



Practise Science Process Skills and Sprout up Environmentally Caring Attitudes Through Worksheet Base on School Gardens

Lufia Krismiyanti^{1✉}, Aditya Marianti², Hartono²

¹ SMP N 1 Brebes, Indonesia

² Universitas Negeri Semarang, Indonesia

Article Info

Article History:
Received 15
November 2018
Accepted 19 February
2019
Published Article In
Press

Keywords:
environmentally caring
attitude; school garden
potential; science process
skills,

Abstract

The study aims to analyze the effectiveness learning worksheet application to practise science process skills and sprout up an environmentally caring attitude. This research is a Research and Development (R & D). There are two stages in this study, the stage of the worksheet development and test effectiveness. In the study the effectiveness measured from the results of students' gains process skills and the results of environmentally caring attitude test students'. The study showed that (1) the worksheet that developed is worthy of being used as a learning device, (2) worksheet that developed effective for science process skills practise and sprout up an environmentally caring attitude towards students. The results of the t / z test of science process skills show $t_{count} > t_{table} = 3,4227 > 1,2935$ and the environmentally caring attitude $t_{count} > t_{table} = 5,2614 > 1,6665$. The conclusion of the research is worksheet that developed on school garden effective for science process skills practise and sprout up an environmentally caring attitude towards students.

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✉ Correspondence address:

Jl. Jenderal Sudirman No.175, Pangembon, Brebes, Kec. Brebes,
Kabupaten Brebes, Jawa Tengah 52212. Indonesia
E-mail: krismiyanti.lufia@gmail.com

p-ISSN 2252-6412

e-ISSN 2502-4523

INTRODUCTION

The Minister of Education and Culture of the Republic of Indonesia Regulation (Permendikbud) No 22 of 2016 concerning basic and secondary education process standards states that learning resources can be in the form of books, print media or the surrounding environment or other relevant learning resources. SMPN 1 Brebes has a school garden with 80 types of plants that can function as learning resources (Malinda & Rahayuningsih, 2017). School gardens as learning resources store various sources of problems. Problems can be explored by students through the process of observation and exploration as a beginning in applying scientific methods (Alimah & Marianti, 2016) and providing opportunities for teachers to grow students' natural curiosity towards their environment (Feille, 2013). The learning process that uses learning resources directly from the surrounding environment is the implementation of overall biology learning both as a product and process (Alimah & Marianti, 2016). The use of the environment as a learning resource encourages students to explore and stimulate their curiosity (Ting & Siew, 2014).

Science learning at SMPN 1 Brebes has not succeeded in practicing science mastery as a whole as a product or as a process. Science process skills in science learning only appear on certain discussion topics and teachers have not yet developed worksheets that contain guidelines for students to practice science process skills (Interview, September 2017). Planting an attitude of caring for students at SMPN 1 Brebes is only 55.90% of all respondents who achieved a score of 70 (Results of the student questionnaire, September 2017). These conditions indicate that mastery of science process skills and the attitude of caring for students needs to be improved.

One effort that can be done is to develop student worksheets based on the potential of school gardens. Student worksheets

are sheets containing assignments that must be done by students (Devi *et al.*, 2009). Worksheet is expected to act as a teacher agent to guide students' attention and provide opportunities for students to work independently (Lee, 2014). The selection and use of appropriate teaching media not only depends on the teacher's skills pedagogically and didactic but also must take into account and utilize the potential of the existing school, the level of intelligence and social students and the goals set by the teacher (Kalathaki, 2016). The development of worksheet should meet two criteria, namely feasible and effective. A product designed to be a learning resource is said to be feasible if it meets the minimum standards of product quality in a good category (Noor & Wilujeng, 2015). The standard of quality of learning resources can be measured based on the fulfillment of needs in the aspects of knowledge, skills, and attitudes that students must learn to achieve predetermined competency standards. The feasibility of a product can be determined based on its validity (Suyantiningsih *et al.*, 2016). Validity is related to the accuracy of the instrument to measure what you want to measure (Arikunto, 2015). Effective learning resources are learning resources that can support the learning process of students to achieve competency standards to be achieved. The effectiveness of worksheets is measured by responses and learning outcomes (Susantini & Lisa, 2016). Learning outcomes are assessed based on competency standards stated in minimum completeness criteria or KKM (Aprilyanti, 2016). Minimum completeness criteria refer to The Minister of Education and Culture of the Republic of Indonesia Regulation No. 21 of 2016 concerning Standard Content for Primary and Secondary Education.

