The implementation of problem-based learning module to improve the students’ learning outcomes and perceptions

R Auly¹, Mudatsir² and Evendi³
¹Department of Science Education, Universitas Syiah Kuala, Banda Aceh, 23111, Indonesia
²Department of Microbiology, Faculty of Medicine, Universitas Syiah Kuala, Banda Aceh, 23111, Indonesia
³Department of Physics Education, Universitas Syiah Kuala, Banda Aceh, 23111, Indonesia

Email: rahmatilaulyib@gmail.com

Abstract. The present study aims to increase students’ learning outcomes and to explore their perceptions of problem-based learning module of living organisms at MTsN 2 Aceh Jaya. The pre-experimental method with the one-group pretest-posttest design was used, and the purposive sampling technique was employed. The collection of data was performed on May–June 2019, and the study was conducted in class VIIId. The research instruments include multiple-choices tests totaling 20 items and students’ perception questionnaire. For the data analysis, the N-Gain was utilized to see the improvement in learning outcomes and the t-test to examine the hypothesis of the implementation of PBL module. The Likert scale was used to analyze the data of student perception questionnaire. The results indicate that the implementation of the PBL-based module of living organisms interaction can improve the student learning outcomes with an N-Gain value of 0.57, which means the medium category, and t_{score} > t_{table} (14.92 > 2.042), and the students’ perceptions on the implementation of the PBL-based module of living organisms interaction are obtained to be an average of 60%, which is considered in good category.

1. Introduction
The nature of science in junior high is developed as an integrative science and applicative-oriented subject. It develops the thinking and learning skills, arouses curiosity, caring attitude, and responsibility towards the natural environment. The learning objectives are generally aimed at improving the learning outcomes of useful knowledge, skills, and attitudes in a balanced way. Learning Natural Science should ideally be carried out by following the students’ conditions in the school. Besides, educators can improve the students’ learning outcomes by using adequate learning resources, and one of the useful and applicable learning resources is the learning module. A module as the learning resource has significant advantages in motivating learners to achieve results that match their ability. It makes equal distribution of knowledge acquired throughout the semester possible and establish a more widespread education. Sepik [1].

Based on the results of previous studies, it is shown that modules can improve learning outcomes [2], improves the teaching and learning quality [3], increases the effectiveness of the learning [4], improves the student activities and learning outcomes [5]. On the other hand, from the learners’
perceptions, the PBL-based module of Natural Science has been excellent [6]. From some of the results of studies mentioned above, an inference can be made that modules have an essential role in enhancing the motivation and learning outcomes effectiveness of the students to support their learning process.

Based on the results of observation at MTsN 2 Aceh Jaya, there are indications that the Natural Science learning does not use the necessary resources under the conditions of how learners obtain the Natural Sciences learning outcomes. Some problems in learning Natural Sciences include: 1) the learners’ low score on regular tests because they were too busy with the activities that they had not paid attention to the educators’ explanation, It has resulted in the test that fails to meet the Minimum Completion Criteria; 2) the learners’ lack of direct involvement in the process of learning which could actually improve their understanding of the subject matter and prevent them from such low learning results. This condition has led to the learners’ negative perceptions of Natural Science learning.

The initial hypothesis is that learning during this time cannot be implemented as a whole. The learners cannot gain the material properly, and this is very influential on their learning outcomes. Improvement in learning outcomes requires modules with an integrated learning model. One of the learning models that can encourage learners to understand the material to its full potential is the Problem-Based Learning (PBL) model. It refers to as a learning type where educators provide opportunities to learners to apply the subject matter, although the educators have previously prepared the topics of the discussion. The focus of the learning process is the learners’ ability to solve problems systematically and logically [7]. The PBL also means a series of learning activities with an emphasis on the scientific problems solving process [8]. Therefore, PBL is a learning model that leads learners to solve the given problems. The implementation of the PBL model on a module may result in the clear and detailed apprehension of the learners in the Natural Sciences subject matter and alter their perceptions toward Natural Science learning.

