

## DEVELOPMENT OF PROBLEM-SOLVING BASED TEST INSTRUMENTS TO FOSTER THE STUDENT'S CREATIVE THINKING SKILLS ON ENVIRONMENTAL CONSERVATION

Annissa Dwi Rizkia\*, Sjaifuddin, and Dwi Indah Suryani

Department of Science Education, Faculty of Teacher Training and Education, Universitas Sultan Ageng Tirtayasa, Indonesia

\*Email: [annissadr@gmail.com](mailto:annissadr@gmail.com)

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**Abstract:** This study aims to obtain data on the feasibility of problem-solving-based test instruments to foster the creative thinking skills of junior high school students on environmental conservation. The method used in this study is Research & Development (R&D) with development procedures according to Sugiyono. This study was conducted in 5 stages: potentials and problems, data collection, product design, design validation, and design revision. The instrument used in this development research is a question validation sheet of material experts, evaluation experts, and expert practitioners. The results showed that based on the assessments of content experts, evaluation experts, and practitioners, scores of 88.4%, 88.6%, and 89.9% were obtained, which were classified in the "Very Feasible" category, respectively. In conclusion, the overall validation of the problem-solving-based test instrument received a score of 88.9%, which belongs to the "Very Feasible" category, so the test instrument can be used as an alternative tool for evaluating science learning for junior high school students with several revisions.

**Keywords:** *Problem-Solving Based Test Instruments, Creative Thinking Ability, Environmental Conservation*

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### INTRODUCTION

Along with the development of science and technology, changes will continue to occur in various fields, so in the 21st century students must improve higher-order thinking skills to adapt to the changes in mental attitudes, knowledge, and skills. One of the higher-order thinking skills is the ability to think creatively [1-2]. Creative thinking skills, especially creativity in the context of problem-solving, are very much needed for students in the current era of globalization. Problem-solving is related to how students can solve problems faced in learning because they always find issues in their life [3-4]. Therefore, everyone, especially students, just not only has problem-solving skills, but students need to train and instill creative thinking skills so that students can solve problems creatively [5]. The importance of incorporating creative thinking skills into the education system is reflected in the educational goals contained in the 2013 curriculum, through strengthening integrated attitudes, skills, and knowledge that can produce Indonesian people who are productive, creative, innovative, and effective [6]. One of the tools that can be used to develop students' creative thinking skills among junior high school students is a test instrument. Apart from being an evaluation tool, the instrument has a role in achieving learning objectives [7].

Based on interviews with three junior high school science teachers and Serang regency, the teachers used 1 to 2 indicators of creative thinking skills like fluency and flexibility, so using indicators in school for creative thinking skills was not optimal. So it can impact students in answering less specific questions or not following the question. When the teacher asks questions, students become passive. There are only a few students who dare to give their

opinion. In addition, when the teacher asks questions different from the examples given, students are already confused in answering the questions. That is because students only memorize or remember the way the teacher has given. When given an example problem, the answers provided by students are less diverse and less creative. Generally, students answer from books, so they do not use their language. It is also known that in evaluating learning, the teacher has applied questions to measure critical thinking skills so that students should have the ability to reason logically. In assessing cognitive aspects of science subjects, it is known that teachers have not used the concept of integration.

The ability to think critically and creatively has a close relationship or is interconnected in producing a practical thought in solving a problem [8]. The ability to think creatively has indicators including problems in fluency (fluency, reducing many ideas), flexibility (flexibility, changing perspectives quickly), originality (originality, compiling something new), and elaboration (developing other ideas from an idea) [9]. Creative thinking skills can be applied in the form of problem-solving. Problem-solving is built by material concepts and methods or steps that play an essential role in solving problems. Through problem-solving-based test instruments, students solving problems can have more than one answer. That's how the solution is taken. There are different ways to solve a problem to be able to produce the correct solution, so it is not only limited to remembering or recalling tasks [10-11]. A question called a "problem" contains at least two things, namely, the question is challenging the mind (challenge), and the question is not automatically known how to solve it (non-routine) [4]. According to Silver (1997), the following table shows the

relationship between creative thinking and problem-solving components.