The problems in this study are (1) how is the effectiveness of worksheet based on the potential of school gardens to train students' science process skills; and (2) how is the

effectiveness of worksheet based on the potential of school gardens to sprout up an attitude of caring for students. The study aims to (1) test the effectiveness of the application of worksheet based on the potential of school gardens to practise students' science process skills; and (2) testing the effectiveness of the application of worksheet based on the potential of school gardens to sprout up a caring attitude towards students.

METHODS

The research for testing the application of worksheet based on the school gardens was carried out at SMPN 1 Brebes in July-October 2018. The research subjects were VII grade students of SMPN 1 Brebes 2018/2019 academic year with a sample of 72 students from class of VIIC and VIID. Worksheet used in research is developed by following the rules of the 4D model.

Before being applied in data collection, school gardens and worksheets that were developed validated by experts and peers in a very good category. The instrument for assessing science process skills and environmentally caring attitudes has also fulfilled several criteria such as item validity, reliability, difficulty level of questions and distinguishing questions. Testing the effectiveness of worksheet applies pre-experimental design in the form of a one-shot case study. Data from the results of the science process skill score and environmentally caring attitude in stage 1 were tested for normality using the Kolmogorov Smirnov test while the phase 2 trial data were not tested for normality because the number of sample observations was large, 72 students. The effectiveness of science process skills and environmentally caring attitudes were analyzed by descriptive analysis and statistical analysis, namely t / z test for 1 variable.

RESULTS AND DISCUSSION

Development Worksheet to Practise Science Process Skills

The results of problem identification are used to create products namely worksheet based on the potential of school gardens. The results of development worksheet products can be seen in Figure 1.



Figure 1. Worksheet based on the school gardens

Furthermore, the overall response of students to the readability of worksheets developed in product trials (Table 1) shows the average readability of the developed worksheet in a very good category. Worksheet systematics has met the criteria of experimental worksheet, namely introduction, tools and materials, objectives, work steps, table of observations, questions, conclusions, and equipped with competencies to be achieved (Devi *et al.*, 2009). The title of worksheet is in accordance with the material, namely classification of plants and has explicitly explained the science process skills and environmental care attitude as characteristics of the developed worksheets and the worksheet cover displays photos of student activities (Figure 1). The presentation of images

and display aspects of science process skills is adjusted to the theme of the activity. Worksheet is equipped with pictures or messages about environmental care.

Display of titles, captions, instructions, pictures, tables and questions is made in contrast to the color of the worksheet background image. The size of the worksheet background image is reduced so as not to interfere with the observation table. The use of a short and simple language on this worksheet is easy for students to understand. Worksheet is equipped with picture illustrations and dialogues of students who are conducting observations in the school park to be more communicative and not boring. In addition to making it easier for students to recognize and remember the scientific terms and names of plants, the worksheet is equipped with a glossarium at the end of the worksheet.

Table 1. Results of Student Response to Worksheet Readings

Aspect/subaspect	Average Score	Criteria
Image and display presentation	3.24	good
Layout of images, tables and questions	3.24	good
Display of titles, captions, instructions, pictures, tables and questions	3.46	Very good
Use of language	3.49	Very good

From the response to the readiness of the worksheet, the results of the observations of learning implementation continued during the research activities taken from five meetings, can be seen in Table 2.

Table 2. Results of Observation of the Learning Process

Observed Aspects	Percentage	Criteria
Introduction activities	90	Very good
Core activities	63.75	Fair
Application of scientific approach	95	Very good
Utilization of learning resources	93	Very good
Assessment activities	45	Not good
Use of language	87,5	Very good
Closing activity	92	Very good

Table 2 shows that in general teachers can apply worksheet developed in the learning process in very good categories. The preliminary activities are carried out by the teacher through prayer activities, checking the attendance of students, motivating students, giving apperception, giving opportunities to ask questions, and conveying learning objectives.

The implementation of the scientific approach is carried out by the teacher through providing opportunities for students to gather information, associate data, and present it in the worksheet. Teachers facilitate students to find concepts, help increase curiosity and build motivation in each learning process (Shirazi, 2017). The application of a scientific approach is supported by the use of learning resources in learning. The teacher has involved students in utilizing the potential of the school gardens in accordance with the worksheet developed and looking for alternative learning resources such as the internet. Exploration activities in the surrounding environment and information search through the internet make students the main focus and encourage students to be responsible for learning (Lestari *et al.*, 2016). Worksheet can be used to develop the ability to think, ask and answer questions, and assess the improvement of student learning outcomes (Utami *et al.*, 2016). Worksheet can also function as a supporting tool in experimental

and demonstration learning methods, to develop student activity and learning outcomes (Guntara & Pamungkas, 2017).

