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DEVELOPMENT OF MOON ORCHID (*Phalaenopsis amabilis L.*) TISSUE CULTURE MODULE AS TEACHING MATERIALS FOR BIOLOGICAL EDUCATION

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ABSTRACT

The module is one of the alternative teaching materials that can help students or educators in the learning and teaching process. This study aims to examine the validity of the tissue culture module of the moon orchid (*Phalaenopsis amabilis* L.) using leaf explants and the hormone Naphthalene Acetic Acid (NAA), which was developed at the Biology Faculty of the Islamic University of Riau. This study uses the ADDIE model with several stages: analysis, design, and development. These research results are a printed product, namely a tissue culture module. This research data was obtained from the validation results by material experts, learning experts, and response tests with lecturers and 16 2015 school year students who had taken the tissue culture course. The validation results by material experts showed that the module developed got an average percentage of 86.45% (very valid). Learning experts got an average percentage of 87.74% (very valid). This developed module received very valid responses from lecturers and students. It can be seen from the average response of lecturers 95.48% (very good) and students with an average percentage of 90.31% (very good). Based on the validation results from the experts, the product in the form of a tissue culture module is very valid to be used in the learning process.

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INTRODUCTION

The tissue culture course is one of the elective courses presented in the Biology Education study program at the Islamic University of Riau. The results of the researcher's observations show that so far, there have been no teaching materials in the form of modules that are used to support teaching and learning activities.

Based on the results of the initial observations and interviews that have been conducted on several sources, namely lecturers and students. The lecturer stated that in implementing the tissue culture learning process, students learn about tissue culture theory using only power-point learning media, and students do tissue culture practicum based on the provided practicum guide. Resource persons for semester five students of the 2017-2018 academic year who took the network culture course stated a need for reference to learning media or other teaching materials other than PowerPoint. It is because there are difficulties in using power points in learning activities. Educators are expected to develop teaching materials as a source of learning (Depdiknas, 2008). One of the teaching materials that can support student learning independently is using teaching materials in modules.

Modules are alternative teaching materials that students can use according to their characteristics. According to Sukiman (2012), the module is a unified program to measure goals. Learning with Modules is an independent learning approach that focuses on mastering the competencies of the study material that students learn at a certain time according to their competencies and conditions.

The use of modules in the implementation of learning has advantages, namely as follows: (a) the module can provide feedback so that students know the shortcomings and immediately make improvements. (b) clear learning objectives are set in the module so that student performance focuses more on achieving learning objectives. (c) modules that are designed to be attractive, easy to learn will be able to motivate students to learn. (d) the module is flexible because students can study the material differently and at different speeds. (e) can establish good cooperation between students, and (f) remedial can be done because the module provides sufficient opportunities for students to find their weaknesses based on the evaluation given (Lasmiyati, 2014).

Based on the introduction stated above, it is necessary to have teaching materials in the form of a lunar orchid tissue culture module that can be used as a reference and guide by lecturers who oversee tissue culture courses to make it easier for students to study plant tissue culture courses. Based on this, the authors are interested in researching with the title "Development of a Tissue Culture Module as Teaching Material at the Biology FKIP, Riau Islamic University."

This study examines the validity of the lunar orchid tissue culture module (*Phalaenopsis amabilis* L.) using leaf explants and the hormone Naphthalene Acetic Acid (NAA) developed at the Faculty of Biology Education, Riau Islamic University.

Research and development (R&D) is developing and validating educational products (Sanjaya, 2014). According to Borg & Gall (1983) in Setyosari (2013), the definition of development research is a process used to develop and validate educational production. The purpose of development research is to assess changes within a certain period (Setyosari, 2013).

In research and development, the ADDIE model consists of five stages. The stages of the ADDIE model are Analysis (Analysis), Design (Design), Development (Development), Implementation (Implementation), and Evaluation (Evaluation) (Prawiradilaga, 2014).

Teaching materials are a set of materials that are systematically arranged, whether written or not, to create an environment or atmosphere that allows students to learn. Some argue that teaching materials are information, tools, and texts needed by teachers or instructors to plan and study the implementation of learning (Prastowo, 2014).

According to the General Guidelines for the Development of Teaching Materials in Prastowo (2014), the module is defined as a book written to learn independently without or with teacher guidance. Furthermore, the module is the smallest unit of learning program that students can study individually.

Tissue culture is one way of vegetative propagation of plants. Tissue culture is a plant propagation technique that isolates plant parts such as leaves, buds, cells, protoplasts and grows these parts (Kurnianingsih, 2020).

Tissue culture techniques emphasize a suitable environment for explants to grow and develop. A suitable environment will be fulfilled if the growing media provides everything plants need (Nofrianinda, 2017). Factors affecting plant growth and morphogenesis in tissue culture can be classified into four: genotype, growing media, growing environment, and physiology (Pratiwi, 2015).