Table 1. The Relationship of Creative Thinking Indicators Using Problem Solving

Aspects of Creative Thinking	Problem Solving
Fluency	Students solve problems in many different ways, can generate many ideas, and have a variety of alternative answers to solving problems.
Flexibility	At first, students use one method to solve the problem. Then they move on to the correct use of another of the different techniques—students' ability to solve problems by utilizing various approaches and methods.
Originality	How well are students able to come up with their ideas and come up with creative solutions
Elaboration	Students can describe the solution in detail and correctly to the given problem.

[31]

Problem-solving can be done through formal education, such as providing learning materials to students about the importance of protecting the environment [14]. However, science learning is always synonymous with nature because science studies the environment. Integrated science learning teaches the basic principles of science and helps integrate science to gain a better understanding for junior high school students. Integration in science learning can be realized by creating a theme consisting of several Basic Competencies (KD) that are linked and interrelated between one KD and another [15]. In this study, KD 3.8 grade VII analyzed the occurrence of environmental pollution and its impact on the ecosystem. KD 3.10 grade IX analyzed processes and products of environmentally friendly technology for the sustainability of life. Integrating the two essential competencies can be realized using the connected integration model by creating an environmental conservation theme. Environmental preservation in school life can encourage the creation of knowledge and awareness in ecological conservation efforts, provide creative answers to environmental problems, and foster an attitude of caring for the environment [16;29].

With creative thinking skills, students go through a thinking process to respond to a problem from various points of view. As a result, they can generate many ideas and develop or add more complex and innovative ideas to solve problems. Based on the research results, improving creative thinking skills is often practicing solving issues in life [12]. Then using problem-solving questions, students' understanding of science concepts becomes higher [13]. Along with the important role of problem-solving and creative thinking skills in science learning, the researchers are interested in researching the development of problem-solving-based test instruments to foster creative thinking skills of junior high school students on environmental conservation.

## RESEARCH METHODS

This research took place at FKIP Sultan Ageng Tirtayasa University, with the research time starting from March 2021 to June 2022. The subjects in this research consisted of material and evaluation experts conducted by FKIP UNTIRTA lecturers and three expert practitioners by junior high school science teachers. in Serang Regency and City. The selection of experts is based on experience in the academic field.

The method of research used is Research & Development (R&D) research, where the steps in this study are development procedures according to Sugiyono (2013), which have been adapted to the limitations of researchers to obtain the feasibility of test instruments with expert trials [17]. The researcher uses the Sugiyono R&D method because it is easy to understand and has potential stages and problems where the background of this research is not only based on deviations that occur (problems). But the potential can be used as added value in product development to be carried out. The following are the stages of this development research:

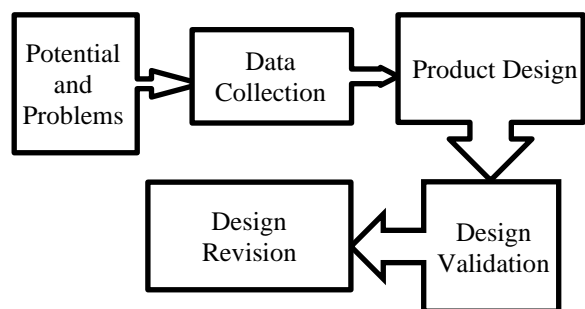


Figure 1. Research Steps

The instruments used in the research on developing test instruments are interview guidelines and validation questionnaire sheets for evaluation experts, material experts, and practitioners [28]. Interview guidelines were used for science teachers in junior high schools to obtain information about teachers' understanding and need for test instruments. At the same time, the validation questionnaire sheet

is used as a guide for validators in assessing the quality of the developed test instrument. The validation questionnaire sheet was filled out by material experts, evaluation experts, and expert practitioners. The result of validation is then used to revise the developed test instrument. Based on the Ministry of Education and Culture (2019), the aspects that must be used in making test instruments are construction, material, and language [18].

In the implementation of this study, the researcher used two types of data collected. First, there is qualitative data in the form of responses such as criticism and suggestions on the developed test instrument that can be used without improvement and used for improvements. The second is quantitative data obtained from the validator assessment questionnaire scores. The results obtained will be converted into the level of product feasibility of the developed test instrument. The validator's assessment questionnaire uses a Likert Scale with five-level criteria, as shown in the table below.

