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Science Creativity Assessment Instruments in the Merdeka Curriculum in Elementary Schools

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Abstract: This research is motivated by the alignment between the learning objectives of Natural Sciences (IPA) and the Merdeka curriculum, one of which is to develop student creativity. Therefore, it is necessary to prepare an assessment instrument that can measure student creativity, including creative thinking skills. This research aims to determine whether the assessment instrument to measure creative thinking skills is feasible to use or not. In this research, the approach employed is Research and Development (R&D). The development research method follows the Borg and Gall model. The data collection method uses a questionnaire that is given to validators. The validation sheet is the instrument used. Content validity is the method used for data analysis. The test instrument's validity was high, with Aiken's V score of 0.82, surpassing the 0.800 threshold for high validity. This makes the instrument reliable for assessing students' creative thinking skills. It is suitable for use in elementary schools to evaluate higher-order thinking and creativity. The implications are that the instrument can be applied in elementary schools to assess student learning outcomes at the level of higher-order thinking skills, particularly related to creativity. Guildford's indicators—Fluency, Flexibility, Originality, Elaboration, and Redefinition—offer a comprehensive creativity assessment. Fluency (3 questions) measures idea quantity. Flexibility (2 questions) assesses adaptability to different perspectives. Originality (5 questions) evaluates the uniqueness of ideas. Elaboration (3 questions) examines idea detail. Redefinition (2 questions) measures perspective shifts. All questions are valid, ensuring accurate and thorough creativity evaluation.
Keywords: Assessment, Elementary school, Creative thinking, Merdeka curriculum, Science.

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A. Introduction

One of the breakthroughs the government has made in its endeavor to improve education standards is the implementation of the Merdeka Curriculum since its introduction in 2020. The introduction of the Merdeka curriculum as an option for all schools ready to implement it to restore learning between 2022 and 2024 due to the

pandemic. The latest innovation, the Merdeka Curriculum, aims to align education with today's needs and promote independence and freedom of learning. Subjects and curriculum components have undergone many changes that are expected to be for the better in this curriculum. One of them is the change of Natural Science (IPA) and Social Science (IPS) subjects from SD/MI to IPAS (combined IPA and IPS) (Sartika, et al., 2023). Meaningful learning involves engaging in everyday activities rather than focusing on theory and rote memorization. This approach supports the objective of science education, which aims to develop students' abstract thinking skills, ultimately equipping them more effectively to handle real-world problems (Saido, 2015).

In line with science learning objectives, the Merdeka curriculum aims to develop students' critical thinking, independence, and creativity by actively involving students in learning (Bali, 2023). Creativity is the capacity to create, that is, the ability to generate new ideas or combinations with social meaning (Munandar, 2012). There are two types of creativity characteristics: cognitive and non-cognitive. Cognitive includes inventiveness, adaptability, familiarity, and elaboration, while non-cognitive characteristics include inspiration, attitude, and character (Slameto, 2010). Meanwhile, (Guilford, 1967) stated that creativity can be assessed from aptitude characteristics such as flexibility, originality, fluency, non-aptitude characteristics, attitude, inspiration, and responsibility in completing tasks. Creative person, creative process, creative thinking, creative product, and creative environment emphasize creativity (Dwikoranto, et al., 2020). However, in this study, creativity is focused on creative thinking skills.

Creative thinking is a method of thinking that produces a variety of potential concepts and ways in various ways. Students actively participate in dealing with problems. If you think creatively, it will generate valuable thoughts and find solutions (Tridaya, 2012). In addition, creative thinking requires a high level of task commitment. It is expected that students can think creatively. Students can solve current problems and those that will arise in the future with creative thinking skills (Astuti, Waluya, & Asikin, 2020). Creative thinking ability produces a wide variety of new solutions to problems (Mahfud, 2013). To find solutions to problems, students must be creative.

Fluency (the ability to produce many ideas), flexibility (the ability to propose various approaches to problem-solving), originality (the ability to produce original ideas as a result of one's thinking and not clichéd), elaboration (the ability to describe something in detail), redefinition (the ability to examine/review an issue through different ways and perspectives from what is already common), are indicators of creative thinking according to Guilford (1973). The achievement of learning objectives from the assessment results measures student creativity in the learning process (Purnawanto, 2020). For students to get used to using creative thinking to solve problems, they need instruments that can train and familiarise them with this. The assessment instrument should have the option to measure students' capacity impartially and can be used as an assessment tool where students can know the limits of their capacity.

