

Development Of Student Worksheets Based On Science Process Skills To Improve High Order Thinking On The Environment Theme Of Our Friend In Elementary School In 15 Sub District Percut Sei Tuan

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Abstract - High-Order Thinking is very important to be trained for learning activities. One way to practice high-order thinking is to create student worksheets. Therefore, it is necessary to develop a student worksheet. This study aims to develop a student worksheets based on science process skills to improve high-order thinking skills. High-order thinking skills measured in this regard are factual, conceptual and procedural. This type of research is research and development. Development stage used 4-D model that is, define, design, develop, and disseminate. Subjects in this study were the students of class V private elementary school Nurul Hasanah, public elementary school 101768 Tembung, public primary school 101770 Tembung, primary school private Tunas Bangsa in the even semester of the academic year 2017/2018. Data collection techniques used in this research are (1) questionnaire validation of student worksheet; (2) the questionnaire of student worksheet feasibility in terms of teachers; (3) tests of science process skills and high-order thinking skills. The results of this study indicate that the ability of high-order thinking increased after the use of science-based students skill-based workbook that implies the increase of factual, conceptual and procedural knowledge.

Keywords – worksheet; order thinking

I. INTRODUCTION

Natural science is one of the compulsory subjects in elementary school. Natural science is related to understanding nature in a systematic way, so that the Natural Science is not only the mastery of a collection of knowledge in the form of facts, concepts, or principles but also a process of discovery. Natural Sciences is expected to be a vehicle for students to learn about themselves and the natural surroundings, as well as the prospect of further development in applying it in their daily lives. [1] Science is both a body of knowledge and applications, this sentence describes science is a collection of facts, concepts, processes and others. There is an important scientific dimension that is part of science. First, is the content of science which contains various facts, concepts, laws and theories. This dimension is the object of human study. Second, science is the process of conducting scientific activities and scientific attitudes from science activists. Third, science is a dimension that focuses on the characteristics of scientific attitudes and character. The competence of graduates of the 2013 curriculum requires a change from the balance of soft skills and hard skills which includes aspects of competency in attitude, skills and knowledge [2]. Learning is directed to encourage students to find out from various sources of

observation, not to be told; able to formulate problems (asking), not only solve problems (answer), practice thinking analysis (decision making) rather than mechanistic thinking (routine) and emphasize the importance of cooperation and collaboration in solving problems [3]. In the implementation of the 2013 curriculum, emphasis on high-level intelligence is framed by the attitude of divinity and social values that are integrated in the learning process. Students are led to learn high-level thinking. High-level skills that are introduced early will have a positive impact on students' lives in the future. Through high-level thinking students will be smart in analyzing the environment, intelligence in analyzing reading, intelligence in socializing, intelligence in understanding the existence of others and even intelligence in solving personal problems.

Skills or skills are the ability to use thoughts, reason, and actions to achieve certain learning outcomes. Process skills are skills that involve cognitive or intellectual, manual and social skills. One of the causes of low science process skills is learning resources that are inadequate or have low competence. Learning resources are not able to help students to develop higher-order thinking skills. One source of learning that has a role in science process skills is student worksheets. The student worksheets used by students in the

2013 curriculum do not overall produce high-level thinking. Thought low order thinking causes student KPS not to develop. In this case, science process skills are important for every student because the science process skills are used in everyday life, improving scientific ability, quality and standard of living [4]. KPS also influences personal, social and individual lives in the global. KPS functions as an effective competency to study science and technology, problem solving, individual and social development. Student worksheets used on the theme of "Our Friends Environment" have not been overall PPP-based, so students' higher order thinking skills are not developed. Meanwhile, if students are accustomed to doing high-level thinking activities, student KPS will also increase. Increased PPP can be marked by students being able to observe, classify or classify, measure, communicate, interpret, predict, use tools, conduct experiments, and conclude animal life cycle material. KPS students do not develop because they are less trained to think high-level through the student worksheets used.