Table 1. Likert Scale Score Criteria on Validation Questionnaire

Score				
1	2	3	4	5
Very Less	Less	Enough	Good	Very Good

[19]

The data from the questionnaire is calculated to determine the result of the percentage score of the assessment using the following calculation formula.

$$NP = \frac{R}{M} \times 100\%$$

Information:

- NP = Expected or sought percent value
- R = Raw score obtained
- M = Ideal maximum score

Table 2. Product Feasibility Scale

Score	Criteria
0-20%	Not Feasible
21% - 40%	Less Feasible
41% - 60%	Feasible Enough
61% - 80%	Feasible
81% -100%	Very Feasible

[20]

The results of the assessment scores using a Likert scale are then converted to a statement of the feasibility of problem-solving-based test instruments, which are classified into five categories in the table 2.

## RESULTS AND DISCUSSION

In making product designs, researchers designed test instruments from interviews and data collection that have been obtained. The steps in preparing problem-solving-based test instruments include determining goals, compiling grids, and writing questions. The theme used by the researcher is Environmental Conservation with a connected integration model, which provides KD 3.8 class VII and KD 3.10 class IX. This theme is chosen because there is a concept that can be linked to preserving the environment and preventing environmental pollution through environmentally friendly technology and taking ecological conservation actions.

Making questions is done by creating a question grid with indicators that have been developed—the grilles made with components of identities and matrices. Identity includes education level, subject, curriculum, and the number of questions. The matrix contains essential competencies, material, question indicators, cognitive level, and the number of questions. The indicator formulation uses a revised Bloom's taxonomy based on Anderson and Krathwohl, where the cognitive processes used in the test instrument are analyzing, evaluating, and creating. In the formulation of the question indicators, a stimulus is used. The stimulus is used in the form of discourse, cases, tables, and pictures.

The question was based on two indicators Problem-solving is a challenge and non-routine by raising environmental problems in Banten Province, has been seen in figure 3. The development of test instruments to foster creative thinking skills on the theme of ecological conservation consists of 25 essay questions [30], with eight questions for fluency (thinking smoothly), eight questions for flexibility (flexible thinking), five questions of originality (original thought), and four questions of elaboration (detailed review). The indicators make the test questions of competency achievement and indicators of creative thinking.

Then an assessment rubric was created consisting of an answer key and an assessment rubric for creative thinking skills with a range of 1-5, as well as scoring guidelines like in figure 4.

The product that researchers have completed; the next step is validation to determine the feasibility of the test instrument [26]. Validation activities are carried out by completing questionnaires by a team of experts consisting of evaluation experts, material experts, and three expert practitioners. The validity results from material experts, evaluation experts, and practitioners can be seen in Figure 2.

Basic Competencies	Theory	Indikator Pencapaian Kompetensi	Indicators of Competence Achievement	Measured Aspects of Creative Thinking Ability	Cognitive Level	Question Number
3.8 Analyzing the occurrence of environmental pollution and its impact on the ecosystem	Causes of Environmental Pollution	Focusing on the causes of water pollution in rivers by household waste	Presented cases of river flow pollution, students are able to focus on what causes water pollution by household waste in detail	<i>Elaboration</i>	C4	1
		Analyzing the causes of increased air pollution	Presented about the parameters of air pollution, students can analyze several activities that cause air pollution to continue to increase appropriately	<i>Fluency</i>	C4	2

Figure 2. Example grid format of test instrument created

**Answer the questions below correctly and correctly!**

1. Along the river, which is located in Salembaran Jaya Village, Kosambi District, Tangerang Regency, there are many water hyacinth plants (Source: BantenNews.co.id in 2020). It is known that wastewater treatment in the Tangerang area in general is still not running well so that water hyacinth can grow fast



and cause a decrease in water quality. One of the causes of this contamination is household liquid waste which is generally discharged directly into river channels. In your opinion, what kind of household waste is the cause in this case?