The use of PBL module is mainly given for interaction of living organisms topic which has yet well-developed at MTsN 2 Aceh Jaya, and this has driven the researcher to conduct the present study entitled “The Implementation of Problem-Based Learning Module to Improve the Students’ Learning Outcomes and Perceptions.” This research aims to investigate the implementation of the PBL module in the interaction of living organism’s topic to improve the students’ learning outcomes at MTsN 2 Aceh Jaya, as well as their perceptions towards the implementation of the PBL module of living organism interaction topic at MTsN 2 Aceh Jaya.

2. Method
The research method used in the present study covers the pre-experimental design with one-group pretest-posttest design, without employing any comparison group. The research variables consist of a free variable (independent variable) and bound variable (dependent variable), which are the PBL-based module and the students’ learning outcomes and perceptions, respectively.

This research was conducted at MTsN 2 Aceh Jaya during the even semester of Academic Year of 2018/2019 or in May and June 2019. The research population includes all of the grade VII students of MTsN 2 Aceh Jaya, numbering 179 in total, divided into 5 different classes. The selection of sample in this research was based on the students’ learning outcomes with low scores on repeated tests. The purposive sampling technique was utilized, indicating that Class VIIId was one with the low learning outcomes.

The research was carried out through the preparation, implementation, and data analysis phases. The data collection was conducted by using two instruments, namely; treatment instrument and measurement instrument. The treatment instrument includes a syllabus, lesson plan, a learning module, and a set of pretest and posttest. The measurement instrument is provided in the form of unique instrument to see the learning outcomes as well as the perceptions of the learners towards the use of PBL-based module.
3. Result and Discussion

The results of this research cover the analysis of research validity, analysis of the research participants, and analysis of the perception-related questions to the learners.

3.1. Analysis of Research Validity

The results of the research validity analysis include the preparation of the PBL-based module of living organism interaction along with its potentials and problems, product design, design validation, revision/correction design, and product testing. The validators validated several assessment indicators on each aspect, which includes the quality of the cover, the format of the module contents, the module materials, and the linguistic conformity. The Students Worksheet index of 3.34, indicates that the PBL module of living organism interaction is valid to be used. The results of Learning Execution Plan validity are based on the assessment indicators of each aspect including the quality of the identity of Learning Execution Plan, systematics, and contents of Learning Execution Plan. The index of 3.46 obtained is used to indicate valid criteria for usage. The results of validity of the students’ perceptions are based on the assessment indicators of each aspect including the compatibility of the module with the learners, the suitability of the module with the learning objectives and technical quality. The index of 3.08 obtained indicate valid criteria to be used.

3.2. Analysis of Learning Outcomes

The analysis consists of testing the normality of the learners’ pretest score, the normality of posttest score, the completeness of learning outcomes, and the hypotheses and N-Gain.

The Normality Test of Pretest score based on the data obtained through the test consisting of multiple-choice items in 20 rounds, the results can be described as follows:

| A    | N     | sig.* | Conclusion                  |
|------|-------|-------|-----------------------------|
| 0.05 | 31    | 0.20  | Data are distributed normally |

* = Kolmogorov-Smirnov Test, if Sig > 0.05 (Normal).

Based on Table 1, the Kolmogorov-Smirnov test shows a significant number of 0.20 > 0.050. Therefore, the students’ pretest scores constitute the normal distribution.

The Normality Test of Posttest score based on the posttest consisting of multiple-choice items in 20 rounds resulting in a mean score of 11.98 with significance levels of 5% at 0.06. Below are the results of Normality Test by using the Kolmogorov-Smirnov, presented in detail in Table 2:

| A    | N     | Sig.* | Conclusion                  |
|------|-------|-------|-----------------------------|
| 0.05 | 31    | 0.06  | Data are distributed normally |

* = Kolmogorov-Smirnov Test, if Sig > 0.05 (Normal).

Based on Table 2, the Kolmogorov-Smirnov test shows that the significant number of 0.06 > 0.050 so that the students’ posttest scores are in the normal distribution.

The analysis of the completeness of learning outcomes, the students’ completeness of learning outcomes was categorized according to the KKM score, which is 70. The results of the completeness of learning outcomes are available in Table 3.
Table 3. Analysis of the completion of learning outcomes

| No. | Completion criteria | Number of students |
|-----|---------------------|--------------------|
|     |                     | Pretest | Posttest |
| 1   | Complete            | 14      | 27      |
| 2   | Not Complete        | 17      | 4       |

Based on Table 3, the number of students who achieve completion increased to 15 after being taught via the PBL-based module. The PBL can increase the students’ learning activities in a pleasant atmosphere, develop the students’ critical thinking skills, application of knowledge in the real world by the students, and direct the students to become independent learners. The study by [9] finds that learning by using the PBL model can increase the learners’ motivation, as well as increase their cognitive skills [10], and their thinking skills [11].

