



VALIDITY OF SCIENCE PROCESS SKILLS TEST INSTRUMENT FOR PROSPECTIVE MI/SD TEACHER STUDENTS IN SCIENCE LEARNING

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Abstract

Validity refers to the degree or level of accuracy of a research instrument used to measure a variable and serves as an essential component in the development of instruments. This study aims to determine the construct and content validity of the science process skills (SPS) test instrument for the Science Learning course in the MI/SD Teacher Education Program at the State Islamic University of Sheikh Ali Hasan Ahmad Addary, Padangsidempuan. The research method employed is a descriptive quantitative-qualitative approach, with data collected using observation sheets for the assessment of the SPS test instrument by two validators. The data from the validators' assessments were analyzed using Gregory's Test formula to determine the instrument's validity level. The results show that 13 SPS test items received validator assessments in the range of scores 3-4, categorized as highly relevant, with an overall validity score of 1 (one). Therefore, it can be concluded that the 13 test items of the science process skills instrument on the topic of temperature and heat possess a very high level of validity.

Keywords: *Validity; KPS Test Instrument; Science Learning; Prospective MI/SD Teacher Students.*

Abstrak

Validitas merujuk pada derajat atau tingkat kesahihan instrumen penelitian yang digunakan untuk mengukur suatu variabel serta menjadi bagian penting dalam pengembangan instrumen. Penelitian ini bertujuan untuk menentukan validitas konstruk dan isi instrumen tes keterampilan proses sains (KPS) pada matakuliah Pembelajaran IPA MI/SD Program Studi Pendidikan Guru Madrasah Ibtidaiyah Universitas Islam Negeri Syekh Ali Hasan Ahmad Addary Padangsidempuan. Metode penelitian yang digunakan adalah metode deskriptif kuantitatif-kualitatif melalui pengumpulan data menggunakan lembar observasi penilaian instrumen tes KPS yang dilakukan oleh dua validator. Data hasil penilaian validator dianalisis menggunakan rumus Uji Gregory untuk menentukan tingkat validitas instrumen. Hasil penelitian menunjukkan bahwa sebanyak 13 butir soal tes KP memperoleh penilaian validator pada rentang skor 3-4 kategori sangat relevan dengan perolehan nilai validitas keseluruhan sebesar 1 (satu). Dengan demikian, dapat disimpulkan bahwa 13 butir soal instrumen tes keterampilan proses sains pada materi suhu dan kalor yang memiliki tingkat validitas sangat tinggi.

Kata kunci: *Validitas; Instrumen Tes KPS; Pembelajaran IPA; Mahasiswa Calon Guru MI/SD.*

INTRODUCTION

Natural Sciences (IPA) is one of the fields of study that plays an important role in building scientific literacy and critical thinking skills in students. At the elementary school level, IPA is taught not only to convey concepts-scientific concepts, but also to develop science process skills (SPS). SPS includes abilities such as observing, classifying, interpreting data, formulating hypotheses, and conducting experiments. These abilities are not only relevant to understanding science conceptually but also to building scientific thinking skills needed in everyday life (Bybee, 2018). Prospective MI/SD teacher students are expected not only to have mastery of science content, but also to be able to integrate SPS in the learning process. This is important because teachers have a strategic role in shaping students' inquiry-based learning experiences. Therefore, mastery of SPS is one of the competencies that must be developed during the education period of prospective teachers. In this context, a valid and reliable instrument is needed to measure the extent to which prospective teachers have mastered these skills (Fraenkel et al., 2019).

A valid KPS test instrument can provide an accurate picture of students' abilities and be the basis for designing appropriate learning interventions. Instrument validity involves several aspects, including content validity, construct validity, and empirical validity. Content validity ensures that each item in the instrument comprehensively represents the KPS domain, while construct validity tests the extent to which the instrument is able to measure the intended concept. In addition, empirical validity is carried out through quantitative data analysis to confirm the reliability of the measurement results (Cohen et al., 2018).

However, the main challenge in developing the KPS test instrument is ensuring that the instrument is in accordance with the characteristics of prospective MI/SD teacher students. Science learning at the MI/SD level has its own characteristics, because it must consider the cognitive development aspects of elementary school children. Prospective teacher students must be able to adjust the scientific-based learning approach to the level of understanding of their students.