Figure 3. Examples of problem-solving-based questions made

**CREATIVE THINKING ABILITY ASSESSMENT RUBRIC**

Aspect	Indicator	Rubric	Score	Question Number	
<i>Fluency</i>	Generate lots of relevant ideas or answers and flow of thoughts smoothly	Students can answer questions smoothly and correctly	Mention 5 keywords or more	5	2, 3, 5, 7, 10, 11, 21, 22
		Students can answer questions fluently and answers are less precise	Mention 3-4 keywords	3	
		Students cannot answer the questions smoothly and the answers are wrong	Mention 1-2 keywords	1	

Figure 4. Example of an assessment rubric format created

Figure 5 shows the validation results from experts on the developed test instrument. Based on the expert's assessment, it is known that the material expert obtained a score of 88.4%, which classifies in the "Very Feasible" category as an evaluation of the aspects of the feasibility of content and language. Assessment from the evaluation expert obtained a score of 88.6%, belonging to the "Very Feasible" category with assessment components in content, construction, and language feasibility. Meanwhile, based on the assessment of expert practitioners, a score of 89.9% was obtained, and it was included in the "Very Feasible" category from the suitability

level assessment, appearance, and language components. Therefore, test instruments can measure or assess student learning outcomes if the questions fall into the appropriate category [21].

**Material Expert Validation**

The material expert validation in this study consisted of one expert validator, namely a lecturer in the Department of Biology Education, FKIP UNTIRTA. Material validation plays a role in assessing the environmental preservation material contained in the problem-solving-based test instrument made by the researcher. Validation was

carried out on May 9, 2022, at FKIP UNTIRTA to assess the feasible content and language aspects. The results of material expert validation are presented in the following graph.

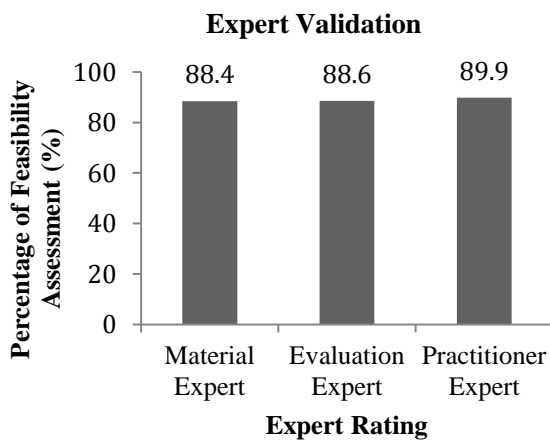


Figure 5. Graph of Test Instruments Feasibility Validation Results based on Experts

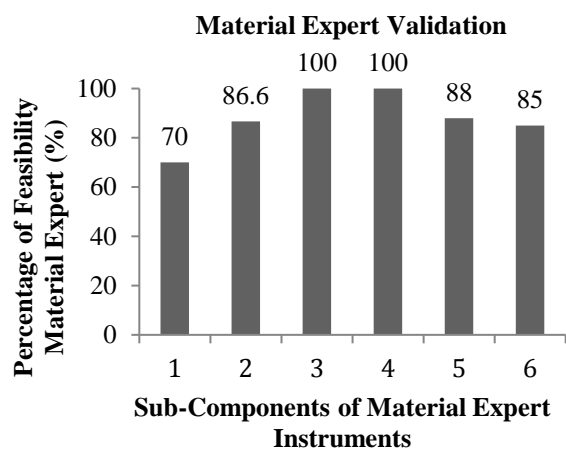


Figure 6. Graph of Material Expert Validation Results

**Information:** 1) The suitability of material with KI, KD, and learning indicators on the theme of environmental conservation, 2) Accuracy of the material on the questions, 3) Up-to-date material on the questions, 4) The suitability of the material integrated with problem-solving, 5) The suitability of the material with indicators of creative thinking ability [27], and 6) Use of language.

Based on Figure 6, the material expert validation results, it concluded that the material with the environmental preservation theme used in the test instrument follows KI, KD, and learning indicators. Environmental preservation material is the result of integrating two concepts: environmental pollution with basic competence 3.8 class VII as the primary essential competencies and the idea of environmentally friendly technology with basic competence 3.10 class IX as supporting. The two

necessary competencies are known that students at least reach the cognitive process of analyzing. Analyzing is a way for students to use their knowledge and understanding to make a connection between pieces of information so that through the process, students can provide many ideas/ideas and find alternative solutions/answers. The cognitive process of analyzing is used in the test instrument, and the researcher uses the cognitive level of evaluating and creating. The specified cognitive level can help students to develop creative thinking skills in the context of problem-solving. However, they still have to fix the inaccurate editorial on the questions and improve the question indicators on the test instrument grid section.

