
VALIDITY AND EFFECTIVENESS OF STUDENTS WORKSHEET BASED ON HANDS ON MINDS ON ACTIVITIES IN ANGIOSPERMS MATERIAL TO TRAIN ARGUMENTATION SKILL

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Abstract

Students worksheet is a learning media used to support learning process and develop cognitive abilities and students' skills. Students worksheet was designed using hands on minds on approach to train argumentation skills in angiosperms material. This material asks students to group plants into division based on general characteristics, link their role in daily life, and make phenetic and phylogenetic analysis. This research aimed to describe validity and effectiveness of student worksheet based on hands on minds on activity in angiosperm material to train argumentation skills. This student worksheet was developed with reference to planning, production, & evaluation (PPE) developmental model. This worksheet has limited trial test for 20 students in the class X SMAN 16 Surabaya. The data collection methods used were validation, questionnaire, and test. Data was analyzed descriptively and quantitatively. The result of this research showed that the validity of student worksheet based on experts validation was 97.75% with a very proper category. The effectiveness of students worksheet based on the result of students' argumentation test had increased the pre-test to post-test from the quite good to be very good criteria, and the response of students was 93.67% with a very good category.

Keyword : *Validity, student worksheet, hands on minds on, angiosperm, argumentation skills.*

INTRODUCTION

21st century education replaces the educational paradigm towards increasing some competencies and skills to solve global challenges. Some competencies and skills needed are critical thinking skills, creative skills, digital and technology skills, communication skills, and the ability to get and apply knowledge to solve the real-life problems (Marope, 2014). The vision of 21st century education was supported by the 2013 curriculum with learning process that applies the formation of attitudes, knowledge and skills in all subjects through student centered, interactive, and applicable learning (Kemendikbud, 2014; Permendikbud, 2016). One of education strivings that must be applied in learning is the ability to communicate (Marope, 2014). Classroom learning that contributes to communication is to train the ability of argumentation as an effort to communicate and disclaim scientific statements (Probosari et al, 2016).

Argumentation in the classroom learning is taught through appropriate instruction, task structuring, and modelling (Jimenez-Aleixandre & Erduran, 2007). The availability of supporting facilities to train students' argumentation skills is needed. One of the supporting facilities that can be used is teaching material. In Indonesia, teaching materials that commonly used by teachers are student worksheets which is developed by educators as a means of supporting learning activities.

Student worksheet is used to achieve the basic competencies requested by the curriculum in learning activities (Prastowo, 2011).

Students worksheet that trains argumentation skills is inseparable from the involvement of models or learning approaches that are appropriate for classroom learning activities. Learning approaches that provide flexibility for students to provide scientific arguments are hands on minds on approach. Baker et al (2009) explained that hands on minds on learning activities are used to provide opportunities for students to communicate, create, interpret, and provide criticism and scientific arguments using scientific principles.

Hands on minds on worksheet was developed on the sub material of angiosperms division. Angiosperms are a group of plants used in daily life to facilitate the needs of human life (Wijiastuti, 2013). This students worksheet can be used as the basis for implementing concepts of angiosperms in daily life by observing and exploring students' thinking abilities to link the concept of angiosperms into daily life. Students in implementing the concept of angiosperms in everyday life, need to have a lot of knowledge and argumentation about the reasons why angiosperms are used in daily life. This worksheet facilitates students to explore the concept of angiosperms as a basis for implementing concepts in daily life by arguing.

Fauziah (2018) in the research on development of students worksheet based on hands on minds on activities in the danger of using psychotropic compounds and the impact on health material showed that the students worksheet was valid according to experts with a percentage of 91.6%, very practical with the percentage of students responses was 100% positive, and effective with the percentage of completeness of learning outcomes of 95%.

Referring to the background above, it is necessary to develop students worksheet based on hands on minds on activities in angiosperms material to train argumentation skills. The purpose of this research was to describe the validity and effectiveness of students worksheet based on hands on minds on activities in angiosperms material to train argumentation skills.

METHOD

This research was a developmental research referred to the PPE development model with stages of planning, production, and evaluation. Student worksheet validation was carried out by three experts, consist of material expert lecturer, education expert lecturer, and biology teacher. Student worksheet validity was reviewed based on the results of the experts' validation on the aspects of presentation, content, and language. The minimum percentage validation is 61% with a proper category (Riduwan, 2015).

The effectiveness of students worksheet was reviewed based on the result of students' argumentation test and responses. Indicators of argumetation skills assessed include claim made, ground used, warrants given, counterargument generated, and rebuttal offered. Data analysis techniques used the analysis of the results of pre-test and post-test argumentation skills by calculating the increase of the result. Beside that, it was also done by analyzing the response questionnaires given to students. Students worksheet categorized as effective by minimum percentage of 61% and good category (Riduwan, 2015).