Preliminary research conducted in elementary schools in the 15th district of Percut Sei Tuan, namely in class V SD Negeri 101768, SD Negeri 101770, Private SD Nurul Hasanah, and SD Private Tunas Bangsa using an interview instrument, obtained information that in science learning the material of the water cycle was flat 60% of students have low process skills. This is indicated by students' ability to observe; classify / classify; measure; communicate; interpret data; predict; using tools; conduct an experiment; and concluded that the material of the water cycle is still low. Teachers pay less attention to the process of delivering material to students so that the students' science process skills have not been seen. In addition to low process skills, students have not been able to do higher order thinking. This is because there is no stimulation by the teacher when the teaching and learning process leads to HOTS. In fact, in the 2013 Curriculum, teachers are expected to be able to compile HOTS questions so that students not only answer at levels C-1 (know), C-2 (understand), and C-3 (apply), but also at level C- 4 (synthesis / analysis), C-5 (evaluation), and C-6 (creative). In fact 70% of Region 15 elementary school teachers have not been able to make high-level thinking-based questions. This is in sharp contrast to the demands of the 2013 curriculum.

If you look at the student worksheets circulating on the market as the results of observations carried out in elementary schools in District 15 of Percut Seit Tuan on March 26, 2018, 90% of student worksheets have not been based on high-level thinking skills. Likewise with the student worksheets that are used in student books, the questions contained in the student's book are difficult but do not include high-level thinking skills. As a matter of high-level thinking ability does not mean a difficult problem. The findings of the previous research on the questions contained in the student book theme "Environment of Our Friends" human and environmental sub-themes in lesson 1 students were asked to write in the water function chart for human

life, the function of water for animals, and the function of water for plants. This includes easy questions because only "memory" is measured.

In lesson 2, students are presented with a stimulus which is a discourse about the water cycle. Then students are asked to make a simple chart to explain the water cycle. This includes difficult questions but does not include high-level thinking skills, because only understanding is measured. In learning 5 students were given a stimulus in the form of a "floating village" image, the stimulus produced was very interesting and contextual. However, questions that have an interesting context are not necessarily about high-level thinking skills, this can be seen from the questions students are asked to answer the question "where do river water supply come from, who uses river water, what are the benefits of river water, is it river water supply can be reduced because it evaporates when exposed to the sun's heat ". These questions can be answered if students understand the water cycle from the previous text in lesson 2.

Other findings in the sub-theme 2 "Environmental Change" in lesson 1 have interesting stimuli from two different images. Then students are asked to comment on the picture. In this case the measured ability is only analyzing two different images and has not yet shown the whole problem of high-level thinking skills. Likewise with the sub-theme 3 "Environmental Conservation", the question of high-level thinking ability has not been seen. In lesson 1 students are asked to write down the uses of water in their daily lives. The measured ability is only an understanding of the previous text.

Based on the characteristics of elementary students who are in the pre-operational stage to concrete operational [5], the form of the exercises applied in this learning process is adjusted to their characteristics. The elementary school thinking system is still tied to reality or concrete situations. In addition to the ability to think high-level abilities that have not been found in student worksheets in the student book, the scientific approach used has not yet appeared. The student worksheets that exist in the student's book are also scientifically based in accordance with the 2013 curriculum. Scientific-based student worksheets should contain 5M which is observing, asking, collecting data, associating, communicating. These five indicators have not been fully seen in the student worksheets in the student book on the water cycle material. Scientific based student worksheets can also help students think high.

High-level thinking skills are also important to be developed to improve science process skills. [6] Science process skills (the skill process) as a cognitive process including the interaction with their contents (content). KPS students do not develop because they are less trained to think high-level through the student worksheets used. The science process skills can be developed if students are active in learning. Students are conditioned to be able to read on their own, linking new concepts by discussing and using new terms, concepts and principles through a series of

learning activities [7]. In this case means the process skill is the ability to think and the ability to process the action. Learning by using meaningful process skills in accordance with the competence of graduates of the 2013 curriculum which requires changes in the predicate of the balance of soft skills and hard skills that includes aspects of competency in attitude, skills, and knowledge.