According to Indria (2016), the success of a tissue culture technique depends on the use of Growth Regulatory Substances (PGR). The

combination of basic media and PGR will optimize the growth of explants. PGR can stimulate or inhibit plant physiological processes.

Growth regulators are compounds given to plants as supplements or additional nutrients to increase the process of cell division to be more active (Mutryarny, 2018).

Plant growth regulators play an important role in controlling biological processes in plant tissue culture. The role of these growth regulators regulates the speed of growth of each tissue and integrates its parts into a whole plant (Lestari, 2010).

Growth regulators consist of auxins and cytokinins. Both ZPT groups can increase the concentration of growth regulators in cells to become a triggering factor in the growth process and tissue development (Lestari, 2010).

Administration of the hormone auxin is closely related to the level of concentration given. Auxin hormone is used to stimulate cells to elongate and develop to form new cell walls so that they can produce the formation of plant organs (Alpriyan, 2018).

Administration of cytokinin hormones in tissue culture plants is used to grow and develop plant cell cultures. Cytokinins also delay senescence in leaves, flowers, and fruits by controlling the processes that cause cell death in plants (Lawalata, 2011).

The tissue culture method can produce seeds in large quantities without requiring many parents and in a relatively short time. The stages in the implementation of tissue culture are: (1) Media making; (2) Initiation; (3) Sterilization; (4) Multiplication; (5) Rooting; and (6) Acclimatization (Basri, 2016).

METHOD

This research is Research and Development or Research and Development (R&D). This research was conducted at the Biology Education Study Program at the Islamic University of Riau on 28 May and 2 June 2018. The tool used in this study was a printed tissue culture module.

This tissue culture module is done in several stages and analyses: 1) KKN analysis, needs analysis, and student analysis. 2) Designing the tissue culture module design. 3) Validation of modules by experts and response tests to lecturers and limited responses to 2015 school year students taught 16 plant tissue culture courses. The sampling technique in this study used the purposive sampling technique. This technique is used with specific considerations (Sugiyono, 2014). The data collection technique in this study used a questionnaire consisting of a material expert validation sheet, a learning expert validation sheet, a validation sheet by a tissue culture course lecturer. After the experts declare the module valid, the response will be limited to students who have taken tissue culture courses. Akbar (2013) suggests a formula for analyzing the level of validity descriptively as follows.

$$Vma = \frac{TSe}{TSh} x\ 100\%$$

$$Vme = \frac{TSe}{TSe} x\ 100\%$$

$$Vs = \frac{TSe}{TSh} x\ 100\%$$

Table 1. Criteria for assessment by validator

Validity Range	Validity Level
85,01% -100%	Very valid, or can be used without revision
70,01% - 85%	Valid enough, or can be used but needs minor revision
50,01% – 70%	Not valid, it is recommended not to use it because it needs a major revision
01,00% - 50%	Invalid, or should not be used.
85,01% -100%	Very valid, or can be used without revision

Source: Akbar (2013)

Table 2. Criteria for the percentage of student response questionnaires

Criteria	Qualification
86% - 100%	Very good
76% - 85%	Good
60% – 75%	Moderate
55% - 59%	Less
≤ 54 %	Very less

Source: Purwanto (2010)

RESULTS AND DISCUSSION

Teaching materials in the form of modules that contain techniques for cultivating the moon orchid (*Phalaenopsis amabilis* L.) In addition to cultivating techniques, this module informs about the lunar orchid plant (*Phalaenopsis amabilis* L.), national pride, or Puspa charm.

Knowing the validity of the tissue culture module as a teaching material, validation of the module teaching material was carried out using an instrument in a validation sheet. 4 validators and 16 students carried out the module validation as a limited response. The results of validation by experts can be seen in Table 3.

Table 3. Average results of validation of tissue culture module teaching materials by material experts

Rated aspect	Percentage Validity (%)	Validity Level
Content Eligibility	86,76%	Very valid
Serving Eligibility	93,75%	Very valid
Language Assessment	78,85%	Valid
Average	86,45%	Very valid

Table 4. Results of Validation by Learning Experts

Rated aspect	Percentage Validity (%)	Validity Level
Format	100,0%	Very valid
Language	83,33%	Very valid
Presentation	87,50%	Valid
Visual	92,86%	Very valid
Benefit	75,00%	Valid enough
Average	87,74%	Very valid

Table 5. Respondent Lecturer's Assessment of the Network Culture Module

Rated aspect	Response Percentage		Average (%)	Qualification
	E. S	M. L		
Presentation	91,67%	95,85%	93,75%	Very good
Language	87,50%	100,0%	93,75%	Very good
Content	91,67%	97,22%	94,49%	Very good
Benefit	100,0%	100,0%	100,0%	Very good
Average (%)	92,71	90,34%	95,49%	Very good

Table 6. Limited Trial Results

Rated aspect	Average (%)	Qualification
Format	89,45%	Very good
Language	84,37%	Good
presentation	93,36%	Very good
Visual	90,63%	Very good
Benefit	93,75%	Very good
Average	90,31%	Very good

