

The Development of Student Worksheet Based on Scientific Approach on Environmental Pollution Topic For Junior High School Student Grade VII

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Abstract - This research was conducted to develop a student worksheet based on scientific approach on environmental pollution. Student Worksheet validated by experts and tested on students and teacher. The purpose of this study was to see the results of activity and response learners. The study was conducted in SMPN 31 Padang by using quantitative research methods research and development (R&D). The development procedure used in this research is Thiagarajan Model or 4-D Model which consists of four stages: define, design, development, and disseminate. The data of this study are primary data obtained from the validity and practicality sheet, and analyzed by descriptive analysis. Student Worksheet based on the developed scientific approach has been validated by experts and practitioners and has been revised to obtain a feasible outcome. The results showed that learning tools based on scientific approach are valid and practical. Based on the research that has been done, it has resulted Student Worksheet based on scientific approach on environmental pollution material for students of SMP class VII valid with average 3,60 and practical with average 3,40 by teacher and 3,52 by learner. Thus it can be concluded that Student Worksheet based scientific approach on environmental pollution topic for students of SMP class VII have very valid and practical criteria.

Keywords - Worksheet; Scientific Approach; 4-D Model; And Activities.

I. INTRODUCTION

The 2013 curriculum is developed to change the mindset of learners in the learning process that originally as a user or memorizer to inventor and owner of science. Implementation of learning in the curriculum of 2013, especially science learning requires learners to develop their own knowledge. Kemendikbud (2016: 45) states that "learners are seen as subjects who have the ability to find, process, construct, and actively use knowledge, so that learning should give learners the opportunity to form knowledge in their cognitive processes".

Learning process is an expected learner participates actively in the learning process, so that learners gain experience of the learning process. In fact, based on observations in SMPN 31 Padang it is known that learners are less encouraged to do the thinking process, learners tend to be passive, and only receive information from teachers. As is the case with class 7.2 students in the school, learners tend to be passive in learning and teacher-centered learning activities. This is reinforced by the results of a questionnaire distributed by researchers to 30 students of class VII in SMPN 31 Padang. A total of 66.6% of the students in the class were unable to ask

questions, consequently inactive learners and teacher-focused learning (teacher center).

One of the solution can be done so that learners get involved directly in the learning process through a scientific approach in the learning process. According to Marjan (2014: 4) learning by using a scientific approach can improve student activeness. Students are able to find their own learning concepts, thus making students a learning center.

A scientific approach is the approach of learning by providing insight to the students in getting to know and understand the various materials using scientific measures (Hosnan, 2014:34). The curriculum stresses learning 2013 with a scientific approach because this very appropriate with the learning theory of Constructivism learning and scientific approach may increase the science process skills in learners. According to a copy of the attachment Permendikbud No. 103 Year 2014 it is known that the five learning experiences on a scientific approach, i.e. observing, questioning, experimenting, associating, and communicating.

The development of learning materials Student Worksheet is indispensable in the world of education. The development of learning materials needed to facilitate the achievement of learning objectives expected. One of the advantages of developing Student Worksheet is can be designed in accordance with the circumstances of learners and school characteristics. Chonga stated that the use of the appropriate situation Student Worksheet can enhance the mastery of concepts. The development worksheet is indispensable in the world of chemistry education to improve the skills of science learners (Karsli, 2009:121-130).

Student Worksheet development is expected to increase the learner activity in the learning process by way of learning process is accompanied by the rules of scientific approach. Nahum (2007: 579-603), states that the development of teaching materials based on a scientific approach can improve students' understanding of the concept deeply. Chen (2011: 1431-1439), states that student achievement in one school in Taiwan increases when taught by using a teaching material developed in accordance with the needs of students.

Based on the interview on July 24, 2017 with Mrs. Irawati, M.Pd who is one of the science teachers in SMPN 31 Padang, obtained information that the curriculum used in the school is Curriculum 2013. However, in the learning process is still centered on the teacher using a lecture method and not yet using a scientific approach in the learning process. The scientific approach is not used in the learning process due to the lack of teacher's knowledge of the scientific approach. In addition to not using a scientific approach in the learning process, the media used by teachers is limited to the learners book Curriculum 2013 and Student Worksheet made by the

team MGMP Padang City. Although the learning process uses the learners book Curriculum 2013, but some of the learners do not have the book because of the small number of books lent by the school. So in the learning of teachers focus more on learning using Student WorksheET made by the team MGMP Padang.

