Validation and Reliability of Strategy Instrument Test the Firing Line with Process Oriented Guided Inquiry Learning Modified (POGIL) on Problem Solving Abilities and Mathematical Representation of Junior High School Students

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Abstract. The purpose of this study was to find out the validation and reliability of strategy instrument test The Firing Line with Process Oriented Guided Inquiry Learning (POGIL) Modified on the solving ability of junior high school students. The subjects of this study were 4 experts. The instruments used are RPP, LKPD, about problem solving abilities and mathematical representations. The results of the expert test using the Aiken's Validation formula concluded that RPP 0.922, LKPD 0.924, problem solving questions 0.893, mathematical representation questions 0.896, while reliability using Anava Hoyt showed RPP 0.710, LKPD 0.730, problem solving questions 0.720, and mathematical representation instruments 0.752 with reliable interpretation tall. This shows that the results of the expert's assessment of the RPP, LKPD, problem solving and representation instruments are feasible to use.

Keywords: Validation and reliability · test of the firing line with process oriented guided inquiry learning modified · problem solving abilities · mathematical representation

1 Introduction

Students' mathematical problem solving abilities are still weak, it is suspected that students' understanding abilities are not good and problem solving in the learning process at school has not been used as the main activity. Learning activities should be carried out by starting with presenting a problem to generate problems (Students with low abilities, do not make plans before doing it (Hanifah, 2020). According to Kusumawati in the results of her research, explaining that in learning mathematics in class, the emphasis of learning is still on problem solving skills. through the provision of the formula, giving examples, and exercises, so that students are trained as mechanics (Aprisda et al., 2019).

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In addition to problem-solving ability, ability representation is crucial owned by students being able to facilitate students to learn mathematics (Triono, 2017).

The ability Mathematical representation is one of the general goals of learning mathematics in schools. This ability is important for students and is related to communication and problem solving skills. To be able to communicate something, one needs to represent in the form of pictures, diagrams, graphs, and representations. other presentations. With representation, problems that initially look difficult and complicated can become easy and simple, so that the problems presented can be solved more easily (Efendi, 2012).

One of the learning models that can be used to improve or develop students' problem solving and representation skills is the learning model *Process Oriented Guided Inquiry Learning* (POGIL). The effectiveness of the POGIL Learning Model with LKPD-Assisted Ethnomathematics on Mathematical Communication Ability of students is better and achieves classical completeness, which is 82.35% of students (Farda et al., 2017). POGIL model learning strategy *Learning Starts With a Question* (LSQ) To improve students' creative thinking skills there is an increase in ability of 0.73 (high) (Noor & Masrukan, 2014). Meanwhile (Barthlow, 2011) states that the activities in *Process Oriented Guided Inquiry Learning* (POGIL) focus on the concept of content and science processes to encourage a deep understanding of the material and develop higher-order thinking skills. *Process Oriented Guided Inquiry Learning* (POGIL) emphasizes cooperative learning, students work in teams, design activities to build cognitive abilities (*conceptual understanding*), and develop skills during the learning process such as science processes, thinking skills, *problem solving*, skills communication, management, building positive social attitudes and self-assessment skills that can develop metacognitive knowledge. According to (Aprisda et al., 2019), improving the mathematical problem solving ability of high school students through the modified POGIL model was significantly higher than students who received learning with a scientific approach.

In addition to learning models, in learning mathematics we need a strategy that can make the learning atmosphere more interesting and invite students to be actively involved in learning, and make students happy in the teaching process, so that each student can solve problems and be more actively involved in the learning process. (Rahmawati, 2017). One strategy that can be used to improve problem solving skills is strategy *The Firing Line.*

Strategy *The Firing Line* is a strategy of learning by rapid movements that can be used to respond quickly to questions posed. Through the questions given between these, the learning carried out becomes interactive learning and builds collaboration between students (Silberman, 2016). With these questions, the learning process will be active so that students can develop problem-solving skills from the questions that have been given.

The instrument is a tool used to obtain data in a study, the instrument in this study was arranged in the form of a problem solving test and mathematical representation. The instrument used in this study is an instrument that meets the criteria for a good test, namely meeting the criteria for a valid test, a good level of test reliability, difficulty level and appropriate discriminating power.

Based on this, the researcher intends to conduct research on the validation and reliability of strategy instrument test *the firing line* with *process oriented guided inquiry learning* modified (POGIL) on problem solving abilities and mathematical representation of junior high school students.

