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Article

Assessment Development to Measure Science Process Skills on the Interaction of Living Things with Their Environment in Junior High School

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ABSTRACT

This study aims to develop an assessment to measure science process skills on living things interaction and their environment. The research used research and development (R&D) that consist research and initial information collection, planning, initial product format development, small-scale trials, product revisions, initial trials, and final products. The trial subjects were expert subjects (assessment experts, material experts and linguists), and the subjects were students of state junior high school in Bengkulu City as product users. Data were analyzed descriptive qualitatively and quantitatively. Feasibility assessment by three validator experts developed on the assessment aspect of 89%, material aspect of 93%, and language aspect of 93%, overall was declared very feasible with an average of 92%. This showed that the assessment of science process skills to measure science process skills was stated to be very suitable to be used to measure the level of students' science process skills. This assessment was the science assessment, where in the development of the science assessment used formative assessment because this assessment was given to every lesson and can be carried out on sub-subjects or each subject. In the development of this formative assessment, multiple choice tests were developed.

INTRODUCTION

In the 2013 curriculum, the learning process emphasizes providing direct experience to learn and develop competencies to care, examine, and understand the natural surroundings scientifically. Education is also the right and obligation of every Indonesian citizen. This is explained in the National Education System Law No. 20 of 2003 Article 5 Paragraph 1 states that every citizen has the same right to obtain quality education. The 1945 Constitution Article 31 Paragraphs 1 and 2 also explains that every Indonesian citizen has the right to education, and every citizen is obliged to attend basic education and the government is

obliged to pay for it. The most basic ability as a basis for mastering higher abilities and science skills is the ability to understand concepts. Understanding the concept of Science provides an understanding that the materials taught to students are not just rote. By understanding the concept of science students are expected to be able to better understand the concept or subject matter itself, the interrelationships between concepts, and use concepts in solving problems. Understanding the concept is one of the goals of science learning that absolutely must be achieved because understanding a concept is very supportive for understanding the next concept, or in other words understanding a concept is a prerequisite for understanding the next concept.

However, reports from international studies show the real reality of the quality of our education, especially at the junior high school level. It can be said that people who have a positive self-concept towards themselves then maintain their abilities with positive feelings towards themselves, towards doubts about their abilities. challenges in life, and results in a low self-esteem in relation to others. This is in accordance with the results of a survey from TIMSS (Third International in Mathematics and Science Study) in 2015 showing that the ability of Indonesian students in the field of Science is 36th out of 49 countries surveyed. Meanwhile, the 2018 PISA (Programme International for Student Assessment) survey report states that the performance of Indonesian students for Science is ranked 70 out of 77 countries evaluated. In the 2013 curriculum, it is explained that student assessment in the learning process is closely related to thinking skills.

Students' thinking skills can be trained through providing meaningful experiences in the learning process. Students' thinking ability in building new concepts in science learning can be trained through the development of Science Process Skills (SPS). Science Process Skills (SPS) are very important for every student as a provision to use the scientific method in developing science to acquire new knowledge or develop the knowledge possessed (Ilmi,2016). The concept discovery process involves basic skills through scientific experiments that can be implemented and improved through laboratory activities as science process skills. Science Process Skills is very important for students to have because as preparation and practice in dealing with the realities of life in society because students are trained to think logically in solving a problem what's in society (Sari, 2016)