The use of language includes written and oral language used by the teacher. Observation activities indicate that teachers use spoken language more often than written language. The teacher only writes learning objectives and materials that require detailed ways to be understood by students such as how to measure leaf area, calculate the amount of flower component, and draw leaf reinforcement shapes.

There are two aspects of learning that are not good, such as core activities and assessment. The implementation of learning in core activities is only 63.75 percent, this is because the teacher is still not able to associate material with other knowledge relevant to the development of science and technology and daily life and still have difficulty presenting material systematically (easy to difficult, and from concrete to abstract).

The implementation of learning in assessment activities is only 45 percent, this is because the assessment of science process skills and environmentally caring attitude is only done once, namely at the 6th meeting. While the assessment of learning journal attitude to care for the environment is carried out between learning activities at each meeting. At each meeting the teacher only controls the learning of students starting from observation activities, filling in the results of observations into worksheets, uploading fotonovela to social media, until implementing environmental awareness and filling out learning journals.

The closing activity is done by concluding the material, conveying plans for further learning activities, giving appreciation to students, and praying.

The Effectiveness of Applying Worksheet to Practise Science Process Skills

Furthermore, the effectiveness of applying worksheet based on school gardens to train students' science process skills can be seen in Figure 2.

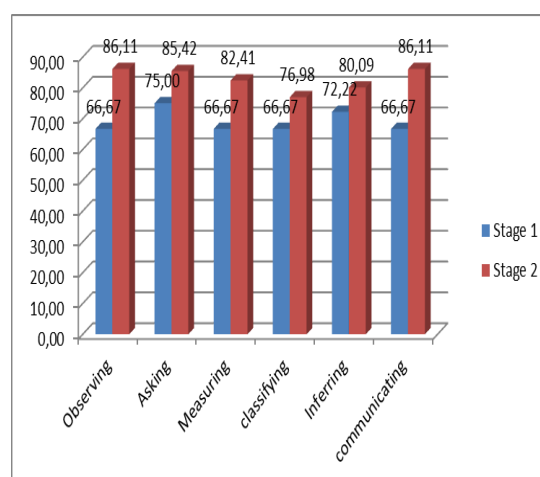


Figure 2. The effectiveness of applying worksheet to practise science process skills

SMPN 1 Brebes has fulfilled the needs of plant classification material in KD 3.3 Understanding the procedure of classifying living things and non-living things as part of scientific work, and classifying various living things and non-living things based on observed characteristics and KD 4.3 Collecting data and classify objects, plants and animals in the environment. This park has a collection of plants consisting of 43 families of the division Spermatophyta (seed plants). This garden is dominated by groups of Angiosperms because in general these plants flower so that they can beautify the garden. The lack of information experienced by students at the time of observing Gymnosperms, mosses and nails was covered by information search via the internet.

Worksheet developed is suitable for use in learning classification of plants. This worksheet has utilized the potential of the school garden which includes the existence of objects and the diversity of plants in the school park. This worksheet provides opportunities for

students to practise science process skills from the surrounding environment. Science process skills students are trained through five activities that have been designed in the worksheet which are observing, asking, measuring, grouping, concluding, and communicating.

Observing skills show students' ability to identify the characteristics of certain plant groups. Observing activities includes several things, namely using several senses, paying attention to relevant details of objects and surroundings, and identifying similarities and differences (Sujarwanta, 2012; Osman, 2012; Wati & Ismono, 2012). Students are trained through various plant observation activities in the school park in 5 activities. This aspect has an effectiveness of 86.11% with very good criteria. Students are divided into small groups so that each group member can play an active role in observation activities.

Questioning skills show students' ability to answer questions and make questions. According to Harlen (2014), the question is using open questions and provoking students to explore their ideas and thoughts. The effectiveness of science process skills on the questioning aspect is very good with a percentage of 85.42. This aspect trains students in answering questions and making questions according to the theme of activities in the worksheet. Students use the internet to find answers to questions in the worksheet and look for examples of sentence questions related to the theme of the observation activity.

Measurement skills show the ability of students to use measuring instruments and mention their units correctly (Hartono & Oktafianto, 2014). This skill trains students in calculating leaf area, number of *perianthium*, and measuring plant stem height. The effectiveness of science process skills on aspects of measuring is very good with a percentage of 82.41.

