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The Validity of the Discovery Learning Model to Improve Students Creative Thinking Skills

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Abstract

This study aims to determine the validity of the product in the form of learning tools based on discovery learning models to improve creative thingking skills of students on momentum and impulse material. The type of research that used in this research is R&D (Research and Development) with a 4D model namely define, design, develop and disseminate. The products develop are syllabus, Learning implementation plan, teaching materials, Student worksheet and creative thingking ability test instruments. Validity data was obtained from the results of filling out the validation sheet by six validators, namely three expert validators and three practitioner validators. The validation sheets is filling by likert scale of 1-4. The percentage of validity results by expert validators has an average value of 84.82% with a fairly valid category. And the results of the validity value by the practitioner validators have an average value of 94.12% with a very valid category. The result of this study indicate that learning devices based on discovery learning models to improve students creative thinking skills are valid for use in learning at school.

Keywords: Learning tools, discovery learning, creative thingking skills

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INTRODUCTION

In the world of education, it is very important to ensure that students must have various abilities. 21st century abilities are abilities that are needed by students at this time (Hutagalung, 2019). In the face of the 21st century, of course it must be balanced with the progress of the abilities by students (Aji, 2017). Every school needs to equip students with today's 21st century abilities namely, critical thinking, creative thinking, problem solving, cooperative dan communication. These skills are skills that can be developed from learning situations into daily life (Setiawan et al., 2018). Because new standards are needed so feature students will have the competencies that are needed in the 21st century (Zubaidah, 2016).

One of the 21st century abilities that students must have is the skills to think creatively. Creative thinking skills can make students more active, dare to express opinions, problems and solutions (Aswan, 2016). Creative thinking skills is a type of thinking that leads students into new insights, new approaches, new perspectives and whole new ways to understand things (Eragamreddy, 2013). Based on Torrance indicators the skills to think creatively has several indicators namely, fluency, flexibility, originality and elaboration (Sipayung et al., 2018). If these indicators can be achieved, it means that students have succeeded in applying creative thinking skills (Nurlaela et al., 2019). One of the advantages of having the ability to think creatively is being able to solve a problem in learning activities (Koestiari et al., 2015).

However, the creative thinking skills of students in current learning activities are less prominent, because schools do not facilitate students at this point (Tumurun et al., 2017).

This statement is in line with the results of observations that have been made by researchers to students of SMAN 1 gerung. In learning activities, students are seen to be less active in responding to the material that has been taught. The application of learning tools such as student worksheet is also not implemented properly. As is known, student worksheet really helps students to understand the material by conducting experiments. So that activeness of students, which is a determinant of the implementation of learning activities can increase. This is in line with the results of Damanik's research (2018) in his research, there are some teachers who only make tools for administrative completeness and student worksheet is not applied. This resulted in the learning objectives could not be achieved properly. The results of observations also state that students in learning activities only take notes, attention to teacher explanations, summarize material books and work on questions (Butar et al., 2020). Teachers are still the only source of information in learning activities. And these activities are not in accordance with the learning process applied in the 2013 curriculum. That is student centered learning. The ongoing learning stills applies teacher centered learning (Damanik, 2018).

Teacher learning centered is a method of learning lectures, questions and answers , assignments and discussions using the blackboard as the only medium in the learning process, so that the involvement of students in the learning process is less prominent (Simanjuntak et al., 2021). Teacher centered learning has an impact on classroom learning, which causes students to be less able to use their potential and do not understand the concept of learning well (Ramadhani, 2017). Coupled with the covid-19 pandemic which has an effect on online learning. Students only understand learning based on their own interpretation (Asmuni, 2020). The existence of a concept error is also one of the factors that makes it difficult to improve creative thinking skills. However, this can be changed by changing the learning paradigm from teacher centered to student centered (Verawati et al., 2017). One way is by applying a learning model. Obne of the learning models that can be used to improve or develop students creative thinking skills in learning is the discovery learning model.

Discovery learning model is a teaching method that can regulate students in order to gain new knowledge that has not been known before, so that knowledge is obtained from their own experience not through the teacher (Suwandari et al., 2019). Students can also find concepts in a more structured and can formulate learning problems in a better way. (Tumurun, 2016). Discovery learning model has six indicators namely, stimulation to stimulate students, identifying problems, collecting data, processing data, verifying data dan making conclusions (In'am & Hajah, 2017). These indicators will help students to improve their creative thinking skills. To support the development of the discovery learning model, a learning device is needed as a medium.