Student worksheets based on the Scientific approach are effective in increasing the KPS of students both students who have high cognitive abilities and students who have low cognitive abilities [8]. These findings can be continued with the development of student worksheets based on science process skills with a scientific approach as a guideline for the implementation of the 2013 curriculum. By developing student worksheets based on science process skills, it is expected to help students improve higher-order thinking skills. Therefore, an alternative solution is needed in observing the problem. Learning by using high-level thinking skills.

Based on the description of the background of the problem, the formulation of the problem under study is the feasibility of the student worksheet based on science process skills used in the environmental theme of our friends in class V elementary school area 15, Percut Sei Tuan District, Deli Serdang Regency; the effectiveness of student worksheets based on science process skills that are used in the environmental theme of our friends in class V elementary school area 15, Percut Sei Tuan District, Deli Serdang Regency; and student worksheets based on science process skills can improve high-level thinking skills on the environmental theme of our friends in class V elementary school area 15, Percut Sei Tuan District, Deli Serdang District.

II. THEORETICAL REVIEW

A. Student worksheets as Teaching Aids

Student work sheets are sheets containing assignments that must be done by students. Activity sheets usually contain instructions or steps to complete a task. And the task must be clearly the basic competencies to be achieved [9]. Student worksheets are sheets that contain tasks that students have to do. Student worksheets are usually instructions, steps to complete a task [10]. Student work sheets are sheets containing assignments that must be done by students. Student worksheets are usually in the form of tips, steps to complete a task. The tasks that are ordered in the student worksheets must be clearly the basic competencies that will be achieved ". Student worksheets have four functions [11] as follows: (a) As teaching materials that can minimize the role of educators, but more enable students; (b) As teaching materials that facilitate students to understand the material provided; (c) As a compact and task-rich teaching material for training; (d) Facilitate the implementation of teaching to students.

The requirements for student worksheets [12] that are good must meet construction and didactic requirements. The

construction requirements include requirements relating to language usage, sentence composition, vocabulary, level of difficulty and clarity which essentially must be effective in the sense that it can be understood by the users of student worksheets, namely students while the active requirements mean that the student worksheet must fulfill effective principles. The terms of the student worksheet are as follows:

Construction Requirements, Construction conditions include the use of language, sentence structure, vocabulary, level of difficulty, and clarity that are essentially effective, which means that it can be understood by users of student worksheets namely students. Conditions are active Conditions are active, meaning that a student worksheet must be in accordance with the principles of effective teaching and learning. Technical requirements Technical requirements are the requirements of all student worksheets, namely: writing, drawing and appearance

B. Dimensions of Cognitive Knowledge

Knowledge dimensions consist of four types [13]: (1) factual knowledge, (2) conceptual knowledge, (3) procedural knowledge, (4) metacognitive knowledge. The difference between factual knowledge and conceptual knowledge needs to be explained here. There needs to be a distinction between the knowledge of content elements that are not developed / closed and separate (for example terms and facts) with the knowledge of parts of knowledge that are more structured and broader (for example concepts, principles, models , or theories).

The dimensions of cognitive knowledge examined in this study are factual, conceptual, and procedural knowledge. Factual knowledge is divided into two: knowledge terminology, and detailed knowledge and specific elements. Conceptual knowledge includes schemes, mental models, or explicit and implicit theories in different cognitive psychology models. procedural knowledge about procedural knowledge for knowledge of skills, algorithms, techniques, and methods that are subject specific or specific to disciplines [14].