Student Worksheet created by MGMP team of Padang City is in accordance with the Curriculum 2013, in this STUDENT WORKSHEET also has the core competence, basic competence, and learning objectives. However, in this STudent Worksheet has not loaded the learning indicator. The color of the writing on this Student WorksheET is black and the page is brown. This makes the Student Worksheet look less attractive. Student Worksheet has been equipped with pictures, but the images presented are colorless and do not attract the attention of learners. According to Soekarno and Lanawati (2004: 14) colors are the most prominent design elements and the presence of colors makes the design more interesting. So that the element of color can make learners understand the material independently. The Student Worksheet also has not used a scientific approach that contains 5 learning activities, ie observing, asking, gathering information, associating, and communicating. Student WorksheET is only a material description and there is a question of evaluation at the end.

Based on the background that has been described, it is necessary Student Worksheet that includes a scientific approach as a learning medium for learners to improve the liveliness and scientific way of thinking learners. Based on the above, it is conducted a research on "Development of Scientific Based Student Worksheet on Environmental Pollution Material for Students of SMP Class VII"

II. LITERATURE STUDY

A. Intructional Media

Arsyad (2008: 3) states that the word learning media comes from the Latin "medius" which literally means "middle", intermediary or introduction. In Arabic, the media is an intermediary or messenger of the sender to the recipient of the message. The Association for Education and Communication Technology (AECT) defines the media that is all forms used for a process of information distribution. While the National Education Association (NEA) defines as objects that can be manipulated, seen, heard, read or discussed along with instruments used properly in teaching and learning

activities, can affect the effectiveness of instructional programs. According Trianto (2010: 46) "learning media is a means of learning that can be used to facilitate learning activities". Media can be used to support the creation of an effective, efficient, and interesting learning process.

B. Student Worksheet

According to Trianto (2012: 222), the types of teaching materials such as Student Activity Sheet are student guides used to conduct investigation or problem solving activities. A student activity sheet can be a guide to cognitive aspect development exercises as well as guides for developing all aspects of learning in the form of experimental or demonstration guides.

Depdiknas (2008: 23), Student Worksheet at least includes title, KD to be achieved, completion time, equipment / materials needed to complete the task, brief information, work steps, tasks to be performed, and reports to do. Presentation of lesson materials can generally encourage learners to develop creativity in learning. So as to encourage learners to actively develop and apply their abilities.

C. Learning with a Scientific Approach

According to Daryanto (2014: 51-53) learning with a scientific approach is a process designed in such a way that learners actively create conceptual, legal, or principle constructs through observing stages (for identifying and finding problems), formulating problems, or formulating hypotheses, collecting data from various techniques, analyzing data, drawing conclusions and communicating 'discovered' concepts.

The steps of a scientific approach in the learning process of the 2013 Curriculum for all levels are carried out using a scientific (scientific) approach. Permendikbud Number 81A (2013: 5-6), suggests that a scientific approach includes five learning experiences: a) observing, b) asking, c) collecting information, d) associating / processing information, and e) communicating. The five basic steps must be implemented in the learning process. Explanation of these steps as follows.

D. Validitas

The validity is important in terms of an evaluation tool. According to Anthony (2004:137) validity was a quality that shows the relationship between a measurement with the aim of learning criteria. According to the MoE (20018:28) validity of component materials includes the following.

1) Component Eligibility

- (a) Conformity with the SK, KD
- (b) Compliance with child development

- (c) Compliance with the requirements of learning materials
- (d) The truth of the material substance of learning
- (e) The benefit to the addition of insight
- (f) Conformity with moral, and social values

2) Linguistic Components

- (a) Readability
- (b) Readability information
- (c) Compliance with the rules of a good and correct Indonesian Language
- (d) Utilization of the language effectively and efficiently (clear and brief)

3) Component Presentation

- (a) The sequence of the presence
- (b) The granting of the motivation of the clarity of purpose (indicators) to be achieved
- (c) Fascination
- (d) Interaction (provision of stimulus and response)
- (e) The completeness of information

4) Components of Art

- (a) The use of the font, type and size
- (b) The Layout or layout
- (c) Illustrations, pictures, photos
- (d) Display design

E. Practicality

According Purwanto (2004: 137) practicality is a quality that shows whether or not a product can be run or not. A product is said to have good practicality when the possibility to use the product is large. According to Sukardi (2012: 52) there are some considerations of practicality, that is developed products should be easily stored, has the characteristics of low cost, and products easy to use by teachers.

