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Validity and Reliability Test of Teaching Materials Using Aiken's V Formula and SPSS 22

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ABSTRAK

Berdasarkan hasil PISA tahun 2018, Indonesia mengalami penurunan dibandingkan dengan PISA tahun 2015. Rendahnya kemampuan dalam memecahkan masalah disebabkan oleh beberapa faktor yang salah satunya proses pembelajaran yang dilakukan disekolah. Pemecahan masalah yang digunakan dalam pembelajaran membuat peserta didik mengkontruksi pengetahuannya dan mengambil peran dalam perolehan pengetahuan. Peneliti akan mengembangkan bahan ajar berbasis kontekstual learning untuk meningkatkan ketrampilan pemecahan masalah pada mupel IPAS kelas V sekolah dasar dengan melakukan validasi butir-butir instrument penyusunan bahan ajar. Penelitian ini menggunakan pendekatan kuantitatif, berbentuk data statistik. Proses perhitungan dalam menentukan kevalidan instrumen menggunakan Aiken's V dan untuk menguji reliabilitas bahan ajar menggunakan SPSS 22. Penelitian dilakukan dengan membagikan angket validasi terhadap bahan ajar kepada 5 validator sebagai responden. Berdasarkan hasil analisis uji validasi isi dengan mempertimbangkan nilai ketetapan pengkategorian yang ditunjukkan pada Tabel Aiken's V dengan nilai koefisien 0,870 menunjukkan pada angka 0,95. Sedangkan hasil reliabilitas data menunjukkan yaitu r = 0.907 dengan r Tabel 0,878. Bahan ajar tersebut dinyatakan valid dan reliabel sehingga layak di gunakan.

Kata Kunci: Validitas; Reliabilitas; Bahan Ajar; Aiken's V; dan *SPSS 22.*

ABSTRACT

Based on the results of PISA in 2018, Indonesia experienced a decline compared to PISA in 2015. The low ability to solve problems was caused by several factors, one of which was the learning process carried out in schools. Problem solving used in learning makes students construct their knowledge and take a role in acquiring knowledge. Researchers will develop contextual learning-based teaching materials to improve problem solving skills in grade V elementary school science students by validating the items on the instrument for preparing teaching materials. This research uses a quantitative approach, in the form of statistical data. The calculation process in determining the validity of the instrument uses Aiken's V and to test the reliability of teaching materials using SPSS 22. The research was carried out by distributing validation questionnaires for teaching materials to 5 validators as respondents. Based on the results of the content validation test analysis taking into account the categorization determination values shown in the Aiken's V Table with a coefficient value of 0.87 showing at 0.95. Meanwhile, the data reliability results show that r = 0.902 with r table 0.878. These teaching materials are declared valid and reliable so they are suitable for use.

Keywords: Validity; Reliability; Teaching Materials; Aiken's V; and SPSS 22.

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INTRODUCTION

In the 21st century, it has an influence on science and technology. One of the impacts of technological advances can be seen in the field of education. Technology as a source of information, developing creative ideas, and as a means of improvising scientific fields. Greenstein in Astuti, N. H., Rusilowati, A., Subali, B., & Marwoto, P. (2020) states that 21st century skills include: Thinking, Acting, and Living in the World. Thinking includes: critical thinking, problem solving, creating, and metacognition. Acting: communication, collaboration, technological literacy, initiative and digital literacy. The 21st century requires several preparations, one of the preparations that students need to prepare is problem-solving skills.

According to Branca in Nurul Fatima Zahro (2022), problem solving skills are very important for every student to have because problem solving is a general goal of teaching. Developing students' problem solving abilities is very important considering that problem solving abilities are still relatively low. This is proven by the results of the Programmer for International Student Assessment (PISA) study.

PISA is a program used to measure the level of learning competency of students globally. Based on the latest PISA Indonesia results released in 2018, there was a decrease compared to PISA in 2015. The results of this study can be input for continuing to develop new strategies, especially to improve solving abilities. The low ability to solve is caused by several factors, one of which is the learning process carried out at school. There are still many teacher-centered learning processes, where the teacher always dominates the class. The learning process in the classroom which is lacking in improving the ability to think at a higher level is also the cause of low problem solving abilities. (Yulianti, D., & Airlanda, G. S. , 2022)

In Oktiningrum, W., & Wardhani, D. A. P. (2019) stated that IPAS problem solving ability is a process of eliminating differences or discrepancies that occur between the results obtained and the desired results. However, students' science problem solving abilities are still low, this can be seen from the ability of those who experience difficulties when studying ecosystem material. This is because teachers still use conventional learning methods, and participants are not faced with concrete problems, because the problems given by students are not complex, monotonous, and lack variety.

