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PENGEMBANGAN LEMBAR KERJA SISWA BERBASIS STEM UNTUK MENINGKATKAN KETERAMPILAN BERPIKIR KREATIF SISWA KELAS V SEKOLAH DASAR

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Abstrak

Penelitian ini dilatar belakangi dari permasalahan terbatasnya bahan ajar dan rendahnya keterampilan berpikir kreatif siswa khususnya pada mata pelajaran IPA di SD Negeri Dukuhturi 01. Tujuan penelitian ini untuk mengembangkan produk dan mengetahui efektivitas penggunaan LKS berbasis STEM dalam meningkatkan keterampilan berpikir kreatif siswa kelas V. Jenis penelitian ini adalah penelitian dan pengembangan (R&D) dengan desain Pre-Experimental Design jenis One-Group Pretest-Posttest Design dan menggunakan model 4D dari Thiagarajan. Pengambilan sampel dilakukan dengan sampling purposive dengan jumlah sampel 25 responden. Teknik pengumpulan data menggunakan wawancara, angket dan tes. Teknik analisis data menggunakan uji prasyarat dan uji regresi linear sederhana. Hasil penelitian di peroleh (1) LKS IPA berbasis STEM layak dan valid digunakan berdasarkan hasil validasi media 4,38 yang termasuk kedalam kategori sangat baik dan hasil validasi materi 4,2 yang termasuk kedalam kategori baik. (2) LKS IPA berbasis STEM memiliki pengaruh ditunjukkan dari hasil output Anova nilai sig. = 0,000 < 0,05, tabel R Square 50,6%, dan nilai thitung = 4.850 dengan signifikansi 5% dan ttabel = 1,711. Saran dari penelitian ini adalah pendidik sebaiknya lebih dapat mengembangkan LKS IPA dengan pendekatan yang lain terutama dalam meningkatkan keterampilan berpikir kreatif siswa.

Kata Kunci: *Pengembangan, Lembar Kerja Siswa Berbasis STEM, Keterampilan Berpikir Kreatif*

Abstract

The background of this research is the limited of subject matter and the low of students' creative think skill problem especially in mathematical and natural sciences subject in SD Dukuhturi 01. The objectives of the research is to develop the product and to know the effectiveness of using STEM-based worksheet in increasing creative think skill of fifth grade students. The type of this research is Research and Development (R&D) with pre-experimental design type of One-Group Pretest-Posttest Design and using 4D model from Thiagarajan (1974). The sample was taking by sampling purposive with the sample amount 25 respondent. The technique of data collection used interview, questionnaire, and test. Technique of data analysis used prerequisite test and simple linear regression test. Finally, from the result it can be found that (1) mathematical and sciences worksheet is suitable and valid to use based on the media validation result 4,38 which is included in excellent categories and the material validation result 4,2 which is included in good categories. (2) mathematical and sciences worksheet STEM-based has influences shown by the output result Anova value sig. = 0,000 < 0,05, table R square 50,6 %, and value thitung = 4.850 with significances 5% and ttabel = 1,711. The suggestion from the research is the teachers should develop the

students' worksheet with another approximant especially to increasing students' creative think skill.

Keywords: Development, STEM-based Students' Worksheet, Creative Think Skill

Introduction

The 21st century is a century with rapidly developing science and technology, so that students are required to master various skills in order to be able to compete globally. The development of science and technology demands an increase in the quality of education. Education plays a role in preparing human resources who are able to think independently, creatively, and critically, because education is the basic capital for the development of quality human beings. The demands in the current era of globalization are humans who are characterized by creativity and criticality. As a result of these demands, the education system must be able to equip students to face life's challenges independently, intelligently, rationally, and creatively (Riana, et al: 2017). In reality, Indonesia's creative thinking skills are still relatively low. The results of the 2015 Global Creativity Index, Indonesia was still ranked 115th out of 139 countries (Richard Florida, Charlotta Mellander, and Karen King, 2015: 57). For this reason, it is very necessary to develop teaching materials in learning in schools that support the development of students' creative thinking skills. Jamaludin (2010) Students' creative thinking skills can be implemented through learning that is oriented towards high-level thinking. One of them can be through science learning which includes problem-solving activities that are characteristic of learning that develops creative thinking skills. Science learning requires students to think creatively, so that students can find alternative solutions to problems while learning science. In addition, students are guided by teachers to actively find their own understanding related to the learning material being taught. Thus, it is expected to produce innovative student thinking results in science learning that can be applied in everyday life. According to Rustaman in Fauziah (2011) fifth grade elementary school students aged between 11 and 12 years, have thinking development at the concrete operational stage. Where at this stage, science learning should not only be focused on studying concepts but students must be involved in activities that take place interacting with the objects being studied. The thinking skills of fifth grade elementary school students can be capital to develop creative thinking skills, namely skills that have the characteristics of being able to propose various solutions to a problem and fluently propose many original ideas individually. Because science learning must be able to increase imagination, creativity and logic in thinking.