The material on the questions is divided into three assessment indicators, namely the accuracy of facts and data in environmental conservation materials presented in the test instrument. The case of environmental pollution presented in the matter uses news sources, regional data, and journals to prove their accuracy. The use of cases is a contextual problem that occurs in the surrounding environment, especially in Banten Province. The information presented follows the facts because it is true that the data exists. The presentation of these cases can enrich students' information about environmental problems. Then the combined material is transparent, and the accuracy of the stimulus is correct. The stimulus used can support the material because it takes the appropriate scope with the material for environmental conservation. The stimulus in the matter of raising pollution is efforts to preserve the environment and the use of environmentally friendly technology.

Using stimuli such as cases, pictures, and other things in the questions are proven accurate by the facts and can support environmental conservation materials. The presentation of the material on the questions contains up-to-date problems and reflects events and events in everyday life, with information on sub-component 3 getting a score of 100%. In addition, the issues presented in the problem are by the material for environmental conservation, where the material is a combination of ecological pollution material and environmentally friendly technology. The presentation of material integrated with problem-solving can challenge the mind and provoke students' knowledge/thoughts in solving problems, that is, in sub-component 4, obtaining a score of 100%. Environmental preservation materials can facilitate the indicators of creative thinking skills.

Which can lead students to provide answers smoothly and accurately related to the problems presented (fluency), stimulate students to solve problems in various ways (flexibility), students can generate original ideas or come from their thoughts (originality). They can describe answers/reasons in detail (elaboration). The results of previous studies state that the contextuality of environmental pollution issues can contribute to the achievement of

students' creative thinking abilities [1]. Another study noted that junior high school students' creative thinking skills in answering questions regarding environmental pollution were in the suitable and sufficient categories [22]. However, based on suggestions from experts so that students can provide varied answers or require more than one answer, then in the editorial, the questions determine the points needed. In the sub-component of language use, the structure of the use of sentences and language is appropriate and follows students' education level. However, there are still typing errors and corrections with multiple meanings. Based on the suggestions given by the material expert, it is used to make revisions so that it can be used as a student evaluation tool in science learning.

### Evaluation Expert Validation

The evaluation expert's role is to provide an assessment based on aspects of content, construction, and language feasibility. The evaluation expert validation consisted of one expert validator who was a lecturer in the Department of Biology Education, FKIP UNTIRTA. Validation was carried out on May 10, 2022, at FKIP UNTIRTA. The results of the evaluation expert validation assessment can see through the figure 7.

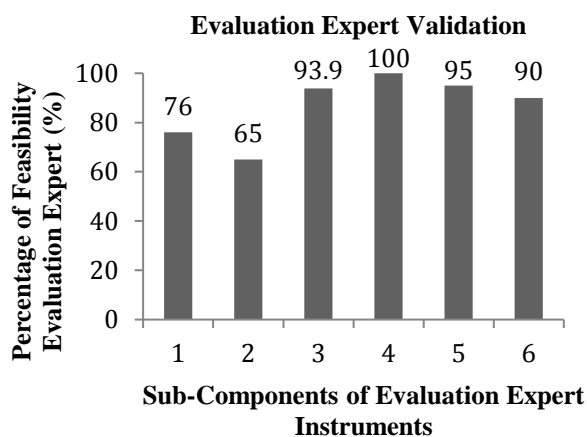


Figure 7. Graph of Evaluation Expert Validation Results

**Information:** 1) Products presented, 2) Indicator formulation, 3) Clarity of questions and other elements, 4) Suitability of questions with problem-solving, 5) Questions can foster students' creative thinking skills, and 6) Use of language.

Based on Figure 7, the evaluation expert validation results in sub-component (1), divided into five assessment points, it is known that the test instrument developed follows Core Competencies and Basic Competencies in the 2013 Curriculum. According to him, the instructions for filling in the test instrument are easy to understand and precise. In general, the structure of test instruments, such as grids and scoring rubrics, have been included, and

the boundaries and questions are pretty straightforward. However, there are several suggestions from experts to add indicators of competency achievement and improve the assessment rubric by using keywords. Assessment should begin with mapping, identifying, and analyzing Basic Competencies (essential competencies) indicators of competency achievement [23].