RESULT AND DISCUSSION

This research was a development research of students worksheet based on hands on minds on activities in angiosperms material to train argumentation skills. This students worksheet was design consist of activities include grouping plants into divisio based on general characteristics, linking their role in daily life, and making phenetic and phylogenetic analysis

The developed students worksheet assessed by three aspects of validation they were design, content, and language feasibility. Each aspect was scored by three validators as seen in Table 1.

Tabel 1. Validation Results of Students Worksheet

No.	Assessment Aspects	Score			Average	Percentage (%)	interpretation
		V1	V2	V3			
A. DESIGN							
1	Physical appearance of students	4	4	4	4	100.00	Very proper

No.	Assessment Aspects	Score			Average	Percentage (%)	interpretation
		V1	V2	V3			
2	worksheet (display, binding quality, layout) Design of students worksheet's cover (includes the title, suitability of students worksheet's topic, suitability of the image)	4	4	4	4	100.00	
3	Title of students worksheet (conformity with material, writing title, readability of title)	4	4	4	4	100.00	
4	Pictures or illustration (image clarify, conformity with the concept, conformity with the material)	4	3	4	3.67	9.75	
5	Systematic presentation of students worksheet (time allocation, learning objectives, problem orientation)	4	3	4	3.67	91.75	
6	Bibliography (writing, reference use, consistency)	4	4	4	4	100.00	
Average					3.89	97.25	
B. CONTENT							
7	Conformity of material to concept (depth of material, do not doouble meaning, truth of concept)	4	4	4	4	100.00	
8	Conformity with argumentation skills (include claim made, ground used, warrants given, counterargument generated, and rebuttal offered)	4	4	4	4	100.00	Very proper
9	Conformity with hands on minds on approach (includes the stages of asking, observing or finding, collecting data, analyzing, and concluding)	4	4	4	4	100.00	
Average					4	100.00	
C. LANGUAGE							
10	Readability (easy to understand, in accordance with EYD, does not contain multiple meanings)	4	4	3	3.67	91.75	Very proper
11	Use of the term (in accordance with latin, consistent)	4	4	4	4	100.00	
Average					3.84	95.88	
Overall Aspects' Average					3.91	97.75	Very proper

Information:

V1 : 1st validator (Material expert of biology lecturer)

V2 : 2nd validator (Educacion expert of biology lecturer)
V3 : 3rd validator (Biology teacher)

Based on the results described in the Table 1, the percentage of validity obtained from experts got a percentage of 97.75% with a very proper category. It showed that the development of students worksheet was feasible used in teaching and learning activities, and meets the requirements in preparation of students worksheet that good and correct. It was in accordance with the opinion of Widjajanti (2008) that students worksheet is feasible and good if its meets the requirements in the preparation of students worksheet including didactic requirements, construction requirements, and technical requirements.

Based on three main aspects that have been assessed in the validation, the content aspect obtained the highest validation (100%) with a very proper category. The assessment score for the aspect of content feasibility has met all criteria with an average score of 4 with a very proper interpretation. Hands on minds on can train the ability of argumentation by involving students in digging information by asking question, investigating or observasing, collecting and analyzing data, and make a conclusions (Bruder, 1993). The series of activities carried out is a collaboration between hands on and thinking activities or minds on. Ates & Eryilmaz (2011) explained that when doing hands on activities, students learn by doing direct activities, while doing minds on, students are doing thinking activities. Activities that are included in hands on activities are when students observe plants and describe their morphological characteristics. Whereas minds on activities are when students exploring their thinking ability to provide the reasons for their decriptions, linking the concept of angiosperms into daily life, analyzing kinship relationships, making observational reports, communicating observations, and analyzing fenograms of plant kinship.

The aspects of design and language, got a percentage of 97.25% and 95.88% respectively. It was resulted due to some assessment parameters getting less scores. The image parameters of design obtained an average score of 3.67 because there was a picture of flower part of plants in page four was clearless, so researcher followed up by enlarging the picture so that students were easier to observe. As well as in students worksheet there was a description of the morphological features that have not been illustrated, so that the researcher followed up by giving an image that represents the morphological characteristics. It was in accordance with Salirawati (2006) that the images presented in the worksheet must deliver the contents or messages effectively to the user. The systematic desain parameter of students worksheet obtained an average score of 3.67 because there were not phenetic and phylogenetic analyzing activities in the worksheet, so researcher followed up by adding questions which regarding fenogram analysis.