The researcher conducted a preliminary study at SD Negeri Dukuhturi 01, namely based on the preliminary test, information was obtained that students' creative thinking skills were low and interviews conducted with grade V teachers, in learning the

teacher had used teaching materials used in the learning process carried out by the teacher using thematic books and equipped with LKS. The LKS is an instant LKS (purchased) not from the teacher's creativity, it only contains material and questions that do not facilitate students' creative thinking skills. In addition, the LKS used in schools is less interesting, because it is not accompanied by pictures and designs that are not varied by using opaque paper. This makes students unenthusiastic and bored in learning so that students' thinking skills do not develop optimally. Limited media and low creative thinking skills of students in the learning process are the main causes of low creative thinking of students, especially in science subjects. Several studies that have been conducted include research by Ratri Sekar Pertiwi (2017) which states that the STEM approach can improve students' creative thinking skills. This is effective if supported by teaching materials in the form of LKS. Research by Clara Aldila (2017) shows that the development of STEM-based LKPD is effective in fostering students' creative thinking skills.

In relation to this problem, a STEM-based LKS IPA was developed on the water cycle material so that in the learning process it can improve students' creative thinking skills through activities contained in the LKS IPA. With the existence of this STEM-based LKS IPA, it is hoped that it can be a vehicle for students to learn about themselves, and the environment, as well as prospects for further development in applying it in everyday life by thinking creatively.

Therefore, researchers want to develop an interesting learning media in the form of Student Activity Sheet (LKS) teaching materials based on STEM to improve creative thinking on the water cycle material in an interesting, logical, systematic, innovative, and easy-to-use way for students in the learning process.

Methods

The type of research used in this study is a quantitative type of research using the Research and Development (R&D) approach. The development design used in this study uses the 4D development design proposed by Thiagarajan (1974) in Sugiyono (2016: 37) which consists of define, design, development, and dissemination. The effectiveness of using STEM-based LKS is measured through field trials. The field trial used the experimental design method Pre-Experimental Design type One-Group Pretest- Posttest Design.

Field trials were conducted in class V of SD Negeri Dukuhturi 01, Bumiayu District. At this stage, the experimental design used was the Pre-Experimental Design type of One-Group Pretest-Posttest Design. In this test, the researcher used one group of test subjects, namely one treatment group (experiment). The experimental group was given treatment using STEM-based LKS and was given a pretest and posttest after the group was given treatment.

This research will be conducted at SD Negeri Dukuhturi 01, Bumiayu District, Brebes Regency. This research was conducted in the even semester of the 2018/2019 school year, namely in May - July 2019.

The sampling technique used is purposive sampling technique, namely the technique of determining samples with certain considerations. The sample in this study was 25 students of class V of Dukuhturi 01 Elementary School, Bumiayu District.

Data obtained from media experts and material experts in the form of quantitative data were analyzed. The data analysis technique used to analyze quantitative data from validation results using quantitative descriptive analysis techniques, namely quantitative data obtained through validation questionnaires converted into qualitative data.

The normality test was conducted to determine whether the data obtained was normally distributed or not. To determine the normality of the data obtained, the Kolmogorov-Smirnov test was carried out using the SPSS 16.0 for Windows program. The data to be tested for normality were the results of the pretest and posttest.

Result and Discussion

In developing this STEM-based Science LKS product, researchers pay attention to several things, namely student characteristics, materials and language used in STEM-based Science LKS. So that STEM-based Science LKS can be effective in learning and can improve the creative thinking skills of fifth grade students of Dukuhturi 01 Elementary School, Bumiayu District. Researchers developed STEM-based Science LKS which contains water cycle material with explanations and language that are appropriate for the child's age level so that students can understand the material presented more quickly.

