Preliminary Studies of the Development of Local Wisdom-Based Biotechnology Module for Biology Students

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Abstract. The development of the local wisdom-based Biotechnology module is one of the important factors that needed to support the ability of Biology Students and their knowledge about their mascot flora. This research was aims to find out about the preliminary studies of the research about the development of a local wisdom-based Biotechnology module for Biology Students on the topic of molecular analysis and the application of them for some aspects of studies. The type of the research about the development of module is Research and Development (R & D) model which has been carried out from the problem studies to the initial investigation data stages. The results showed that based on the results of the curriculum analysis and Semester Learning Plan (RPS of Biotechnology) that had been implemented, the topics in biotechnology learning consisted of ten topics in learning. The results of interviews conducted with lecturers in the Biotechnology subject also revealed that there were several obstacles in the implementation of the Biotechnology course at the Riau Islamic University Biology Education Study Program, one of which was the lack of student references to study biotechnology. Based on the student problem questionnaire, it is known that students do not have a local wisdom-based biotechnology module yet (about 100%). The results of the student need analysis questionnaire showed that the students strongly agreed with the development of the Biotechnology module based on local wisdom (with a percentage of 100%). In conclusion, it is necessary to develop a module for Biotechnology subjects based on local wisdom for biology students to help students understand the learning material in the learning process.

1. Introduction

Nibung (Oncosperma tigillarium Jack Ridl.) is one of the family members of the Palms plant [1] it used by the people as their mascot flora in Riau Province, Indonesia. This plant has widely used for building materials, for traditional medicine, for fishery too in that area. Furthermore, we found that all of the parts of the nibung plant have high economic value that supports the local community lives, hence used much as construction materials and for traditional medicine. Nibung’s stem is used for water pipes, floors of houses on stilts, or simple bridges. The bark can be woven into the roof or wall of the house. The leaves can be woven for the roof of the house or basket. Flower buds can be made vegetables by the community. The roots of nibung is used for traditional medicine. Nibung has also
been used by the people of Riau both for carpentry materials, bridge poles, for weapons in the form of swords and spears [2].

Based on the previous research, it was collected data’s about the characterization of morphological [3], anatomical [4], and molecular of nibung plant. For the research about local wisdom of people who used nibung, we found that Riau’s Malay People in Bengkalis Regency are very caring for, respecting, and supporting efforts to conserve nibung plants. They using nibung with full of wisdom, good-value, and full of wise. Wisdom of local people in the use of nibung plants can be seen in various aspects, namely cultural, social economy, and eco-tourism, which is harmony existed in the communication between nature, human and built environment between them. It is implemented in cultural values, rituals, and spiritual beliefs in the local community. It can be concluded that the utilization of nibung plant in Bengkalis, Riau is supported by the local community and conducted wisely [5]. Ironically, some people who as Riau’s residents do not know about these plants, especially the students in the Biology Program of Universitas Islam Riau.

For this reason, the development of the local wisdom-based Biotechnology module is one of the important factors that needed to support the ability of Biology Students and their knowledge about their mascot flora. These facts were support the importance of this study. This research aims to obtain information about how the results of the preliminary research of the development of the local wisdom-based Biotechnology module for Biology Student.

2. Materials and Methods

Data collection about the development of a local wisdom-based Biotechnology module was conducted at Biology Program, Universitas Islam Riau, Pekanbaru, Riau Province, Indonesia. This research is a survey method that conducted by interviewing Biotechnology lecturers and giving the questionnaires to the student. The process of research and development begins with the defined stage. At the define stage, the learning requirements are determined by analyzing the syllabus and learning objectives in the Biotechnology Subject.

Overall, the defined stage is carried out in three main steps, namely: needs analysis, student analysis, and task analysis. There are the steps that are defined consisting of: needs analysis, student analysis, and task analysis. The research conducted by 4-D Model for Research and Development Research by Thigagarajan, et al. 1974 [6] that states that the analysis is a stage of the process of the initial step to describe the first step before research and development.

Firstly, the needs analysis is guided by the learning syllabus as well as the problems that arise in Biotechnology Subject learning in higher education, including the lack of teaching materials for students, the unavailability of Biotechnology learning resources that are contextual under the problems at hand. Therefore, the syllabus was updated by referring to the syllabus of the Biotechnology Subject in the Biology Education Program, Education Faculty of Universitas Islam Riau.

