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SENIOR HIGH SCHOOL STUDENTS' CREATIVE THINKING IN THE ECOLOGICAL LEARNING THROUGH MIND MAPPING STRATEGY - A DEVELOPMENT RESEARCH

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Abstract:
The low level of creative thinking skills is due to the absence of student worksheet which can be used to explore students' creative potential. This research aims to produce the Ecology concept student worksheet using mind map strategies to improve students' creative thinking skills. This study uses two stages of the Plomp development research model, namely the preliminary stage and the prototype stage, while the assessment phase is not carried out. The research subjects in the field test were 16 students of class X natural science 2 in SMA Negeri 12 Banjarmasin. Data collection uses performance instruments creative thinking skills. Descriptive quantitative data analysis. The results of the study show that: The developed student worksheet is effective. For the results of testing the effectiveness of class X natural science 2 data obtained for fluency indicators 71.56% (high), flexibility 77.43% (high), authenticity 75.50 (high), specifying 73.93% (high) and indicators assessing 82.81% (high). The conclusion is that the ecological concept student worksheet using the mind map strategy developed is effective for training students' creative thinking skills.

Keywords: learning result, creative thinking skill, student worksheet, mind mapping strategy

1. Introduction

Biology is one of the subjects taught from high school to college to equip students with the ability to think logically, analytically, systematically, creatively and the ability to cooperate. Students are educated to be creative so that they are not only consumers of knowledge but also able to produce new knowledge. For this reason, the teacher's role is required in preparing the material, processing the learning process and assessing student competencies according to curriculum demands (Silvia et al., 2015). Based on the reality in the field, the assessment in measuring the ability to think creatively in

Biology is still not optimal. Thinking skills are capital that must be possessed by students as a provision in facing social development and knowledge in the community (Priantini, 2016).

Changes in the curriculum have the essence to improve the learning process. Educators are required to be able to provide knowledge, attitudes, and skills through learning pattern strategies in the 21st century (Hosnan, 2014). The 21st-century learning methods must be directed to encourage students to seek information from various sources, formulate and solve problems, train analytical thinking/decision making, and emphasize collaboration and collaboration in solving problems.

Indonesia has the 2013 Curriculum which explicitly includes attitudes/characters as competencies that must be achieved and learning strategies that are used emphasize more on modern pedagogical dimensions in learning, namely using a scientific approach. The 2013 Curriculum focuses on the importance of preparing human resources who have soft skills and hard skills. Biology lessons require soft skills and hard skills that are reflected in 4 elements of the nature of learning which include attitudes, processes, products, and applications (Suhartini et al., 2016).

The implementation of the learning process is carried out by developing a culture of reading and writing. Therefore, the teacher must describe the syllabus and lesson plan into learning tools such as student worksheet and learning media (Government Regulation, 2005). With the student worksheet, students will have a culture of reading and writing, so that the ability of creative thinking skills will develop. With the learning media, students are not bored, will be challenged, and interested. Thus it is expected that the process of teaching and learning activities in the classroom can take place effectively and efficiently (Government Regulation, 2005).

Learning is said to be effective and efficient if: (1) the teacher plans the learning process that is making syllabus and lesson plan analysis, student worksheet, teaching materials, and assessment sheets, (2) the teacher carries out the learning process, (3) the teacher carries out learning outcomes assessment owned by students (Government of Indonesia, 2005).

Student worksheet is one of the right learning alternatives for students because it can help students to add information about concepts learned through systematic learning activities. Student worksheet has several benefits if used in the learning process, namely: (1) activating students in the learning process, (2) helping students in developing concepts, (3) helping students obtain notes about the material learned through learning activities, and (4) help students to add information about concepts learned through systematic learning activities (Suyitno, 1997).

Biology learning emphasizes understanding concepts and real applications in the field. The problems that occur at this time in the field, in the learning process often the teacher becomes the center of learning (teacher centered) and students are still the recipient's object. The use of the current learning system learners are only given knowledge verbally, so that students receive knowledge in the abstract without experiencing it themselves. Even though Biology subjects have a close relationship between concepts and surrounding environment, so students do not have the

opportunity to develop their knowledge and ability to think creatively. For this reason, we need teaching materials that can make students think more creatively. In developing teaching materials a teaching material is needed that is valid, practical and effective, besides that it also requires an appropriate approach / method to help students understand the material taught and is expected to be able to improve students' creative thinking skills.