This makes measuring KPS in prospective teacher students more complex than measuring at other levels (Holbrook & Rannikmae, 2019). Previous research has shown that most of the available KPS test instruments are designed for high school students or college students at pure science study program. The instrument is less relevant for use on prospective MI/SD teacher students who have different backgrounds, needs and learning contexts. Nugroho et al. (2021) found that the adaptation of the KPS instrument for prospective MI/SD teacher students was still minimal, so the validity of the instrument became a question that had not been answered properly.

In addition, the development of the KPS test instrument must also consider the context of inquiry-based learning which is one of the main approaches in science learning. This approach emphasizes the active participation of students in exploring natural phenomena, formulating questions, and finding solutions through investigation. Therefore, the instrument developed must reflect these abilities and be able to measure the scientific thinking process in depth (Bybee, 2018). The validity of the instrument is also closely related to the data analysis method used in its development. Quantitative analysis, such as exploratory and confirmatory factor analysis, is an approach that is often used to test construct validity. In addition, reliability testing is needed to ensure the consistency of measurement results. The combination of qualitative and quantitative approaches can provide more comprehensive results in testing the validity of the instrument (Fraenkel et al., 2019).

This study focuses on the development and validity testing of the KPS test instrument, specifically designed for prospective MI/SD teacher students in science learning. The process of developing this instrument involves a literature review, needs analysis, and validation by experts in the field of science education. In addition, empirical testing was carried out to confirm the validity and reliability of the instrument using quantitative data processed through modern statistical tools (Nugroho et al., 2021). With a valid KPS test instrument, it is hoped that universities can be more effective in developing the competencies of prospective MI/SD teacher

students. This instrument is not only an evaluation tool, but can also be used to design more innovative learning strategies.

The results of this study are expected to contribute to improving the quality of science learning at the elementary education level while also supporting the development of professionalism of prospective MI/SD teachers (Holbrook & Rannikmae, 2019). Overall, this study offers a new perspective in developing relevant KPS test instruments for prospective MI/SD teacher students. With a comprehensive validity-based approach, this study not only enriches the literature on KPS measurement but also provides practical implications for improving the quality of science education in Indonesia.

RESEARCH METHOD

This research was conducted using a descriptive quantitative-qualitative method. This is based on the flow and process of the research carried out where symptoms, facts, events or incidents that are currently or have occurred are described through quantitative and qualitative data processing and analysis. This study aims to describe the level of validity of the science process skills (KPS) test instrument in the MI/SD Science Learning course, Elementary School Madrasah Teacher Education Study Program, Syekh Ali Hasan Ahmad Addary, Padangsidempuan State Islamic University. The validators or experts who assessed the KPS test instrument in this study were two external lecturers from other universities. The selection of this validator was based on expertise in the fields of Science Education, grammar and curriculum of each (Isa & Azid, 2022).

The research instrument used was a non-test, namely an observation sheet for assessing KPS test questions on the learning material of temperature and heat in the form of multiple-choice questions totaling 13 questions. The observation sheet for assessing KPS test questions contains four assessment aspects for each question item that will be assessed by each validator, namely a) the suitability between the material, type of KPS, question indicators, questions and answer keys, b) the suitability of question statements with good and correct EYD, c) the suitability of

questions with answers and assessment guideline rubrics, and d) the suitability of assessments to aspects of science process skills.

The research data analysis technique uses descriptive statistics to determine the average expert assessment score for each question item. Descriptive statistical analysis in this study conducted using Microsoft Excel application to analyze the data of KPS test instrument assessment observation sheet conducted by validator related to the suitability between material, construction, language and science process skill indicators. Furthermore, Gregory Test is conducted to calculate the validity value of construct and content of the KPS test instrument in order to determine the level of validity of the test instrument assessed by both validators as a whole.

RESULTS AND DISCUSSION

The test instrument validated in this study was a multiple-choice science process skills (KPS) test item consisting of 13 questions arranged based on KPS indicators according to Rustaman (2007). The expert validity assessment sheet related to the suitability of the material, construction, language and KPS indicators consisted of four assessment aspects, namely: a) suitability between the material, KPS type, question indicators, questions and answer keys, b) suitability of question statements with good and correct EYD, c) suitability of questions with answers and assessment guideline rubrics, d) suitability of assessment to aspects of science process skills. Furthermore, the scoring of KPS questions for each aspect was given by the validator with the options (4) very relevant, (3) quite relevant, (2) less relevant, and (1) not relevant (Retnawati, 2016). The data from the validator's assessment results for each KPS question item are presented in table 1.