C. Higher Order Thinking Skills

As high-level thinking skills [14] are as follows: "Analyzing is to break the concept of material into parts, determine how the parts relate to or relate to each other or with the overall structure or purpose. Evaluating is making judgments based on criteria and determining checks and criticisms as a whole. Creating put together elements to form a coherent or functional whole; reorganizing elements into a new pattern, which is comprehensive, produce and produce

Indicators of high-level thinking [15] are as follows: (1) indicators of ability to analyze (C4) that have been developed are the ability to analyze factual, conceptual, procedural, and metacognitive knowledge; (2) indicators of ability to evaluate (C5) that have been developed are the ability to evaluate factual, conceptual, procedural, and

metacognitive knowledge; (3) The indicator of the ability to create (C6) that has been developed is the ability to create conceptual, procedural, and metacognitive knowledge; (4) an instrument for assessing higher-order thinking skills as an assessment for effective learning to train students' thinking skills and measure students' effective thinking skills according to the level of thinking of each student.

D. Science Process Skills

Process skills are a learning approach that emphasizes the learning process, activities and creativity of students in acquiring knowledge, skills, values and attitudes and applying in daily life [16]. The process skills that will be used in this research are basic skills. Basic process skills include: observing, namely the skill of identifying and naming the properties of objects or events through the five senses. Classify, namely skills developed through practice. Measuring, namely measuring skills can be developed through activities related to the development of suitable units of length, area, content, time, weight. Communicate, namely conveying the results of observations that have been collected by collecting information from graphics or images. Referencing, which uses logic to make conclusions from facts observed. Predict, that is, to predict future events or circumstances that are expected to occur based on current events. Draw conclusions, namely to explain or interpret (interpretation) made based on observations. Learning theory that is in accordance with science process skills suggests that in learning with the discovery process process skills the child will use his mind to perform various concepts or principles. In the process of discovery, children perform mental operations in the form of measurement, prediction, observation, inference, and grouping [1]. Mental operations involving intellectual skills, can develop children's ability to shape knowledge, children will know the environment with the provision of concepts or knowledge that already exists.

III. RESEARCH METHODS

This research is a research and development research (R & D) with a development model according to Thiagarajan, namely a 4-D development model consisting of four stages consisting of defining, designing, developing and distributing disseminate) [17]. The subjects of the trial in the study consisted of construction, active, and technical experts on student worksheets based on science process skills. Experts consist of field state university lecturers and teachers in the 15th Elementary School of Percut Sei Tuan District. Students who are the subject of the Trial are developing student worksheets, namely students of the Nurul Hasanah Tembung Foundation Primary School. The type of data used in this study is qualitative data and

quantitative data. Qualitative data is obtained from the results of teacher and student interviews in the early stages and data in the form of criticism and suggestions from the results of expert validation and student criticism and suggestions. Quantitative data is obtained from the results of the assessment of construction, active and technical experts.

Data collection instruments used in this study consisted of expert validation questionnaires. The results of the study in the form of interview data were analyzed using qualitative descriptive. The data is used to determine the potential problems that exist before the development of student worksheets is carried out. Data from the results of the feasibility assessment by construction experts and instructional design experts of student worksheets will be analyzed descriptively. Inputs in the form of criticism and suggestions from experts are then used to improve student worksheets developed.

The measurement criteria for validation results are presented in the following table:

TABLE 1. Assessment Criteria for Expert Validation Sheets

Score	Criteria
4	Very good
3	Good
2	Less
1	Veri less

Data from the validation sheet is then calculated using the formula: Eligibility of student worksheets = (number of scores obtained) / (number of total scores) x 100%

Then from the results of expert validation that has been calculated with the formula the data is interpreted according to the eligibility criteria, as follows:

TABLE 2. Interpretation of Feasibility Scores

Score	Criteria
81% - 100%	Very decent
61% - 80%	Worthy
41% - 60%	Decent Enough
21% - 40%	Not Feasible
0% - 20%	Very unworthy

