Effectiveness of students worksheet based on mastery learning in genetics subject

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Abstract. Genetics is one of the subjects that must be followed by students in Biology education department. Generally, students do not like the genetics subject because of genetics concepts difficult to understand and the unavailability of a practical students worksheet. Consequently, the complete learning process (mastery learning) is not fulfilled and low students learning outcomes. The aim of this study develops student worksheet based on mastery learning that practical in genetics subject. This research is a research and development using 4-D models. The data analysis technique used is the descriptive analysis that describes the results of the practicalities of students worksheets based on mastery learning by students and lecturer of the genetic subject. The result is the student worksheet based on mastery learning on genetics subject are to the criteria of 80,33% and 80,14%, which means that the students worksheet practical used by lecturer and students. Student’s worksheet based on mastery learning effective because it can increase the activity and student learning outcomes.

1. Introduction

Biology is a science that can not be separated from the facts, concepts, and principles relating to living things, and their interaction with the environment. In biology, students are required to be able to master facts, concepts, propositions, and principles. Biology is a science that requires understanding, application, analysis, synthesis, and evaluation or high-level thinking. In studying biology should use what questions, why and how [1]. Biology has various branches of science, such as microbiology, plant morphology, biochemistry, genetics.

Genetics is one of the subjects of sciences and skills in the field of Biology. Genetics subject must be followed by every student of the Biology education department in STKIP PGRI Sumbar on the fifth semester. The genetics subject has a code BIO 10024 with a weight of 4 credits. Genetics is part of the science of Biology that requires the ability to think creatively in solving various problems in society [2]. The purpose of this subject so that students of the biology education department in STKIP PGRI Sumbar have knowledge in the basics of Mendel genetics, introduction to modern genetics and able to apply the science of genetics in everyday life. But in reality, there are still many students who do not master the concepts in the genetic subject.

Many students regard to genetics as a difficult and unpopular science. Students only expect information and notes from the lecturer whereas the library and wifi facilities are available, the students are not able to solve the problems given by the lecturer because these subjects discuss more math problems like math and the lack of adequate student worksheet. As a result, the learning process through (mastery learning) in the genetic subject did not happen. Therefore, it is necessary to develop
a student worksheet based on mastery learning in genetics subject as one of the alternative teaching materials in overcoming the low learning outcomes and not the complete learning (mastery learning). Student worksheets can enhance students understanding of the learning process and the quality of learning outcomes [3]. Student worksheet based on mastery learning can improve the process of complete learning and the occurrence of educational interaction between lecturer and students [4]. This study aims to develop a student worksheet based on mastery learning that is practical and effective in genetics subject. Student worksheet based on mastery learning that contains the tasks that must be done by the students until the completeness of learning can be achieved.

2. Methods
This research was conducted in the odd semester 2016/2017 on Biology education department in STKIP PGRI Sumbar. The type of research is 4-D models [5]. The stages development of 4-D models are defined, design, development, and disseminate. In this research, the development stage, which is limited to the test of the practicality and effectiveness of student worksheet based on mastery learning in genetics subject.

On the test of practicality is done a limited trial of student worksheets to lecturer of genetics subject and students who follow the genetics subject. This practicality test aims to find out the use of student worksheets by lecturer and students. Data obtained by using questionnaire given to lecturer and student. According to [6] considerations of practicality can be seen in several aspects, such as ease of use, the time required in the implementation, the attractiveness of the device to the interests of students, ease in interpreting, and have the same equivalent.

In the effectiveness test carried out a limited effectiveness test conducted in a class of 29 students. Effectiveness test is done to know the effectiveness of student worksheet in increasing student activity and result of learning. Aspects of activity observed by the observer, ie doing the exercises, working in groups, and presenting group results. Learning outcomes are obtained from the final exam score after attending the lecture. Processing the value of learning outcomes tailored to the standard assessment used by STKIP PGRI Sumbar to determine the graduation of students.

3. Results and Discussion
The result of practical test of student worksheet based on mastery learning by lecturer and students shows that student worksheet based on mastery learning in genetics subject is in practical criteria.

| Aspects | Item | Assessment of lecturer | The value of practicality (%) | Criteria      |
|---------|------|------------------------|-------------------------------|---------------|
| Ease of use | 1-5 | 16 | 80 | Practical |
| Time required in execution | 6-7 | 6 | 75 | Quite practical |
| The appeal of work sheet on student interest | 8-12 | 16 | 80 | Practical |
| Ease in interpreting | 13-15 | 11 | 91,67 | Very Practical |
| Has the same equivalent | 16 | 3 | 75 | Quite practical |
| Average | | 80,33 | Practical |
Based on the results of practical tests conducted by lecturer and students, the ease of use aspect shows practical criteria with 80% and 81.27%. This is caused the student’s worksheet can be used repeatedly and can be used even if there is no lecturer. This can happen because the instructions for using the student’s worksheet are easy to understand. The characteristics of a learning media, that is independent, in the sense of providing convenience and completeness of the contents in such a way that the user can use without guidance of others [7].

