1090–1097. https://doi.org/10.17977/jp.v1i6.6422 .

Prastowo, A. (2011). Creative Guide to Making Innovative Teaching Materials Creating Interesting and Fun Learning Methods. Yogyakarta: Diva Press.

Primiani, CN (2018). Development of Research-Based Textbooks on Local Natural Ingredients as Estrogenics in Animal Physiology Courses.

Portillo, M., Z., 2004. Mildew (Peronospora farinose) of Quinua (Chenopodium quinoa) in the Andean Region. Beson Agriculture and Foot Institute. Peru

Rahmat Arofah Hari Cahyadi.2019. Development of Teaching Materials Based on ADDIE Model. HALAQA: Islamic Education Journal doi: 10.21070/halaqa.v3i1.2124

Rasyid Hardi Wirasasmita, Yupi Kuspandi Putra.2017. Development of Interactive Video Tutorial Learning Media Using Camtasia Studio and Macromedia Flash Applications. EDUMATIC: Journal of Informatics Education Vol.1, No.2: 2549-7472

Rohmaini, L., Netriwati, N., Komarudin, K., Nendra, F., & Qiftiyah, M. (2020). Development of Winggeom-Assisted Ethnomathematics-Based Mathematics Learning Module Based on Borg And Gall Steps. Theorems: Mathematical Theory And Research, 5(2), 176–186.

Satyasa. I.W.2007 "Conceptual Foundation of Learning Media". Bali : Ganesha University of Education.

Sudjana N.2017. Hasi Research; Learn how to teach. Bandung: Rosdakarya.. _

Suhardjono. 2008. *Preparing Teaching Materials to Achieve Lecture Goals More Enjoyable* . Papers on Workshop on preparing teaching materials for A2 Grants, Civil Engineering Department, Faculty of Engineering, Universitas Brawijaya, 26 May 2008.

Suhardjono. 2012. *Compiling Textbooks* . Training on Writing Textbooks for Masters in Teacher Education for Madrasah Ibtidaiyah PPS State Islamic University Maulana Malik Ibrahim Malang, Saturday, June 4, 2011.

Sundayana. 2015. Educational Research Statistics. Bandung: Alphabet

Sugiyono. 2011. Quantitative, Qualitative, and R&D Research Methods. Bandung: Alphabeta

Sparrow, F.K. 1960. Aquatic Phycomycetes. 2nd edition. The University of Michigan Press, Ann Arbor, Michigan.

Wena, Made. 2012 in "Contemporary Innovative Learning Strategies An Operational Conceptual Review". Jakarta: Earth Literacy, 2012.

Zahro, NH 2015. Analysis of Readability Levels in Integrated Thematic Learning Textbooks Curriculum 2013 Elementary/MI Grade 2. *NOSI*, 3 (2):176—185.