Seeing these problems, a teacher should train students in science problem solving skills from an early age. This can be done by presenting concrete problems with contextual learning, where students can understand concepts based on the results of their observations in their own environment. Students can train and develop their science problem solving abilities in the learning process. Problem solving used in learning can also enable students to construct their knowledge and take a role in acquiring knowledge. In this case, researchers will develop contextual learning-based teaching materials to improve problem-solving abilities in science students in class V of elementary schools.

In research in the field of education, the term valid cannot be separated from the instrument items in compiling teaching materials. Instrument validity is wanting to know how the measurement tool can be said to be accurate in measuring what it wants to measure. Ayu Dessy Sugiharni, G., Wayan Setiasih (2018) stated that the validity of instrument items is a determinant of success or accuracy in the process of measuring objects studied in the education sector. An instrument can be said to be good if it has gone through a validity test and the data is declared valid. Valid means that the instrument can be used correctly to measure the object to be measured with the measurement results accurately reflecting the characteristics of the object.

Ifada Novikasari 2016 National Seminar on Innovative Research explained the validity of the content provided to experts. Validity checking can be carried out by several validators who are competent in their fields. Validator selection aims to understand the scope, content and objectives of your research study. For example, in educational research, expert validators/experienced lecturers are selected who know the truth of the concepts, pedagogy and educational paradigms being applied.

Apart from testing validity, the teaching materials also need to be tested for reliability. In Janna, N. M., & Herianto. (2021) reliability is a measuring tool that can be trusted or relied upon. Reliability testing can be used to determine the consistency of measuring instruments. A measuring instrument is said to be reliable if it produces the same results even if the measurement is carried out several times.

Based on these needs, it is necessary to carry out an appropriate calculation process in determining the validity of the instrument using several formulas, including using the Aiken's V formula. This approach refers to Aiken's (1994) proposal in Suhardi, I. (2022) which aims to measure the validity rating

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of each question items. Aiken formulated the Aiken's V formula to calculate the content-validity coefficient which is based on the assessment results of an expert panel of n people on an item in terms of the extent to which the item represents the construct being measured. The value of the V coefficient lies between 0 and 1.

$$V = \sum S/(n(c-1)), \text{ with } s = r - l_o$$

V = content validity index
r = rating given by the assessor
lo = lowest assessment rating
n = amount of raters/validators
c = amount of rating categories

In simpler terms, the categories for determining item validity based on Aiken's V content validity values are:

Table 1 Validation Rating of Aiken's V Formula

No. of Items (m) or Raters (n)	Number of Rating Categories (c)											
	2		3		4		5		6		7	
	V	p	V	p	V	p	V	p	V	p	V	p
2							1.00	.040	1.00	.028	1.00	.020
3							1.00	.008	1.00	.005	1.00	.003
3			1.00	.037	1.00	.016	.92	.032	.87	.046	.89	.029
4					1.00	.004	.94	.008	.95	.004	.92	.006
4			1.00	.012	.92	.020	.88	.024	.85	.027	.83	.029
5			1.00	.004	.93	.006	.90	.007	.88	.007	.87	.007
5	1.00	.031	.90	.025	.87	.021	.80	.040	.80	.032	.77	.047

The item score is classified as valid, if the results of the analysis show that each question given has shown a value above V table, which is in the range 0 – 1 according to the number of validators. If the data can be said to be valid, then the data can be used. Meanwhile, if it is invalid then the item is discarded/not used. So it is necessary to re-study and even re-create items for each aspect of the evaluation with in-depth analysis and validation of the material content.

Reliability calculations in this research use the Product Moment Correlation formula with the help of SPSS 22 for Windows. In Ardyani, W., Nugroho, A. A., & Shodiqin, A. (2020) data from the validation of instrument items were analyzed by calculating the reliability test $h \geq r\ t$ using the Alpha Cronbach formula assisted by the SPSS 22 for Windows program, namely, if the Alpha value > r table then it can be said that the instrument meets the reliability test.

Table 2 r Table

N	The Level of Significance	
	5%	1%
3	0.997	0.999
4	0.950	0.990
5	0.878	0.959

RESEARCH METHODS

This research uses a quantitative approach, in the form of statistical data. In Ardyani, W., Nugroho, A. A., & Shodiqin, A. (2020) explains that quantitative research approaches in the form of statistics are used to determine the process of calculating validity and reliability tests for the teaching material instruments that will be used.

In Icam Sutisna (2020) quantitative research is a research method based on the philosophy of positivism, objects that can be observed as targets in quantitative research, these objects can be observed

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in part (sample) or in whole (population), data collected from these objects in the form of numbers which are then analyzed using statistical calculations, from these statistical calculations you can describe an object which can be displayed in the form of a table or graph. The feasibility test of teaching materials is carried out by expert validators and analyzed by calculating the score percentage.