The components of STUDENT WORKSHEET's developed practice are ease of use, effectiveness of learning time, and benefits. These components will be created in the form of question instruments in accordance with the scientific-based Student Worksheet approach to environmental pollution materials.

III. METHODS

This type of research is research development or Research and Development. This research aims to produce a product in the form of Worksheets Students

scientific approach based on environmental pollution for Class VII junior high school.

The data used in this research in the form of the results of the validity and practicalities were sourced from the now granting validity and practicalities. This data includes the primary data, i.e. data obtained directly through the granting instrument against the subject of the research.

Student Worksheet scientific approach based on environmental pollution was developed using the model of the development of four-D-models, namely through the stage define (definition), design (design), develop (development), and disseminate (the spread) (Thiagarajan, 1974). Given the limited time and the cost of research is only performed to develop phase (development).

Student Worksheet already developed and then tested the quality by experts later tested cobakan on learners. Instruments used in collecting data is a sheet of validity and practicalities. Data analysis technique used is the quantitative analysis in the form of a descriptive which describe the validity and practicalities Student Worksheet developed.

IV. RESULT

1. Potential Problem

SMPN 31 Padang is one of the schools located in strategic areas and which has adequate school facilities. Based on observations at SMP 31 Padang, it was found that students were less encouraged to do the thinking process, students tended to be passive, and only received information from the teacher. As is the case with students in grade 7.2 at the school, students tend to be passive in learning and teacher-centered learning activities.

Based on the interview on July 24, 2017 with Miss. Irawati, M.Pd who is one of the science teachers in SMPN 31 Padang, obtained information that the curriculum used in the school is Curriculum 2013. However, in the learning process is still centered on the teacher using a lecture method and not yet using a scientific approach in the learning process. The scientific approach is not used in the learning process due to the lack of teacher's knowledge of the scientific approach. In addition to not using a scientific approach in the learning process, the media used by teachers is limited to the learners book Curriculum 2013 and Student Worksheet made by the team MGMP Padang City. Although the learning process uses the learners book Curriculum 2013, but some of the learners do not have the book because of the small number of books lent by the school. So in the learning of teachers focus more on learning using Student Worksheet made by the team MGMP Padang.

The worksheets created by the Padang City MGMP team are in accordance with the 2013 Curriculum, this worksheet also has core

competencies, basic competencies, and learning objectives. However, in this Student Worksheet has not loaded the learning indicator. The color of the writing on this Student Worksheet is black and the page is brown. This makes Student Worksheet look less attractive. Student Worksheet has been equipped with pictures, but the images presented are colorless and do not attract the attention of learners. According to Soekarno and Lanawati (2004: 14) color is the most prominent design element and the presence of color makes the design more attractive. So that the element of color can make learners understand the material independently. The Student Worksheet also has not used a scientific approach that contains 5 learning activities, namely observing, asking, collecting information, associating, and communicating. Student Worksheet is only a material description and there is a question of evaluation at the end.

2. Collect Information

In July 2017 researchers conducted observations at the school of SMA 31 Padang. The results of observations and interviews with the school obtained several findings that cover the state of schools, students, teachers, and teaching materials.

3. Design of the Product

STUDENT WORKSHEET is designed according to the 2013 curriculum approach that is a scientific approach. This STUDENT WORKSHEET began to be designed by researchers from November 2017 to February 2018.

4. Validation

Student Worksheet scientific-based approach must first be examined by a validator that is competent experts. This step is used to obtain the eligibility of use Student Worksheet from experts. The assessment process is conducted by giving an already printed for Student Worksheet were investigated by the validator. The validator checks the assessment, advice and input for the sake of feasibility of use Student Worksheet using sheet Student Worksheet validation. Aspects that are assessed by the validator are aspects of eligibility of the contents, the linguistic component, component rendering, and kegrafikaan components.

5. Design Restructure

Student Worksheet corrected according the directives from the validator. The initial design made of researchers has not been in accordance with the scientific approach. Validator suggested to return to design in accordance with the scientific approach. Student Worksheet designed by giving a clear problem and supported with interesting pictures. Validator suggest fixing to make it more interesting.

