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Development of SSCS Based Material of Biological Diversity to Improve Critical Thinking Ability

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Abstract

The rapid development of science and knowledge in the 21st century raises competition from each country to create various innovations in various fields. To meet these challenges are those who have the ability to think critically, logically, systematically, and creatively in order to be able to survive and compete globally. This study aims to analyze the development of SSCS-based worksheets on biodiversity materials including syllabus, lesson plans, worksheets, and evaluation tools on students' critical thinking skills (CBC). The learning model used in this study is Search, Solve, Create, and Share (SSCS). The study was conducted at MAN 1 Brebes class X. Samples were taken using a purposive sampling method consisting of 3 classes with a total of 105 students. This study uses R&D research methods with one group pretest-posttest design. Based on the analysis results obtained an average critical thinking ability of students of 86% complete and 14% of incomplete by obtaining an average N-Gain score of 0.6 in the medium category. Furthermore, the average score of pretest-posttest and N-Gain per KBK indicator has quite a small comparison. These results indicate that the development of SSCS-based worksheets is effective against students' critical thinking skills.

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INTRODUCTION

The challenges of the 21st century require one to have some abilities that must be mastered, so students need to be prepared to master these abilities. This is intended so that students are able to survive in global competition. The ability of life that is needed in this globalization era is the ability to think critically. Students' critical thinking skills are one of the factors that support learning achievement. Usmeldi *et al*. (2017) stated, critical thinking is one form of learning that involves learning activities to analyze ideas that are more specific, differentiate, choose, identify, assess, and develop their abilities towards more perfect and the ability to create rational decision. So students who have these abilities will be able to ask the right questions, provide effective and efficient information, have sensible reasons, solve problems, make decisions, and have consistent conclusions. In addition, the achievement of test indicators is basically the effect of critical thinking success (Afriani *et al*., 2018; Corebima *et al*., 2017).

21st Century skills in the learning process in Indonesia, were developed to train students with curriculum learning in 2013. In accordance with Permendikbud No.64 of 2013 concerning content standards states that one of the competencies that must be developed in implementing the 2013 curriculum is critical thinking competency. Students who have critical thinking skills will try to provide logical reasoning in understanding and making complex choices, as well as understanding the interconnection between systems (Husamah *et al*., 2018). Therefore, these skills need to be accustomed to be trained in learning in schools so that students are equipped to face the future through interactions between teachers and students (Mahanal *et al*., 2016).

To meet these challenges, are those who have the ability to think critically, logically, systematically, and creatively so that they can face life's challenges independently by one of them using a scientific approach (Satriawan, 2017). The scientific approach to learning does not only focus on how to develop students' competencies in observing or experimenting, but how to develop their knowledge and thinking skills so that they can support creative activities in innovation or work. Based on the results of interviews with teachers conducted at MAN 1 Brebes shows that, teaching materials used by teachers have not shown the steps of learning with a scientific approach. Teachers still think that to teach critical thinking skills requires intelligent and critical students. According to Chukwuyenum (2013) said, actually the ability to think critically can be trained, one of them is by familiarizing learning activities that lead students to contextual problems that arouse students' curiosity and not just conceptual. In addition, teaching materials used by teachers have not varied. One of the teaching materials used is the student worksheet (LKS). Actually, LKS that students use can be made by the teacher concerned so that the teaching and learning process runs more effectively and efficiently.

