

# Validity of student creativity test instruments on energy and its changes for junior high school students

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## ABSTRACT

Science subjects not only master various types of knowledge, such as facts, concepts, or principles, but are also a process of discovery. In this era, creativity has become mandatory in schools and universities. This is also mentioned in relevant research which explains that creative thinking in learning is very important, especially in science learning. Therefore, the aim of this research is to create a test that improves students' creative abilities, with special emphasis on energy and its changes, which is one of the subjects in the field of natural sciences. This research is development research (R&D) using the ADDIE model. The results of data analysis show that the test questions have quite high validity and reliability, the difficulty index shows that the test questions are in the quite good category. Furthermore, with a question reliability index ranging from  $0.69 > 0.60$  on high criteria, this test instrument can be said to produce the same results if tested at a different time or place with reliable criteria. Based on the results of the data analysis, it was concluded that the test questions developed were suitable for use with students to measure students' creative abilities in the matter of energy and its changes.

### How to cite

Hardila, D., Vebrianto R., 2024. Validity of student creativity test instruments on energy and its changes for junior high school students. *Jurnal Mangifera Edu*, 9(1), 56-63.  
<https://doi.org/10.31943/mangiferaedu.v9i1.190>.

## ARTICLE INFO

### Keywords

Creativity, Development, Physics Material, Question Instruments

### Received

March 16, 2024

### Revised

June 24, 2024

### Accepted

July 2, 2024

### Published

July 31, 2024

## INTRODUCTION

Creativity has become an educational and study imperative (Treffinger et al., 2021) and in the educational context has also generated a wealth of research from different theoretical and empirical perspectives. Based on research (Hernández-Torrano & Ibrayeva, 2020) in the last 45 years, four general main themes have been discussed in the education and creativity literature: creativity teaching and learning; correlation between creativity and psychoeducation; the role of creativity in organizations; and cognitive and affective processes that influence creativity. Based on Khayati & Bachelor Research, (2015) Through creativity, students' self-efficacy increases. Integrating creativity into education through the development of learning tools is a success and may be a promising channel for dissemination into science classrooms.

To help individuals generate unique ideas, various methods or techniques can be used, such as techniques for developing attitudes or habits of thinking that enable creativity, including: determination in making decisions, willingness to explore various options and persistence beyond the main idea. Thus, instead of waiting for inspiration to appear, students can use strategies to

proactively direct their new thinking (Eragamreddy, 2013). Science subjects not only master various knowledge such as facts, concepts or principles, but are also a process of discovery (Artinta & Fauziah, 2021). Science education emphasizes providing direct knowledge to students to improve their ability to understand the natural environment objectively. Therefore, the science learning process requires activities that emphasize students (Conradty & Bogner, 2019).

Problems in the field show that students are still less creative in the learning process (Fatma, 2021; Turmuzi et al., 2022). Therefore, it is important to foster a diverse, inclusive and supportive learning environment that maximizes the participation, strengths and potential of all students. The choice of approach to learning can also influence the learning process so that it can provide meaningful learning (Mutanaffisah et al., 2021), and to increase students' creativity, learning strategies are needed that have been prepared, schools must be facilitated with various technologies to support effective learning and efficient in line with current developments (Fahrozy et al., 2022).

According to research Yasiro et al., (2021) explains that in learning, creative thinking is very important, especially in learning natural sciences. Students must have the ability to think creatively to find or create new things that are useful for them to learn. However, brilliant students do not always have high creativity, so follow-up is needed to improve and develop these skills. Creativity is also mentioned that in an era of increasingly stringent globalization, education must improve creative thinking abilities, which are very important for thinking. high level by giving questions can help improve students' creative thinking abilities (Anditiasari et al., 2021).

Then creativity is also supported by a capable learning model. According to research (Harefa, 2020) To achieve the goal of increasing achievement, it is necessary to improve the quality of education. One way is to use a learning model that actively involves students to help the learning process become effective and interactive. Especially in science subjects, a learning model is needed that involves students directly and realistically in the learning process. According to research (Budiyono et al., 2020) with the title "The influence of implementing the Steam integrated PBL model on creative thinking abilities in terms of students' conceptual understanding" explains that creative thinking is an ability that can help students in learning in the modern era. Budiyono also explained that the implementation of the PBL model integrated with the STEAM approach had an impact on students' creative thinking abilities, based on students' understanding of concepts.