6. Uji Validitas oleh Validator

Student Worksheet already designed given to validator for assessment given by using a sheet of validity. The results of the assessment against Student Worksheet validators can be seen in table 1.

Table 1.Result of data validity Student Worksheet

No	Komponen Penilaian	Validator		Rata-Rata Aspek	Kriteria
		1	2		
1	The Eligibility Of The Contents	3,67	3,17	3,42	Very valid
2	The linguistic	3,40	3,80	3,60	Very valid
3	Presentation	3,67	3,47	3,56	Very valid
4	Art	3,67	4,00	3,83	Very valid
Overall average				3,60	Very valid

7. Uji Coba Produk

Student Worksheet which has been validated and is fixed according the directives tested cobakan validator on learners and teachers. The target learners test Student Worksheet is Class VII 2 totalling twenty-nine people and one teacher of the IPA. This step is carried out by means of distributing Student Worksheet to all learners to learn and also given to teachers to examine the feasibility of contents Student Worksheet. Learners and teachers are requested to fill in a sheet of practicalities. This sheet contains a number of statements relating to keterpakaian Student Worksheet developed. The practicalities of this Student Worksheet judged from the aspect of ease of use, effectiveness, and the benefits of learning time. The practicalities of data can be seen in table 2.

Table 2.The data results of the practicalities of by teachers and learners

No	Aspek	Teacher		Student	
		Nilai Kepraktisan	Kriteria	Nilai Kepraktisan	Kriteria
1	ease of use	3.5	Very practical	3.49	Very practical
2	The efficiency of the learning time	3	Very practical	3.47	Very practical
3	Benefits	3.7	Very practical	3.60	Very practical
Overall average		3.4	Very practical	3.52	Very practical

Data analysis from the Student Worksheet validation sheet based on the scientific approach by the validator is two lecturers of FMIPA UNP's biology department based on four components namely content feasibility, linguistic, presentation and graphic, so that in general Student Worksheet based on scientific approaches made have very valid criteria. This value of validity is the average result of four aspects, namely the feasibility of the content, the components of the scientific approach, linguistics, presentation and graphics. The results of data analysis show that the developed Student Worksheet has very valid criteria. This is in accordance with the determination of the value of validity by Purwanto (2009: 102-103) which provides very valid criteria on the range of validity values 3.25-4.00.

V. DISCUSSION

A. Validity

Judging from the components of content eligibility, the STUDENT WORKSHEET experiments developed have very valid criteria. This indicates that STUDENT WORKSHEET based on the developed scientific approach has been in accordance with the applicable

curriculum, the Curriculum 2013 which emphasizes the learning process with scientific approach. Depdiknas (2008: 8) states that the developed teaching materials must be in accordance with the demands of the curriculum. The contents of this STUDENT WORKSHEET have been in accordance with the demands of core competence (KI) and basic competence (KD) in the curriculum 2013. Karsli and Sachin stated the work sheet worship is indispensable in the world of education, especially chemistry in order to improve the science skills of learners

The linguistic; according to Prastowo (2011: 23) states that the sentences used in Student Worksheet should be clear, effective, and simple so that students easily understand it. This is shown by the value obtained for the linguistic component indicating very valid criteria. This linguistic component is concerned with the use of good Indonesian, using Improved Spellings, and the language used is simple, and easy to understand, so as not to cause misinterpretation of the concept, making it easier for learners to understand the material in this Student Worksheet.

The criterion is very valid on this language component indicates that the type of writing used in this Student Worksheet is easy to read. The letters on Student Worksheet are dominated by Maiandra GD, 12 pt sizes, and 1.5 sp spacing. Arsyad (2009: 89) states that the good size of the text is 12 pt. In accordance with the Ministry of National Education (2008: 18) states that the letters used in printed teaching materials should not be too small and easy to read. In addition, the background color selection contrasts with the color of the letters so that the writing is easy to read. In special sections like IPA info used different images so it is more interesting to read it.

Validity of the presentation component is obtained by very valid criteria. This shows that the developed Student Worksheet has included clear indicators and learning objectives and in accordance with the 2013 curriculum, so that students can learn systematically and directed. Very valid criteria on this component indicate that the Student Worksheet experiment presents activities based on scientific approaches that involve students actively in learning. Avsec, et al (2014) stated that learning that invites learners to be more active in terms of learner-centered learning can build knowledge, develop reasoning skills and increase students' learning motivation. According to Sadiman, et al (2012: 113) the order of presentation in teaching materials is arranged logically, showing the ability of learners. Teaching materials contain tasks that are structured in a systematic and structured so that learners are more active in the learning process. Revelation states Student Worksheet should contain tasks that can be done by learners and in accordance with the expected competencies. This highly valid criterion also indicates that the developed Student Worksheet experimental design has been good and interesting covering the type and size of the letters.