After the preparation of the LKS, the product was then validated by media experts and material experts. The media expert in this study was a lecturer at Peradaban University, namely Mrs. Eka Trisnawati, M.Pd who has expertise in the field of learning media, especially printed teaching materials. The media validation questionnaire consists of several indicators including the support capacity of the LKS teaching material media, the appropriateness of the use of language used, paying attention to student abilities, having benefits and objectives, the design of the front and back covers of the LKS, the appropriateness of the use of writing, images and illustrations as well as the size of the LKS and the placement of the layout. The results of the validation questionnaire from the media expert on the STEM-based Science LKS obtained a score of 4.38 with a very good category. The following are the validation results by the media expert. Based on the table of STEM-based Science LKS assessment results, it is known that the overall average score is 4.38. If converted into qualitative

data, the score of 4.38 is in the range of X> 4.2 with a very good category. Thus, STEM-based Science LKS can be said to be suitable for use with revisions according to the criticism and suggestions contained in the STEM-based Science LKS validation questionnaire from media experts.

The media experts in this study were lecturers at the University of Peradaban, namely Mrs. Eka Trisnawati, M.Pd. who has expertise in science and Mrs. Upi Muslimatin as a fifth grade teacher at Dukuhturi 01 Elementary School. The material validation questionnaire consisted of the suitability of the material to students' abilities, activities that stimulate students, the suitability of the material to the applicable curriculum, material presentation techniques, the suitability of the material in encouraging students to think actively, the use of language and the material presented contains the STEM learning phases. The assessment of STEM-based Science LKS is known that the overall average score is 4.2. If converted into qualitative data in the categorization table, the score of 4.2 is in the range of > 3.4 - 4.2 with a good category. So that the STEM-based Science LKS is said to be suitable for use in the field without revision.

The product that has been validated by media experts and material experts was then tested on a limited basis to 6 students randomly. The limited trial was conducted on 5th grade students of Dukuhturi 02 Elementary School, Bumiayu District on July 15, 2019. The limited trial was conducted to determine whether students were able to use and understand the water cycle material through STEM-based Science LKS developed by researchers. In addition, to determine students' responses after using STEM-based Science LKS. The results of the limited trial of student responses to the STEM-based Science LKS product show that the overall average score is 4.401 with a very good category. Based on observations, students are very enthusiastic when learning to use STEM-based Science LKS, especially when students do direct experiments.

The field trial was conducted on July 16, 2019. The field trial was conducted to determine the effectiveness of the STEM-based Science LKS media on a wider scale. The field trial was conducted in one class, namely SD Negeri Dukuhturi 01, Bumiayu District, with 25 students. The researcher conducted a pretest activity, namely a creative thinking ability test, with 8 essay questions with the same value weight. Furthermore, the researcher conducted learning in class using STEM-based Science LKS. This activity was carried out to measure the achievement of the development objectives, namely to improve the creative thinking skills of grade 5 students in the water cycle material. This study ended with the researcher giving a posttest, namely the final creative thinking ability test. The questions consisted of 8 essay questions with the same value weight. This test was conducted to obtain conclusions that apply to the population and were used as research data.

The results of the study on hypothesis test II showed that there was an influence of the use of STEM-based Science Worksheets on students' creative thinking skills. The

calculation results showed that in the Anova output the sig. = 0.000 <0.05, so there was an influence of the use of STEM-based Science Worksheets on students' creative thinking skills. Based on the R Square table, it shows that there was an influence of the use of STEM-based Science Worksheets on students' creative thinking skills of 50.6%.

Learning using STEM-based Science Worksheets was carried out for three meetings. In the learning process using STEM-based Science Worksheets, students looked more active and happy. Because with the STEM approach, students learn through direct experience with experiments and observations, in addition, this approach is student-centered so that it can create active learning.

The learning process at the first meeting began by distributing STEM-based Science Worksheets to each student and each student described the water cycle simply and then explained the picture. The first meeting students were still adapting to STEM-based Science Worksheets. In addition, some students paid less attention to the explanation given by the teacher, there were still some students who could not express their opinions and did not listen when other students were expressing their opinions. This resulted in the achievement of creative thinking skills indicators being less than optimal.

In the second meeting, students had begun to adapt to the STEM-based Science LKS. This can be seen from the enthusiasm of students in the next LKS learning activity, namely the experimental activity. Students were divided into five groups, each group consisting of five students. Previously, students prepared tools and materials to carry out the experimental activities. The tools and materials used included scissors, cutters, rulers, pens/markers, cloudy water, used mineral water bottles, coconut fiber, gravel, charcoal, and palm fiber. Based on the researcher's observations, at this stage students worked according to the work steps in the LKS. The cooperation of each group member was seen to be good. So at this stage, the researcher only supervised and guided the process of the experimental activities. After conducting the experiment, the results of the experiment were written in the column provided (answer sheet). Based on observations, the answers in the LKS, some students were able to communicate the results and in accordance with what was done. It's just that there was a lack of initiative from other groups in responding to the presentation of the group that was presenting the results of their experiments.

