

Development of Learning Media of Ulatics (Optical Standards) to Measure Science Process Skills

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Abstract: This research is development research that aims to find out students' science process skills in physics subjects related to optical material for class XI SMA Muhammadiyah 1 Pontianak. Aspects of skills that are measured are observing, communicating, classifying, predicting, and concluding. Where science process skills are measured after being given learning with the media of ulatik (optical snake ladder) physics. It was found that the ulatik media could measure students' science process skills well. Where the instrument used has been validated by a material expert with a feasible criterion of 80%. In addition, the learning tools in the form of lesson plans used also obtained an average of 3.27 with a very suitable category for use.

Keywords: Science process skills; Caterpillar learning media; Ulatics

Introduction

Education is a place to improve the mindset of humans to be better. Education includes various kinds of science, one of which is physics, which is a subject where students can improve their skills in solving the problems presented (Tanti et al., 2018). Physics is basically an interesting and fun subject, because many physics concepts are related to everyday life. Hasyim (2018) states that there are still many students who think that physics is boring, many formulas/equations in physics material make students feel confused. In physics learning activities, in addition to making students master the targeted material, it is also directed to develop process skills that are useful in helping solve problems (Erina & Kuswanto, 2015).

The development of technology and information takes place very quickly, this makes it easy for students to learn. In education, information technology is needed to support learning and improve students' knowledge and skills. So that the media in learning at school needs to be considered so that students do not get bored in learning.

Learning media can function as a tool in learning. Where the technology that has been developed can make it easier for students to learn to increase their knowledge and train in solving problems in physics problems. However, many students use cellphones to play games, so that in measuring science process skills, learning media in the form of snakes and ladders will be used which can be applied to students' cellphones. This student can easily learn anywhere and anytime.

Educational games are learning media that make students play while learning, where students do not feel burdened in learning the material. Game as a learning media is a game that can be entertaining and contains educational elements (Wibisono and Yulianto, 2010). One example of educational game media that can be used in the learning process is the snake and ladder game. According to Karimah et al. (2014) Snakes and Ladders game can be used as a fun learning medium for students. There is research that is relevant to the development of learning media in the form of snakes and ladders game, namely research conducted by Nugroho et al. (2013) by developing learning media in the form of snakes and ladders game which includes

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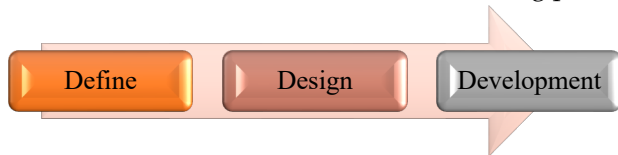
very good criteria. However, developing an existing educational game requires a new innovation, one of which is by using developed technology. The lack of variety of media that is distributed is not solely the teacher's fault, but because it does not optimize technological developments (Oktiana, 2014).

Good products are produced from good process skills. The purpose of science is to make students able to use science process skills. Students' science process skills in learning need to be done by looking at the increasingly rapid developments of the times, so that students can be trained and can follow global competition (Gencosman & Dogru, 2012; Keil et al., 2009).

Science process skills are the skills used by scientists in solving a problem in the world of science, starting from understanding the problem, formulating hypotheses, designing experiments, proving hypotheses, collecting data and formulating conclusions (Karamustafaoglu, 2011; Aydin, 2013; Olufunmiyi & Afolabi, 2010; Rabani, 2014).

Method

The method used in this research is the development research method. Where before doing the research, the researcher first observed the school and the learning process in the classroom. Observations were made directly to the school to see the condition of the school, the school curriculum, and the learning process.



Gambar 1. Langkah-Langkah Penelitian dan Pengembangan

Where here, the researchers developed an assessment with the help of caterpillar learning media (optical snake ladder) to measure students' science process skills. Learning tools in the form of lesson plans are analyzed by using.