Learning devices are tools that have been prepared by the teacher to support the learning process (Salam et al., 2017). With the learning tools, teacher can more easily to convey the material. The integration of the implementation learning model is poured in the form of learning tools. With the teachers learning tools, it will be easier to convey learning material (Sahidu, 2019). Based on this description, this researcher aims to develop learning tools that are in accordance with the 2013 curriculum, namely student-centered learning tools. Thus learning device based on a discovery learning model was develop.

METHOD

The type of research that used by researchers in this study is Research and Development. Research and development is research method that used to produce certain products and test the effectiveness of those products (Arifuddin et al., 2021). The development model that used in this study is the 4-D model. The development model consists of four stages namely, define, design, develop and disseminate, which was develop by Thiagarajan. However, in this study only three stages were used, that is until the development stage. **Define stage**, is the first stage of this research, this stage aims to obtain information about the curriculum used, student characteristics, field problems, learning

models and concepts in learning. Interview sheets are used in this stage, as a data collection tool. **Design stage**, aims to prepare a prototypethat will used in research. Learning tools that will be developed are syllabus, lesson plan, teaching materials, student worksheet and test instruments. **Develop stage**, aims to produce learning tools. The learning tools that were developed then validated for suggestions and comments by experts alidators and practitioner validators. The validation of the learning tools was carried out by 3 expert validatots from the Physics Education lecturer at the University of Mataram and 3 practitioner validators who were physics subject teachers at SMAN 1 Gerung and SMAN 2 Gerung. The formula used in calculating the percentage of validation obtained is.

$$P = \frac{f}{N} \times 100\%$$

Description:
f = Score obtained
N = Maximum score
P = Percentage number

Changing the data from the assessment results from letters to scores with the provisions of using the rating scale in table 1.

Table 1. Assessement Score Against Answer Choices

Statement	SS	S	TS	STS
Positive statement	4	3	2	1
Negative statement	1	2	3	4

(Source: Hidayat Aziz, 2013).

Validation questionnaire and response using four choices of statements. The percentage data is then converted into the criteria for the validity of the learning device.

Table 2. Learning Toll Validity Criteria (Akbar, 2013)

Percentage (%)	Validity Criteria
85.1-100	Very valid
70.1-85	Quite valid
50.1-70	Not valid valid
0-50	Invalid

RESULTS AND DISCUSSION

Define stage

At this stage, four activities are cerried out, namely (a) The initial analysis was conducted to find out the basic problems that occur ins school through observation. Observations were made by interviewing physics teachers at SMAN 1 Gerung. It was obtained information that physics learning that took place in the classroom tented to be less active in responding. The learning provided is still one way or teacher centered. This is in line with the research results by Purohita et al., (2020) where the learning that takes place in the classroom is only teacher centered, not in line with the expectations of the government which expects student centered learning.

The use of student worksheet learning tools is also not applied in learning. (b) Concept analysisis is the identification stage of the main concepts. By linking the main concept and other concepts will form a concept maps (c) Task analysis is a collection of information needed to determine the contents of the assignment draft in the lesson plan derived from core competencies and basic competencies (Wiyatmo et al., 2015). The subject that used in this lesson is momentum and impulse material (d) The specification of learning objectives is the formulation of learning objectives based on core competencies and basic competencies about a material concept (Wiyatmo et al., 2015). Indicators become a reference in making learning objectives in this study.

Design stage

The purpose of this stage is to prepare a prototype of the learning tools used in the research. The learning tools based on the discovery learning model are composed of syllabus,

lesson plans, teaching materials, worksheets and test instruments. Learning tools are then validated by expert validators and practitioners.

Develop stage

Validation of learning devices, this validation stage aims to obtain data on the results of the validity of the devices developed by researchers before being tested (Saputro et al., 2015). The validation of learning tools was carried out by three expert validators and three practitioner validators. The expert validator is a lecturer in the Department of Physics Education, FKIP, University of Mataram and the practitioner validator is a physics subject teacher at school. In the validation there are qualitative data and quantitative data. Qualitative data obtained from comments and suggestions given by the validator. While quantitative data is obtained from the results of filling out the validation sheet by the validator. The validation sheet is filled out using a Likert scale. Based on the results of the validation sheet, the data obtained from research on the validity of learning devices from expert validators and practitioner validators with an average value of 89.47% which is in the very valid category.

Syllabus validity

The syllabus is a reference for making other learning tools. The average percentage of syllabus validation is 90.8% with a very valid category. However, it still needs some improvements based on the suggestions and comments that have been given. This is in line with the results of the Indiastuti research (2016) where suggestions from the validator will later be used as material in making revisions. Based on the results of the assessment as well as suggestions and comments given by the validator, overall this syllabus is suitable for use in learning at school. ecause it contains all the components of the syllabus in accordance with applicable school regulations. Where the components of the syllabus that are made generally contain competency standards, basic competencies, indicators, subject matter, learning activities, assessments, time allocation, and learning resources (Zubaidi, 2015:112). And all these components have been included in the syllabus made by the researcher.