The teaching and learning process will be more effective by using appropriate models, one of which is the Search, Solve, Create, and Share (SSCS) model. The products developed are SSCS-based worksheets. LKS is the most important learning support used by students in teaching and learning activities. Prastowo (2015) and Mulyawati *et al*. (2017) states the function of worksheets as teaching material, namely: (1) makes it easier for students to understand the material, (2) can practice student learning independence, (3) activates students, and (4) can facilitate the implementation of learning. While the SSCS model is one of the learning models that directs students to construct knowledge, meaning that it can be applied with a constructivist approach or with the *Problem Solving* learning method. The learning process that is based on constructivism learning theory, namely learning by facilitating students to gain meaningful learning experiences on the knowledge learned (Nasution, 2018). This SSCS model has 4 stages, namely at the search stage where students look for or identify a problem, the solve stage is a way for students to solve a problem, the create phase is the student summarizes the solution of the problem given to students by creating a product, and the share stage is the student sharing knowledge or communicating their findings with peers and teachers (Milama *et al*., 2017). states the purpose of the SSCS learning model is to expand student knowledge through solving a problem.

The advantages of this SSCS learning model are that it can improve interactions between students, improve students 'questioning abilities, and increase students' sense of responsibility towards their learning. The results of the development of SSCS-based worksheets conducted by Rahmatika & Alimah (2014) stated that the aspect of material eligibility gained a score of 75.75% and a media worth of 83.9%. The results of this study indicate that SSCS-based worksheets are feasible and effectively applied in learning. Another study conducted by Maulana *et al*. (2014) in one of the Inderalaya State XI High School 2 high school, the results of his study showed that there was an increase in learning outcomes after using the SSCS learning model. Before using the SSCS model, the percentage of student learning outcomes was 25% then after using the 4 stages the SSCS learning model increased to 87.5%. Learning using these models requires students to think critically in solving a problem, so as to build problem solving skills in students. Milama *et al*. (2017) states the purpose of the SSCS learning model is to expand student knowledge through solving a problem.

The purpose of this study is to analyze the effectiveness of SSCS-based worksheets for biodiversity material developed whether it can improve students' thinking abilities from previous learning. The benefits of this study were obtained by SSCS-based worksheet can improve students' critical thinking skills in learning biodiversity.

METHODS

The study was conducted at MAN 1 Brebes on biodiversity material. This research design uses one group pretest-posttest design. The population in this study were students of class X MAN 1 Brebes in the 2018/2019 school year. Sampling was done by purposive sampling technique consisting of 3 classes with a total sample of 105 students.

The independent variable in this study is learning design. The treatment of the use of SSCS-based worksheets was carried out in 3 classes as an experimental class to find out whether the learning outcomes using the method and the model had the same increase or not. While the dependent variable in this study is students' critical thinking skills on biodiversity material.

The data collection method is done by the documentation method, the LKS method, and the test method. The documentation method is used to register the name, number of students, and all data needed in the study. The worksheet method is used to guide during learning that includes pictures, problem solving columns, hypothesis columns, tables and observational data. While the test method is used to get students critical thinking skills data in accordance with the indicators.

The research data of students 'critical thinking skills were analyzed by increasing the N-gain test and t test to find out whether there was an increase in students' critical thinking skills between classes. Primary data analysis which consists of analysis of the results of the pretest and posttest using the N-gain test. N-gain test is used to obtain a neutral gain value, this is to eliminate the assumption that the largest gain value shows the best learning outcomes. The N-gain index formula used is as follows.

$$N\text{-}Gain = \frac{posttest\ score - pretest\ score}{the\ higest\ score - pretest\ score}$$

The large interpretation of gain shows an increase in students' critical thinking skills after learning using SSCS-based worksheets for biodiversity material as a learning resource. N-gain interpretation categories can be seen in Table 1.

Tabel 1. Description of *N-gain*

Normality Gain	Category
$g < 0,3$	Low
$0,3 \leq g \leq 0,7$	Middle
$g \geq 0,7$	High

RESULTS AND DISCUSSION

Analysis of the *pretest* and *posttest* data of students' critical thinking skills obtained on average in each class showed a significant difference. The average critical thinking ability of experimental class II students (MIA 2) is higher than the average critical thinking ability of students of experimental class I (MIA 1) and experiment III (MIA 3). The average *pretest-posttest* and *N-gain* data can be seen in Table 2.