Secondly, student analysis was carried out by looking at the student's learning experience of contextual learning efforts which were still minimal in the Biotechnology Subject. Therefore, it is necessary to have teaching materials that can provide knowledge to students on contextual learning by the problems encountered in everyday life. This is related to efforts to increase students' understanding of nibung conservation as the flora mascot of Riau Province.

Thirdly, task analysis includes analysis of learning objectives and analysis of concepts (structure of content). The analysis of learning objectives is used as the basis for designing teaching materials, while concept analysis is carried out by identifying the main concepts of the Biotechnology Subject which are associated with the teaching material.

Data obtained from the need analysis questionnaires were measured using a scoring with four answer choices for each statement of the 13 statements for and each answer has its score interval. Its uses to describe the perception of a student about the Biotechnology Subject and their learning material and references that they used to the learning process.
3. Results and Discussions

The results of research and development show that based on the analysis of the curriculum that has been done with how to analyze the Semester Learning Plan (RPS) used in biotechnology lectures, then we get ten main topics in biotechnology learning. The analysis phase is the first stage before design a product. Based on the needs analysis is guided by the learning syllabus as well as the problems that arise in learning Biotechnology in the Biology Education Study Program, Education Faculty of Universitas Islam Riau, including the lack of alternative teaching materials for students, the unavailability of contextual Biotechnology learning resources according to the problems faced. Therefore, the syllabus was updated by referring to the syllabus of Biotechnology courses in the Biology Education Study Program and all the problems faced.

In this case, the suitability of the material covered with the RPS used will facilitate the achievement of learning objectives that must be achieved by students in biotechnology lectures. It means that the lecturer has an important factor in the learning process. This is in line with the opinion of previous researchers, namely: Maison, et al. 2019 [7] that states that educators play a central role in the process and outcomes of education because educators are subjects who expected to be able to make implementation and integration between the curriculum to be more operational in the form of syllabus or RPS and teaching materials. Furthermore, learning resources are all the things that can be implemented to facilitate the learning activity for achieving the learning goals and can improve student performance in the learning process. This is in line with some other research that conducted before, that state that this is an important thing to evaluate of student’s attitude toward Science [8; 9].

Based on the results of interviews conducted with biotechnology lecturers, there were several obstacles in biotechnology lectures, including not having lecture modules that were made by the lecturers. They assume that the development of a module is necessary to improve student knowledge. Lectures are still dominated by lecturers and students who lack references, so that it has an impact on the lecture process. In this case, the results of the initial study on the need for lecturers to develop research-based teaching materials are very important things to do. This is in line with the opinion of [10] which states that the results of the analysis of the needs of lecturers who teach courses are the starting point for researchers to develop teaching materials, and for overcoming the problems in the learning process in Indonesia.

The second phase is about an analysis of teaching materials. The results of analysis of the references that used in the Biotechnology Subject based on the guidelines for the preparation of learning devices and teaching materials have been released by the Ministry of Research, Technology and Higher Education, Directorate General of Learning and Student Affairs, Directorate of Learning, 2017 [11].

The next step is about the student analysis. It has been carried out by looking at the student's learning experience of contextual learning efforts which are still minimal in the Biotechnology Subject and did not an in-depth discussion of the contextual learning with the facts faced by the student in their daily activities in learning. Therefore, the module is an alternative teaching material that can provide knowledge to students on contextual learning by the problems encountered in their daily lives. This is related to efforts to increase students' understanding of nibung conservation as the flora mascot of Riau Province.

Task analysis includes analysis of learning objectives and analysis of concepts (structure of content). The analysis of learning objectives is used as the basis for designing teaching materials in the form of modules based on the results of characterization research and studies of local wisdom on the use of nibung plants in Riau Province. Meanwhile, concept analysis is carried out by identifying the main concepts of the Biotechnology Subject which are associated with the teaching materials.

Analysis of student problem questionnaires in the Biotechnology Subject shows that students do not have a local wisdom-based biotechnology module yet (about 100%). The results of the student need analysis questionnaire showed that the students strongly agreed with the development of the
Biotechnology module based on local wisdom (with a percentage of 100%), and the student has determined the type of writing and to be used in the module.

It can be concluded that all of the steps of this research support for developing the local wisdom-based Biotechnology module as teaching material for Biology Students. It needed to produce a biotechnology module that in line with the student’s needs. It is in line with the opinion of the other researchers that states that analysis is important to be a point of view in teaching because it is through needs analysis, lecturer, students, teaching materials, teaching procedures; all can be connected harmoniously to improve the learning process of students and to build the character and the soft skills of student [12; 13], also able to support students in learning, it can be viewed from the affective aspects of students [8].