Classifying skills show students' ability to classify plants and understand plant relationships. The ability to group is the ability to group materials by type (Wati & Ismono,

2012). The grouping aspect only has an effectiveness of 76.98 percent (Figure 2). This is because grouping activities require students to understand the morphological characteristics of each group of plants as the basis of the concept of grouping plants. Observation activities involve cognitive abilities because students must understand the basic concepts or material that is being studied (Alhajjah *et al.*, 2014).

Inferring skills show students' ability to make conclusions based on observations. The concluding activity is the ability of students to make statements based on observations (Wati & Ismono, 2012). Osman (2012) further explained that the concluding activities included three things, namely identifying relationships between variables, ensuring the correctness of data associations, and making assumptions about applying conclusions in general. Concluding aspects have effectiveness of 80.09% with very good categories. In this aspect students are trained through conclusions on the results of observations at each activity. Students still have difficulty in summarizing the results of observations because of a lack of understanding of the concept of classification of plants and lack of mastery of students' language. There are several factors that influence the process of understanding including cognitive, affective, reading texts, and mastery of language. Cognitive factors are related to knowledge, experience and level of intelligence (one's thinking ability). Affective is related to emotional conditions, attitudes, and situations. Reading text is related to the level of difficulty and readability of a reading that is influenced by the choice of words, structure, reading content, and use of the language. Language mastery relates to the level of language skills related to mastery of vocabulary, structure, and elements of discourse (Samniah, 2016).

Communication skills show students' ability to deliver observations in table form and discuss them. Communication skills are interpreted as speaking, listening, or writing to sort ideas; make observational notes during the

investigation; use charts, charts, and tables to convey information; and choose the right way of communication (Osman, 2012; Wati & Ismono, 2012). This aspect trains students in making reports on observations, presentations, and uploading photos of observations to social media (fotonovela). The effectiveness of science process skills in communicating aspects is very good with a percentage of 86.11.

The Effectiveness of Applying Worksheet to Sprout up Environmentally Caring Attitude

The developed worksheet has also fostered a caring attitude towards students. The attitude of caring for the environment is grown through the provision of images and messages that invite students to care about the surrounding environment and equipped with learning journals filled by each group. The learning journal must be signed by the group leader and science teacher so that this learning journal can train students' honesty in every activity they do.

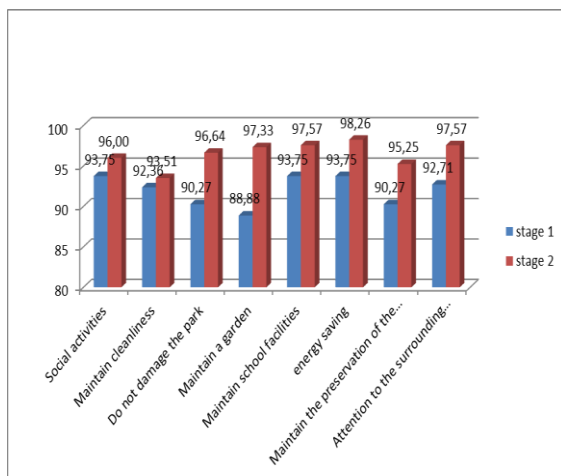


Figure 3. Effectiveness of the application of worksheet to sprout up an environmentally caring attitude

Aspects of participating in social activities are grown through community service activities such as daily pickets and community service that are carried out at certain times. The effectiveness of this aspect reaches 96.00% with

a very good category. The aspect of maintaining cleanliness is cultivated so that students are accustomed to throwing trash in its place, students are able to distinguish organic and inorganic waste, and do not feel compelled to pick up garbage near it. The effectiveness of this aspect is 93.51% because students tend to choose to dispose of garbage in the nearest garbage bin rather than having to dispose of garbage according to its type but far away.

The aspect of not damaging the school park is growing so that students do not pluck the plants, damage the plant signs and dispose of garbage near the school garden plants. The effectiveness this aspect is 96.64% (very good). The behavioristic learning theory proposed by Thorndike states that learning is an event of the formation of associations between stimulus and response (Triyanto, 2011). The involvement of students in maintaining a school park is a stimulus for students to care about the surrounding environment and is expected to give birth to a response in the form of desired behavior. The involvement of students in making plant nameplate encourages students to have a sense of belonging to the school garden. Cannata *et al.* (2017) states that non-cognitive skills can be developed if a sense of belonging and responsibility has become an individual character.