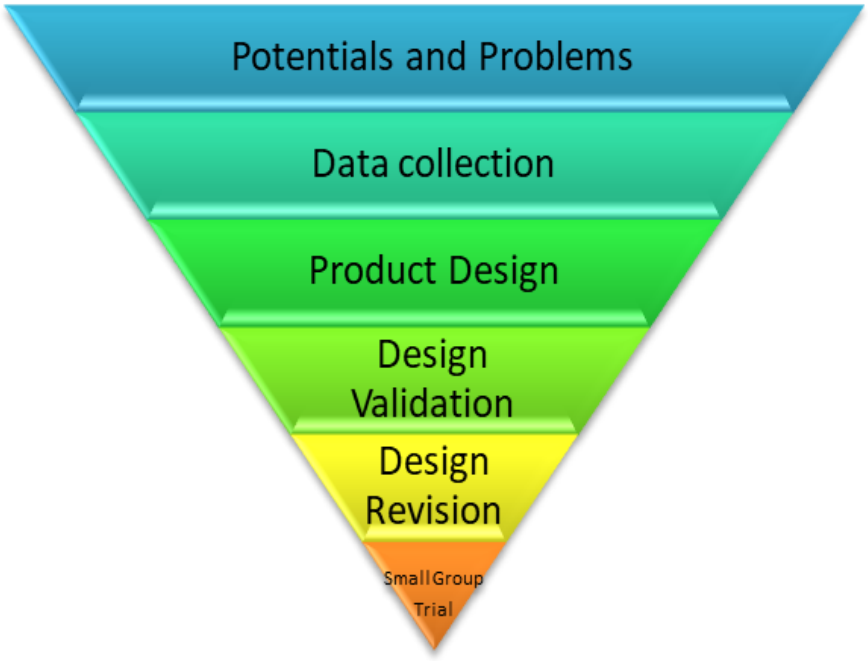
The results of observations made by researchers in three junior high schools, namely State Junior High School of 1 Bengkulu City, State Junior High School of 8 Bengkulu City and State Junior High School of 19 Bengkulu City in class VII. The material for the interaction of living things with their environment which contains Science Process Skills (SPS) was relatively low, this was evidenced by the analysis of the questions presented. Conducted at State Junior High School of 5 Bengkulu City showed that the average percentage of the Science Process Skills (SPS) indicator was 29% while from State Junior High School of 8 Bengkulu City showed an average Science Process Skills (SPS) indicator of 23% while from State Junior High School of 19 Bengkulu City it showed that the average percentage of the Science Process Skills (SPS) indicator was 19%.

Based on the description of the background of the problem, the researchers were interested in developing an Assessment of Science Process Skills for the Material of Interaction of Living Things with Their Environment in class VII at State Junior High School in Bengkulu City, so the title of this research was "Development of an Assessment to Measure Science Process Skills on the Interaction of Living Things with Their Environment at State Junior High School of Bengkulu City ".

METHODS

This study used the development model according to Borg & Gall which was developed by Sugiyono. Borg & Gall states that the research and development (RnD)

approach to education includes ten steps. Of the ten steps that exist, the researcher will limit it according to the needs of the research and development carried out. After simplifying the research and development procedure into eight steps only until the development stage.
The research steps are as shown in the chart below:



(adaptep from Sugiono, 2017)

Figure 1. The research steps by researcher

From the ten steps that exist, the researcher will limit it according to the needs of the research and development carried out. After simplifying the research and development procedure into eight steps only until the development stage. And the instrument can be seen on the table 1 below.

Table 1. Instrument for taking the data

Step	Activity	Instrument	Data Type	Subject
Need analyzing	Analyze the problem in the location	Analyze test instrument (pocket book, middle test, final examination, etc)	Qualitative	Science Teacher
	Analyze and Classify question that acquired	Science Process Skill Indicator by Muh.tawil et.al	Quantitative	Test/Question

Based on table 1, can seen that for taking the data there were some steps that required to do. First the researcher have to come to the location that we want to research, analyze the problem and analyze what is the problem related with our topic to research. So we ask the science teacher there to confirm the pocket book or references that used during learning process . in other hand, there were some instrument that we analyze that was the test of middle semester, and also the instrument of final examination. After that we want to analyze the other instrument related science process skills that ever tested to their students.

RESULTS AND DISCUSSION

The product produced by researchers was in development (Research and Development) to measure science process skills, namely questions with material on the interaction of living things with their environment in class VII of junior High School students. The procedure for developing this problem uses assessment development based on Borg and Gall. As for the steps, namely, collecting information and research, when the researchers conducted pre-research in 3 Junior High Schools in Bengkulu City, from the day of observation the researchers found out that the level of students' science process skills was still low, this was known when the researchers adjusted assessment used by the school with indicators of science process skills. The next stage that the researcher did was the research planning stage, where the researcher conducted a literature study to find the subject of the interaction of living things with their environment, to then make questions based on science process skills. Indicator of Science Process Skills (SPS) according to Muh. Tawil and Liliasari in 2014 are as follows:

Table 2. Indicator of Science Process Skills

No	Science Process skills	Indicator
1	Observation	a. Using more sense b. Collect the relevance facts
2	Classification	a. Note every observation separately b. Search the similarity and the difference c. Comparating
3	Prediction	a. Connect the observation result b. Find the structure in observing c. Conclutioning
4	Communication	a. Describe data of empiric result from grapich or table or diagram from experiment b. Arrange the experiment report c. Explain the experiment result