The results of the researchers' preliminary study obtained information that Biology learning in Public High Schools in Banjarmasin City still uses teacher-centered conventional learning so that students are less skilled and creative. The development of the mind map of student worksheet aims to improve learning by involving students in activities and providing meaningful learning experiences.

Research conducted by Riyanto (2013) on the effect of mind map methods on science learning completeness in Full Day School students concluded that: (1) The mind map method applied in learning influences the completeness of learning science in Full Day School students, (2) learning with conventional methods can help improve learning achievement but has not been able to improve the completeness of learning in Full Day School students with completeness of only 0.70%, (3) learning by mind map method can improve learning completeness of Full Day School students with a level completeness of students reached 93.75%.

One learning model that provides opportunities for students to improve the learning process is the guided inquiry model. Using a guided inquiry learning model is a series of activities that involve learning activities to the maximum of all students' abilities to search and investigate systematically, creatively, logically, analytically, so that they can formulate their own findings with self-confidence. Inquiry not only has a positive impact on critical thinking (Zaini & Rusmini et al., 2016, Zaini & Asnida, 2016; Zaini et al., 2017), but also creative thinking. Guided inquiry learning benefits students in understanding basic concepts, expressing better ideas and developing creative thinking skills. Creative thinking skills are one of the abilities demanded in the 21st century (Suhartini et al., 2016).

Creative thinking skills are the ability to find many possible answers to existing problems based on data or information. The characteristics of operational creative thinking skills can be formulated as abilities that reflect fluency, flexibility (flexibility), originality in thinking, and the ability to elaborate (develop, enrich, detail) an idea (Munandar & Utami, 1992).

Fitriani (2010) concluded that the active learning model using mind maps can improve biology learning outcomes of the students in SMA Negeri 8 Tangerang Selatan. Saliyem (2012) also concluded that teaching and learning activities using the student worksheet Guess Flow TGT cooperative learning model can improve the creative thinking skills of the students in SMA Negeri 1 Banjarmasin.

Based on interviews and observations, researchers found real conditions in the field that students' creative thinking skills were still not trained enough so that creativity from students did not emerge. This has an impact on the low daily test results on some learning materials so that they do not reach the minimum standard. Therefore,

students must be trained to be accustomed to using student worksheet that is more honing their creative thinking skills.

The weaknesses of the student worksheet that have been used so far are: (1) the student worksheet has not been specific, (2) the student worksheet only contains the tasks of students to answer questions in a monotonous manner, (3) the student worksheet is not supported by interesting images (4) the student worksheet is inadequate to achieve the minimum competencies requested in Basic Competence. The teacher is monotonous in teaching and learning activities in the classroom and is verbalism. Teachers continue to dominate the teaching and learning activities in the classroom. Teachers as centers of learning or known as Teacher Centered Learning (Yunanto, 2004).

One of the learning material that has not yet reached the minimum standard is Ecology material. Daily test scores for Ecological material for 3 years (2013/2014 to 2015/2016) averaged 66.5, while the minimum standard for the material was 70. Based on information from fellow Biology teaching teachers that Ecological material was very large and generally memorized. Based on the findings in the field, the researcher wants to develop and apply one of the learning tools, namely developing and implementing the student worksheet of the Ecology concept using the mind map strategy on the students' creative thinking skills.

2. Material and Methods

This research is development research that develops the student worksheet mind maps to improve creative thinking skills. The research method used is a design with one group pre-test post-test. The development design used in this study refers to the development of Plomp and Nieveen (2010) which consists of 4 stages or phases, namely: (1) preliminary research, (2) prototyping stage, (3) assessment stage, and (4) systematic reflection and documentation. This development research is limited to the prototyping stage. The formative evaluation used in this study is a Tessmer evaluation technique consisting of self-evaluation, expert review, one-to-one evaluation, small group or micro evaluation and field test (Tessmer, 1998). This research focused on the field test.

The research subjects in the field test were 16 students of X class of natural science 2 in SMA Negeri 12 Banjarmasin. The effectiveness data is obtained from the results of creative thinking skills in the field test which includes indicators of fluency, flexibility, authenticity, detailing, and assessing. The assessment was taken from the students' answers in working on the LKPD and post-test, with the formula as follows:

$$\text{Percentage score} = \frac{\text{achieved score}}{\text{maximum score}} \text{ x } 100\%$$

The percentage value obtained is then categorized by adapting the category from Karim (2015), which is very high (81.25 <X ≤ 100.00), High (71.50 <X ≤ 81.25), Medium (62.50 <X ≤ 71.50), Low (43.75 <X ≤ 62.50), and Very low (0 <X ≤ 43.75).