In the third meeting, students were able to adapt to the STEM-based Science LKS. This can be seen from the enthusiasm of students in interactive Q&A. Students study the material on the liter ladder, then continue by observing water waste according to the step guide in the worksheet and discussing the observation data with their groups. Students interact by exchanging opinions and are able to solve the questions in the worksheet with the steps to solve the questions.

In this learning, students actively participate in discussion activities with other group members, especially when conducting experiments and observations. In the experimental activities, students appear to work together to get the best results and students have been able to find answers to the problems given,

After carrying out the learning process, the results of the students' pretest and posttest scores were tested using a simple linear regression test. Based on the results of the simple linear regression test, it shows that there is an effect of using STEM-based Science Worksheets on creative thinking skills compared to not using STEM-based Science Worksheets. So, it can be said that STEM-based Science Worksheets are effective in improving the creative thinking skills of fifth grade elementary school students.

Asmuniv (2015) one of the goals of STEM is to foster citizens to have knowledge, conceptual understanding, and critical thinking skills that come from studying STEM subjects. In addition, STEM also seeks to foster soft skills such as scientific inquiry and problem-solving skills. Supported by scientific behavior, STEM integration education seeks to build a society that is aware of the importance of STEM literacy.

Conclusion

Based on the results of the research and discussion, it can be concluded that STEM-based Science LKS is suitable for use in the field with a media expert score of 4.38 with a very good category, material experts get an average score of 4.2 with a good category. While from the limited trial student response of 4.401 with a very good category. Meanwhile, the effectiveness of STEM-based Science LKS is seen based on the results of the pretest and posttest through hypothesis testing using a simple linear regression test which obtained t count greater than t table, namely 4.850> 1.711. Thus, it can be concluded that STEM-based Science LKS is effective and valid to use and can improve the creative thinking skills of fifth grade students on the water cycle material.

References

Aldila, Clara. 2017. Pengembangan Lembar Kerja Peserta Didik (LKPD) Berbasis STEM Untuk Menumbuhkan Berpikir Kreatif Siswa Pada Materi Elastisitas dan Hukum Hooke. Universitas Lampung.

Amirono dan Daryanto. 2016. Evaluasi dan Penilaian Pembelajaran Kurikulum 2013. Yogyakarta: Gava Media.

Arinillah, Githa Azmi. 2016. Pengembangan Buku Siswa Dengan Pendekatan Terpadu Science, Technology, Engineering. And Mathematics (Stem) Berbasis Inkuiri Terbimbing Pada Materi Kalor. Universitas Lampung.

Arsyad, Azhar. 2017. Media Pembelajaran. Depok: PT. Rajagrafindo Persada. Asmuniv. 2015. Pendekatan Terpadu Pendidikan STEM Upaya Mempersiapkan Sumber Daya Manusia Indonesia Yang Memiliki Pengetahuan Interdisipliner Dalam Menyosong Kebutuhan Bidang

Karir Pekerjaan Masyarakat Ekonomi ASEAN (MEA). Diakses dari http://www.vedcmalang.com/pppptkboemlg/index.php/menuutama/listrikelectro/1507-asv9.

Bakkidu, Nurhinda dan Sumartini. 2014. "Pemanfaatan Multi Media Dalam Proses Pembelajaran Di Sekolah Dasar". Jurnal Penelitian Pendidikn INSANI, Vol. 16, Nomor 1, Juni 2014, hal 47-53.

Darmawan, Deni dan Dinn Wahyudin. 2018. Model Pembelajaran di Sekolah. Bandung: Rosda.

Dewi, Helvin Riana, dkk. 2017. Peningkatan Ketrampilan Berifikir Kreatif Siswa Melalui Penerapan Inkuiri Terbimbing Berbasis STEM. Universitas PGRI Madiun.

Endrayanto, Poli dan V. Wiratna Sujarweni. 2012. Statistika Untuk Penelitian. Yogyakarta: Graha Ilmu.

Fauziah, Yuli Nurul. 2011. "Analisis Kemampuan Guru Dalam Mengembangkan Keterampilan Berpikir Kreatif Siswa Sekolah Dasar Kelas V Pada Pembelajaran Ilmu Pengetahuan Alam". Edisi Khusus No. 2 Agustus 2011.