(Tawil, 2014)

The first step that must be done by a question development is to define competencies that can be shown by students, the characteristics of students' abilities and the purpose of the test. The questions developed in this research are questions multiple choice. The developed grid contains an overview of between indicators of science process skills, sub-indicators of skills scientific process related to material content and questions. Preparation of questions in this study based on the research instrument grid the cognitive aspect (knowledge) there are 20 multiple choice questions. The test component as follow:

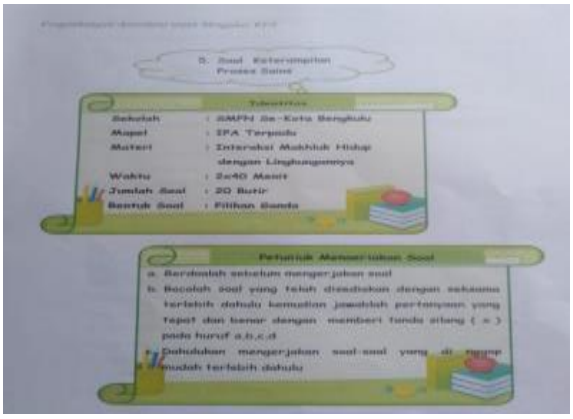
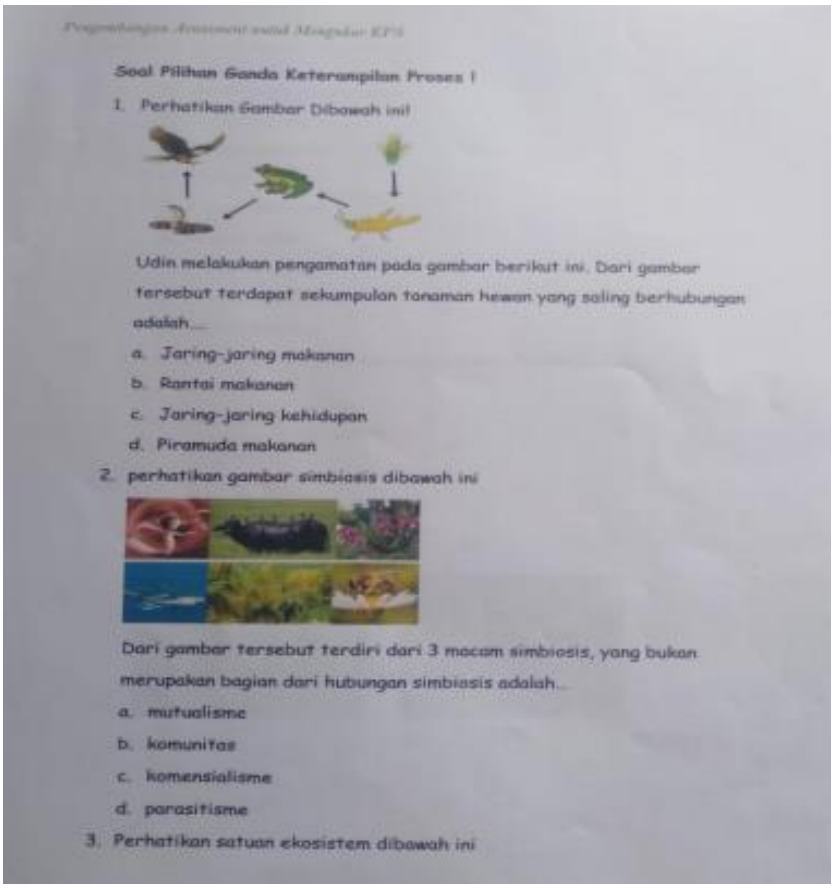


Figure 2. Guidence for working test



Soal Pilihan Ganda Keterampilan Proses I

1. Perhatikan Gambar Dibawah ini!

Udin melakukan pengamatan pada gambar berikut ini. Dari gambar tersebut terdapat sekumpulan tanaman hewan yang saling berhubungan adalah....

a. Jaring-jaring makanan
b. Rantai makanan
c. Jaring-jaring kehidupan
d. Piramuda makanan

