Bioinformatics Supplement Material Lecture based on Research Diversity of Local Durian (Durio Spp) in Jailolo using DNA Barcode Matk Gen

Abdulrasyid Tolangara[1], Joko Suratno[2], Nuraini Sirajudin[1], Sundari[1]
[1]*Biology Education Study Program, Faculty of Teacher Training and Education, Khairun University, Ternate, Indonesia*
[2] *Mathematics Education Study Program, Faculty of Teacher Training and Education, Khairun University, Ternate, Indonesia*

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Abstract: Research is based on development research diversity of local durian in Jailolo as a local resource for *Durio* Spp. which grows on the West Halmahera Island (Jailolo). This study aims to build a breeding model of local tropical fruit resources in North Maluku through superior genetic data-based selection and development of material suplement Bioinformatic course. The *mat*K DNA barcode application in this study can be used as a study guide for local durian genetic diversity. The results of this study indicate that the analysis of genetic diversity and relationship of local durian in Jailolo using matK molecular markers can be used as a supplement to Bioinformatics course material for introduction of nucleotide databases and phylogenetic tree construction. The results of expert validation showed that the supplement of Bioinformatics-based lecture material on the research on local durian genetic diversity in Jailolo was suitable for use with a validation value of 83.75%.

1 INTRODUCTION

Bioinformatics is conceptualising biology in terms of molecules (in the sense of physical chemistry) and applying "*informatics techniques*" (derived from disciplines such as applied maths, computer science and statistics) to *understand* and *organise* the *information* associated with these molecules, on a *large scale*. In short, bioinformatics is a management information system for molecular biology and has many *practical applications* (Aprijani, et al, 2004).

This new study of Bioinformatics is inseparable from the development of modern molecular biology characterized by human ability to understand the genome, namely the blueprint of genetic information that determines the nature of every living thing encoded in the form of a ribbon of DNA molecules (deoxyribonucleic acid). The ability to understand and manipulate the genetic code of DNA is strongly supported by IT through hardware and software. Bioinformatics, presenting data generated from the genome project can be stored regularly in a short time with a high degree of accuracy as well as analyzed with programs made for specific purposes (Witarto, 2003).

Bioinformatics is one of the elective courses that supports cell and molecular biology courses. Bioinformatics is a study of the techniques of analyzing molecular data and predictions of the potential of bioactive compounds in biological research. So far there has been no minimalist model of teaching materials and standard teaching materials. The main applications of bioinformatics: 1) The database is a collection of information stored on a computer systematically so that it can be checked using a computer program to obtain information from the database; 2) Sequence alignment (sequence alignment) is the process of arranging / arranging two or more sequences so that the equations of these sequences appear real; 3) Prediction of protein structure seeks to predict the three-dimensional structure of proteins based on their amino acid sequences (in other words, predict tertiary structures and secondary structures based on the primary structure of proteins).

In general, current prediction methods for protein structure can be categorized into two groups, namely comparative protein modeling methods and de novo

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modeling methods; 4) Expression of genes is a process of translating genetic information (in the form of alkaline sequences into DNA or RNA) into proteins, and further phenotypes; 5) Phylogenetic is a study that discusses kinship relationships between various types of organisms through molecular and morphological analysis (Hidayat & Pancoro, 2008; Rahayu, 2007).

This study aims to develop supplementary lecture material Bioinformatics in Biology education study program based on research results of durian spp in Jailolo using barcode and gene genes.

2 METHOD

This study is a development study of teaching material supplements that uses the 4D model proposed by Thiagarajan, et al. (1974) consisting of define, design, develop, and disseminate. research and development is carried out until the develop stage, and the trial process for students is done formatively because of the consideration of the time and implementation of Bioiformatics courses in the Biology study program FKIP Khairun University. The define procedure consists of a preliminary analysis (analysis of RPS documents and problems with Bioinformatics learning, task analysis and concepts, character analysis of students, and objective analysis; the design stage is the initial format preparation stage for teaching materials based on analysis at define; the develop stage is the testing phase of teaching book supplements to three expert validators and the trial stage to students of biology education study programs who have taken Bioinformatics and Biotechnology courses.

Expert assessment consists of assessment of material validator, assessment of media validator, and assessment of language validator. The product trial consisted of individual tests by 5 students. The research instruments used included the validation sheet of teaching materials by expert validators. The data obtained consisted of qualitative data (advice and input data from validators and respondents) and quantitative data (scores from questionnaires). Data were analyzed using descriptive statistics and converted in percentage form. The calculation results are matched to the product feasibility criteria table to determine the feasibility of the textbook and test decisions.

3 RESULT AND DISCUSSION

3.1 Result

The results of research and development in the form of qualitative data and quantitative data. Qualitative data in the form of advice and input from validators and respondents, while quantitative data in the form of score data from expert and student validation instruments.

3.1.1 Data on Validation Results of Bioinformatics Supplement of Supplement Experts based on Durian Spp in Jailolo using Barcode and Gene Genes

The results of expert validation consist of three people, namely two material experts, linguists and one linguist can be seen in table 1 below:

Table 1: Results of Validation of supplement experts on Bioinformatics teaching materials based on research on durian spp in Jailolo using DNA barcode matk gen.

