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UKBM in Enhancing Students' Scientific Literacy Skills on Kingdom Plantae Materials

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Abstract: Biology learning plays an important role in stimulating student literacy skills. This is because biology is the answer to the problems which are related to nature and their interactions with environment. Scientific literacy skills can be imparted to students by using UKBM (*Unit Kegiatan Belajar Mandiri* or Independent Learning Activity Unit) on Biology. The purpose of this study was to find out the effectiveness of UKBM towards the enhancement of students' scientific literacy skills. The type of this research is quasi-experiment as it is using pretest and post-test question instruments. The statistical data shows that the average value of scientific literacy skills in the experimental class (20.36) is higher than the control class (15.85). The statistical test with Anakova shows an F value is 51,901 with a probability of 0,000 (sig.< 0,05) meaning that there is a significant relationship between pretest and post-test scientific literacy skills and the value of F = 10.607 and sig. (0.002) < 0.05 indicates that UKBM which is used in learning process is effective to improve students' scientific literacy skills.

Key Words: UKBM, plantae, literacy

Abstrak: Pembelajaran biologi berperan penting dalam menumbuhkan keterampilan literasi sains siswa, sebab biologi menjadi solusi permasalahan terkait alam dan interaksinya dengan lingkungan. Keterampilan literasi sains dapat dibekalkan kepada siswa dengan menggunakan UKBM Biologi. Tujuan dari penelitian ini untuk mengetahui keefektifan UKBM terhadap peningkatan keterampilan literasi sains siswa. Jenis penelitian adalah *quasi experimental*, dengan menggunakan instrumen soal pretes dan postes. Data statistik menunjukan rata-rata nilai keterampilan literasi sains kelas perlakuan (20,36) lebih tinggi daripada kelas kontrol (15,85). Uji statistik dengan Anakova menunjukkan nilai F sebesar 51,901 dengan probabilitas 0,000 (sig.< 0,05) artinya ada hubungan yang signifikan antara pretes dan postes keterampilan literasi sains dan nilai F = 10,607 dan sig.(0,002) < 0,05 artinya bahwa UKBM yang digunakan dalam pembelajaran efektif meningkatkan keterampilan literasi sains siswa.

Kata kunci: UKBM, plantae, literasi

INTRODUCTION

Education in the 21st century is a learning process in which the students are challenged to find out from various sources of problems and are expected to have 21st century skills. 21st century skills possessed by students can only be gained through activity-based learning that is in accordance with competency characteristics and learning material (Rustaman, 2017) and one of which is in biology learning. Biology is a complex scientific discipline compared to other scientific disciplines. It has a strategic role in preparing students who are critical, creative, competitive, collaborative, able to solve everyday life problems and dare to make the right decisions (Sudarisman, 2015) so they are ready to compete in the world of industry 4.0 that is full of opportunities and challenges (Kusuma Astuti, 2016). That strategic role can be obtained by carrying out literacy activities in biology learning process.

Through literacy learning, students not only get one competency but an array of competencies; those are scientific competencies, thinking competencies and attitude as well as character competencies. One of the literacies needed in the 21st century is scientific literacy. Science literacy is knowledge that combines scientific ideas and understanding concepts in various

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scientific disciplines and scientific practices which are needed to make reflection toward themselves and their environment (OECD, 2016). It is revealed that science literacy skills of Indonesian students are still relatively low which is shown by the PISA rank that Indonesia is in 62 out of 72 countries participating in PISA. This low level of scientific literacy skills is influenced by internal factors and external factors. The internal factor is student intelligence while the external factors are teacher, learning process, learning facilities and infrastructure such as teaching materials used. In terms of teaching material, Biology teaching materials which are used by the teacher lack of emphasis on scientific literacy learning and the problems presented there are still considered in low cognitive levels—memorizing knowledge or information (Biologi, Universitas, & Indonesia, 2008).

The teacher has a role in improving students 'scientific literacy skills that is by creating teaching materials which stimulate students' scientific literacy skills (Rohmah et al., 2018). One of the teaching materials currently expected by the government to be set by the teacher is UKBM. UKBM stands for *Unit Kegiatan BelajarMandiri* or Independent Learning Activity Unit. This is a modular learning unit that its usage is in accordance with the pace of learning of each student to achieve the competence as well as a means to stimulate 21st century life skills and literacy culture (Direktorat Pembinaan SMA, 2017). Guided inquiry-based UKBM on the kingdom plantae material involves students actively investigating plant morphological characteristics that are in the school environment and the role of plants for life. Through inquiry activities, students can find their own concepts, and are able to solve problems related to plant conditions in the current environment. The UKBM was arranged through a validity testing done by material experts and media experts and hence the results were declared valid. Whilst its practical tests are carried out by field practitioners and the results are declared appropriate and practical to use. This study, therefore, was conducted to determine the effectiveness of UKBM in improving students' scientific literacy skills on the kingdom plantae material.

