

The Effectivity of Medicinal Plant Based on Local Wisdom of Dayak Community Textbook Development on Improving Student Learning Outcome

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Abstract: Exploration of local plant germplasm as a source of biopharmaceuticals is a practice that has often been carried out by the Dayak community in Central Kalimantan, one of them is *Diplazium esculentum* which is believed to treat acne. Scientific testing of the effectiveness of *Diplazium esculentum* as an acne medication can be a source of learning in lecture activities as a medicinal plant based on local wisdom of Dayak community textbook development. This research aims to generate a local wisdom and laboratory experiment textbooks that are valid, practical and effective in Biotechnology courses, specifically on pharmaceutical biotechnology topic of biology education program, Islamic State University of Palangka Raya. This textbook development followed the model ADDIE. The results of this research showed that the textbooks that developed using ADDIE model are a) categorized very valid based on the results of an content expert (91,68%), media expert (83,58%) and practitioners' assessment (91.22%), b) practically based on limited testing of college student of biology education program in Islamic State University of Palangka Raya and c) effective based on the result of cognitive test on health biotechnology topics that had a significant effect with p-value $0.009 < \alpha$ ($\alpha = 0,05$). This research concluded that the textbooks based on local wisdom and laboratory experiment which were developed have been proved valid, practical, and effective to increase learning outcome.

Keywords: Dayak community; Development research; *Diplazium esculentum*; Local wisdom; Medicinal plant

Introduction

State the objectives of the work and provide an adequate background, avoiding a detailed literature survey or a summary of the results. Achieving 21st century competencies can be achieved through improving the quality of learning, one of which is through the development of textbooks based on research results in lecture activities. The developed textbook based on research by presenting concrete data capable of realizing contextual learning so that it is expected to improve student learning outcome because learning activities become more meaningful. This is accordance

to (Fitriani et al., 2016), who stated that students that gain more meaningful experience in learning process will remember the material delivered so that it will impact on the result of students' learning outcomes.

A 21st century learning demands students to have the knowledge and skills in technology, media and information so that they can be successful in work and life (Wardani et al., 2017). In biology, some problems can be solved by using technology, namely using health-based technology in the form of bioinformatics studies as a dry laboratory approach.

Bioinformatics is an interdisciplinary research area between biological and computational science (García-

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Moreno et al., 2023). In silico studies is a part of bioinformatics approach that can be used to solve problems in the field of biology for example, such as the exploration of traditional medicinal plants as a form of local wisdom saintification.

Indonesia, especially in central Kalimantan has local wisdom in the form of using local plants as traditional medicine. *Diplazium esculentum* is a local plant that used by dayak people as a traditional medicine to treat acne in central Kalimantan, Indonesia (Zannah et al, 2017).

Scientific proof of *Diplazium esculentum* as anti-acne is a form of local wisdom saintificaion, which can be studied using in silico studies. In silico studies includes software techniques that help to analyze and integrate biological and medical data from a variety of sources, using a computational models or simulations for making predictions by applying software tools of computational chemistry (Cava et al., 2020). In silico studies became very useful in the drug discovery and design of medicinal plants because very effective (time, facilities, costs). The results of in silico studies can be a source of learning in lecture activities.

Based on the results of interviews with 23 students in the biology education program at IAIN Palangka Raya who have studied biotechnology material, it was found that several important things were the reasons for the development of textbooks. The facts show that of 23 students, there were 82.6% of students who had difficulty in understanding the lecture material. As many as 7.1% of students felt difficulties because of the unavailability of adequate reference books, 71.4% of students felt the material presented was difficult to understand because the material was abstract, and as many as 21.4% of students felt difficulties in understanding the lecture material because the references were used is in English.

Based on the problems faced by students, all students agreed on the need for the use of textbooks that contained the results of research using local potential as a source of learning in lecture activities. Some of the reasons are as many as 8.7% of students arguing that there is still a lack of use of textbooks based on research results using existing local potential, whereas as many as 13.1% of students argue that Central Kalimantan is rich in local potential and needs to be explored and 30, 4% of students feel interested and want to know about how to use local potential in Central Kalimantan. As many as 39.1% of students also argue that the use of textbooks can add insight and can help in understanding the material and as many as 8.7% of students think that textbooks based on research results can be an accurate source of information.