Table 1. Analysis of Lesson Plan

Score interval	Criteria
3.25 M 4.00	Very Worthy
3.25 M 4.00	Worthy
3.25 M 4.00	Decent enough
3.25 M 4.00	less worthy

Furthermore, for the feasibility of the science process skill instrument, it is analyzed by a material expert so that the instrument's feasibility is obtained.

$$Eligibility\ Presentation\ (\%) = \frac{Observed\ Score}{Expected\ Score} \times 100\% \quad (1)$$

Table 2. Interpretation Criteria for Instrument Feasibility Assessment Validation by Material Expert

Percentage (%)	Criteria
85	Very good
70 - 85	Well
55 - 70	Enough
40 - 55	Not enough
40	Very less

Furthermore, after the instrument is declared feasible, it is used to measure students' science process skills until a category is obtained for each aspect to be measured.

$$\% = \frac{Value\ of\ Acquired\ Science\ Process\ Skills}{EMaximum\ Value} \times 100\% \quad (2)$$

The percentage calculation is then categorized according to the following criteria.

Table 3. Category of Science Process Skills Assessment

Percentage (%)	Criteria
0 ≤ 20	Very Inappropriate
21 ≤ 40	Not feasible
41 ≤ 60	Enough
61 ≤ 80	Worthy
81 ≤ 100	Very Worthy

(Arikunto, 2007)

After that, it will be known how much science process skills students have.

Result and Discussion



Figure 1. Learning Process

From the results of research carried out with learning carried out using rattlesnake learning media (optical snake ladder), learning tools in the form of lesson plans obtained validation with an average of 3.27 with a very feasible category. Furthermore, the instrument is obtained that the instrument used is feasible with a percentage of 80%. The results of the RPP validation can be seen in Table 4.

Table 4. Results of Lesson Plan Validation Analysis

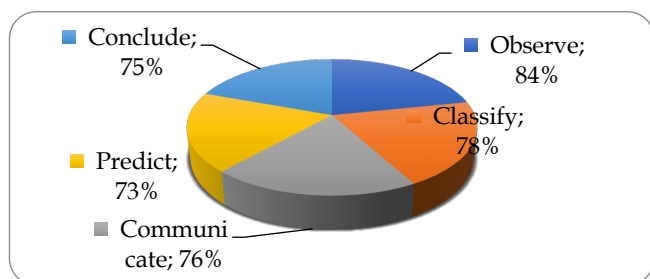
Indicator	Scoring score			Average	Category
	V1	V2	V3		
1	4	4	3	3.67	so worth it
2	4	3	4	3.67	so worth it
3	4	4	3	3.67	so worth it
4	3	3	3	3.00	worthy
5	3	4	3	3.33	so worth it
6	4	3	3	3.33	so worth it
7	3	3	3	3.00	worthy
8	4	3	4	3.67	so worth it
9	3	4	3	3.33	so worth it
10	3	3	3	3.00	worthy
11	3	3	3	3.00	worthy
12	3	3	3	3.00	worthy
13	3	4	4	3.67	so worth it
14	3	3	3	3.00	worthy
15	3	3	4	3.33	so worth it
16	3	3	3	3.00	worthy
17	3	3	3	3.00	worthy
Average Score				3.27	so worth it

It can be seen that the average analysis of the RPP used is 3.27 with a very decent category. Furthermore, the instruments that will be used are also validated by material experts and the criteria are obtained as shown in table 5 below.

Table 5. Validation results of Science Process Skills Instruments by Material Experts

Rated aspect	Validator(%)			Average per aspect	Average	Criteria
	1	2	3			
	Theory	78	79	80	79	80
Construction	83	81	80	81	80	Worthy
Language	80	82	81	81	8-	Worthy

From the validation results, 80% of the eligible criteria were obtained for the instruments to be used in measuring students' science process skills. After learning with media and assessment with instruments that have been validated, the results of measuring the science process skills of class XI science students at SMA Muhammadiyah 1 Pontianak are obtained with five aspects being measured, which can be seen in the following pie chart.



Gambar 2. The Results of Measuring Students' Science Process Skills on Five Aspects

From the picture, it can be seen that the students' science process skills are good with an average percentage of 77%, which is dominated by the observing aspect of 84%.

Conclusion

Based on the research that has been done, it can be concluded that students' skills in observing aspects are 84%, classifying 78%, communicating 76%, predicting 73%, and concluding 75% so that it is good with an average percentage of 77%. Obtained by the learning process using learning media caterpillar (optical snake ladder) physics. In addition, the tools used in learning are lesson plans with very feasible validation results of 3.27 and on instruments with material expert validation results of 80% on the criteria for use.

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