Table 1. Validator Assessment Result Data for Each KPS Question Item

Item	Validator Assessment I						Evaluation Validator II					
	a	b	c	d	Total	Average	a	b	c	d	Total	Average
1	3	4	3	3	13	3.25	4	3	4	4	15	3.75
2	3	3	3	4	13	3.25	3	4	4	4	15	3.75
3	4	3	3	3	13	3.25	3	4	3	3	13	3.25
4	3	3	4	4	14	3.50	4	3	3	4	14	3.50
5	3	4	3	3	13	3.25	3	3	4	4	14	3.50
6	4	3	3	4	14	3.50	3	4	3	4	14	3.50
7	3	4	3	3	13	3.25	3	3	4	3	13	3.25
8	3	3	4	3	13	3.25	4	3	3	4	14	3.50
9	3	3	3	4	13	3.25	3	3	4	3	13	3.25
10	4	3	3	4	14	3.50	3	4	3	4	14	3.50
11	3	3	4	3	13	3.25	4	4	3	4	15	3.75
12	4	3	3	3	13	3.25	3	3	4	4	14	3.50
13	4	3	4	3	14	3.50	3	4	4	4	15	3.75

Based on Table 1, the assessment by both validators for each question item is in the score range of 3 and 4. For the assessment of validator I, there were nine questions that obtained an average score of 3.25 and four questions with an average score of 3.50. While the assessment of validator II, there were three questions that obtained an average score of 3.25 and six questions with an average score of 3.50 and four questions with an average score of 3.75.

Furthermore, the validator assessment data is used to group the data using the Gregory Test which consists of two categories, namely relevant and irrelevant (Gregory, 2007). The validator assessment classification data for each KPS question item can be seen in Table 2.

**Table 2. Classification of Validator Assessment for Each KPS
Question Item with TestGregory Validator IValidator II**

Validator I		Validator II	
No- Relevant (scor 1-2)	Relevant (scor 3-4)	No- Relevant (scor 1-2)	Relevant (scor 3-4)
-	1,2,3,4,5,6,7,8, 9,10, 11, 12, 13	-	1,2,3,4,5,6,7,8, 9,10, 11, 12, 13

Based on Table 2, the assessment of the two validators shows that all KPS questions are in the relevant category with a score range of 3-4. This means that all questions have a high level of validity or are very valid. Furthermore, a validity analysis was carried out by the expert by entering it into a 2x2 cross tabulation column as shown in Table 3 below.

Table 3. Tabulation of Expert Assessment for Each Question Item

Validation Assessment Tabulation		Expert I	
		Not Relevant (scor 1-2)	Relevant (scor 3-4)
Expert II	Not Relevant (skor 1-2)	A 0	B 0
	Relevant (scor 3-4)	C 0	D 26

Based on Table 2, a validity analysis was then carried out by 2 experts using the Gregory Test formula (Larasati & Syamsurizal, 2022). The results of the expert validity calculations using this formula are as follows:

$$V = \frac{D}{(A + B + C + D)}$$

$$V = \frac{26}{(0 + 0 + 0 + 26)}$$

$$V = 1$$

Information:

V = Construct Validity

A = Both raters disagree (Weak-Weak)

B = Rater 1 agrees, rater 2 disagrees (Strong-Weak)

C = Rater 1 disagrees, rater 2 agrees (Weak-Strong)

D = Both raters agree (Strong-Strong)

Determination of criteria in the validity of the content of a test instrument includes, 1) 0.8-1 = Very high validity, 2) 0.6-0.79 = High validity, 3) 0.40-0.59 = Moderate validity, 4) 0.20-0.39 = Low validity and 5) 0.0-0.19 = Very low validity. Based on the data in Table 3, it shows that there is no category of weak-weak, weak-strong, or strong-weak questions. Among the 13 questions validated by both validators, they gave a score with a strong-strong category, so that by using the Gregory Test formula, the validity results were obtained with 26/26, which is 1. Thus, the validity value obtained is 1 shows that the validity criteria of the science process skills (KPS) test instrument assessed by the two experts are very high.

CONCLUSION

Based on the presentation of the research results and discussions that have been described, it can be concluded that there are 13 questions on the science process skills test instrument on the material of temperature and heat that have a very high level of validity. This is based on the results of the analysis of assessment data by two validators using the Gregory Test to determine the validity of the content of the science process skills test instrument with a validity value or score of one (1).

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