METHOD

The design used in this research is quasi experiment. It was conducted at SMA Katolik St. Albertus Malang with research subjects 33 students of class X-A6 as the experimental class and 33 students in class X-A5 as the control class. The experimental class is a class that uses guided inquiry-based UKBM while the control class is a class that does not use UKBM and uses conventional learning instead. The instrument for data collection was in the form of pretest and post-test of learning outcomes which are integrated with scientific literacy skills that had been validated by the material experts. The results of pretest and post-test data were then tested its normality by using Kolmogorov Smirnov and its homogeneity by using Levene Test. Whereas the Hypothesis testing uses Anakova to find out hypothesis 1 (H1), namely the significance of the pretest and post-test relationship of scientific literacy skills and to find out hypothesis 2 (H2), namely the significance of the relationship between scientific literacy skills between the experimental class and the control class.

RESULT

Testing the Differences of Scientific Literacy Skills between Experimental Classes and Control Classes

The results of the differences in scientific literacy skills between the experimental class and the control class were viewed from the competency domains of students' scientific literacy skills which were integrated in pretest and post-test. The competency domain of scientific literacy skills assessed was the competence on explaining scientific phenomena and interpreting scientific evidence and data. The results of scientific literacy skills between experimental classes and control classes are presented in Figure 1.

Based on the graph presented in Figure 1, the information obtained is the differences in the mean

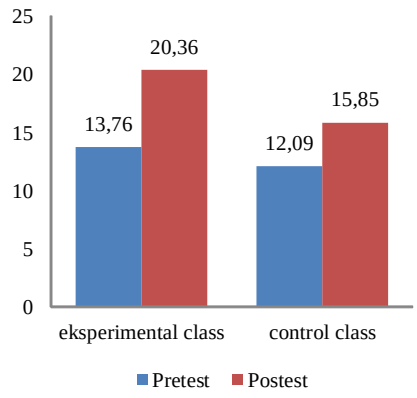

Figure 1. Science Literacy Skills Results in the Experimental Class and Control Class

scores of pretest and post-test students' literacy skills in both the experimental class and the control class. The pretest and post-test values of the experimental class were higher than the pretest and post-test scores of the control class. The post-test value of the experimental class and the control class was higher than the pretest value. The average value shows that there is an increase in post-test scores, meaning that there is an increase in the value of students' literacy skills after learning.

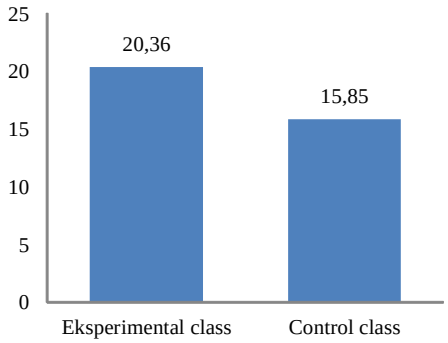

Figure 2. Graph of Average Value of Science Literacy Skills

Hypothesis Testing

The data obtained about values of scientific literacy skills were tested its normality and its homogeneity. The results of the normality test from the analysis of differences in scientific literacy skills produce a value of 0.101 with a probability of 0.094 (sig. > 0.05) so that the data normality is fulfilled. Based on the homogeneity test results from the analysis of the differences in science literacy skills produces a value of 1.877 with a probability of 0.175 (sig. > 0.05) so that the data has a homogenous variety. Furthermore, to find out the differences in the value of science literacy skills students, the Anakova test was run through statistical analysis of SPSS 22 for windows. The results are presented in Table 1.

Based on the results of the statistical tests listed in Table 1, it can be seen that the pretest and post-test scientific literacy skills produce F test statistics of 51,901 with a probability of 0,000 (sig. < 0,005) so that the hypothesis which stated that there is a significant relationship between pretest and post-test scientific literacy skills is accepted. Furthermore, the analysis on the differences in the control class with the experimental class resulted in F test statistics of 10.607 with a probability of 0.002 (sig. < 0.05); so that the hypothesis which claimed that there is a significant difference between the control class and experimental class in terms of scientific literacy skills is accepted. This shows that the use of UKBM in kingdom plantae material learning can improve students' scientific literacy skills. The average graph of the value of science literacy skills in the experimental class and control class is presented in Figure 2.

Based on Figure 2. It can be seen that the average value of scientific literacy skills between experimental classes and control classes is different. The difference shown by the average value of science literacy skills in the experimental class is higher than the average value of the control class scientific literacy skills. The experimental class using guided inquiry-based UKBM has a higher average score, meaning that UKBM used in kingdom plantae material learning can effectively enhance students' scientific literacy skills.