Apart from selecting the right learning approach or model to improve creative abilities, it is also necessary to develop test instruments or questions that can measure these creative abilities. According to research (Angriani et al., 2018) test instruments in learning evaluation are tools that can be used to assess or evaluate the extent to which the learning process achieves its targets. Research (Rahayu et al., 2019) adds that multiple choice, short entries, and descriptions including matching and true-false are instruments in the form of tests.

Researchers assessed student creativity in this study with four main elements. every test given to students. In this case, according to Guilford, (1973) creativity must include the following: *flexibility*; original thinking skills, fluency and detailed thinking skills (*Elaboration*). Based on the background above, researchers are interested in developing a question instrument on energy and its changes in order to increase the creativity of class VII SMPS/MTs students.

**METHOD**

This development uses research and development methods, also known as research and development (R&D). This method is used to make certain products and test how effective they are. In this research, the ADDIE model development model, which was developed by Dick and Carry, was used to design learning systems. Because of its ability to adapt to various situations and has undergone revision and evaluation at every step, the ADDIE model is still very relevant to use (Budoya et al., 2019; Kurnia et al., 2019). In addition, the ADDIE model provides an organized framework for the development of instructional interventions and evaluation and revision at each stage (Angko, 2017; Sari et al., 2019).

The ADDIE model development stage consists of (1) analysis or analysis, (2) design or design, (3) development or development, (4) application or application, and (5) evaluation or evaluation (Pradipta et al., 2020). This development research involved three experts as validators, and to determine the reliability of the questions, it was tested on 33 class VIII students. Creative ability/creativity is also a variable used in this research. Analysis begins by reviewing previous creative test developments to find problems. Furthermore, creative thinking-oriented question instruments were created using design techniques that included the competencies to be used, the formulation of indicators regarding the material based on the learning outcomes set by the Ministry of Education and Culture, and the preparation of grids and discussions about creative abilities regarding energy materials and their changes. After that, the questions that have been created are solved using the development method. The numbers from the validity tests indicate the possibility that this research is quantitative in nature.

**Table 1** Correlation coefficient of question item validity

No	Correlation coefficient	Validity criteria
1	0.800-1.00	Very tall
2	0.600-0.800	Tall
3	.400-.600	High enough
4	.200-.400	Low
5	0.00-0.200	Very low

Validity tests are carried out to assess the level of validity of an instrument or the accuracy of data collected directly from objects by researchers. To calculate this validity test, use the product moment correlation technique used by Pearson (*Pearson product moment*). The validity test on SPSS can be seen from the significance. The interpretation criteria for the validity correlation coefficient of the items are shown in table 1.

Next, differentiating power is used to show the ability of an item that differentiates between students with low ability and students with high ability. To determine the differentiating power in SPSS, it can be seen from the *Corrected item-Total Correlation value* in the reliability test.

Then the level of difficulty (*difficulty index*) is a number that shows how easy or difficult a problem is (Arikunto, 2018). The criteria for the difficulty of the questions can be seen in table 3. Analysis of the level of difficulty of the questions using SPSS.

**Table 3** Categories of difficulty level of questions

No	Coefficient	Category
1	P 0.00 – 0.30	Hard
2	P 0.31 – 0.70	Currently
3	P 0.71 – 1.00	Easy

The preparation and development of creativity instruments formulated several constructs including: 1) Fluency, 2) Flexibility, 3) Detailed thinking skills (*Elaboration*), and 4) Novelty/originality (*Originality*). Below is a data table for the instrument grid regarding creativity.