No.	Validator	Value %	Criteria of validity
1	Subject 1	83,23	valid
2	Subject 2	82,12	valid
3	Subject 3	84,33	valid

Based on Table 1 above, it can be seen that the results of the validation of the development of supplementary teaching materials for bioinformatics subjects by three expert validators, are generally valid based on the description of aspects of the adequacy of supplementary, systematic and language material. The average percentage of expert validation on supplement Bioinformatics teaching materials for material aspects and language is 83.75%.

3.1.2 Data of Expert Validator Comments on Book Products

The data from the expert validator's comments on supplementary bioinformatics teaching materials based on research on local durian diversity in Jailolo based on the sequence of DNA matK barcodes can be seen in Table 2 below:

Table 2: Comment of 3 expert validators regarding product development.

No.	Comment	Information
V.P2	Adequate aspects of basic database material are sufficient, preferably a project for students	accepted
V. P3	The basic writing procedure should be improved, the use of letters should use the times new Roman standard	accepted
V.P1	The display of material in this supplement form module is communicative and good	accepted

Source: primary data processed.

Based on Table 2, it is known that in general the expert validator provides a proper assessment for this development product. A bioinformatics teaching material supplement based on the diversity of Jailolo local durian based on the matK DNA barcode is the first product to develop a supplement for bioinformatics teaching materials in Biology education study programs.

3.1.3 Data on Validation of Supplement Products for Bioinformatics Teaching Materials based on Research on Durian Spp in Jailolo using the Barcode MatK Gene

The results of product validation consist of five students, namely one student taking the Bioinformatics course and 4 students taking the Biotechnology course can be seen in table 3 below:

Table 3: Validation of supplement products for Bioinformatics teaching materials based on research on Durian Spp in Jailolo using DNA Barcode Matk genes.

No.	Validator	Value (%)	Criteria Validity
1.	Bioinformatic	85,25	valid
2.	Biotechnology	85,10	valid
3.	Biotechnology	85,30	valid
4.	Biotechnology	82,28	valid
5.	Biotechnology	86,80	valid

Based on Table 3 above, it can be seen that the results of the validation of the development of supplementary teaching materials for bioinformatics subjects by five students as product validators are generally valid based on the description of communicative language aspects (ease of understanding), systematics and scope of teaching material. The average percentage of validation for supplement Bioinformatics teaching materials is 85.36%.

3.1.4 Data of Expert Validator Comments on Book Products

Data from product validator comments on research-based supplementary bioinformatics teaching material supplementary genetic diversity of Jailolo durian based on DNA sequence matK barcodes can be seen in table 4 below.

Table 4: Comments on product validators.

No.	Comments	Notes
1	No comment	-
2	Good material and easy to know	accepted
3	Material is systematic	accepted
4	No comment	-
5	No commet	-

Source: 2018 primary data processed.

3.2 Discussion

Based on the results of data analysis, it can be seen that the results of validation of both validation from expert validators and product validators are known that all validators provide feasibility assessment or validation of book supplement products in the valid category and are suitable for use as Bioinformatics teaching materials. There are three principles needed in developing teaching materials. The three principles are relevance, consistency and sufficiency. The principle of relevance means linkages or close relationships. The principle of consistency means ‘keataatazasan’ or the consistency between teaching materials with basic competencies that must be mastered by students. The principle of sufficiency means that the material taught should be sufficient enough to help students master the basic competencies taught (Muclish, 2010). Textbooks can function as learning resources for students and provisions for lecturers to prepare learning. Based on the needs analysis, students lacked bioinformatics' learning resources as new subjects.

All references are written in the reference list at the end of the chapter with the aim, students are able to access the references used in the development of

textbooks. In line with the opinion of Adalikwu, et al. (2013) which states that teaching material acts as a facilitator between educators and students and develops students' motivation during learning activities. Teaching materials are able to become material to carry out learning for new educators. Teaching materials can also be used to find out the material to be taught and as a source of knowledge that can be used for educators as a provision for planning learning.

According to MacKay (1999), the format of teaching materials equipped with images can support process-oriented learning. Process-oriented learning stimulates students to analyze and process information. MacKay (1999) and Rotter (2006) reveal that the images in teaching materials have a positive effect on learning outcomes; and make it easier for students to read and improve understanding. Rotter (2006) describes four aspects that must be considered to design an interesting teaching material, namely contrast, layout, letter arrangement, and image design. The four aspects will determine the process of delivering messages in teaching materials to students.

4 CONCLUSION

Development products in the form of supplementary teaching materials for Bioinformatics courses based on the results of validation have met the eligible requirements for use in learning according to experts and respondents (students). Suggestions needed include utilization, further product development, and product dissemination. Supplementary books on teaching materials on Bioinformatics courses can be used as a companion learning resource in addition to the main sources used during the course of Bioinformatics. To support laboratory activities, further teaching materials for Cell Biology products can be equipped with simple practical guidance components. The materials for teaching Bioinformatics subjects developed are tested only at small scale formative test stages. To find out the effectiveness of the product, a summative evaluation in the real class is needed, through a quasi-experimental or PTK method.

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