IV. RESEARCH RESULT

The development of student worksheets based on science process skills consists of four stages, which consist of a define, design, and disseminate stages. The defining phase is carried out with several activities, namely: 1) curriculum analysis, based on curriculum analysis obtained information that the curriculum applied in elementary schools in the 15th district of Percut Sei Tuan is 2013 curriculum; 2) front end analysis, the analysis is carried out to determine potential problems before development activities are carried out. Based on interviews with teachers and students, it can be seen that in the training carried out so far it has not used student worksheets based on science process skills. This is because the teacher has not developed a learning tool. 3) analysis of students, from the results of

the interview, it can be seen the characteristics of class V students of elementary schools in District 15 of Percut Sei Tuan District, having middle to upper academic abilities; 4) concept analysis, in accordance with the 2013 Curriculum syllabus for natural science material on the theme "Our Friends Environment" in the even semester consists of two Basic Competencies, namely basic competencies 3.8. Analyze the water cycle and its impact on events on earth and the survival of living things; 4.8. Make work on water cycle schemes based on information from various sources; 5) task analysis, assignments given to students are arranged according to the Basic Competencies that students must master in the syllabus. Student worksheets are presented based on sians process skills to improve higher-order thinking skills.

The second stage is designing. The design phase aims to design learning tools. Four steps must be taken at this stage, namely: (1) preparation of the test standard (criterion-test construction), the test compiled through the KPS-based student worksheet is a test of high-level thinking skills in the material of animal life cycles; (2) selection of media (media selection) that is in accordance with the characteristics of the material and learning objectives, the media to be used in the form of pictures and the environment around students; (3) format selection (selection format), which examines the format of existing student worksheets and establishes the format of student worksheets to be developed, (4) design student worksheets. designing student worksheet activities based on science process skills. compile material, types of activities, and questions about evaluating high-level thinking skills tests.

The third stage, namely the development stage. The development phase is a stage to produce development products carried out through two steps, namely: (1) expert appraisal followed by revision, (2) developmental testing. The develop phase includes the activities of developing student worksheets that are produced after being revised based on expert input and data obtained from field trials. Revisions from experts and the validation values obtained will be used as a reference for revision of learning tools.

The fourth stage is the dissemination stage. The dissemination phase is carried out to promote development products to be acceptable to users, whether individuals, groups or systems. the deployment phase was carried out in 4 schools namely, elementary school 15 sub district Percut Sei Tuan. Recapitulation of the results of construction experts or material experts in the validation stage will be presented in the following table:

TABLE 3. Recapitulation of the results of assessment of material experts 1

No	Componen	Score (%)	Interpretation
1.	suitability of the contents of student worksheets	83,33%	very decent
2.	suitability with active conditions	85%	very decent
3.	completeness of student worksheets with construction requirements	86,9%	very decent
4.	suitability of student worksheets with technical requirements	85%	very decent

Based on the expert's assessment of the material in the student worksheets there are several suggestions used as references, among others, experts: the pictures are numbered and open; there are competency numbers and criteria after competency tests; reduce material, in this case the material is too broad. In addition, the results of the study of instructional desian expert student worksheets will be presented in table 4 below:

TABLE 4. Recapitulation of the results of the evaluation of instructional design experts on student worksheets

No	Component	Score (%)	Interpretation
1	Learning approaches	100%	Very good
2	The truth of the concept of the water cycle	87,5%	Very good
3	Depth of concept	100%	Very good
4	Conformity of concepts	91,6%	Very good
5	Science process skills activities	75%	Good
6	Assessment	87,5%	Very good
7	Clarity of sentence	75%	Good
8	Linguistic	75%	Good
9	Physical appearance of student worksheets	91,6%	Very good

Based on the assessment of design experts there are several suggestions, among others: the physical appearance of the student worksheet needs to be improved; Student worksheets match the rules of scientific writing. Student worksheets that have been validated are then tested in small, medium and large groups (dissemination). The results will be presented in Table 5 below:

TABLE 5. Recapitulation of student assessment results

No	Trial Stage	Score (%)	Interpretation
1	Small group trial	89,5%	Very good
2	Medium group trial	87,5 %	Very good
3	Large group trial	87,5%	Very good

The development of student worksheets based on science process skills is carried out in several stages, first define 1) curriculum analysis, based on curriculum analysis, information is obtained that the curriculum applied in elementary schools in the 15th district of Percut Sei Tuan is

