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DEVELOPMENT OF LESSON PLAN INSTRUMENT ON POGIL MODEL FOR JUNIOR HIGH SCHOOL

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Abstract:
This research is aimed to develop a lesson plan instrument with a POGIL model on validity and practical. The research method used is Tesmer model which covers: 1) self evaluation; 2) expert review; 3) one-to-one; 4) small group; and 5) field test. The lesson plan instrument covers the syllaby, lesson plans, materials, students workbook, observation sheet cognitive, observation sheet critical thinking skills, observation sheet activities of teachers and students, observation sheet response of participants, observation sheet self regulation, and observation sheet psychomotor skills. The research in SMPN 2 Alalak. The results of the study show that: 1) the validity of lesson plan instrument based on experts is category as very valid, the level of readability of the module and students workbook is category as good; 2) the practicality of learning devices based on the implementation of lesson plans instrument is very good.

Keywords: lesson plan instrument, development research, POGIL, critical thinking skills

1. Introduction

Science is essentially a discipline that studies natural phenomena in the form of facts, concepts, principles and laws that are validated through a series of activities in scientific methods that can train critical thinking skills (Liliasari, 2009). Science products are obtained through a process of thinking and acting in dealing with or responding to problems that exist in the environment so as to foster critical thinking skills, work and be scientific and communicate them which are important aspects of life skills (Zubaidah et al., 2014). Bassham (2010) states that science education has not been more oriented in adapting and developing higher thinking skills (critical thinking), while still emphasizing the results of lower cognitive studies. Science learning that has been

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taught so far focuses more on how to help students improve cognitive knowledge but not for critical thinking skills that help students learn how to apply scientific concepts in real life outside of school (Liliasari, 2009). The critical thinking skills in question are critical thinking, focusing on patterns of decision making about things that must be trusted and things that must be done (Ennis, 1993).

Critical thinking skills are essentially problem solving skills (Costa, 2001). Facione (1999) as quoted by Filsaime (2007) explains critical thinking skills can be learned, measured, and taught. According to Robbins (2005) critical thinking skills are skills that can be taught, so that these skills can actually be learned. Schools have an important role in training critical thinking skills. Through the learning process in school critical thinking skills of students can be trained (Nadziroh, et al. 2018).

Based on the results of a preliminary study conducted at SMPN 2 Alalak, it shows that the learning process in schools has not been maximal in training critical thinking skills which can be seen from the teacher's lack of planning in learning. Learning devices that are used in schools even though they are based on the 2013 curriculum with learning strategies use the Discovery Learning model that demands the active participation of students in the learning process in terms of cognitive, affective and psychomotor domains, but not optimal in training critical thinking skills. This can be seen from the difficulties of students in working on the C3-C6 Bloom taxonomy problem and impacting only 33 out of 97 students in class VIII who fulfill the KKM.

The results of observations through direct observation in the class show that only a few students ask questions about the material that has not been understood and provide an explanation of the questions given by the teacher accompanied by a logical or reference opinion that supports, while most are not actively asking questions. In discussion activities, both groups and classes, only a few students discuss the problems faced in teaching and learning activities and present the results of the discussion and relate it to existing theories. Students are still not active in giving an assessment of other students who have expressed opinions. The core problem is that students are not empowering reasoning in thinking, so the ability to think critically in real terms is still low.

One solution to solving the problem of the lack of critical thinking skills of students is by designing a learning tool that is effective in training critical thinking skills. Teachers as learning designers in schools need to develop learning tools that allow students to have critical thinking skills. Learning strategies to gradually train critical thinking skills can be designed with the POGIL model (Yuliani et al., 2017).

The POGIL model is one of inquiry learning models that is guided inquiry that is process-based by applying the learning cycle. Inquiry is a learning process where students explore all available resources to gain understanding (Brickman et al., 2009). POGIL learning applies a method based on student-centered learning and a structure that consistently presents how students learn and achieve learning outcomes (Warsono and Hariyanto, 2012). The POGIL model is a learning model based on constructivism

theory. This learning is based on scientific discoveries obtained from a series of investigative processes (Simonson and Shadle, 2013).