Handayani, Fitri. 2013. Pengembangan Lembar Kerja Siswa (LKS) Berbasis Science, Tecnology, Engineering, And Mathematics (STEM) Pada Materi Hidrolisis Garam. Universitas Syiah Kuala.

http://file.upi.edu/Direktori/DUALMODES/KONSEP_DASAR_BUMI_ANTARIKSA_UNTUK_SD/BBM_5.pdf diakses pada tanggal 16 Maret 2019 Pukul 10:20

http://file.upi.edu/Direktori/DUALMODES/KONSEP_DASAR_BUMI_ANTARIKSA_UNTUK_SD/BBM_4.pdf diakses pada tanggal 20 Maret 2019 Pukul 11:04

Jamaluddin. 2010. "Kemampuan Berpikir Kreatif Siswa SD Dalam Pembelajaran IPA". Jurnal Ilmu Pendidikan, Jilid 17, Nomor 3, Oktober 2010, hlm. 202-209. Universitas Mataram.

Kaniawati, DS., Ida K., & Irma RS. 2015. "Study Literasi Pengaruh Pengintegrasian Pendekatan STEM Dalam Learning Cycle 5e Terhadap Kemampuan Pemecahan". Seminar Nasional Fisika (SINAFI) 2015. Universitas Pendidikan Indonesia.

KBBI (Kamus Besar Bahasa Indonesia) Edisi Ketiga. 2002. Jakarta: Balai Pustaka

Kelley, T. R dan Knowles, J. G. 2016. A Conceptual Framework for Integrated STEM Education. International Journal of STEM Education. Springer.

Kustandi Cecep dan Bambang Sutjipto. 2013. Media Pembelajaran Manual dan Digital. Bogor: Ghalia Indonesia.

Munandar, Utami. 2009. Pengembangan Krativitas Anak Berbakat. Jakarta: Rineka Cipta.

Nasution, S. 2012. Metode Research (Penelitian Ilmiah). Jakarta: Bumi Aksara.

Pertiwi, Ratri Sekar. 2017. Pengembangan Lembar Kerja Siswa Dengan Pendekatan STEM (Science, Technology, Engineering, Mathematics) Untuk Melatih Keterampilan Berfikir Kreatif Siswa Pada Materi Fluida Statis. Universitas Lampung,

Prastowo, Andi. 2016. Pengembangan Bahan Ajar Tematik. Jakarta: Kenanga. Purakom, Atchara dan Theerasak Soykeree. 2017. "STEM Education: Innovation Education For Young Generation In Asean". May 2017, p. 9-12. Kasetsart University Kamphaeng Sane Campus Thailand.

Putra, T. T. 2012. Meningkatkan Kemampuan Berpikir Kreatif Siswa dengan Pembelajaran Berbasis Masalah. Jurnal Pendidikan Matematika, 1(1). Rahmadani, A., Nonong, A., & Helma. 2012. "Penggunaan Lembar Kerja Siswa Yang Dilengkapi Mind Map Dalam Pembelajaran Matematika". Jurnal Pendidikan Matematika. 1 (1): 30-34.

Salirawati, Das. 2006. Penyusunan dan Kegunaan LKS dalam Proses Pembelajaran. Makalah dipresentasikan pada Kegiatan Pengabdian Masyarakat, UNY Yogyakarta.

Samatowa, Usman. 2011. Pembelajaran IPA di Sekolah Dasar. Jakarta: PT. Indeks.

Sudarma, Momon. 2013. Mengembangkan Keterampilan Berpikir Kreatif. Jakarta: Rajawali Pers.

Sugiyono. 2012. Metode Penelitian Kuantitatif, Kualitatif, dan R&D. Bandung: Alfabeta. . 2016. Metode Penelitian & Pengembangan Research and Development. Bandung: Alfabeta.

Sulistiyowati. 2018. Pengembangan Lembar Kerja Siswa Berbasis Science,Technology, Engineering And Mathematic Materi Gelombang Bunyi Untuk Meningkatkan Literasi Sains Siswa SMP. Universitas Lampung.

White, W. David. 2014. "What Is STEM Education and Why Is It Important?". Florida Association of Teacher Educators Journal Volume 1 Number 14 2014 1-9. Florida A&M University.

Widoyoko, Eko Putro. 2016. Evaluasi Program Pembelajaran. Yogyakarta: Pustaka Pela.