Sub-component (2) consists of 4 items that obtained a score of 65% of the maximum score of 100%. It is because the formulation of indicators does not include aspects of creative thinking skills, and some questions are not following the indicators. It is appropriate to use active verbs, and the assessor quickly understands the indicator formulation. The requirements for a good indicator are to contain the characteristics of the Basic Competencies to be measured, to include the active verb that can be measured, related to the selected material (teaching materials), and the questions can be made [18]. In formulating indicators, the active verb used in the product uses Bloom's taxonomy based on Anderson and Krathwohl, which consists of analyzing, evaluating, and creating. The three cognitive levels are processes of creative thinking. In addition to using the active verb in the formulation of indicators, the degree section uses indicators of creative thinking ability to measure the achievement of learning objectives. The fluency aspect uses a degree with several keywords, the flexibility aspect that determines the idea correctly, the originality aspect with a degree in designing original ideas, and the elaboration aspect with a degree in detail.

Next, sub-component (3) is divided into three assessment items in the form of a stimulus on a question that is clear and can function correctly. The subject matter has been formulated clearly and firmly, and the question can be used to demand unraveled answers. Initial information in the form of reading texts, cases/problems, pictures, and tables serves as a stimulus in answering questions. Students use thinking skills in processing the information and linking it to the questions [24].

Sub-component (4), consisting of 3 assessment items, gets a score of 100% where the questions presented in the development product can challenge students' minds, the answers are not automatically known, and the problems presented in the questions are following the material for environmental conservation. The sub-component (5) is divided into four assessment items where the questions can stimulate students' creative thinking skills and provide varied answers. Some questions must be changed to fit the expected abilities. Finally, in sub-component (6), the language used in the test instrument is already communicative, following the education level of junior high school students, and does not cause double interpretation. However, there are still some words that must be corrected following PUEBI.

### Expert Practitioner Validation

The expert practitioner validation consisted of three validators: teachers of science subjects at junior high school Serang City and Serang Regency. Expert practitioner validation plays a role in assessing the practicality of the problem-solving-based test instrument made by the researcher. Validation was carried out in May 2022 at Serang City and District Junior High Schools to evaluate the content, construction, and language feasibility. Based on the calculation results, it can be seen that the validation of practitioner I obtained a value of 88.5%, the validation of expert practitioner II got 98.5%, and the validation of expert practitioner III got 82.8%. Based on the acquisition of these scores, the test instrument can be categorized as "Very Eligible" by making several revisions. The results of the validation of three expert practitioners accumulated based on the sub-components of the assessment sheet are presented in the figure 8.

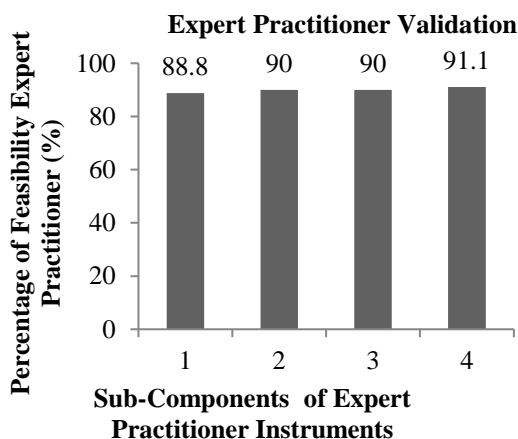


Figure 8. Graph of Expert Practitioner Validation Results

**Information:** 1) The suitability of Core Competencies, Basic Competencies, and indicators, 2) Construction, 3) Practicality, and 4) Use of language.