Broadbear (2003) states that experimental or practical activities that require the observation of symtomps and phenomena will challenge students' critical thinking skills. Trautmann (2000) states that collaborative investigation can improve students' hard work and stimulate critical thinking skills that are trained to discuss every assumption and interpretation they have.

The subject of "light" is one of the subjects which in many learning requires students to think and reason concretely and abstractly. In the topic of light students are not only required to learn theories but also are required to make observations to find concepts and applications in everyday life. With critical thinking skills students can apply material in their daily lives and can even create a work / model that utilizes the characteristics of light, and not just being told.

Learning by using the POGIL model is considered to be useful for teaching the concept of light, because students work groups in conducting investigations aimed at mastering concepts. Broadbear (2003) states that experimental or practical activities that require the observation of symtomps and phenomena will challenge students' critical thinking skills. Trautmann (2000) states that collaborative investigation can improve students' hard work and stimulate critical thinking skills that are trained to discuss every assumption and interpretation they have. Students are able to develop high-level thinking skills and metacognition, communication, team work, management, and assessment and no longer rely on memorization, but develop skills to succeed in learning so students can make observations to find the concept of light and apply it to everyday life. The POGIL model is designed to improve mastery of subject content and develop abilities in the learning process. And solve problems that can train critical thinking skills (Hanson, 2006).

Based on the description above, development research needs to be done. The development research in this study was to develop science learning tools with the POGIL model to train students' critical thinking skills in junior high school on light material. Learning tools developed are reviewed based on the criteria of validity, practicality and effectiveness.

2. Methods

This study used a formative evaluation development model by Tesmer. Stages of research 1) self regulation, 2) Expert review 3) one to one 4) small group and 5) field test.

This research was held at SMPN 2 Alalak. The subject of expert trials was purposively determined, namely 3 lecturers based on expertise in the field of science education (cognate subjects), experts at least holding master's degrees and 2 teachers of science subjects. Individual try out subjects from among students, namely each of the 3 class VIII A students with different academic abilities. The small group trial subjects

came from students in class VIII A 12 people each. Small group test activities and field tests using learning tools that have been developed are POGIL model learning on light topics for class VIII SMP. Field tests also use learning tools that have been developed, namely the POGIL model on the topic of light class VIII C and VIII D.

Validity is obtained through expert opinion with the instrument validation sheet, namely content validation. Expert review validates syllaby, lesson plans, materials, students workbook and assessment sheets. Then evaluated by researchers to improve the quality of learning devices made.

Practicality is obtained through small group testing, and field testing. Small group trials are used to determine the practicality obtained from students' responses to learning devices through the assessment of students on the learning process guided by the teacher. Large field tests are used to determine the actual practicality obtained from the results of observations and assessments of the activities of teachers and students during the learning process.

3. Results and Discussion

Validation of learning devices in this study consisted of syllaby, lesson plans, materials, student workbook, observation sheet learning outcomes, observation sheet critical thinking skills, observation sheet self regulation, observation sheet skills of students, observation sheet teacher activities, observation sheet activities of students and observation sheet responses of students. The results of the validation carried out by 5 experts as a whole stated that the lesson plandeveloped with the POGIL learning model by the researcher produced a valid prototype. Assessment instruments must be valid to reduce errors in the measurement process (Taherdoost, 2016). A summary of the results of data validity is presented in Table 1.

The results of the validity of this lesson plane in line with Dewi et al (2013) stating that learning is classified as valid if the lesson planis in accordance with the indicators of construct validity and content validity, and is prepared in accordance with the curriculum. Jaya et al. (2014) report that a lesson plan that has been developed is said to be appropriate to use if it meets the minimum criteria with a valid category. Validity is one of the criteria that determines the quality of a product (Akker, 2006).