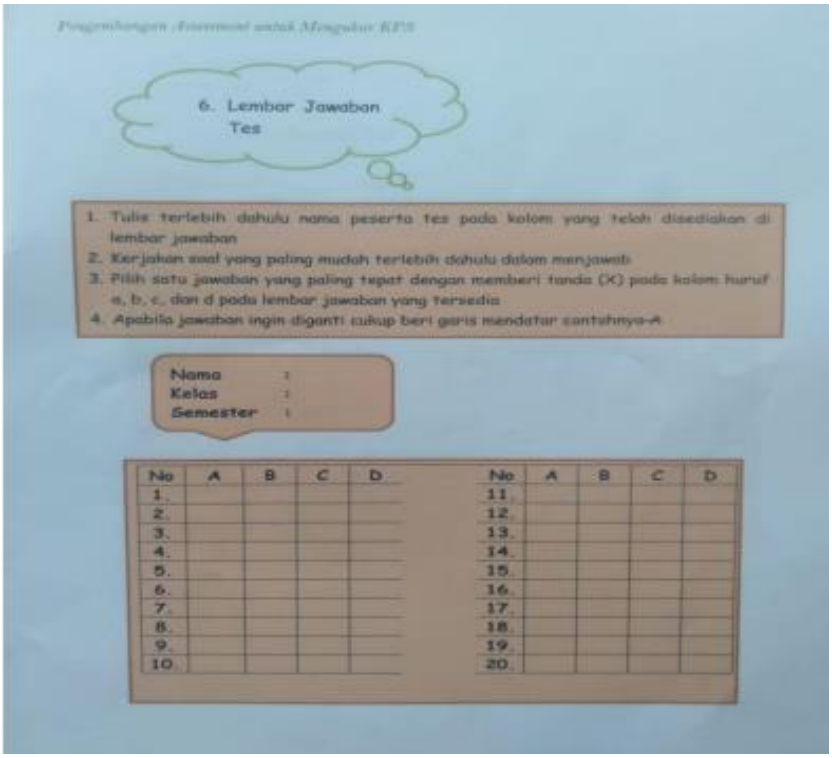
2. perhatikan gambar simbiosis dibawah ini

Dari gambar tersebut terdiri dari 3 macam simbiosis, yang bukan merupakan bagian dari hubungan simbiosis adalah...

a. mutualisme
b. komunitas
c. komensialisme
d. parasitisme

3. Perhatikan satuan ekosistem dibawah ini

Figure 3. example for science process skills test



6. Lembar Jawaban Tes

1. Tulis terlebih dahulu nama peserta tes pada kolom yang telah disediakan di lembar jawaban
2. Kerjakan soal yang paling mudah terlebih dahulu dalam menjawab
3. Pilih satu jawaban yang paling tepat dengan memberi tanda (X) pada kolom huruf a, b, c, dan d pada lembar jawaban yang tersedia
4. Apabila jawaban ingin diganti cukup beri garis mendatar contohnya-A

Nama :
Kelas :
Semester :

No	A	B	C	D	No	A	B	C	D
1.					11.				
2.					12.				
3.					13.				
4.					14.				
5.					15.				
6.					16.				
7.					17.				
8.					18.				
9.					19.				
10.					20.				

Figure 4. Answer Sheet for the test

The question of science process skills tested in the form of multiple choice on the material content of the interaction of living things with environment with four answer choices (A, B, C and D) which refers to science process skills.

The next stage, which was carried out was the product development stage, at this stage the research developed an assessment product measuring science process skills, which was contained in the evaluation questions with indicators of science process skills. Furthermore, the researcher conducted a limited trial validation stage, the product that had been designed was then validated with several experts including assessment experts, linguists, and material experts. The development carried out by the researchers resulted in an assessment product to measure the ability of science process skills on the subject of the interaction of living things with their environment which was adapted to the 2013 curriculum (K-13). Below are the validation results obtained by the experts as follows:

1. Assessment expert

   Based on the results of the assessment development to measure science process skills that have been carried out, it is known that the results of the validator to obtain results of 89%. So from the results of the validator referring to the conversion table, it can be concluded that the assessment to measure the developed science process skills is feasible to use or can be tested on students and no longer needs to be revised by researchers. The results of the validation assessment from assessment experts can be seen in the table below.