Other findings are based on observations to lecturers in the biology education program at IAIN Palangkaraya, it is known that the absence of textbooks developed based on research results, especially using in silico studies. Though as many as 95.7% of students feel the need for the development of textbooks based on the results of research using in silico studies on the grounds that the use of such textbooks can help to understand the material (64.5%). Another reason is the use of textbooks based on research using in silico studies can train critical thinking (7.1%), making abstract material more concrete (7.1%), favored by young people (7.1%) and able compare information correctly (7.1%). The development of textbooks based on the results of research using in silico studies is a necessary thing to do.

Local wisdom is the positive behavior of human connecting with nature and the surrounding environment where enable leaners to learn and connect then contribute to the sustainable creation of new knowledge (Kwangmuang et al., 2021). Local wisdom can help stabilize and conserve the cultures of Indonesia from the globalization invasion where people's everyday social activities related to local wisdom (Pesurnay, 2018). Integration of local wisdom in biology learning can create an effective learning environment.

Local wisdom related to education activities (Risdianto et al., 2020) . According to Dwianto et al. (2017), learning activities based on local wisdom is effective to improve science process skill and scientific attitude. Furthermore, using the local wisdom as learning resource like textbook can make the teacher more easily to interest the students and the students easier to understanding the material because the contents of the material are related directly to the student's daily life (Andriana et al., 2017). Local wisdom can also be the basis for developing student character so that it becomes the character of students based on local wisdom (Suastra et al., 2017).

However, developing a learning source like a textbook based on in silico studies and local wisdom become a major challenge in biology learning. Based on this fact, the development of textbook based on in silico studies have been done. The purpose of this study was to develop to generate a local wisdom and laboratory experiment textbooks that are valid, practical and effective in Biotechnology courses, specifically on pharmaceutical biotechnology topic of biology education program, Islamic State University of Palangka Raya.

Method

The method of this research is development research that adopt ADDIE model. The research

implementation consisted of the following five stages: analyze, design, development, implementation and evaluation (Nasrulloh et al., 2020).

The analyze aimed to evaluate performance gap, determining instructional goals, identifying learning profiles, availability of learning resources and learning facilities, determining appropriate solutions to problems, and developing development plans by formulating recommendations for predetermined solutions aimed at overcoming gaps in Biotechnology courses.

The design aimed to design the concrete steps from solutions that have been planned before such as compiling indicators of learning achievement, instruments in the form of learning achievement test questions, instruments to measure the readability of teaching books, student responses to textbooks, and textbook assessment instruments by several experts in their respective fields. In addition, at this stage the framework of the teaching book is also prepared by referring to the instructional objectives that have been previously set so that teaching books can be used as learning resources to optimize the Biotechnology courses process. The overall structure of the textbook can be seen in Table 1.

Table 1. Structure of the Textbook

| Textbook Content | Textbook Component |
|---------------------------------|---|
| Cover | Textbook title In silico exploration of apigenin compounds in the Biotechnology course |
| Preface | Preface |
| Table of contents | Preface, all chapters and sections in the textbook |
| Chapter 1. Biotechnology | Application of biotechnology in the pharmaceutical field |
| Chapter 2. Diplazium esculentum | Benefits of Diplazium esculentum Compound exploration |
| Chapter 3. Bioinformatics | In silico studies in drug design Steps for in silico approach in drug design |
| Glosarium | Glosarium |
| References | References |

The development aimed to develop the textbook product to support Biotechnology lecture activities, especially in pharmaceutical biotechnology materials. The step taken at this stage is to validate the textbook in the form of assessing the feasibility of the textbooks that have been prepared by several experts in their respective fields, namely in the form of validation by material experts, media and practitioners. The validation results will be used to determine whether the prepared textbooks have included appropriate or inappropriate

categories based on predetermined assessment criteria. Determination of the feasibility of textbooks that have been developed based on the evaluations of the validators in the form of quantitative data was analyzed by percentage. The percentage of assessment will then be compared with the eligibility criteria for developing textbooks (Table 2).

Table 2. Qualification of the Feasibility Level of Development Products

| Percentage (%) | Qualification | Explanation |
|----------------|---------------|--|
| 76-100 | Very valid | Can be used, it needs a small revision |
| 51-75 | Valid | Can be used, it needs a revision |
| 26-50 | Less valid | Can be used, it needs major revisions |
| 0-25 | Very Invalid | Cannot be used, it needs major revisions |

(Sugiyono, 2010).