The readability parameter of language aspect obtain an average score of 3.67 because some questions did not contain a short direction, so researcher followed

up by giving a short direction to the questions to make it easier for students to understand the questions. It was in accordance with Prastowo (2013) that students worksheet will provide maximum results in understanding every concepts that exist if the language used is easily understood by students.

The developed students worksheet has stages of activity that can improve students' argumentation skills through a hands on minds on approach. The students' argumentation skills was measured through pre-test and post-test with the results presented in figure 1.

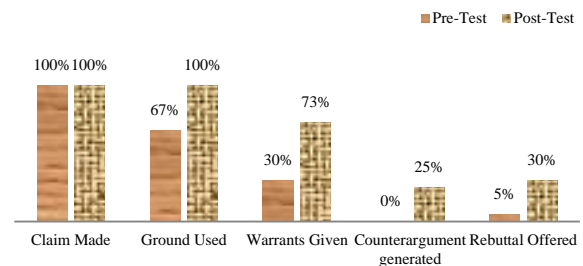


Figure 1. Diagram of pre-test and post-test result in every argumentation's indicators

Figure 1 showed that every argumentation's indicators had increased scores from pre-test to post-test. Argumentation's indicators that got the most consistent value from pre-test to post-test was the claim made indicator with a percentage of 100%. It was showed that students have succeeded in making claim or stated well. It was happens because students have made decisions in previous learning. In addition, claims made are the lowest ability of argumentation, so that the students does not require complex capabilities to master it (Osborne, 2010).

Argumentations's indicators that got the lowest results at pre-test and increased when post-test was the counterargument generated with the percentage of 0% to 25%. The lowest results on the pre-test was happen because almost all the students did not provide alternative opinions or alternative opinion that have been provided was not in line with the reason. The increased score of post test was happen because the students worksheet having question at the analysis stage that could improve the ability of counterargument generated that has been validated by validators with very proper interpretation. In addition, the answers of limited trial results showed that students have been trained to provide alternative opinions. It was also happen because the ability to make alternative opinions requiring high analytical and accurate skills. This argumentation's indicators require students to intergrate alternative theories to support their oppinions (Khun, 2003).

Students activities in a good learning can not be separated from the response of students after using the students worksheet. The students responses to learning using hands on minds on activity worksheet is presented in Table 2.

Table 2. Recapitulation of Student's Responses to Learning Process Using Students Worksheet Based on Hands On Minds On Activity

No.	Rated Aspects	Yes (%)	No (%)
1	The students worksheet attracts students to learn it	95	5
2	The students worksheet's presentation is interesting	100	0
3	The language used in students worksheet is easy to understand	85	15
4	The questions in students worksheet are easy to understand	90	10
5	The steps of students worksheet's activities are easy to do	100	0
6	The students worksheet helps students find material concepts	100	0
7	The students worksheet helps students in following the lessons	90	10
8	The time allocation is sufficient to complete all tasks in the students worksheet	75	25
9	The students worksheet helps students to understand the subject matter	100	0
10	The problem orientation in students worksheet helps students to find the problems or questions	90	10
11	The students worksheet trains students in doing activities to formulate the questions	90	10
12	The students worksheet trains students in conducting plant observations	100	0
13	The students worksheet trains students to describing morphological features and relating them to their roles in daily life	90	10
14	The students worksheet trains students in analyzing activities	100	0
15	The students worksheet trains students in concluding activities	100	0
Average		93,67	6,33
Category		Very good	

Table 2 showed the average of students' responses, from fifteen questions in the response questionnaire that must be answered by students. There are seven of fifteen questions got 100% of the "Yes" answers, while eight of the fifteen questions got <100%. Based on the average results of the students' responses showed 93.67% with very good category. It was in line with Winthrop (2016) and Ghosh (2017) that learning using hands on minds on activities can activate students because it was a participatory learning that connects many ideas, allows interaction, provides real, relevant, and dynamic experiences. Beside that, the students responses data showed that in question number 8 regarding the time allocation in the students worksheet given has the lowest percentage of "Yes" answers which was 75% because students feel that the processing time was not enough with so many questions on the worksheet and the observation time used was too short. So that, the researcher provides

the suggestions for the further research to consider the use of time allocation.

CONCLUSION

The validity of students worksheet based on hands on minds on activities in angiosperm material to train argumentation skills was categorized into proper with a percentage of 97.75% with very proper categories. The effectiveness of students worksheet was said to be effective with the results of the argumentation skills' test has increased from pre-test to post-test from quite good criteria to be very good and the students responses was 93.67% with a very good category. So that, the students worksheet developed proved to be worthy used in learning process, not only because of the validity of the theory but also it was proven to improve students' argumentation skills.

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