Lesson plan validity

The lesson plan is a short-term plan to estimate the things that will be done in learning. The average percentage of lesson plan validation is 90.8% with a very valid category. Based on the results of the assessment of suggestions and comments given, overall lesson plan with the application of the discovery learning learning model is feasible to use in learning in schools. Because it contains all the components of the lesson plan in accordance with applicable government regulations. Where according to article 20 of the government regulation, the lesson plan contains at least the learning objectives, teaching materials, teaching methods, learning resources and assessment of learning outcomes. (Zubaidi, 2015:110). And the lesson plan made by the researcher contains all of these things.

Validity of teaching materials

Teaching materials are the main things that need to be conveyed by the teacher and understood by students, so that later students are able to master the learning delivered. The average percentage of teaching material validation is 88,5% with a very valid category. However, in the validation of this yeaching materials, some improvements are still needed based on the validators suggestions and comments. Based on the overall assessement and suggestions and comments, this teaching materials is feasible to be applied in learning at school. This is because, learning tools in the form of concept maps and teaching materials contained in teaching materials really help students to understand the subject matter, because presentation in the form of books alone will not be enough for students, so other media are needed, namely teaching materials.

Validity of worksheet

Student worksheet are sheets that used as guidelines in learning that contain experiments and questions. Student worksheet make experiments from each material

presented in several meetings that refer to indicators of creative thinking skills. The average percentage of validation for student worksheet is 88,05% with a very valid category. Based on the assessment of suggestions and comments, this student worksheet is feasible to be applied in learning in schools. This is also because the LKPD made by researchers has included components of creative thinking skills in the questions made. Another thing is because the student worksheet that is made contains interesting pictures/illustrations and brings up experimental/experimental activities that can support the performance of students to improve creative thinking skills.

The validity of the creative thinking ability test instrument

The test instrument is one part of the learning device that is used as a measure of the achievement of learning competencies. The instrument test prepared by the researcher was intended to measure the creative thinking skills of students at school. The average percentage validation of the creative thinking skills test instrument is 89,2% with a very valid category. Overall, the test instrument learning device to improve students' creative thinking skills is feasible to be applied in learning at school. This is because the test instrument made contains components of creative thinking abilities. So that the expected learning objectives can be realized properly.

The following are the results of the analysis of the validity of learning tools from expert validators and practitioner validators.

Table 3. The Results of the Validity Analysis of the Validator Learning Tool

No	Learning Tools	Scoring scores by expert validators						Total	(%)	Category
		V.1	V.2	V.3	V.4	V.5	V.6			
1	Syllabus	87.5	80	90	92.5	100	95	544.8	90.8	Very valid
2	Lesson plan	85	80	92.5	90	100	97.5	544.8	90.8	Very valid
3	Student worksheet	90.6	78.1	87.5	78.1	94	100	528.3	88.05	Very valid
4	Teaching materials	84.3	78.1	87.5	90.6	97	93.7	531.3	88.5	Very valid
5	Test instrument	89.2	78.5	83.9	94.6	92.8	96.4	535.4	89.2	Very valid
Average						**89.47**				
Category						**Very valid**				

The results of the percentage of validity obtained from the expert validators are in the quite valid category with an average value of 84.82%. As for the practitioner validator, the average percentage value is 94.12% and is in the very valid category. In general, for research from expert validators and practitioner validators, the learning tools developed are assessed in a very valid category from the syllabus to the creative thinking skills test instrument. Thus, the learning tools used in the research are considered adequate. This is supported by the research results of Purohita et al., (2020) where researchers found that the use of discovery learning-based learning tools was able to improve students' creative thinking skills.

Calculation of validity data from expert validators and practitioner validators can be seen in the following Table 4 and Table 5.