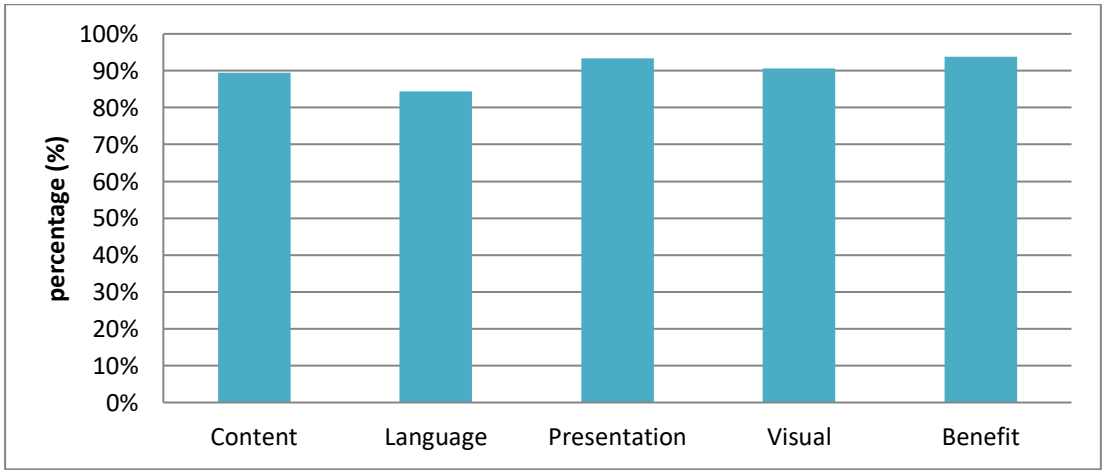

Figure 1. Student trials

The material expert emphasizes the assessment on three aspects, namely the content feasibility aspect, the presentation feasibility aspect, and the language assessment aspect. The material expert who became the validator of the product developed was Prof. Dr. Ir. Hasan Basri Jumin. Based on the assessment of material experts, the average overall assessment of aspects is 86.45%, indicating that the teaching materials developed are very valid.

Giving a very valid level of validity implies that the teaching materials developed already have elements of material suitability with learning outcomes and competencies to be achieved. Teaching materials can help and motivate students so that the teaching materials deserve to be tested in the field. This means that the teaching material follows technical considerations in packaging the content or subject matter.

Material experts also provide comments and suggestions to improve the writing system for sources on images, namely information on the year of publication of the image quoted from the internet. Learning experts focus on module format, linguistic aspects, presentation aspects, visual aspects, and benefits aspects. The learning expert who validated the product developed was Dr. Riki Apriyandi Putra, M. Pd. Based on the assessment of learning experts, the average overall assessment of aspects is 87,74% which indicates that the teaching materials developed are categorized as very valid without revision to be tested in the field.

Learning experts also provide comments and suggestions on aspects of module format. Learning expert validators provide comments. The module format follows the guidelines for preparing learning tools and teaching materials for RISTEKDIKTI 2017, and learning outcomes are made more in line with those in the RPS. Moreover, in this visual aspect, learning experts provide input to provide the word module in the title on the cover, and the writing is replaced with black.

Then the average response of ES and ML lecturers to the tissue culture module was 95.48%, with a very good response rate. It shows that the lecturers responded well to teaching materials for the tissue culture module of the moon orchid plant (*Phalaenopsis amabilis* L.). The lecturer gave a very good response by stating that the module developed was exciting and easy to understand.

The average student response to the tissue culture module is very good, with 90.31%. This score indicates that students respond well to using the lunar orchid (*Phalaenopsis amabilis* L.) tissue culture module. Students gave good responses by stating that the modules developed were exciting and easy to understand. With this module, students are also helped because previously, there was no module in the tissue culture course, so that with the presence of this module, students are easier to understand and remember the material.

Figure 2 is an appearance of the Moon Orchid (*Phalaenopsis amabilis* L.) plant tissue culture module.

Figure 2. Appearance of the module

CONCLUSION

Teaching materials in the form of modules are considered very valid based on the validity criteria according to the validator's assessment. The average assessment of material experts is 86.45% (very valid) and learning experts is 87.74% (very valid). The tissue culture module teaching materials received a very good response from the lecturers with an average percentage of 95.48%. The tissue culture module teaching materials received very good responses based on student responses with an average percentage of 90.07%. After validation and limited trials have been carried out, the development of tissue culture module teaching materials is very valid to be used in the implementation of tissue culture course learning.

In the development of tissue culture teaching materials, it is necessary to carry out further research to test their effectiveness by proceeding to the Implementation stage and the Evaluation stage. used as an alternative in developing modules on other lecture materials. The tissue culture module teaching materials need to be re-validated with an assessment instrument that is in accordance with the 2017 Minister of National Education.

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