Based on Figure 8, the expert validation assessment results concluded that sub-component (1) is divided into 3 points of evaluation. The test instrument developed according to the expert practitioners follows the Core Competencies and Basic Competencies in the 2013 Curriculum. Indicators of competency achievement have used active verbs and materials to review the measured aspects of creative thinking skills. But the grid made several indicators have not been equipped with degrees because, in the formulation of the questions, indicators are written using the ABCD (Audience, Behavior, Condition, and Degree) formula [25]. Sub-component (2) consists of 4 assessment points. According to expert practitioners, the problems presented in the questions follow the material, the questions are very well integrated with problem-

solving concepts, and the stimulus is presented well to stimulate students to think creatively. Sub-component (3) contains four assessment points. The completeness of the test instrument format is developed in the correct order and is easy to understand, making it easier for educators to assess student abilities. In addition, the stimulus on the question is apparent and functions well. Sub-component (4), consisting of 3 assessment points, is known that the language used in the problem-solving-based test instrument to foster students' creative thinking skills used communicative language and followed the education level of junior high school.

The results of the expert validation assessment are classified as very feasible. However, revisions are still made based on the suggestions given so that problem-solving-based test instruments are produced to foster creative thinking skills in junior high school students of environmental conservation themes. So that science teachers in schools can use them as an alternative measure of student learning outcomes.

### CONCLUSION

From the results of development research obtained from the material expert validation questionnaire, evaluation, and practitioners, it can be concluded the problem-solving-based test instrument got a score of 88.9%, which belongs to the "Very Eligible" category. Therefore it can be an alternative tool for evaluating science learning in junior high school students.

### REFERENCES

- [1] Hidayani, S., Amelia, T., & Muhartarti E. (2020). Analisis Kemampuan Berpikir Kreatif Siswa SMP di Tanjungpinang dalam Merespon Isu Pencemaran Lingkungan. *Jurnal Pedagogi Hayati*, 4(1). 31.
- [2] Ihsan, H.F. 2020. *Filsafat Ilmu*. Jakarta: Rineka Cipta.
- [3] Kusuma, Y. (2010). *Creative Problem Solving*. Tangerang: Rumah Pengetahuan.
- [4] Zulkarnain R., Sugiarno., & Bistari. (2018). Pengembangan Instrumen Problem Solving Dengan Sajian Masalah Matematika Kontekstual Di Sekolah Menengah Pertama. *Jurnal Pendidikan dan Pembelajaran Khatulistiwa*, 7(7). 1-2.
- [5] Al-khatib, B. A. (2012). The Effect of Using Brainstorming Strategy In Developing Creative Problem-Solving Skills Among Female Students In Princess Alia University College. *American International Journal of Contemporary Research*, 2(10). 29-38.
- [6] Kemendikbud. 2014. *Impelementasi Kurikulum 2013*. Jakarta: Indonesia.
- [7] Busyairi, A., & Sinaga, P. (2021). Pengembangan Instrumen Tes Model Ideation-Explanation untuk Mengukur Kemampuan