Table 3. The results of the validation assessment from assessment experts

Validator	Number of Items	Ideal Score	Score obtained	%	Qualification	Note
1	13	65	58	89 %	Very feasible	Revision required

2. Material expert

   Material validation is used to assess the material that has been prepared in the assessment to measure science process skills. The learning aspect is assessed to determine whether the material presented is in accordance with KI and KD as well as learning objectives that include material in one semester. While the content aspect is to find out whether the content of the material is clear in its presentation. The results of the validation assessment from material experts can be seen in the table below.

Table 4. The results of the validation assessment from material experts

Validator	Number of Items	Ideal Score	Score obtained	%	Qualification	Note
1	9	45	42	93 %	Very feasible	Revision required

The results of the learning expert scores are categorized as X> 81% (very feasible), 61%< X ≤ 80% (adequate), 41%< X ≤ 60% (fair enough), 21%< X ≤ 40% (less feasible), and X ≤ 20% (very unworthy). The percentage of the final product is 93% with very feasible criteria.

Regarding the average score scoring criteria percentage, it can be stated that the results of the assessment development for measuring science process skills in the interaction of living things with the environment was very feasible from the aspect of syllabus assessment and lesson plan (RPP) assessment. The validator's suggestions and comments on the assessment to measure science process skills as follows.

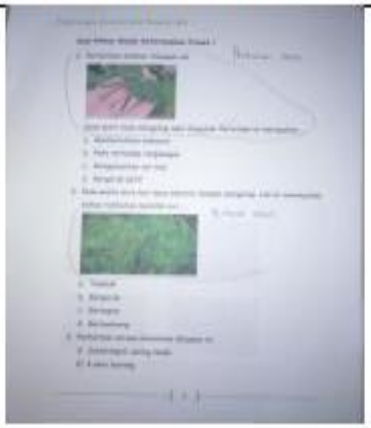
Saran Perbaikan	Sebelum Perbaikan	Sesudah Perbaikan
Pebaiki soal no 1 dan 2 materi interkasi makhluk hidup dengan lingkungannya		

Figure 5. Screen capture from material experts

3. Language expert

Aspects of language use to assess the vocabulary used, conformity with good and correct Indonesian rules. This assessment aims to see whether or not the assessment was used for students. The results of the validation assessment of linguists can be seen in the table below.

Table 5. The results of the validation assessment from language experts

Validator	*Number of Items*	*Ideal Score*	*Score obtained*	*%*	*Qualification*	*Note*
1	9	45	42	93 %	Very feasible	Revision

So from the results of the validator referring to the conversion table, it can be concluded that the assessment to measure the developed science process skills is feasible to use or can be tested on students and no longer needs to be revised by researchers.

Saran Perbaikan	Sebelum Perbaikan	Sesudah Perbaikan
Perbaiki penulisan		

Figure 6. Screen capture from language experts

The material experts get an average percentage of 93% with a decent category. Prior to the validation of the questions, the sentences used were still ambiguous. Then after validation, the questions that have been made have been well formulated, most of them have referred to the science process skills and the material asked according to the grade

level. So that the question is worthy to be tested. This is in accordance with KI, KD, learning indicators and indicators of science process skills, questions and answers are formulated correctly, the material asked is in accordance with the measurement objectives, level, type of school and grade level. In the teacher's response, obtaining an average percentage of 92% with a very decent category.

The science assessment based on science process skills developed is in accordance with the question grid and the language used is good and correct. The using of science process skills-based science assessments in school has not been applied to students, but in doing teacher assessment still uses levels C2 to C6 (Irsyad, 2016). While the question that have been developed already include Core Competencies (KI), Competencies Basic (KD) and indicators of science process skills. Besides already covers the grid, the questions developed have also gone through stages of expert validation and has been revised in accordance with the advice of experts (Juhairiyah, 2017).

CONCLUSION

The development of an assessment to measure science process skills is carried out based on eight of the ten stages of Borg & Gall. And the development of science process skills on the material of the interaction of living things with the seventh grade environment in Bengkulu City, the questions developed are in accordance with the steps for preparing good questions.

The feasibility of a science assessment to measure science process skills can be seen from the results of expert validation, namely, assessment experts by 89% in the very appropriate category, material experts by 93% in the very appropriate category and linguists in 93% in the very appropriate category and In the teacher's response, obtained an average percentage of 92% with a very decent category. The science assessment based on science process skills developed is in accordance with the question grid and the language used is good and correct. So that the question is worthy to be tested.

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