The time aspect required in the execution shows practical and practical criteria with 75% and 79.93% judgments. This indicates the student’s worksheet can save the lecturer time in explaining genetic material because it does not require a long time like explaining the material without using the student worksheet. An aspect of device appeal to student interest has practical and quite practical criteria with 80% and 75.50% assessment. Interest in learning is a great contribution to the success of students learning. The use of media can arouse the desire and interest of students and generate motivation and stimulation of student learning activities.

Aspects of ease in interpreting the material show very practical and practical criteria with an assessment of 91.67% and 79.93%. This is caused the student’s worksheet can be a facilitator between lecturer and students. This is in line with the opinion of [8] which suggests that the function of learning media is able to explain the presence of messages and information so as to accelerate and improve the learning process, learning media can improve and direct the student’s attention so as to generate student learning motivation.

The same equivalent aspect represents a fairly practical and practical criterion with an assessment of 75% and 84.09%. This is caused the material used in accordance with the standards of competence, basic competencies, indicators and learning objectives that have been formulated so that the material on this student worksheet can represent all the material that has been studied.

The results of the assessment state that the student worksheets that researchers develop useful in the learning process, both for lecturers and for students. Benefits gained for lecturers, which can assist lecturers in providing a correct explanation of the concepts in the genetic material to students. The advantages of learning media one of them raise the perception of a similar concept [5]. The clarity of instruction in the learning media, the suitability of the content on the learning media, the preparation of the material on instructional media, the suitability of the material with the learning media, the harmony of the colors, the appearance of the drawing, the writing on the material, and the custom of the language used can help understand the material [9].

In the effectiveness test of student worksheets, there are two aspects observed, namely activity and students learning outcomes. The observation of students activity is in very good and good category (Table 3). Table 3 shows activity data from 29 students who have followed the learning process by using mastery learning based student worksheet in genetics course. In the aspect of doing the exercises are very good criteria with a value of 98.5%.

### Table 2: Practical test results of student worksheets by students

| Aspects                          | Item    | The value of practicality (%) | Criteria   |
|----------------------------------|---------|-------------------------------|------------|
| Ease of use                      | 1-7     | 81,27                         | Practical  |
| Time required in execution       | 8-9     | 79,93                         | Practical  |
| The appeal of worksheet on student interest | 10-12   | 75,50                         | Quite practical |
| Ease in interpreting             | 13-14   | 79,93                         | Practical  |
| Has the same equivalent          | 15-16   | 84,09                         | Practical  |
| Average                          |         | 80,14                         | Practical  |

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Table 3. Student activity observation result

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| Has the same equivalent                  | 15-16| 84,09                         | Practical    |
| Average                                  |      | 80,14                         | Practical    |

The aspect of cooperation in the group is very good criteria with a value of 83.5%. While the aspect of presenting the learning outcomes is in good criteria with a value of 65.7%. So it can be concluded that student worksheets based on mastery learning in genetics subject can increase activities where students are more serious in doing the exercises, sharing knowledge with friends and confident in presenting the results of learning.

Activity is any activity carried out either physically or spiritually. Activities in question are activities that lead to learning processes such as, asking, opinion, doing tasks, can answer questions teachers, and can cooperate with other students [10].

Student learning outcomes in the form of a description test obtained from the final examination value of the semester. Of the 29 students who attended the lectures all students passed. Based on the percentage, then students who get an A there is 44.9 with very good value criteria. Students who get a B score of 17.2 with good value criteria. Students who get a C score of 20.7 with good enough value criteria. Students who get the value of D there are 17.2 with criteria of less good value. From the data, it is known that the average score of students' learning outcomes is 74.6, which means that the students' scores are graduated in accordance with STKIP PGRI West Sumatra standard. The variation in student values is influenced by several factors such as those presented by [11], namely the instrumental input in the form of environmental influences on learning outcomes. Analysis of learning outcomes is used to see the success rate of students in using student worksheets. Learning outcomes obtained from the given problem in the form of a description test of 5 questions. The learning result test is a test item used to determine students' learning outcomes after following the learning activities [5].

4. Conclusion
Students worksheet based on mastery learning in geneti subject declared practical and effective.

5. References
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