- Berfikir Kreatif dalam Pemecahan Masalah. *Jurnal Pijar MIPA*, 16(1). 57-63.
- [8] Treffinger, D. J. (2007). Creative Problem Solving (CPS): Powerful Tools for Managing Change and Developing Talent. *Gifted and Talented International*, 22(2). 8–18.
- [9] Putra, T.T. (2012). Meningkatkan Kemampuan Berpikir Kreatif Siswa dengan Pembelajaran Berbasis Masalah. *Jurnal Pendidikan Matematika*, 1(1). 22-26.
- [10] Nguyen, D. H., Gire, E., & Rebello, N. S. (2010). Facilitating Students' Problem Solving Across Multiple Representations In Introductory Mechanics. *Proceedings of AIP Conference* 1289. 45–48.
- [11] Funke, S. G. (2013). Perspective on Problem Solving in Educational Assessment. *Journal of Problem Solving*, 72.
- [12] Putranta, H. and Supahar. (2019). Development of Physics-Tier Test (PysTT) to measure students' conceptual understanding and creative thinking skill: A qualitative synthesis. *Journal For The Education of Gifted Young Scientists*, 7(3). 747-775.
- [13] Liana M., Sarkity, D., Elvi, M., & Fitriyah, D. (2019). Pembekalan Pra-OSN Menggunakan Soal-Soal Problem Solving Berbasis Representasi Multimodus bagi Siswa SMP. *Jurnal Anugerah*, 1(2). 59 – 69.
- [14] Lestari, Yeni. (2018). Penanaman Nilai Peduli Lingkungan dalam Pembelajaran Ilmu Pengetahuan Alam. *Jurnal Pendidikan Ke-SD-an* 4(2). 332-337.
- [15] Maryati, A. M. (2016). *Pengembangan Buku Konteks Pelajaran IPA Terpadu Menggunakan Model Webbed dengan Tema Kesehatan*. Bandung: Universitas Pendidikan Indonesia.
- [16] Badan Pengendalian Dampak Lingkungan. 2006. *Status Lingkungan Hidup Daerah Provinsi Banten*. Banten: Pemerintah Provinsi Banten.
- [17] Sugiyono. (2013). *Metode Penelitian Pendidikan (Pendekatan Kuantitatif, Kualitatif, Dan R & D)*. Bandung: Alfabeta.
- [18] Kemendikbud. (2019). *Panduan Penilaian Tes Tertulis*. Jakarta: Pusat Penelitian Pengembangan Kemendikbud.
- [19] Sudijono, A. (2012). *Pengantar Statistik Pendidikan*. PT Raja Grafindo Persada.
- [20] Riduwan. (2014). *Dasar-dasar Statistika*. Bandung: Alfabeta.
- [21] Warju, Ariyanto, S.R., Soeryanto, & Trisna, R. A. (2020). Analisis Kualitas Butir Soal Tipe Hots Pada Kompetensi Sistem Rem Siswa di Sekolah Menengah Kejuruan. *Jurnal Pendidikan Teknologi dan Kejuruan*, 17(1). 98.
- [22] Widiawati, Fuadiyah, S., Syamsurizal, & Ardi. (2019). The Analysis of Creative Thinking Ability of VII Class Student in Biology Learning at SMPN 25 (Junior High School 25) Padang. *Bioeducation Journal*, 4(4). 75-84.
- [23] Susiatin (2019). Meningkatkan Kemampuan Guru dalam Menyusun Kisi-Kisi Soal dengan Metode Pendampingan Pola "OCF". *Jurnal Dinamika Manajemen Pendidikan*, 4(1). 17-24.
- [24] Ritdamaya, D., & Suhandi, A. 2016. Konstruksi Instrumen Tes Keterampilan Berpikir Kritis Terkait Materi Suhu dan Kalor. *Jurnal Penelitian & Pengembangan Pendidikan Fisika*, 2(2). 87.
- [25] Harsono, Hafsi, A. R., & Budiman, H. (2020). Pengembangan Profesionalisme Guru SDI Al Munawwarah Pamekasan melalui Pelatihan Penyusunan Soal. *JMM (Jurnal Masyarakat Mandiri)*, 4(2). 281-290.
- [26] Sjaifuddin, S., Hidayat, S., Fathurrohman, M., Ardie, R., & El Islami, R.A.Z. (2019). The Development of Food Security Behavior Model Through Environmental-based Learning: a System Dynamics Approach. *Jurnal Pendidikan IPA Indonesia* 8(2). 230-240.
- [27] Havita, V. N., Sjaifuddin, Saefullah, A., Nulhakim, L., & Rostikawati, D. A. 2021. The Effect of Using Project Base Learning (PjBL) Models on Students' Creative Thinking Skills in Solar System Materials. *Jurnal Pembelajaran Fisika* 9(2). 233-242.
- [28] Putri, A., Sjaifuddin, Berlian, L. (2022). Pengembangan E-Modul IPA Berbasis *Adobe Flash* Pada Tema Makananku Kesehatanku Untuk Kelas VIII SMP. *PENDIPA Journal of Science Education*, 6(1), 143-150.
- [29] Sjaifuddin, S. (2020). Sustainable Management of Freshwater Swamp Forest as an Ecotourism Destination in Indonesia: a System Dynamics Modeling. *Entrepreneurship and Sustainability Issues* 8(2). 64-85.
- [30] Utami, T. P., Sjaifuddin, Berlian, L. (2022). Pengembangan Soal Uraian Berbasis Indikator Kemampuan Berpikir Tingkat Tinggi pada Konsep Sistem Pencernaan pada Manusia untuk Siswa Kelas VIII SMP/Mts. *PENDIPA Journal of Science Education*, 6(1). 129-135.
- [31] Silver, Edward A. (1997). Fostering Creativity through Instruction Rich in Mathematical Problem Solving and Thinking in Problem Posing. 29(3). Electronic Edition ISSN 1615-679X.