2013 curriculum; 2) front end analysis, the analysis is carried out to determine potential problems before development activities are carried out. Based on interviews with teachers and students, it can be seen that in the training carried out so far it has not used student worksheets based on science process skills. This is because the teacher has not developed a learning tool. 3) analysis of students, from the results of the interview, it can be seen the characteristics of class V students of elementary schools in District 15 of Percut Sei Tuan District, having middle to upper academic abilities; 4) concept analysis, in accordance with the 2013 Curriculum syllabus for natural science material on the theme "Our Friends Environment" in the even semester consists of two Basic Competencies, namely basic competencies 3.8. Analyze the water cycle and its impact on events on earth and the survival of living things; 4.8. Make work on water cycle schemes based on information from various sources; 5) task analysis, assignments given to students are arranged according to the Basic Competencies that students must master in the syllabus. Student worksheets are presented based on science process skills to improve higher-order thinking skills.

Second, the design stage is the design stage aims to design learning devices. Four steps must be taken at this stage, namely: (1) the preparation of the test standard (criterion-test construction), the test compiled through the student worksheet based on science process skills is a test of high-level thinking skills in animal life cycle material; (2) selection of media (media selection) that is in accordance with the characteristics of the material and learning objectives, the media to be used in the form of pictures and the environment around students; (3) format selection (selection format), which examines the format of existing student worksheets and establishes the format of student worksheets to be developed, (4) prepares an initial design according to the format chosen. design activities of student worksheets based on the steps and structure of the preparation of student worksheets so as to obtain products for developing student worksheets based on Science Process Skills In this case, compiling material, types of activities, and evaluating tests of high-level thinking skills. Activities at this stage are collecting data in the form of KI and KD, formulating indicators and achieving objectives, developing a framework for student worksheets based on science process skills to find relevant literature. The material that will be used is sourced from the books of the 5th grade students of the 2013 curriculum and the internet. Search for and select images about material, types of activities to be used in student worksheets, and questions for evaluating Science Process Skills based learning.

Third, the develop phase is the stage to produce development products which are carried out through two steps, namely: (1) expert appraisal followed by revision, (2) developmental testing. The develop phase includes the activities of developing student worksheets that are produced after being revised based on expert input and data obtained from field trials. Revisions from experts and the

validation values obtained will be used as a reference for revision of learning tools.

The results of the calculation of material experts that is the content of the contents of the student worksheet obtained a score of 83.33% in the very feasible category. In the suitability component with the active condition, the result is 85% with a very feasible category. In the suitability component of student worksheets with construction conditions obtained a value of 86.9% is very feasible. In the suitability component of student worksheets with technical requirements obtained a score of 85% with a very feasible category. There are a number of expert advice that are used as references for the development of student worksheets. The results of the assessment of instructional design students' worksheets, obtained data on the learning approach component by 100% with very good categories. In the truth component, the concept of the water cycle is 87.5% with a very good category. In the component depth concept is 100% in the very good category. In the suitability component the concept is 91.6% in the very good category. In the component of science process skills activities 75% in the good category. The valuation component is 87.5% in the very good category. In the component clarity the sentence is 75% in the good category. In the linguistic component of 75% in the good category. And the physical appearance component of student worksheets is 91.6% in the very good category. The results of field trials in small group trials were 89.5% with very good categories. The results of the medium group trial were 87.5% in the very good category. The results of field trials in large groups obtained 87.5% with very good categories.

V. CONCLUSION

Based on the data obtained from the results of the material expert validation, instructional design experts specifically student worksheets, and the results of the dissemination showed that student worksheets based on science process skills can improve high-level thinking skills in the water cycle material of our friends' environmental themes in elementary schools in 15 percut districts sei sir.

VI. SUGGESTION

Based on the results of this study, it is suggested that educators in primary schools using the 2013 curriculum can use student worksheets based on science process skills to improve higher-order thinking skills. In this case, high-level thinking ability is one of the competencies that students must possess.

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