Table 2. The result of *pretest-posttest* and *N-gain* each class

Class	Pretest				Posttest				Gain	Criteria
	Score	Final Score	∑Student		Score	Final Score	∑Student			
			TT	T			TT	T		
MIA 1	12.7	50.9	35	0	19.7	79	6	29	0.6	Middle
MIA 2	12.9	51.4	35	0	21	83	5	30	0.6	Middle
MIA 3	11.2	44.7	35	0	20.3	81	3	32	0.7	Middle

Student learning outcomes by using SSCS-based worksheets as learning, all students have increased and experienced learning outcomes completeness with a minimum completeness criteria value (KKM) determined by the school that is 75 with a total of 105 students who are complete and incomplete can be seen in Figure 1.

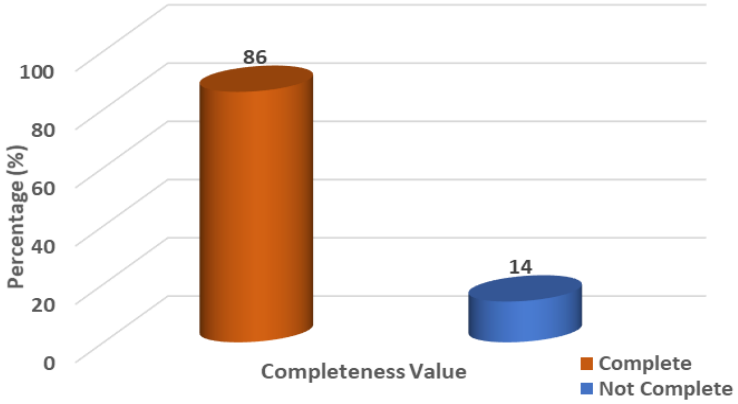

Figure 1. Overall learning outcomes completeness

Based on these results that mastery learning is achieved because students feel interested in learning that exercises the critical thinking skills of students so that they can express something and utilize the environment as a source of learning. This is consistent with the opinion of Wijayanti *et al*. (2016) states, learning outcomes increase because learning by creating something will give its own impression for students so that learning is centered on students, invites students to do relevant activities, and the teacher as a facilitator. Students not only learn the theory but directly practice the concepts taught (Adula & Kassahun, 2010) thereby increasing students' cognitive abilities (Class & Ahn, 2011).

The difference in the average value of the *pretest-posttest* can be seen in the overall CBC indicator values can be seen in Figure 2.

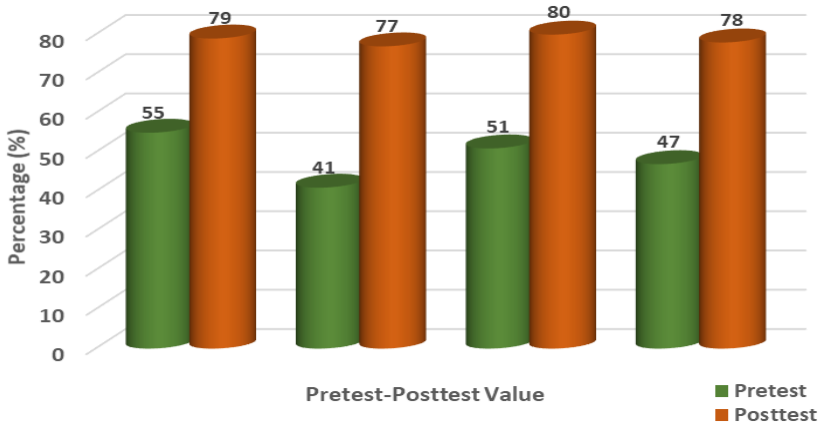

Figure 2. Graph of average *pretest-posttest* scores per CBC indicator

Note:

Indicator 1: Focus the question

Indicator 2: Analyze arguments

Indicator 3: Induce and consider the results of induction

Indicator 4: Determine an action

Comparison of the value of the *pretest-posttest* both the highest and lowest indicator values on each indicator as a whole has an average *posttest* value that is higher than the *pretest* value. Comparison of the average N-gain per KBK indicator as a whole can be seen in Figure 3.