In addition, at this stage a readability test was carried out for 15 students who had taken Biotechnology courses to get recommendations for improvements to the draft textbooks that had been prepared. The Implement aimed to implement the revised textbook products on a small scale, namely in Biotechnology courses of Biology education (S1 program) at IAIN Palangkaraya. The lecture process is done by Direct instruction using textbooks that have been prepared for Biotechnology courses.

The evaluate aimed to assess the quality of textbooks and their implementation in lecture activities by measuring student responses to textbooks. Assessment is also carried out by carrying out the pretest and posttest to measure the achievement of learning achievement indicators between before and after the application of textbooks in lecture activities. The learning outcome test is conducted to identify student knowledge in the form of incorrect questions as many as 18 questions which were analyzed by paired sample t-test using the SPSS program. Assessment was carried out on 7th semester college students of Biology Education (S1 program) at IAIN Palangkaraya.

Result and Discussion

The Developed Product

The product in this research is the textbook based on laboratory study which examines the exploration of natural compounds in Diplazium esculentum regarding their potential as anti-acne. Diplazium esculentum used by dayak ethnic in central Kalimantan to treat acne (Zannah et al., 2022; Zannah et al., 2017; Zannah & Dewi,

2021). This knowledge is obtained from the community for generations as a form of local wisdom that needs to be preserved.

Efforts that can be made to preserve local wisdom, one of which is to use it as a learning resource. Integration of local wisdom values in lecture activities can build a suitabilities between the cultivated attitudes and knowledge for the values growth in society (Hartini et al., 2018).



Figure 1. Cover design before revision

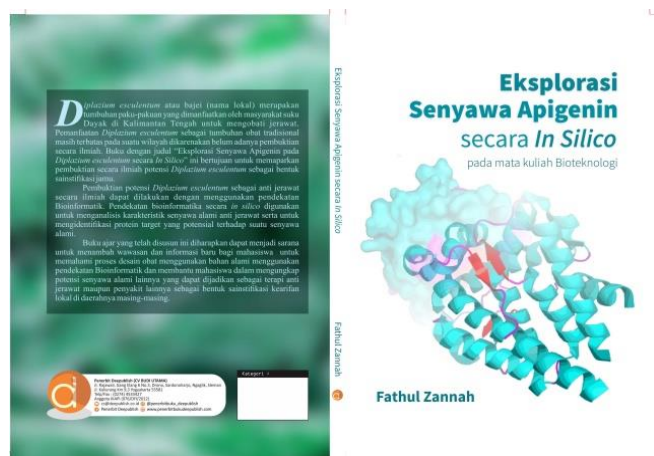


Figure 2. Cover design after revision

The textbook based on in silico studies that produced has specifications on aspects:

Content (substance)

The structure of the textbook consists of introduction, introduction, table of contents, list of images and tables, achievement of learning and competencies, and material. The material description in this textbook consists of 3 chapters, chapter I in the form of biotechnology material, chapter II *Diplazium esculentum* and chapter III bioinformatics material. Each chapter is equipped with a material scheme and practice questions. The material in the textbook was compiled based on the research of the characterization of chemical

compounds in the *Diplazium esculentum* as an anti-acne based on in silico studies.

Display

Textbooks in the form of textbooks with a standard font size of 12-14 points and Times new romance letters. The front cover of the book contains the title, sub-title, author's name. The back cover of the book contains a synopsis of the book. Display form, color and presentation of information has been arranged by taking into account the contrast aspects so that it attracts reading interest for textbook users.

Utilization

Textbooks are equipped with instructions for use in the form of technical steps to operate software and web servers used in designing drugs based on in silico studies.

The Validation Results of Textbook

The validation of textbook was divided into content expert, media expert and practitioners' assessment. Assessment of textbook by material experts was carried out by Dr. Muhammad Zaini, M.Pd as a biotechnology material expert and Didik Huswo Utomo, M.Sc, as an expert in silico material. Assessment of textbooks by media experts was carried out by Dr. Munzil, M.Sc. The results of the textbook validation analysis are given in Table 2.