Table 4. The Results of the Analysis Validity of the Expert Validator Learning Tool

No	Learning tools	Scoring scores by expert validators			Total	(%)	Category
		V.1	V.2	V.3			
1	Syllabus	87.5	80	90	257.5	85.8	Very valid
2	Lesson plan	85	80	92.5	257.5	85.8	Very valid
3	Student worksheet	90.6	78.1	87.5	256.2	85.4	Very valid
4	Teaching materials	84.3	78.1	87.5	249.9	83.3	Quite valid
5	Test instrument	89.2	78.5	83.9	251.5	83.8	Quite valid
Average				**84.82**			**Quite valid**

Table 5. The Results of the Analysis Validity of the Practitioners Validator Learning Tool

No	Learning tools	Scoring scores by practitioners validators			Sum	(%)	Category
		V.4	V.5	V.6			
1	Syllabus	92.5	100	95	287.5	95.8	Very valid
2	Lesson plan	90	100	97.5	287.5	95.8	Very valid
3	Student worksheet	78.1	94	100	272.1	90.7	Very valid
4	Teaching materials	90.6	97	93.7	281.3	93.7	Very valid
5	Test instrument	94.6	92.8	96.4	283.8	94.6	Very valid
Average					**94.12**		**Very valid**

Qualitative data obtained from the validation sheet in the form of suggestions and comments from expert validators and practitioner validators. These suggestions and comments are used by researchers as a reference in improving learning devices. However, if the learning device made is in the invalid category, it can be revised first. So that the learning tools are categorized as valid and can be used in learning at school. The following are suggestions and comments provided by expert validators and practitioner validators.

Table 6. Suggestions and Comments of Expert Validators and Practitioners

No	Learning tools	Suggestions and Comments	Repair
1	Syllabus	Validator ahli	
		In the syllabus, it is necessary to add time to test students creative thinking skills in the form of daily tests	Adding time to test students' creative thinking skills during daily tests
		Validator praktisi	
		In learning activities, it is more clear about the activities of students and teachers	Adding student learning activities to the syllabus
		The assessment is broken down between knowledge, skills and attitudes	Detailing/adding assessment of knowledge, skills and attitudes
2	Lesson plan	Validator ahli	
		In the validation rubric there needs to be a statement of the relevance of the learning process to improve students' creative thinking skills	Adding a description of creative thinking skills on the lesson plan validation sheet
		On the validation sheet it is necessary to have a TPACK learning process	Adjusting the TPACK learning process on lesson plan validation
		Initial activities should be varied and there are alternative teacher choices	Adding alternative apperception options for teachers
		Validator praktisi	
		-	-
3	Student worksheet	Validator ahli	
		The validation sheet does not only talk about technique or completeness but contains the content or contents of the student worksheet to support improving creative thinking skills	Adding a description of creative thinking skills on the student worksheet validation sheet
		Validator praktisi	
		Activities in student worksheet are adjusted to thr learning objectives in the lesson plan	Adjusting student worksheet activities with the objectives of the lesson plan
		The activities steps are explained in the sentence structure	Clarifying sentence structure in student worksheet
		The result recording table is made clearer	Make the table of recording results clearer
4	Teaching materials	Validator ahli	
		Adjust the validation statement with the material or teaching materials, namely momentum and impulse, so that it is more specific and not general	Clarify the validation statement by adding momentum and impulse descriptions to the appropriate criteria

		Validator praktisi	
		-	-
5	Test instrument	Validasi ahli	
		The statement on the validation sheet must contain elements that support creative thinking skills	Add a description of the ability to think creatively on the appropriate criteria
		The concepts of momentum and impulse are written down	Adding momentum and impulse decription to the appropriate criteria

Suggestions and comments given by expert validators and practitioner validators indicate improvements that must be made by researchers to the learnings tools developed. Improvements made by researchers have been listed in the repair column above. Thus, the learning tools developed as a whole in the study are feasible or valid to be used in the learning process in schools. This is based on the results of the percentage value of validity and the improvement of suggestions and comments given by expert validators and practitioner validators.

Learning tools based on the discovery learning model is one way tahtcan be used to implement the 2013 curriculum comprehensively. Discovery learning based learning activities can make learning more meaningful for students to understand the material with the ability of the relevance of the information they have (Roza *et al.,* 2018). This is in accordance with research (Arifani, 2016) which states that the discovery learning model is the most effective learning model in learning in the form of a team or independenly. The learning tools developed are expected to change the learning paradigm from what was originally teacher centered to become student centered and the approach that was originally more textual turned into contextual. This is supported by the results of research by Damanik *et al.*, (2018) which says that the discovery learning model is considered capable of changing teacher centered learning into student centered learning.

CONCLUSION

Based on the results of research and discussions, it can be concluded that the product development of discovery learning model devices to improve students creative thinking skills on momentum and impulse material in valid for use in learning at school.

RECOMMENDATION

Base on research result, (1) limited time in learning due to the covid-19 pandemic; (2) the problem of creative thinking skills made only consists of one question for one indicator; (3) the covid-19 pandemic has made interactions between researchs and student rare outside of class hours; so for researchers who will conduct research on the development of similar devices to pay attention to each part and element in the learning device and described obstacles.

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