Development of Entomology Handout Based on Natural Resources from Tropical Rain Forest

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Abstract—Lecturers and students of the Biology Education Program of Teachers Training and Education Faculty of Mulawarman University have conducted a lot of research in the field of entomology including use of natural resources from tropical rain forest as organic pesticides. Unfortunately, they have not been widely used as a source of learning sources in teaching and learning of entomology subjects. The purpose of this study was to develop an entomology handout based on research on the natural resources from tropical rain forest. This research is a research development using ADDIE model. This research conducted analyzing, designing and developing of the entomology handout. The handout was validated by media and content experts. The results showed that the handout was made based on student needs on the entomology courses, the validity of media was very valid and the validity of the content was quite valid. It can be concluded that the entomology handout was feasible used in teaching and learning.

Keywords: handout, entomology, tropical rain forest

I. INTRODUCTION

At present, all aspects of life, including education, are digitalized and dependent on technology. Changes in perspective in education have implications for learning activities and its supporting factors. One of them is learning resources. At high school and college, lecturers are not only learning resource, but rather as mediators and facilitators [1]. Learning resource in digital era vary greatly, for example the environment, drawings, sketches, diagrams, films, written teaching materials such as newspaper clippings and scientific articles [2,3], as well as various sources from digital technology media [4].

Research articles are one of the contextual learning resources that support the implementation of contextual learning. Contextual learning can motivate students to make connections between knowledge and its applications to their lives as family members, citizens, and workers and engage in the hard work that learning requires [5]. Another advantages are that it can help students to construct their knowledge, facilitate students to interact with the environment one of which is a social environment, and help students to be able to overcome everyday problems [6]. Lecturers and students of the biology education study program of the Faculty of Teachers Training and Education Mulawarman University have produced a lot of research in the field of entomology, for example about the use of natural resources in the tropical rain forest areas for organic pesticides. Some of the research results have been published, but not widely used as a source of learning materials in class.

Based on authors’ observation that was conducted before this study, students used books as learning resources in entomology courses. Most of them also used articles from internet that unknown theirs truth and novelty. We also that, most of sources data in papers prepared by students from the internet and the data were from approximately 2 research articles. During discussion in learning process, students were not using data from research articles, especially research from local wisdom. At present, learning resources developed based on lecturers and students research Biology Education Program of Mulawarman University that support entomology learning has not been found. Developments of contextual-based learning resources from research results of lecturers and students of biology education program of teacher training and education faculty, as well as other faculties at Mulawarman University, on the entomology courses were needed. Through the development the learning resources, students are expected to know relationship between knowledge and its application in life, so they can appreciate local wisdom around them.

Handouts are written materials prepared by a teacher to enrich students’ knowledge [7]. Handouts generally contain some literature that relevance to the subject taught. Trough handout, students are easier to master, understand and remember the concepts learned [8]. Handouts can be used as alternative teaching materials in the learning process and give a good influence on student learning outcomes [9,10,11]. Handout is arranged with steps such as analyzing curriculum, determining titles, determining achievement competencies, gathering references, writing the handout, rereading and asking friends to read the handout, evaluating the handout and following by revision.

Based on the reason above this study was conducted to analyze, design and develop a handout on entomology subject based on research results of lectures and students of biology education program of Teacher Training and Education Faculty and other related Faculties at Mulawarman University.

II. METHOD

This study is categorized as research and development and was conducted at Biology Education Program of Faculty of Teacher Training and Education of Mulawarman University, Samarinda, East Kalimantan Province, Indonesia, in academic year 2018/2019. ADDIE (analysis, design, development, implementation, and evaluation) model was used in this study. This study was conducted in 3 phases; the analysis, the design and the development phases. In the
analysis phase, an analysis of student characteristics, analysis of student learning resources, understanding of student concepts about entomology courses through grades, and analysis of learning outcomes were carried out. In the design phase, design of the teaching handout including the design of cover, contents, and reference sources were designed. In the development phase, the handout was developed and validated.

The entomology handouts were validated by content and media experts. The data obtained were quantitative data in the form of assessment scores from the questionnaire and qualitative data in the form of comments and suggestions from validator. Data collection instruments in the form of a validation questionnaire. Validation data were analyzed using percentage techniques. The percentage was calculated using formula (1).

\[ P = \left( \frac{x}{x_i} \right) \cdot 100\% \]  

where P is percentage, \( x \) is respondent's answer in one item statement, and \( x_i \) is maximum respondent's answer in one statement.

The scale used in the questionnaire was 5 levels, scale 5 as the highest scale and 1 as the lowest scale. Then the scale was grouped into 4 groups ranging in percentage values as shown in Table 1 [12].

III. RESULTS AND DISCUSSION

The results of the analysis student needs show that the students are digital native young generation. Students often use digital media technology in learning and finding learning resources. While, they rarely use text book in library to find the learning resources. The analysis of learning resources showed that number of the learning resources from lecturers and research students at Mulawarman University is limited. Thus, additional supplementary teaching materials were needed to help students learn contextual materials, by developing teaching materials in the form of handouts in entomology courses based on natural resources of tropical rain forests in East Kalimantan.

At the design phase, an entomology handout has an arrangement handout design that includes learning objectives and materials. The handout is designed to contain material about 1) pests, 2) biological control of pests, 3) organic pesticides, 4) organic pesticide plants in East Kalimantan tropical rainforest, 5) How to manufacture and apply organic pesticides. Potential plants as organic pesticides discussed in the handout included babandotan plants, kepok banana peels, breadfruit flowers, pineapple skin, saliara leaves, gamal leaves, avanese chili, red ginger, and kirinyu leaves.

### Table 1

| No. | Validity | Category |
|-----|----------|----------|
| 1.  | 85 ≤ \( P \) ≤ 10 | Very valid, or feasible to use without revision. |
| 2.  | 70 ≤ \( P \) < 85 | Quite valid, or feasible to use but it needs a small revision. |
| 3.  | 50 ≤ \( P \) < 70 | Less valid, recommended not used because it needs a major revision. |
| 4.  | 0 < \( P \) < 50 | Invalid, or may not be used. |

![Fig. 1. Cover of the entomology handout](image-url)
The entomology handout was developed. The developed handout was very valid as a media and the content of the handout was quite valid. The developed entomology handout was feasible to be used in the entomology course.

IV. CONCLUSION

The entomology handout was developed. The developed handout was very valid as a media and the content of the handout was quite valid. The developed entomology handout was feasible to be used in the entomology course.

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