The research was carried out by distributing validation questionnaires for teaching materials to 5 validators as respondents. The researcher carried out a content validation test using the Aiken's V formula. The aim of the five experts in validating this instrument was to avoid ambiguity or double meaning of the statements in it and to examine each indicator used. Then, in the reliability test, researchers used the Product Moment Correlation formula with the help of SPSS 22 for Windows..

RESULTS AND DISCUSSION

Zakaria, L. M. A., Purwoko, A. A., & Hadisaputra, S. (2020) stated that teaching materials function as materials/tools to facilitate the implementation of learning so that it becomes more effective and efficient. Teaching materials are needed by educators as a guide in learning activities, including in science and science learning. Learning provides learning experiences in everyday life regarding existing concepts.

Define stage (defining)

In the product development process, at the define stage, the necessary information or data is collected. Starting from analyzing student needs, adjusting student characteristics, teacher needs, curriculum, learning outcomes and analysis of learning objectives. Based on the results of the analysis, it was concluded that the textbooks used by educators were not optimal and effective. Teachers still need a lot of development to improve learning.

Design stage (designing)

At this stage, the format and initial product design are selected. At the design stage, the format and initial product design are selected. The resulting product is in the form of teaching materials based on a contextual approach using the learning environment to improve students' problemsolving abilities.

Develop stage (developing)

At this stage, the researcher developed teaching materials based on a contextual approach to improve problem solving abilities in IPAS students which were adapted to learning outcomes and learning objectives. Then it is also equipped with a teaching module design, student worksheets (LKPD), and evaluation instruments (written tests). The results of this design are then used as draft teaching materials.

Disseminate stage (spread)

At this stage is the validation of teaching materials by validators, the results of the revision of this activity become the second draft of teaching materials. The purpose of expert validation is to determine the level of validity of the teaching materials being developed. The results of the validation analysis can be seen in Table 3.

Table 3 Content Validation Calculation Results Using Aiken's V Formula

No	STATEMENT	EXPERT					S1	S2	S3	S4	S5	∑ s	N (c-1)	V	V table	Category
		1	2	3	4	5										
1	Clarity of product title	4	4	4	3	3	3	3	3	2	2	13	15	0,87	0,87	VALID
2	Clarity of user goals or objectives	4	4	4	3	3	3	3	3	2	2	13	15	0,87	0,87	VALID
3	Clarity of study instructions	4	4	4	4	4	3	3	3	3	3	15	15	1	0,87	VALID
4	Accuracy of implementing learning strategies (independent learning)	4	4	4	4	4	3	3	3	3	3	15	15	1	0,87	VALID
5	Accuracy in explanation of	4	4	4	3	3	3	3	3	2	2	13	15	0,87	0,87	VALID

	material															
6	The attractiveness of the material in helping user understanding	4	4	4	3	4	3	3	3	2	3	14	15	0,93	0,87	VALID
7	Clarity of instructions for taking practice questions or tests	4	4	4	4	4	3	3	3	3	3	15	15	1	0,87	VALID
8	Clarity of the formulation of practice or test questions	4	4	4	4	4	3	3	3	3	3	15	15	1	0,87	VALID
9	Difficulty level of practice questions or tests	4	4	4	4	4	3	3	3	3	3	15	15	1	0,87	VALID
10	Coverage (breadth and depth of material content)	4	4	4	4	3	3	3	3	3	2	14	15	0,93	0,87	VALID
11	Clarity of material content	4	4	4	4	4	3	3	3	3	3	15	15	1	0,87	VALID
12	The structure or sequence of material content	4	4	4	4	4	3	3	3	3	3	15	15	1	0,87	VALID
13	Clarity of the language used	4	4	4	4	4	3	3	3	3	3	15	15	1	0,87	VALID
14	The series of questions presented	4	4	4	3	4	3	3	3	2	3	14	15	0,93	0,87	VALID
15	Suitability of learning outcomes	4	4	4	3	3	3	3	3	2	2	13	15	0,87	0,87	VALID
16	Suitability of learning objectives	4	4	4	3	4	3	3	3	2	3	14	15	0,93	0,87	VALID
17	Conformity of learning outcomes with product material	4	4	3	3	4	3	3	2	2	3	13	15	0,87	0,87	VALID
18	Conformity of material with the IPAS concept	4	4	4	4	4	3	3	3	3	3	15	15	1	0,87	VALID
19	Text readability	4	4	4	3	3	3	3	3	2	2	13	15	0,87	0,87	VALID
20	Type of font used	4	4	4	4	3	3	3	3	3	2	14	15	0,93	0,87	VALID
21	The text size used	4	4	4	4	4	3	3	3	3	3	15	15	1	0,87	VALID
22	Match the color of the text	4	4	4	3	4	3	3	3	2	3	14	15	0,93	0,87	VALID
23	Overall color composition	4	3	4	4	3	3	2	3	3	2	13	15	0,87	0,87	VALID
24	Layout proportions (text layout)	4	4	4	3	4	3	3	3	2	3	14	15	0,93	0,87	VALID
25	Design each page	4	4	4	3	4	3	3	3	2	3	14	15	0,93	0,87	VALID
26	Attractive front and back cover	3	4	4	4	3	2	3	3	3	2	13	15	0,87	0,87	VALID