Table 1: The validity result of lesson plan instrument

No	Prototype	The result	V1	V2	V3	V4	V5
1	Syllaby	Score (%)	87,5	92,5	95	87,5	92,5
		Category	very valid	very valid	very valid	very valid	very valid
2	Lesson plan	Score (%)	87,5	95,3	95,3	95,3	95,3
		Category	very valid	very valid	very valid	very valid	very valid
3	Material	Score (%)	85,9	92,2	96,9	93,75	92,2
		Category	very valid	very valid	very valid	very valid	very valid
4	Student workbook	Score (%)	92,5	95	95	95	95
		Category	very valid	very valid	very valid	very valid	very valid
5	LP cognitif	Score (%)	93,75	93,75	100	93,75	93,75
		Category	very valid	very valid	very valid	very valid	very valid
6	LP critical thinking skills	Score (%)	93,75	93,75	100	93,75	93,75
		Category	very valid	very valid	very valid	very valid	very valid
7	LP Psikomotor skill	Score (%)	93,75	93,75	93,75	93,75	93,75
		Category	very valid	very valid	very valid	very valid	very valid
8	LP Teacher activity	Score (%)	87,5	93,75	87,5	93,75	87,5
		Category	very valid	very valid	very valid	very valid	very valid
9	LP Student Activity	Score (%)	93,75	93,75	100	93,75	81,25
		Category	very valid	very valid	very valid	very valid	very valid
10	LP Students response	Score (%)	100	93,75	100	100	93,75
		Category	very valid	very valid	very valid	very valid	very valid
11	LP Self-regulation	Score (%)	87,5	93,75	93,75	100	93,75
		Category	very valid	very valid	very valid	very valid	very valid

Note : very valid (100-76%), valid (75-51%), less valid (50-26%), invalid (25-0%)

Readability tests were obtained from the One-to-one test using lesson plan that had been developed including materials and student workbook. The result of material and students' workbook legibility by students is presented on Table 2.

Tabel 2: Material and Workbook Legibility Result

Indicator Students Judgement	**Indicator Students Judgement**
Material	
1. Content	Interesting
2. Appearance	Interesting
3. Font used	Good
4. Font size	Good
5. Language legibility	Good
6. Term and vocabulary selection	Good
7. Term/symbol usage consistency	Good
8. Communicative language usage	Good
9. Effective language usage	Good
10. Abstruse explanation	Nothing
LKPD/Workbook	Interesting
1. Content	Interesting
2. Appearance	Good
3. Font type	Good
4. Font size	Good
5. Language legibility	Good
6. Term/vocabulary selection	Good
7. Term/symbol usage consistency	Good
8. Communicative language usage	Good
9. Effective language usage	Nothing
10. Abstruse explanation	Interesting

Seen in Table 2 which shows that the teaching material is categorized as good and can be used for the next stage with a slight revision as there are some typos and improvements to the explanation that is difficult to understand in the students workbook. Based on the results of the expert review and one to one lesson plandeveloped it was stated to be very valid with small revisions.

Based on the explanation it was concluded that the prototype developed could be said to be valid or feasible. Suggestions and criticisms from the validators were used as material to revise the prototype.

Practicality is the ease of learning devices developed in learning. Practicality means easy to use by users, and can be given and used by all students (Tessmer, 1998). The practical learning tool used was assessed by the observer based on the implementation of the learning carried out by the teacher and the responses of the students in the class. Jaya et al. (2014) stated that the practicality of the device can be concluded based on observations by observers on the implementation of the RPP in learning. Learning devices from research results have met the practicality criteria, this is based on research data in the form of implementation of RPP and students' responses to the learning carried out. A summary of the results of observations of teacher activities in the test field is presented in Table 3.