The aspect of maintaining a school garden is grown so that students are involved in the procurement of plants, watering and not throwing garbage around the plants. The effectiveness of this aspect is 97.33% with a very good category. The activity of watering flowers is done in the afternoon in groups. The aspect of maintaining school facilities is grown so that students do not scribble on walls, go to school, and maintain library books. The effectiveness of this aspect is very good with a percentage of 97.57. Energy-saving aspects foster student awareness to turn off lights and tap water in the school environment. The effectiveness of this aspect is very good with a percentage of 98.26. The teacher reminds students to always turn off

the lights when closing learning activities. The aspect of preserving the surrounding environment fosters student awareness not to damage plants or public facilities in the environment around students. The effectiveness of this aspect is very good with a percentage of 95.25. In this aspect there are students who answer "may damage the plant to get a photo that hits". This is prone to teenagers because they need self-existence on social media by finding interesting places as photo backgrounds without caring about the surrounding environment. Therefore the planting of this caring attitude is important to students.

The aspect of attention to the surrounding environment fosters concern for students to use plants in the surrounding environment to support the learning process. The effectiveness of this aspect is very good with a percentage of 97.57. This aspect fosters student awareness to use the school and home environment as a learning resource. Learning from the surrounding environment is important to be planted so that they feel they have the environment and finally the desire to take care of it. Taufiq *et al.* (2014) states that the higher the student learning outcomes, the student's attitude will be more positive, meaning that students' cognitive understanding of the environment has a large influence on environmentally caring attitudes.

The results of the t / z test score of the science process skills test show that $t_{\text{count}} > t_{\text{table}} = 3.4227 > 1.2935$ and the attitude of caring for the environment $t_{\text{count}} > t_{\text{table}} = 5,2614 > 1.6665$, meaning H_0 is accepted is worksheet developed effectively for training skills the science process and foster a caring attitude towards students. The development of worksheet based on the potential of school gardens is in accordance with Piaget's theory of child development. The cognitive development possessed by middle school students aged 12-14 years is the formal operational stage (Ibda, 2015). Arianto (2012) states that learning becomes meaningful if students are able to associate one thing with

another thing that they already know. Learning packaged in small groups containing 4-5 people with heterogeneous levels of ability makes students able to exchange ideas (discussions) with friends in one group (Ambarsari, 2013). The results of the study of Hassan & Ratnakar (2012) states that students who have good scientific attitudes also have good environmental awareness. Parents have a role in building student environmental awareness.

The environmentally caring activity during the study was controlled by the class leader and science teacher through learning journals. Journals are signed every day by the class leader and science teacher after the students have finished habituating but there are still students who do not carry out their duties. This is the task of the group leader and teacher to direct students who are lazy to carry out the task. *Operant Conditioning Theory* proposed by Burrhus Frederic Skinner states that reinforcement is something that can improve behavior when given interpreted repetition and exercise are used so that the desired behavior can become desirable habits and behavior will get positive reinforcement (Triyanto, 2011). Positive reinforcement can be in the form of appreciation or praise for groups who consistently do their jobs.

The results of Ghosh's study (2014) state that there is a strong positive correlation between environmental awareness and attitudes towards environmental education if environmental education has been introduced as a compulsory subject in the curriculum. The environmentally caring attitude of students at SMPN 1 Brebes during the research was good and would be better if applied in the school curriculum. Environmental education is not a separate branch of science or subject of study but must be carried out in accordance with the principle of lifelong integral education (Hassan & Ratnakar, 2012). Environmental education in the school environment is the basic capital for the formation of environmental ethics across generations (Mulyana, 2009). The attitude of

students is getting better will show good behavior (Istijabatun *et al.*, 2016). The understanding of students about the environment can create young people who care about the environment, so it is necessary to equip junior high school students with knowledge about the environment. Environmental education fosters more positive perceptions and develops psychological and spiritual relationships between students and nature (Kelani, 2015). The understanding of students about the environment can create young people who care about the environment, it is necessary to equip junior high school students with knowledge about the environment. Thus learning activities can be beneficial for students in community life.

CONCLUSION

This study concluded that worksheet was developed effectively to practise science process skills and sprout up an attitude of caring for students with very good categories. Suggestions for further research, namely the collection of moss and nail plants in school gardens should be added, teachers need to ensure the necessary facilities and infrastructure such as the internet for student exploration activities and library books, worksheet can be packaged in electronic forms such as cellphones or computers and can be developed again become worksheet for animal classification so that science process skills are more trained and the environmentally caring attitude of students can grow well.

ACKNOWLEDGMENT

Thank you to Dr. Sigit Saptono, M.Pd. and Dr. Talitha Widiatningrum, M.Si, PhD. from Postgraduate of the Semarang State University on the advice and input, as well as all parties who have helped the research process until the manuscript is completed.

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