2 Method

Problem solving ability and mathematical representation for the expert team test (panelist test) using the Aiken formula (1980) as follows:

$$V = \frac{\sum n_i |i - r|}{N(t-1)} \text{ (Sugiyono, 2017)} \quad (1)$$

Description:

V = Validity Index
Rating scale: from r to t
i = from r + 1 to r + t − 1
n_i = many values on i

$$N = \sum n_i \quad (2)$$

The value of V between 0 and 1 (is said to be valid if the value of V ≥ 0, 6).
Calculate reability by using ANOVA formula Hoyt (Sugiyono, 2017), namely the:

Sum of squares total $JKT = \sum X_{ij}^2 - \frac{(\sum X_T)^2}{bk}$.
Sum of squares panelist $JKP = \sum \frac{\sum X_p^2}{b} - \frac{(\sum X_T)^2}{bk}$.
Error sum of squares $JKB = \sum \frac{\sum X_b^2}{p} - \frac{(\sum X_T)^2}{bk}$.
Sum of squares panelists JKE = JKT − JKP − JKB.
Total squared point $RK_b = \frac{JKB}{b-1}$.
Error sum of squares = $RK_e = \frac{JKE}{(p-1)(b-1)}$.
Koefisien ICC = $\frac{RK\ B - RKE}{RK\ B + (p-1)(RKE)}$ (Sugiyono, 2017)

Keterangan:
ICC = Koefisien ICC
RK_b = Average grain kuadrad $RK_b = \frac{JKB}{b-1}$.
RK_e = Squares error average $RK_e = \frac{JKE}{(p-1)(b-1)}$
p = Number of panellist

3 Result and Discussion

Expert validation test using 4 experts, namely lecturers from Postgraduate Mathematics Education UNIB Bengkulu, namely Dr. Zamzaili, M.Pd, S1 Mathematics Education lecturer at UIN Raden Intan Lampung, namely Mr. Suherman, M.Pd and Mathematics teacher at SMP Negeri 2 Lahat, namely Mr. Ramlan Effendi, M.Pd and Mr. H. Firdaus, M.Pd. The instrument was validated and declared eligible or not.

The results of the problem-solving ability test questions and mathematical representations were declared worthy to be used as tests for students, although there were slight improvements in the sentence questions (Table 1).

The results of the analysis of the analysis of the analysis of the lesson plans, worksheets, problem solving ability instruments and mathematical representations in this study used a panelist test with the Aiken and Anava Hoyt formula is shown in Table 2.

This shows that the results of the expert's assessment of the RPP, LKPD, problem solving instruments and mathematical representation ability instruments and can be trusted so that the RPP, LKPD, mathematical representation ability instruments that have been compiled can be used.

Table 1. Comments/Suggestions Validator Regarding Research Instruments

Validator	Comments/Suggestions
First	Improve the correctness of the discussion and writing more clarified question orders
Second	Explained again the writing of the RPP in the Application and Recording stages. Writing error fixed
Third	Adjust the KD in each LKPD and RPP.
Fourth	Instructions are clarified so that students better understand each step of the firing line strategy with a *Process Oriented Guided Inquiry Learning* modified (POGIL)

Table 2. Results of Instrument Validation by the Expert Team

No	Aspects	Validity	Reliability	Description
1.	RPP strategy *The Firing Line* with *Process Oriented Guided Inquiry Learning* (POGIL) modified	0,922	0,710	VALID
2.	Conventional RPP	0,907	0,705	VALID
3.	LKPD strategy *The Firing Line* with *Process Oriented Guided Inquiry Learning* (POGIL) modified	0,924	0,730	VALID
4.	Conventional LKPD	0,910	0,721	VALID
5.	Problem Solving Instruments	0,893	0,720	VALID
6.	Mathematical Representation Instruments	0,896	0,752	VALID

4 Conclusion

Based on the results and discussion, The results of the expert test using the Aiken's Validation formula concluded that RPP 0.922, LKPD 0.924, problem solving question 0,893, mathematical representation questions 0,896, while reliability using Anava Hoyt showed RPP 0,710, LKPD 0,730, problem solving questions 0,720, and mathematical representation instruments 0,750 with reliable interpretation tall. This shows that the results of the expert's assessment of the RPP, LKPD, problem-solving and representation instruments are feasible to use.

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