3. Results

The results of the student worksheet effectiveness test on the field tests conducted on students obtained from the average post-test data and student answers to the student worksheet can also be seen in Table 1.

Table 1: The student worksheet effectiveness on each indicator of creative thinking

No	Indicators of Creative Thinking Skill	Students' Learning Result (post-test average and student worksheet)	
		Percentage	Category
1	Fluency	71.56	High
2	Flexibility	77.43	High
3	Authenticity	75.5	High
4	Specifying	73,93	High
5	Assessing	82,81	Very High

Based on Table 1, it can be seen that the effectiveness of student worksheet on each indicator of creative thinking skills is in the category of high to very high. Therefore, it can be stated that the student worksheet is developed with an effective mind map strategy to improve the creative thinking skills of high school students in learning the Ecology concept with a mind map strategy.

Based on the results of this study, it can be concluded that the effectiveness of student worksheet on creative thinking skills for fluency indicators is 71.56% (high), flexibility is 77.43% (high), authenticity is 75.50 (high), specifying is 73.93% (high) and assessing is 82.81% (high).

4. Discussion

Learning outcomes of students using student worksheet mind map strategies have reached the school minimum score of 70. This can be stated, that learning outcomes are classified as effective by using the student worksheet mind map strategy. Learning outcomes obtained by the average value in the field test is better than the initial test. This is thought to be caused by one of the advantages of the developed student worksheet, namely there are examples of working according to indicators of creative thinking skills so that it will facilitate learning. In addition, the role of inquiry cannot be ruled out, Zaini (2014) reports that inquiry has a positive effect on learning outcomes and processes.

Putri (2015) states that by training students with mind mapping-based student worksheet that have been developed can train students' thinking skills to develop better. Student worksheet can also improve student learning outcomes because in the

learning process it can provide motivation and can provide opportunities for students to actively participate in the learning process. It also can improve student learning outcomes, because in the learning process it can provide motivation and can provide opportunities for students to actively participate in the learning process. Learning using the student worksheet mind map can change the habits of learners by listening and receiving information from the teacher to learn by thinking a lot and finding it directly.

Buzan (2007) states that mind maps are solutions that are expected to facilitate students in understanding learning material. Learning to use mind maps is one method that can be used as an alternative teacher to teach. Mind maps are creative recording methods that make it easier for students to be able to remember a lot of information because with a map of the mind of students it is enough to remember the main ideas or ideas to be able to stimulate memories easily. Learners can save time, arrange writing regularly, explore more ideas, have more fun with their respective creativities and get better learning outcomes with mind maps.

Based on the results of the study, the overall average with high and very high categories was obtained on the five thinking skills indicators. The tendency of students' cognitive learning outcomes is high if the value of doing student worksheet is also high. These results indicate that the learning process performance outcomes of students during the learning process on the Ecology concept using student worksheet with mind map strategies to improve students' creative thinking skills have been very good. This is in line with Putri's research (2015) which states that the application of learning with student worksheet has a significant influence on students' creative thinking skills. Dewi et al. (2013) stated that the mind mapping method influences creative thinking skills and students in learning social studies.

Achievement of learning outcomes of students after following the process of learning the Ecology concept using student worksheet with mind map strategies tends to increase in each indicator. This was allegedly caused by the superiority of the student worksheet that was developed in growing and improving the creative thinking skills of students in learning Ecology concepts.

The creative thinking skills of students on fluency indicators show high results. The developed student worksheet can be used well to learn the concept of Ecology in high school. This is allegedly caused by the superiority of the developed student worksheet, namely problems that are equipped with images in the student worksheet unit are things that relate to the lives of students, making it easier for students to find problems and associate with the material learned then pour it in the form of mind maps. The advantages of the student worksheet are thought to be able to foster the ability of students to understand and express, explain and give meaning to information data, so that they can interpret images or phenomena according to their visual abilities to motivate students to find and find their own problems.