**Table 4** Instrument grid for creativity questions

<b>Creativity Components</b>	<b>Number</b>	<b>Amount</b>
Fluency	5,10,14	3
Flexibility	6,7,11,15	4
Elaboration	1,3,9,12	4
Originality	2,4,8,13	4
<b>Total</b>		<b>15</b>

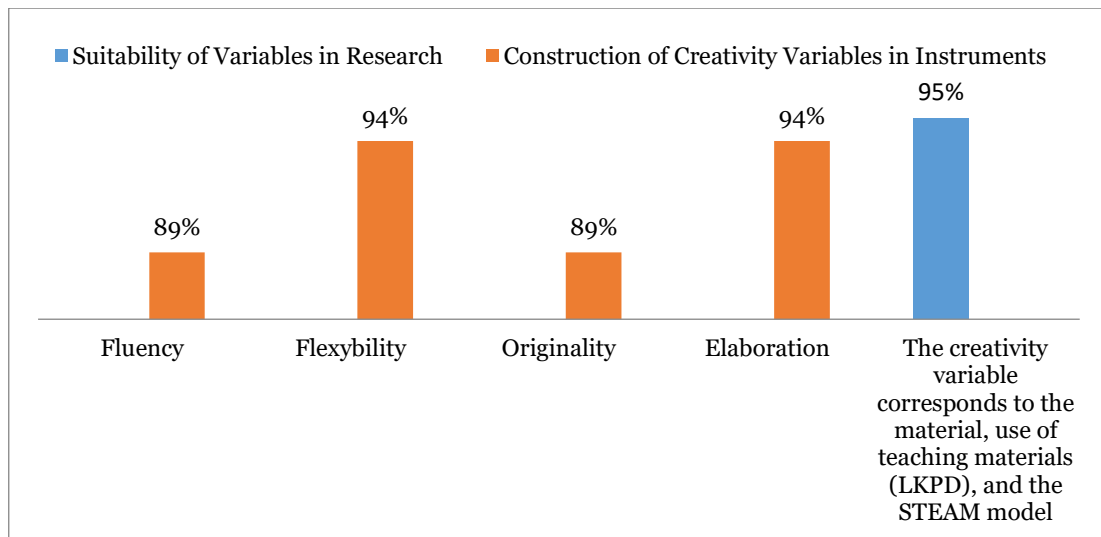
Table 4 above shows that the number of statement items is 15 items spread into four constructs. After the researcher compiled the instrument grid for each construct, the researcher then compiled the statement items using a Likert scale and validated them by experts. The next stage the researcher carried out an analysis of the question items. Analysis of question items or analysis of the level of difficulty and different strengths of questions means questions that will be given to students first. The goal of this process is to obtain quality question sections through review. This can help teachers revise or discard questions and measure students' abilities (Susetyo, 2020). In this research, questions that are valid according to experts will be given to class VIII MTs students to test their reliability.

**RESULTS AND DISCUSSION**

The instrument used in this research is test questions in the form of essays. Before the instrument is used in research, the test questions are validated first by experts to find out whether or not the questions are in accordance with the indicators of creativity. Through content validity, it can be seen whether the questions prepared are in accordance with the existing material is basic competency or not. The content validity of a question will be said to be valid if the question meets something that is measured (indicator). Content validity shows the extent to which the questions, tasks or items in a test or instrument represent the overall learning that will be achieved.

Validity testing according to research (Janna & Herianto, 2021) correlates the overall construct score with each indicator item using a significance level of 0.05. The test criteria are as follows:  $H_0$  is accepted if  $r$  calculated is greater than  $r$  table, which indicates that the instrument is valid or valid; conversely,  $H_0$  is rejected if  $r$  statistic is less than  $r$  table, which indicates that the instrument is not valid or valid. The validity test is used to mark a test instrument that is good and capable of measuring what it should measure (Solichin, 2017).

The validation questionnaire was completed by three validators on the creative ability assessment instrument. The results of this validation can be seen in Figure 1.



**Figure1.** Graphic validation of creative ability questions by experts

Furthermore, in the aspect of suitability of variables to the material, teaching materials and learning approach used in this research, the STEAM approach obtained a percentage of 95% in the valid category. During its development, this creative ability assessment instrument has undergone revisions based on the recommendations provided (Afrita & Darussyamsu, 2020). The validator suggested improving the sentence structure, adding meaning to the images in some questions and removing unnecessary statements. Questions with high quality have good validity for high or valid assessments. The average percentage value shows that the creative ability assessment instrument developed is valid in terms of material, use of teaching materials and learning approaches used in this research.