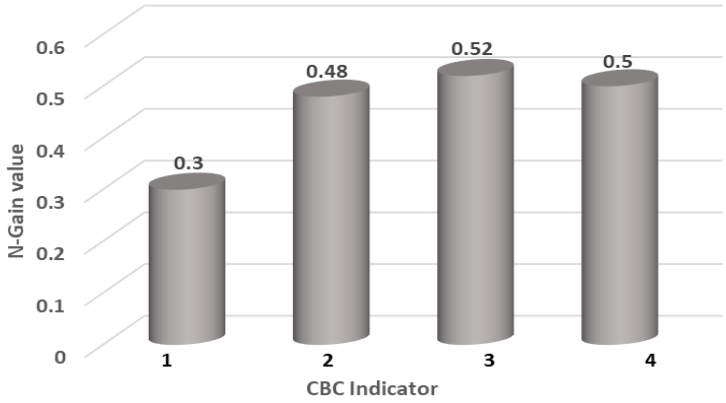

Figure 3. Graph of the average N-gain value for each CBC indicator

Note:

Indicator 1: Focus the question
Indicator 2: Analyze arguments
Indicator 3: Induce and consider the results of induction
Indicator 4: Determine an action

Based on Figure 2. and 3. shows the results of the comparison of the average percentage of each indicator as a whole has increased quite a bit both the results of the pretest-posttest indicator and the value of N-gain. This increase is in accordance with the results of research conducted by Maulana *et al*. (2014) said there was an increase in learning outcomes after using the SSCS learning model. Milama *et al*. (2017) also said learning using the SSCS model requires students to think critically in solving a problem so as to build problem solving skills in students. The purpose of the SSCS learning model is to expand student knowledge through problem solving. Based on these results that in learning, teachers are required to be able to create an interesting learning atmosphere and can stimulate students' critical thinking skills, so students get an interest in teaching and learning in the classroom and outside the classroom, and students can also explore and develop their potential.

This SSCS model teaches a problem solving process and gives students the opportunity to practice and improve their problem solving abilities, so that this learning model can facilitate the development of their thinking skills (Satriawan, 2017). This is in accordance with the opinion of Kurniawati & Fatimah (2014), namely the ability of students 'logical thinking taught with the SSCS model problem solving approach is higher than the ability of students' logical thinking taught with conventional learning.

After learning to use the worksheets developed, students more easily understand the material presented. The material presented in the worksheet does not only contain questions that only ask for answers to those questions. Instead, this worksheet contains stages of work that help students to practice their critical thinking skills based on the knowledge they have. Students are also more active in conducting a series of activities or activities that are in the worksheet, so students do not feel bored and passive in learning activities. According to Hamdani (2011), the advantage of using LKS is that it can increase learning activities, encourage students to be able to work alone and guide students well towards the development of concepts. Then Majid (2011) states that the advantage of LKS for students is to be able to study independently and carry out a written assignment. Whereas the teacher only facilitates students to find concepts, help increase curiosity and build motivation in each learning process (Shirazi, 2017).

With the LKS being developed based on SSCS, students become more interested in participating in learning biology. Learning by doing activities that are usually done or liked by students will not make students bored and make students more active, because the basic potential of students can be actualized by following the

activities arranged in the worksheet (Afiif *et al*., 2017).

CONCLUSION

Based on the development and trial of LKS that has been carried out, biological LKS was obtained in class X biodiversity material through development research using a valid, feasible, and quite effective SSCS model. The resulting worksheets are interesting to be studied by students. The material presented has a connection with the real life of students. Explanation of the concept is assisted by images that support and practice in LKS train students in the process of critical thinking. The worksheets produced through this research can also support the learning process both for teachers and students, and the worksheets used can improve learning outcomes of students' critical thinking skills in biology learning.

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