Also, it recommended that this module can improve the student ability and give the solution to the difficulty in that subject. It is in line with [14] state that teachers reported a range of obstacles to the teaching of biotechnology including the difficulty of the subject matter and a lack of practical work that was suited to the content of the teaching unit in New South Wales (NSW), Australia. Furthermore, a module is a complete measuring tool and the unity of a program that can measure goals [15].

In conclusion, it is necessary to develop a module for Biotechnology Subjects based on local wisdom for biology students to help students understand learning material that was suited to the content of the teaching unit in New South Wales (NSW), Australia. Furthermore, based on the preliminary investigation data, it is possible to develop a local wisdom-based biotechnology module containing research results for Biology Students.

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References
[1] Anderson. 2009. Mangrove Guidebook for Southeast Asia. Part 2: Descriptions-Palms, Cycads & Pandans. Arecaceae: Oncosperma tigillarium (Jack.) Ridl.
[2] Desti, Fitmawati, Yulis, P.A.R., and Isda, M.N. 2019. Characterization of Ethnobotany of Riau Province Maskot Flora (Oncosperma tigillarium) Jack Ridl. Proceeding of The Second International Conference of Science, Engineering, and Technology (ICOSET) p. 250-253.
[3] Desti, and Mellisa. 2017. Morphological Characterization of Mascot Flora of Riau Province (Oncosperma tigillarium) and its Development as Teaching Material for Plant Botany Subjects. Bioterdidik Journal FKIP Universitas Lampung. Vol. 5 No. 7. [Indonesian].
[4] Desti and Maryanti, A. 2018. Characterization of Anatomy of Nibung (Oncosperma tigillarium) and Its Development for Material Teaching. LPPM UIR Research Report. p: 1 – 115.
[5] Desti, Fitmawati, Yulis, P.A.R., and Isda, M.N. 2019. Local Wisdom of Riau Province Maskot Flora (Oncosperma tigillarium) Jack Ridl in Baganbatu, Bengkalis District Riau Indonesia. Proceeding of The International Conference of CelSciTech 2019-Science, and Technology Track (ICCELT-ST 2019) p. 92-95.
[6] Thiagarajan, S. and others. 1974. Instructional Development for Training Teachers of Exceptional Children. National Center for Improvement of educational. Washington DC.
[7] Maison., Emawati, M. D. W., Budiarti, R. S., Kurniawan, W., Ningsih, Y., Puspitasari, T. O., Jannah, N., Putra, D. S. (2019). Learning in Nature Science: Social Implication, Normality of Scientist., Attitudes Towards Investigation of Natural Science, and Interest Adds To Science Learning Time. International Journal of Scientific & Technology Research, 8(12), 1478-1484.
[8] Asrial, Syahrial, Maison, Kurniawan, D.A., dan Piyana, S.O. 2020. Ethnoconstructivism E-Module to Improve Perception, Interest, And Motivation of Students in Class V Elementary School. JPI, Vol. 9 No. 1.
[9] Astalini., Kurniawan, D. A., Kurniawan, N., Anggraini, L. 2019. Evaluation of Student’s Attitude Toward Science in Indonesia. Open Journa of Educational Research (OJER), 3(1), 1-12.

[10] Sukasni, A., & Efendy, H. (2017). The Problematic of Education System in Indonesia and Reform Agenda. International Journal of Education, 9(3), 183.

[11] Ministry of Research, Technology and Higher Education, Directorate General of Learning and Student Affairs, Directorate of Learning. 2017. Scafolding of Teaching and Learning in Indonesia. Open Journal of Educational Research (OJER), 3(1), 183.

[12] Musika, I.K. 2018. Local Wisdom Based Character Education in Teaching Balinese to Achieve National Integration of a Nation. SHS Web of Conference, 42. 00013 (2018). GC-TALE. p: 1-7.

[13] Wijana, N. 2015. Berorientasi Kearifan Lokal Ke Dalam Materi Ajar Soft Skill Mahasiswa Jurusan Pendidikan Biologi Universitas Pendidikan Ganesha. Jurnal Pendidikan Indonesia, 4(2), 647–7.

[14] Steele, F., and Aubusson, P. 2004. The Challenge in Teaching Biotechnology. Research in Science Education volume 34, pages365–387.

[15] Kristanto, A., Mustaji, Mariano, A., Sulistiowati, and Nuryati, D.W. 2018. Developing Media Module Proposed to Editor in Editorial Division. IOP Conf. Series: Journal of Physics: Conf. Series. 947 012054.