The Department of National Education stated in 2017 that the content developed must meet Basic Competencies and Indicators (Education & Culture, 2017). The percentage value obtained shows that the creative thinking ability assessment tool has been created in accordance with core competencies and basic competencies. The assessment tools created by researchers can be used to improve students' creative thinking abilities .

Reliability testing in this study used 33 class VIII students so that an  $r$ -table of  $df-N = 0.344$  was obtained. The next variable measured is 21st century skills, namely creativity. Below are presented the validity values, distinguishing power, difficulty index (IK) and reliability of the creativity instrument using ANATES.

The suitability of the question content to the subject matter and indicators are assessed for question validity (Oktanin & Sukirno, 2015). Based on table 5, it corresponds to the valid criteria, namely if the calculated  $r$  value is greater than the  $r$  table with a significance level of 0.05, then the number of valid questions in this study is 11 questions and the invalid ones are 4 questions. For the results of the calculation of the differentiating power test from the 11 questions that had been tested, the criteria for questions were low, medium and high. Based on the results of calculating the level of difficulty of the 11 questions that have been tried out, the criteria for questions are easy and medium. When the questions have valid criteria, have significant differentiating power, and have a moderate level of difficulty. then this question can be used for a post-test to measure student understanding (Lapenia & Hidayati, 2023). Discriminating power is used to show the ability of

items that differentiate students with low and high abilities. The number that indicates how easy or difficult a task is is called the difficulty index. Meanwhile, reliability aims to ensure that the test instrument provided will show the same data if it is tested to measure the same object several times (Saputri & Larasati, 2023).

**Table 5** Validity value, difficulty index, and reliability of the creativity Iinstrument

No. Question item	Corr elati on	Down Paymen t%	Interpretation (DP)	Kinderga rten%	Interpretation (IK)	Information	KR2o
1	0.530	26.67	Currently	66.67	Currently	Valid	0.69
2	0.175	11,11	Low	72.22	Easy	Invalid	
3	0.303	17.78	Low	60.00	Currently	Invalid	
4	0.558	26.67	Currently	82.22	Easy	Valid	
5	0.403	26.67	Currently	68.89	Currently	Valid	
6	0.499	24.44	Currently	83.33	Easy	Valid	
7	0.235	13.33	Low	75.56	Easy	Invalid	
8	0.485	17.78	Low	75.56	Easy	Valid	
9	0.744	42.22	Tall	74.44	Easy	Valid	
10	0.468	13.33	Low	86.67	Easy	Valid	
11	0.484	17.78	Low	82.22	Easy	Valid	
12	0.544	17.78	Low	68.89	Currently	Valid	
13	0.081	2.22	Low	74.44	Easy	Invalid	
14	0.374	13.33	Low	73.33	Easy	Valid	
15	0.444	28.89	Currently	61.11	Currently	Valid	

Furthermore, the overall reliability test results for creative skills items were 0.69 (high). An instrument has a high correlation or is reliable if the correlation figure is above 0.60 and less than 1, whereas if the correlation figure is below 0.50, then the instrument is low correlated or unreliable (Hariyanto, 2014). In other words, the creativity test instrument in this research has a high category and can be said to produce the same results if tested at different times or places with reliable criteria. Psychometric experts have set standards for good measuring tools, such as instruments. These standards are valid, reliable, standard, economical and practical (Arifin, 2017).

**CONCLUSION**

The results of the data analysis carried out showed that there were 11 out of 15 creativity questions on the subject of energy and its changes with a relatively high level of validity, and with a difficulty index and differential power that showed the test questions were in the quite good category. Furthermore, with a question reliability index ranging from 0.69 > 0.60 on high criteria, this test instrument can be said to produce the same results if tested at a different time or place with reliable criteria. Based on the results of the data analysis, it was concluded that the test questions developed were suitable for use with students to measure students' creative abilities in the matter of energy and its changes.

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