DISCUSSION

The results of analyzing the effectiveness of developing biology teaching materials in the form of UKBM for kingdom plantae material showed that students' literacy skills in the experimental class were higher than those in the control class. This difference occurs because the experimental class uses UKBM with guided inquiry-based. Inquiry learning process provides opportunities for students to make observations, to predict, to formulate problems, to test hypotheses, to collect data, to analyze data and to generalize explanations (Wenning, 2007). The learning activities began by presenting a phenomenon that is intentionally set like the surrounding environment, es-

Table 1. Results of the Anakova Test for Student Scientific Literacy Skills

Source	Sum of Square	Df	Mean Square	F statistik	Sig.
Pretes_LS	851,854	1	851,854	51,901	0,000
Class	174,093	1	174,093	10,607	0,002
Error	1034,025	63	16,413		
Total	23859,000	66			

pecially about the characteristics and role of plants. The students, then, were guided to observe the phenomena existed. Based on the results of phenomenon observations, students were identifying by asking questions which were then formulated in the form of a problem statement. Rooted from the results of the problem formulation, students were motivated to think about finding answers (hypothesizing) and designing investigative activities. Next, students were given the opportunity to carry out investigation activities. By conducting the investigation, students could collect data and analyze data to make conclusions. Then the students could convey the conclusions. This inquiry process is in line with the competency framework of science literacy skills which includes the explanation of scientific phenomena, designing scientific investigations and interpreting scientific data and evidence (OECD, 2016).

Guided inquiry-based in UKBM involves students to be active in learning and to write about their results, while the teacher as the facilitator acts to guide the students. Learning activities that directly involve students to be able to learn a concept through investigation or involvement might improve scientific literacy skills (Ergül et al., 2011; Garner-O'Neale, Maughan, & Ogunkola, 2013; Ngertini, 2014; Tamara & Sunarti, 2017). Inquiry-based learning aims to help students develop conceptual and high-level thinking skills (Arends, 2010). Inquiry learning processes provide opportunities for students to learn actively, develop logical thinking skills based on facts and theories, and think critically to solve problems so that indirectly improve science literacy skills (Asyhari, 2015).

UKBM contains motivation so students collaborate with their friends to discuss and find alternative solutions of the problems, because discussions involve the ability to think more dominantly than just reading and listening (Jihda & Haris, 2013). Group discussion activities contribute to significantly improving complex learning demands such as problem solving, conceptual understanding and literacy skills. Besides being able to collaborate, by using UKBM students can also undergo independent learning activities as part of personal development (Gormally, Brickman, Hallar, & Armstrong, 2009) through working on problem exercises containing questions tailored to the learning indicators and scientific literacy skills indicators.

The questions presented in UKBM are complemented by discourses or scientific articles, or information related to daily life in accordance with subject matter such as kingdom plantae or the plant world. Science literacy questions—or discourse questions—if it is taught to students, it can improve the students' scientific literacy skills (Angraini, 2014). The discourse presented is expected to encourage students to read and learn to construct and make a connection between the knowledge they have and the applications in everyday life, thus students can have an attitude to solve problems in daily life, in this case problems related to the world plant.

Each activities result in the inquiry learning process about kingdom plantae was written in UKBM by students. Writing activities can incite students' scientific literacy skills, because writing can bridge students' previous knowledge with the new one. In addition, writing activities might also stimulate students' thinking skills, which is in line with the fact that the writing to be developed in the form of facts, concepts, data and processes requires science literacy skills (Abidin, Mulyati, & Yunansah, 2017). Writing learning activities reflection done within UKBM can encourage students' scientific literacy skills. Students are guided to reflect on what students have done and analyze their thought processes during the learning. Students can write down the results of self-reflection related to what they have learned, what they have understood and also what they have not understood in UKBM. Through reflection activities there is a sharpening of the experience gained. Reflection also serves to educate students to learn from the experiences they have been obtained. Biology learning that ignite science literacy skills is not got by training the problems of science certification as per PISA but by examining the components assessed and providing them to students (Rustaman, 2017).

CONCLUSIONS

Based on the results and discussion it can be concluded that guided inquiry-based UKBM can improve students' literacy skills on the kingdom plantae material.

The role of the teacher in preparing UKBM is very necessary to create student-oriented learning, to foster 21st century life skills and literacy culture, and to strengthen character education. Then it is suggested that the teachers arrange Biology UKBM for other materials or other Basic Competencies and with other scientific learning models to improve critical thinking skills, creative thinking, collaboration, and communication as well as scientific literacy tailored to the characteristics of students.

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