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27	Paper quality	4	4	4	4	3	3	3	3	3	2	14	15	0,93	0,87	VALID
28	Overall appeal	4	4	4	3	4	3	3	3	2	3	14	15	0,93	0,87	VALID
29	There are principles of readiness and motivation	4	4	4	4	4	3	3	3	3	3	15	15	1	0,87	VALID
30	There is a principle of concentration of attention	4	4	4	4	4	3	3	3	3	3	15	15	1	0,87	VALID
31	There is a principle of active student participation	4	4	4	4	4	3	3	3	3	3	15	15	1	0,87	VALID
32	There is a principle of repetition	4	4	4	4	4	3	3	3	3	3	15	15	1	0,87	VALID
33	There is a feedback principle	4	4	4	4	4	3	3	3	3	3	15	15	1	0,87	VALID
Aiken's V Validity Test Average														0,95	0,87	VALID

Based on the results of the content validation test analysis of each item of the teaching material instrument by considering the value of the categorization range determination shown in Table 1, with the Aikens V coefficient value ranging from 0 - 1. The Aikens V coefficient value in the data validation table is with a number of validators of 5 is 0.870. The results of this analysis show that each statement given shows a value above V table, namely 0.95. So the data can be said to be valid.

The Aiken's V coefficient value ranges from 0 – 1 with validator 5 of 0.87. The coefficient for item 1 is 0.87; item 2 is 0.87; item 3 is 1; item 4 is 1; item 5 is 0.87; item 6 is 0.93; item 7 is 1; item 8 is 1; item 9 is 1; item 10 is 0.93; item 11 is 1; item 12 is 1; item 13 is 1; item 14 is 0.93; item 15 is 0.87; item 16 is 0.93; item 17 is 0.87; item 18 is 1; item 19 is 0.87; item 20 is 0.93; item 21 is 1; item 22 is 0.93; item 23 is 0.87; item 24 is 0.93; item 25 is 0.93; item 26 is 0.87; item 27 is 0.93; item 28 is 0.93; item 29 is 1; item 30 is 1; item 31 is 1; item 32 is 1; and item 33 is 1; This can already be considered to have sufficient content validity.

Next, the reliability test using SPSS 22 is as follows:

Case Processing Summary

		N	%
Cases	Valid	5	100.0
	Excluded[a]	0	.0
	Total	5	100.0

a. Listwise deletion based on all variables in the procedure.

Reliability Statistics

Cronbach's Alpha	N of Items
.907	33

From these data it can be concluded that the statements regarding teaching materials are said to be reliable data with the reliability of the instrument using SPSS 22.0 obtained, namely r = 0.907 with r table 0.878. Based on the results of this research, the teaching material instrument was declared reliable and suitable for use.

There are also several other researchers who also use this formula to carry out validity tests. An Nabil, N. R., Wulandari, I., Yamtinah, S., Ariani, S. R. D., & Ulfa, M. (2022) used Aiken index analysis to determine the content validity of a chemical science context-based minimum competency assessment instrument to assess the quality of the instrument. Sulistiyono, S., Suherman, W. S., Pambudi, D. K., & Martono, M. (2022) conducted research on the validity and reliability of football school management assessment instruments based on a quality management system, carried out product validation tests by several expert experts using the Aiken's V formula. Meanwhile, the research carried out by Alfiatunnisa, E., Zulfah Khairunnisa, H., Hayati, S., & Listya Maulida, V. (2022) carried out data validity and reliability tests using SPSS software to describe the analysis of the validity and reliability tests of the research instruments.

CLOSING

Based on the research results, there are several conclusions, namely the validity and reliability of the teaching material instruments which were determined through the Aiken's V validity test and reliability through SPSS 22, showing valid and reliable results. So that teaching materials based on a contextual learning approach to improve problem solving skills in grade V elementary school science students are suitable for use in the learning process.

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