Hypothesis testing, the hypothesis to be tested in this study is as follows:

\[ H_0 : \text{The implementation of PBL module of the interaction of living organisms can improve the learning outcomes students at MTsN 2 Aceh Jaya.} \]

The hypothesis testing was carried out based on the data obtained from the scores of the tests in the study. The following are the results of the hypothesis testing by using the paired T-Test:

Table 4. Results of hypothesis testing by using Paired T-Test

| Mean | SD  | Standard error of the mean | T score | Sig. (2-Tailed) | Conclusion               |
|------|-----|---------------------------|---------|-----------------|-------------------------|
| 17.90| 6.68| 1.20                      | 14.92   | 0.00            | Learning outcomes can be improved |

Based on Table 4, the value of sig (2-tailed) is 0.00 or less than 0.05, as well as the value of \( t_{\text{score}} \) which is 14.92. The value of \( t_{\text{table}} \) is obtained from the \( \text{df} \) (degrees of freedom) = (n -1 = 30) on a significant level of \( \alpha = 0.05 \), which is 2.042. Therefore, it can be concluded that \( t_{\text{score}} > t_{\text{table}} \), \( H_0 \) is rejected, and \( H_a \) is accepted so that the implementation of PBL module in interaction of living organism’s topic can improve the learning outcomes of the students at MTsN 2 Aceh Jaya. It is because the PBL module can clarify and simplify the presentation of the message so that it becomes not too verbal, can resolve the limitations of time, space, and power of senses, both for the participating learners and educators/instructors. Also, it can be used appropriately and variedly, such as to increase the motivation and passion for developing skills and learning; to interact directly with the environment and other learning resources for potential learners. It is also suitable for self-learning and other relevant purposes. The research findings stated by [12] proved that the PBL module could attract learners’ attention. Besides, the results of study by Iriani et al. (2019) [13] shows that the PBL module can improve learning outcomes. The results of the students’ N-gain scores are presented in a chart of Figure 1 below:

![Figure 1. Results of the Students’ N-Gain](chart.png)
Based on Figure 1 N-Gain, the students obtain the N-gain score, and it can be divided the following categories: 6 students in low category, 15 students in medium, and 10 in high. The mean of the students’ N-gain score is 0.57, or under the medium category bracket.

3.3. Analysis of the question form of student perceptions

The result of students’ perceptions assessments was obtained from 31 questions given and three indicators (compatibility of module with learners, suitability of module with learning objectives, and technical quality). The criteria of perceptions are strongly agree; agree; slightly agree; disagree; strongly disagree; the findings are:

The percentage of students responding to module compatibility indicator 73% chose ‘strongly agree’ and 27% chose ‘agree.’ For learning module suitability with learning objectives indicator, 66% of the students strongly agree, 29% agree, and 0.5% slightly agree. As for the technical quality indicator, 40% responded that they strongly agree, 20% agree, and 0.1% slightly. For more details, the overall results of percentage of student response are available in Figure 2.

![Figure 2. Mean scores of student perceptions on the implementation of problem-based learning module of interaction of living organisms](image)

From Figure 2 it is apparent that the student perceptions towards the PBL module of living organisms interaction are positive. The data shows clearly that the students responded each aspect with more than 60% agreement. It is because the PBL module can develop the students’ problem-solving thinking skill, the knowledge they obtained are applicable in the real world, and it directs them to become independent learners. The research findings by [14] shown positive responses of learners on a PBL-based module. Likewise, [15] stated that the PBL-based module is considered as excellent and very positive.

4. Conclusion

Based on the findings, it can be concluded that the implementation of a Problem-Based Learning module of living organism’s interaction can improve the learning outcomes of the students at MTsN 2
Aceh Jaya with the mean score of N-gain on the medium criteria. The results of the students’ perceptions toward the implementation of the Problem-Based Learning module of living organism’s interaction indicate positive response under the good category.

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