Components of art on Student Worksheet are classified as very valid criteria with the average. This indicates that the display format and layout of words in Student Worksheet is interesting and neat. According to Arsyad (2009: 88) the consistency of the format and layout on each page is an important element in print media. Researchers create a uniform format to be more neat and systematic. The images presented are relevant to the material, making it easier for students to understand it. The color I use is adjusted to the type of writing. In the opinion of Rini, et al. (2014: 132) the selection of colors according to the different types of writing in the titles and the images presented are more colorful so that it will make Student Worksheet look attractive

Student Worksheet is dominated by blue because blue symbolizes peace, comfort, and relaxation. According to Laura (2011: 1090) some people feel more productive when they see blue. In the science of blue color symbolizes intelligence, so it is suitable to be the dominant color in Student Worksheet. The colors in each activity are differentiated to emphasize the differences of each activity. The background color used is white which symbolizes purity, cleanliness and neatness. This Student Worksheet design pays attention to all aspects, colors, shapes, compositions, good writing procedures so that it can attract students' interest.

Overall, the average value of Student Worksheet validity based on scientific approach by validator is quite valid. This proves that the developed Student Worksheet has fulfilled all four aspects of validation, namely, the feasibility of the content, the components of the scientific approach, language, presentation and graphics. Thus, Student Worksheet based on a scientific approach can be used as a supporting teaching material in the learning process at Padang 31 Junior High School.

B. Practicality

Data analysis from questionnaire of Student Worksheet practice based on scientific approach on environmental contamination material for students of SMP class VII by 29 students of SMPN 31 Padang and 1 science teacher of SMPN 31 Padang, so in general Student Worksheet experiment based on scientific approach that has been made has very criteria practical. This practicality value is the average result of three aspects, namely ease of use, effectiveness of learning time, and benefits. The results of the data analysis show

that the developed Student Worksheet has practical criteria.

Judging from the ease of use aspects, the developed Student Worksheet experiments have very practical criteria by teachers and students. This suggests that Student Worksheet experiments based on the developed scientific approach have presented the material clearly, simply and as a whole the content of Student Worksheet is easy to understand. So that learning goals can be achieved by learners. According to Chonga, one of the advantages of Student Worksheet development is that it can be designed according to the students' condition and school characteristics, the use of Student Worksheet in accordance with the state of learners can improve the mastery of the concept so that the learning objectives can be achieved. One of the indicators written on the aspect of ease of use is the type of writing and the display used has been interesting. Student response results state that the type of writing and appearance of LKDP is interesting. Fauziah stated that the responses of students mostly gave good responses to the application of the scientific approach.

Judging from the aspects of efficiency in learning time, the Student Worksheet experiment based on this scientific approach has practicality with very practical criteria. The results of the analysis show that the overall learning time is effective and efficient. According to the Ministry of National Education (2008b) the function of teaching materials is to overcome time constraints.

Judging from the aspects of benefits, the developed student worksheet experiments have very practical criteria by students. This shows that the Student Worksheet experiment based on the scientific approach developed has been able to help teachers and students in the learning process.

Overall the average value of the experimental practical results of the Student Worksheet based on the scientific approach by the validator is very practical. This proves that the experimental Student Worksheet developed has fulfilled all four aspects of validation, namely, the ease of use, the effectiveness of learning time, and the benefits. Thus, the Student Worksheet experiment based on a scientific approach can be used as teaching material in the learning process in class VII junior high school.

VI. CONCLUSION

Based on the results of research and discussion, it can be concluded that the teaching materials have been produced in the form of Student Working Sheets with scientific approach on environmental pollution material for students of SMP class VII. Student Worksheet developed has valid criteria. Student Worksheet is in accordance with the demands of the 2013 curriculum which emphasizes the learning process with a scientific approach. The resulting Student Worksheet has very practical criteria and can help

teachers and students in the learning process. Thus it can be concluded that Student Worksheet based scientific approach on environmental pollution material for students of SMP class VII developed has very valid and practical criteria.

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