Table 2. The Validation Results of Textbook

| Validation | Score (%) | Category |
|----------------|-----------|------------|
| Content Expert | 91.68 | Very valid |
| Media Expert | 83.58 | Very valid |
| Practitioner | 91.22 | Very valid |

Validity is defined as the extent to which a concept is accurately measured (Heale & Twycross, 2015), where validity represents the truth findings (Mohajan, 2017). Based on the validation results, a textbook that developed is very valid on the aspect of content and language is obtained based on the assessment by material experts and practitioners. The textbook also very valid on the aspects of presentation, graphics and typography based on the assessment by media expert.

The Practicality of Textbook

The practicality of textbook was measured through a response questionnaire comprising the aspect of elusive terms and typing errors. The results show that there are several terms that are difficult to understand like binding site, sebum, chromatography, scientification, in vitro, in vivo, artificial intelligence and FAQ. The definition of these terms will then be explained in the textbook in the glossary section.

The textbooks are developed based on the results of in silico studies as a dry laboratory approach, in silico studies itself have never been applied to lecture activities at IAIN Palangkaraya especially in biology education programs. This causes the college student still unfamiliar with several terms in the in-silico study.

In silico studies need to be introduced to college students because it can be a solution for solving problems in the field of biology. In this research, in silico studies used in exploration of medicinal plants that is *Diplazium esculentum* related to its potential as a anti-acne. In silico studies can be used to explore the potential of pharmacological activities of natural material compounds through computational (Huang et al., 2018). *The Effectiveness of Textbook*

The effectiveness of textbook was measured through assessment of the students' learning outcomes

that is achievement of learning indicators. Achievement of learning indicators is measured through the achievement of student learning outcomes in the form of cognitive tests. The achievement of learning achievement indicators was analyzed using the Paired Sample T-test presented in Table 3.

Based on the results paired sample t-test, obtained p-value $0,009 < \alpha$ ($\alpha = 0,05$), meaning that there are significant effect between the post-test and the pre-test, so it can be concluded that textbooks that are developed based on in silicostudies effectively for use in Biotechnology lecture activities especially on indicators describe the application of biotechnology in the pharmaceutical field as one of the studies in biotechnology and explain examples of solving problems in biotechnology pharmacy by applying health-based technology.

Table 3. The Result of Cognitive Test Paired Samples Test

| | | Paired Differences | | | | | T | Df | Sig. |
|--------|------------------|--------------------|----------|-----------------|---|--------|-------|----|------|
| | | Mean | Std. Dev | Std. Error Mean | 95% Confidence Interval of the Difference | | | | |
| | | | | | Low | Upper | | | |
| Pair 1 | Postest- Pretest | 7.223 | 8.371 | 2.321 | 2.165 | 12.282 | 3.111 | 12 | .009 |

The results of previous studies also show the same results. The use of research-based textbooks can be an effort to improve students' understanding because it presents contextual examples to build meaningful connections (Vahey et al., 2018).

The use of learning resources to increase the quality of learning needs to continue to be developed because it serves as a source of various information and knowledge to develop the desired competencies in the study fields studied generally in the 4.0 industrial revolution era (Singh & Marappan, 2020). Learning resources that can attract student participation can be in the form of cultural and local wisdom (Setiawan et al., 2017) and the surrounding environment which have a lot of influence on the learning process and support science learning (Hikmawati et al., 2020).

Textbooks that are developed based on current research by presenting concrete data are able to realize contextual learning and can motivate students to always keep up with the development of science (Lestariningsih et al., 2021).

The implementation of textbooks in biotechnology courses using direct instruction also contributes to the achievement of learning indicators. Direct Instruction model assists students to increase their learning capabilities (Buchori et al., 2017). This is in consistency with the results of previous research. Direct instruction plays a role in achieving student learning outcomes in various fields of education (Pedaste et al., 2015); (de Jong et al., 2023).

Direct Instruction builds on the opinion that all students can learn with well-designed instruction (Stockard & Wood, 2018). Developed textbooks are instructions that are expected to be able to direct learning activities.

Furthermore, an assessment of the responses of college students and lecturers to the textbook that developed was also carried out. The results of college student responses of textbook are presented in the table 4 and the results of lecturer responses of textbook are shown in the table 5.

Based on the responses of students and lecturer of textbook, it can be concluded that students and lecturers feel helped in lecturing activities with the existence of biotechnology textbooks that are developed based on research results.