Table 3: The results of observations of teacher activities field test

No	Activity	Class VIII C			Class VIII D		
		Observer 1	Observer 2	Observer 3	Observer 1	Observer 2	Observer 3
1	Introduction	82,67%	80,00%	93,33%	89,33%	84,00%	90,67%
2	Phase 1 *Engange*	89,00%	84,00%	89,00%	87,00%	88,00%	89,00%
3	Phase 2 *Elicit*	88,00%	93,33%	86,67%	89,33%	93,33%	88,00%
4	Phase 3 *Explore*	90,67%	92,00%	85,33%	83,33%	89,33%	80,00%
5	Phase 4 *Explain*	92,00%	94,40%	92,80%	96,00%	94,40%	94,40%
6	Phase 5 *Elaborate*	96,00%	100,00%	84,00%	96,00%	96,00%	88,00%
7	Phase 6 *Extend*	92,00%	96,00%	84,00%	88,00%	92,00%	88,00%
8	Phase 7 *Evaluated*	94,00%	94,00%	90,00%	90,00%	94,00%	91,00%
9	Closing	97,00 %	95,00 %	92,00 %	96,00 %	97,00 %	97,00 %
Average		91,26%	92,08%	88,57%	90,55%	92,01%	89,56%
Category		Done very good	Done very good	Done very good	Done very good	Done very good	Done very good

Note: Done very good (100-81%), done good (80-61%), done enought good (60-41%), done less good (40-21%), not done (20%-0%)

The results of observations of teacher activities in the field test can be seen in Table 3 which shows the teacher can do the learning well. Singh (2016) the teacher is the center of attention in classroom learning that truly empowers classroom management, so the practicality of learning can be seen from the teacher's ability to implement learning. The achievement of this excellent category is because the teacher is used to the learning process using the POGIL model that has been developed by researchers so that they can manage the learning process well. The use of contextual models also affects the course of the learning process, because students are faced with problems of daily life that make students become challenged to find solutions. The responses of students to learning are presented in Table 4.

Table 4: Students response *field test*

No	Assessment Aspect	VIII C	VIII D
		Score (%)	Score (%)
1.	Learning process uses fun lesson plan	84	87
2.	Learning process uses lesson plan which can simplify the material	92	89
3.	Learning uses motivating lesson plan instrument to think critically	83	84
4.	The learning process uses lesson plan instrument which simplifies concept relation among skeleton, muscles, and simple machine topic	84	85
5.	Learning uses challenging lesson plan instrument	83	83
6.	The practicum and group discussion with guided inquiry model give chance to think critically	80	81
7.	Cooperation among partners with guided inquiry model makes students think	88	88

	critically so they can learn towards each other.		
8.	Lesson plan instrument with guided inquiry model helps to train critical thinking skill in doing experiment based on problems	84	86
9.	Learning process uses lesson plan instrument which supports contributing various ideas so that the critical thinking skill is trained	81	83
10.	Learning process uses effective lesson plan instrument	83	83

The practicality of learning devices is also determined based on students' responses to the learning process. The practicality of the lesson planto the responses of students in the test field test class VIII C and class VIII D responses of students on all aspects stated a positive response. Overall, the attitude of students to learning using the POGIL model to train critical thinking skills has been classified as positive. Students succeed to receive, digest, process, and express opinions related to the material presented. Students consider the learning process that takes place is a new thing and can help students in learning. This is in line with Anam (2015) which states that students' responses must be interpreted as an indication that the learning process is going well. Hosnan (2014) states that the positive attitude of students to the learning process includes the atmosphere of learning, strategy, methodology, and learning techniques used to foster students' learning motivation so that they can achieve maximum learning outcomes. Based on the explanation as a whole, it can be concluded that the learning devices developed have achieved practicality, thus fulfilling the feasibility of developing devices.

4. Conclusion

The research developed was carried out to answer the objectives and problems in this study, from the results of the research that has been conducted, it was concluded that learning devices using the POGIL model were valid and practical. The developed learning plan instrument is categorized as valid based on the results of the validity of 5 experts and the feasibility test of materials and students workbook. The practical learning plan developed in the very good category in the implementation of the stages implemented is learning using the POGIL model seen from the implementation of lessons during the learning process observed with the lesson plan implementation sheet.

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