The skills of students' creative thinking on flexibility indicators show high results. According to Karim and Normaya, (2015) students who are able to make hypotheses on indicators of flexibility, one of which is caused by the superiority of the student worksheet that provides motivation for students to find and find their own

answers to a problem they face. As explained by Sanjaya (2006) learning strategies with a series of learning activities that emphasize the process of thinking creatively and analytically to find their own answers to a questionable problem.

The creative thinking skills of students in the authenticity indicator show high results, which means that the developed student worksheet can be used well to learn the concept of Ecology in high school. This was allegedly caused by the advantages of the developed student worksheet, namely the problems that were supplemented with the pictures in the student worksheet unit had become commonplace, making it easier for students to relate the material to be studied. design, image, color, are in accordance with the contents of the Ecology concept material being studied, so students will be motivated to make an analysis of the data they find.

The creative thinking skills of students in the detailed indicators include high categories, meaning that the developed student worksheet can be used very well to study the ecological concepts in high school. This is thought to be due to the detailed step of the students being asked to make an experimental design to be used in investigations in the school ecosystem so that the material that must be processed on this indicator already exists in the previous indicator. Besides the student worksheet there are examples of working according to the indicators of creative thinking skills so that it is easier for students to obtain the required material in accordance with the problem based on the data found. On the Indicator detailing it does not rule out the possibility that there are still some students who get a value of 2, this is due to the mistakes of students when interpreting indicators detailing, so when pouring in the form of mind maps at the stage of designing the experiment is also right.

The creative thinking skills of the students in the indicator assessed that making conclusions showed good results with very high categories, meaning that the developed student worksheet could be used very well to learn the concept of Ecology in high school. This is thought to be due to the assessment stage of students being asked to make guesses according to the facts to make a conclusion so that the material that must be processed on this indicator already exists in the previous indicator. Besides student worksheet, there are examples of working according to the indicators of creative thinking skills so that it makes it easier for students to obtain the material needed in making rational conclusions by considering the information that fits with a problem based on the data found. In the Indicator, assessing does not rule out the possibility that there are still some students who get a score of 2, this is due to the mistakes of students when answering in the indicator assessing to make a conclusion, so when pouring it in the form of mind maps it is also not right.

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creative thinking skills so that it makes it easier for students to obtain the material needed in making rational conclusions by considering the information that fits with a problem based on the data found. In the Indicator, assessing does not rule out the possibility that there are still some students who get a score of 2, this is due to the mistakes of students when answering in the indicator assessing to make a conclusion, so when I put it in the form of a mind map is not right.

Based on this study, learning using mind maps combined with inquiry models has a good impact on student learning outcomes and creative thinking skills. However, this does not mean without difficulties, the inquiry learning model requires considerable time for teachers and students to get used to (Zaini, 2016).

5. Conclusion

Based on the findings, it can be concluded: the developed student worksheet includes effective training of creative thinking skills in students, including fluency indicators 71.56% (high), flexibility 77.43% (high), authenticity 75.50 (high), specifying is 73.93% (high) and assessing is 82.81% (high).

References

Buzan, T. (2007). *Buku pintar mind map*. Jakarta: Gramedia Pustaka Utama.

Dewi, K., Sadia, W., Ristiati, N.P. (2013). Pengembangan perangkat pembelajaran ipa terpadu dengan setting inkuiri terbimbing untuk meningkatkan pemahaman konsep dan kinerja ilmiah peserta didik. *Jurnal Pendidikan IPA, 3*(1).

Fitriani, S. (2010). *Pengaruh model pembelajaran aktif menggunakan Mind Map Terhadap hasil belajar biologi pada konsep keanekaragaman hayati (Eksperimen di SMAN 8 Tangerang Selatan)*. Skripsi. UIN Syarif Hidayatullah, Jakarta.

Hake, R.R. (1999). *Analyzing Change/Gain scores*. www.physics.indiana.edu/~sdi/AnalyzingChange-Gain. Accessed 18 July 2018.

Hosnan. (2014). Pend*ekatan saintifik dan kontekstual dalam pembelajaran abad 21*. Bogor: Ghalia Indonesia.

Karim & Normaya. (2015). Kemampuan berpikir kreatif peserta didik dalam pembelajaran matematika dengan menggunakan model jucama di sekolah menengah pertama. *Edumat Jurnal Pendidikan Matematika*, *3*(1), 92.

Munandar, S.C., dan Utami (1992). *Mengembangkan Bakat dan Kreativitas Anak Sekolah: Penuntun Bagi para Guru dan Orang Tua*. Jakarta: Grasindo.