Textbooks based on in silico studies which have been developed can facilitate lecture activities because the textbook does not only present biotechnology-related material in the pharmaceutical field, but also covers problems and solutions that can be done in the field of biotechnology in the pharmaceutical field so that the material delivery becomes more focused on achieving the competencies. Furthermore, the use of textbooks makes lecture activities a two-way communication. In line with that, (Fatmawati, 2016) stated that education is a process of two way communication which lecturer not only teaching, but also act as a facilitator during lecture activities,

especially a textbooks in the form of digital (D'Ambra et al., 2022).

The use of textbook by lecturers can help students who tend to be less skilled in choosing learning resources that are in accordance with the concepts learned so that it affects the mastery of the material

(Surma et al., 2018). The use of teaching materials can also facilitate lecturers in carrying out learning activities and generate interest and motivation for college student by linking teaching material with the phenomena in everyday life (Suárez et al., 2018).

Table 4. College student response of textbooks

| Aspect of Assessment | Score (Average) |
|--|-----------------|
| The appearance of the cover (book cover) makes you interested in reading the contents of the book | 3.20 |
| The table of contents helps you to find the information you need in a textbook | 3.20 |
| Indicators of learning achievement make it easier for you to find out what abilities you must have after learning textbooks | 3.40 |
| The material is in accordance with the learning outcomes that you must master | 3.30 |
| The discussion topic or chapter title draws your attention to learn more | 3.40 |
| The images presented in the textbook make it easier for you to understand the material | 3.40 |
| Pictures presented in textbooks are clear and accompanied by information so that they can be well understood | 3.30 |
| The steps of Reverse docking and Molecular docking in textbooks are well understood | 3.30 |
| The steps of Reverse docking and Molecular docking in textbooks make it easier for you to work independently | 3.40 |
| Evaluation at the end of each chapter can make it easier for you to measure the achievement of understanding of the material presented | 3.20 |
| The bibliography is useful to help you find out which literature is useful for studying material related to pharmaceutical biotechnology | 3.20 |
| The glossary helps you to understand the meaning of foreign terms to make it easier to understand the material | 3.30 |
| The language used in teaching books is easy to understand and communicative | 3.50 |
| Total | 43.10 |
| Final Score (%) | 82.80 |

Table 5. Lecturer response of textbooks

| Aspect of Assessment | Score |
|---|-------|
| Display cover (book cover) according to you can attract student reading interest | 3.0 |
| The table of contents according to you makes it easy for students to find the information they need in textbooks | 3.0 |
| Indicators of learning achievement in textbooks are relevant to the expected competencies in biotechnology courses | 4.0 |
| The material delivered is in accordance with the indicators of learning outcomes that are listed in the textbook | 4.0 |
| The material presented can attract student interest / attention to learn more because it presents a new thing in the form of In silico techniques in solving problems in the field of Biotechnology | 3.0 |
| The picture presented in the teaching book according to you can make it easier for students to understand the material | 4.0 |
| The picture presented in the teaching book according to you is presented clearly and accompanied by information so that students can understand it well | 4.0 |
| The steps of Reverse docking and Molecular docking in teaching books according to you are well understood by students | 4.0 |
| The steps of Reverse docking and Molecular docking in teaching books according to you can make it easier for students to work independently | 4.0 |
| Evaluation at the end of each chapter according to you can make it easier to measure the achievement of student understanding of the material presented | 3.0 |
| The bibliography according to you is useful to help students know the literature that is useful for learning material related to pharmaceutical biotechnology | 4.0 |
| The glossary according to you can help students to understand the meaning of foreign terms so that it is easier to understand the material | 4.0 |
| The language used in teaching books is easy to understand and communicative | 3.0 |
| The use of textbooks makes it easy for you to deliver material | 4.0 |
| Total | 51.00 |
| Final Score (%) | 91.10 |

Conclusion

This research concluded that the textbooks based on local wisdom and laboratory experiment which were developed have been proved valid, practical, and effective to increase learning outcome of college students on pharmaceutical biotechnology topics. Especially on indicators describing the application of biotechnology in the pharmaceutical field as one of the studies in the field of biotechnology and explain examples of solving problems in the field of pharmaceutical biotechnology by applying health-based technology.

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Author Contributions

The roles of the authors in this research are divided into executor and advisor in this research.

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Conflicts of Interests

The authors declare no conflict of interest.

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