Peraturan Pemerintah No. 19 Tahun 2005 tentang *Standar Nasional Pendidikan* Pasal 19 Ayat 1. Jakarta: Departemen Pendidikan dan kebudayaan.

Plomp, T., & Nieveen, N. (2010). *Educational Design Research*. In T. Plomp, & N. Nieveen (Eds.), Part A: An introduction. Enschede, the Netherlands: SLO.

Priantini, D.A.M.M.O. (2016). Pengaruh Metode Mind Mapping Terhadap Keterampilan Berpikir Kreatif Dan Prestasi Belajar IPS. *Widya Accarya*, *6*(2), 118-131.

Putri, D. (2015). Pengembangan lembar kerja peserta didik berbasis *peta pikiran* pada materi laju reaksi untuk melatihkan keterampilan berpikir kreatif peserta didik Kelas XI SMA. INESA *Journal of Chemical Education, 4*(2*),* 340-348.

Riyanto, B. (2013). *Pengaruh metode peta pikiran terhadap ketuntasan belajar IPA pada peserta didik full day school*. Tesis Program Magister Sains Psikologi Unuversitas Muhammadiyah Surakarta.

Saliyem. (2012). *Pengembangan LKPD tebak alur dengan model pembelajaran kooperatif tipe teams games tournament (TGT) terhadap kemampuan berpikir kreatif peserta didik*. Tesis. Universitas Lambung Mangkurat. Tidak dipublikasikan.

Sanjaya, W. (2006). *Strategi Pembelajaran Berorientasi Standar Proses Pendidikan*. Bandung: Kencana

Silvia, F., Risnita, Syaiful. (2015). Pengembangan rubrik keterampilan berpikir kreatif dalam memecahkan masalah matematika peserta didik Kelas VIII SMP Attaufiq Jambi. *Edu-Sains: Jurnal Pendidikan Matematika dan Ilmu Pengetahuan Alam Universitas Jember*, *4*(1), 10-20.

Suhartini, E.Z.A., Supardi, I., Agustini, R. (2016). Pengembangan perangkat pembelajaran model inkuiri terbimbing berbantuan teknik peta pikiran untuk meningkatkan penguasaan konsep dan kemampuan berpikir kreatif peserta didik SMP. *Pendidikan Sains Pascasarjana Universitas Negeri Surabaya 5, No. 2 ISSN: 2089-1776.*

Suyitno, Amin, dkk. (1997). *Dasar dan proses pembelajaran matematika*. Semarang: FMIPA Unnes.

Tessmer, M. (1998). *Planning and Conducting Formative Evaluation*. London: Cogan.

Yunanto, S.J. (2004). *Sumber belajar anak cerdas*. Jakarta: Gramedia Widiasarana Indonesia.

Zaini, M. (2014). Model Inkuiri Terbimbing Dalam Pembelajaran Konsep Penghematan Air Di Kelas V Sekolah Dasar. *Sekolah Dasar: Kajian Teori dan Praktik Pendidikan*, *23*(1), 85-95.

Zaini, M. (2016). Guided Inquiry Based Learning on the Concept of Ecosystem toward Learning Outcomes and Critical Thinking Skills of High School Students. *IOSR Journal of Research & Method in Education (IOSR-JRME), 6*(6), 50-55. doi: 10.9790/7388-0606085055

Zaini, M., & Asnida, D.J. (2016, January). The Development of Science-Biology Learning Instrument Oriented to Mangrove Forest for Junior High School Students. In *Proceeding Biology Education Conference: Biology, Science, Environmental, and Learning* (Vol. 12, No. 1, pp. 134-141).

Zaini, M., & Rusmini, R. (2016, November). Pengembangan Perangkat Pembelajaran Konsep Klasifikasi Benda Terhadap Keterampilan Berpikir Kritis Siswa SMP. In *Prosiding Seminar Biologi* (Vol. 13, No. 1, pp. 102-111).

Zaini, M., Kaspul, K., & Rezeki, A. (2017, October). Hasil Belajar dan Keterampilan Berpikir Kritis Siswa SMA pada Pembelajaran Biologi Menggunakan Model Inkuiri. In *Proceeding Biology Education Conference: Biology, Science, Enviromental, and Learning* (Vol. 14, No. 1, p. 323).