The fact is that primary school teachers, especially in Tulungagung, have never compiled student creativity assessment instruments. Teachers do not understand the importance of creative assessment instruments for students. In addition, teachers need to guide students better in practicing creative thinking skills and use rubrics or assessment guides so that students feel involved in managing and evaluating their learning. Teachers need to know how students can demonstrate creative thinking skills that meet the objectives of the Merdeka curriculum. One of the most essential aspects of creative expression is the method for identifying various perspectives (Astawan, et al., 2023).

Creative thinking abilities have been the subject of numerous studies. As a result, within the learning process framework, students need to have the opportunity to learn directly and think critically. Teachers must develop strategies to address various issues during the learning process (Ernawati et al., 2019). The research conducted by Suciati, et al. (2023) Indicates that students' creative thinking skills across various academic abilities can be enhanced through practical learning. In this study, the difference lies in the initial phase of developing assessment instruments, while testing is planned for subsequent research. Thinking creatively is only one aspect of creativity; creative products are another. In the 2023 study by Saraswati, Wahidmurni, & Zuhriyah (2023), various forms of visual-spatial creativity were found among students, including drawing, solving puzzles, creating posters and bulletin boards, making pinwheels, and batik making, among other activities. This also aligns with the indicators presented in this study: fluency and originality. These indicate that students can generate many original ideas and not copied from others. Astuti, Waluya, and Asikin's (2020) research uses four creativity indicators and the creative thinking instrument in this study. There is currently no indicator of redefinition in her study. The developed creative thinking test instrument is valid, dependable, and research-friendly. In a similar vein, the creative thinking skills of students can be assessed through the use of learning questions (Faresta, Anggara, Mandiri, & Septiawan, 2020). Faresta focuses on physics questions for 10th graders, whereas this study focuses on elementary school science topics. In this study, indicators of creative thinking refer to Guilford's indicators, which are fluency, flexibility, originality, elaboration, and redefinition.

The importance of creative assessment instruments is assisting students in realizing their strengths and increasing students' understanding of human abilities, especially about the relationship between innovativeness and conventional conceptions of intelligence. It can serve as a starting point or baseline for educators working in the following learning process: evaluating the instructor's implementation during the learning experience, learning about untapped possibilities, namely the untested imagination of students, removing the idea that creativity cannot be explained and is challenging to construct Treffinger in (Starko, 2010). Research conducted by Astuti, Waluya, & Asikin (2020) The responses to the trial and creative thinking ability test questions were valid and reliable. They had complex, medium, and easy difficulty levels and differentiating power, which can be said to be very good, very good, or bad.

In the context of the Merdeka Curriculum, the assessment of creative thinking skills cannot be ignored. Apart from being a traditional evaluation tool, assessment is also a measuring tool to determine how well the teaching and learning process is going. Students can measure progress and identify improvement areas by using assessment as feedback. Given the issues above, the primary need is for an instrument to assess one's creative thinking skills as a resource for educators. Teachers can encourage students' imaginative thinking in the learning process, thus reducing the use of subjective assessment.

In the context of Indonesia's educational development, this study makes a significant contribution to the implementation of the Merdeka Curriculum. An elementary school-level Creativity Assessment Instrument (IPA) was developed as a result of the study. The curriculum's context and goals were considered when designing this instrument, which focuses on encouraging students' creativity. The novelty of this study lies in its holistic approach to assessing students' creative thinking abilities, which encourages students to creatively apply their knowledge in real-world situations and measure their understanding of concepts. As a result, this study is anticipated to offer practical advice for creating elementary school curricula and learning strategies to improve students' creative thinking abilities. This study's novelty stems from its connection to the Sustainable Development Goals (SDGs) and its focus on improving learning quality. This study investigates how imaginative appraisal instruments can be coordinated into an autonomous educational plan that upholds the SDGs, especially regarding rudimentary schooling. This research contributes to efforts to improve the quality of learning in elementary schools by focusing on developing creative thinking skills consistent with global objectives. The goal of this method is not only to make students more creative but also to ensure that learning is relevant to the problems and needs of the world today. It is anticipated that integrating SDGs and creative assessment will support the achievement of broader educational goals and enhance students' learning experiences.

B. Method

In this study, the approach employed is a Research and Development (R&D) approach, utilizing the Borg and Gall model. The preparation of this science creativity assessment instrument is based on the adaptation of 5 of the ten stages of the Borg and Gall development model. The other five stages were continued after these five stages were declared complete and valid due to time constraints. The research steps are as follows: (1) identifying potential problems through preliminary studies; (2) planning by determining learning outcomes and learning objectives and compiling question grids; (3) product design by compiling questions based on the prepared grids, answer keys, and scoring guidelines; (4) validation by two experts who are Bhinneka PGRI University lecturers who master the curriculum and materials, and one elementary school teacher who has obtained a professional certificate as an educator; and (5) revision of product design based on feedback and input from experts (Suarti, 2022). The creativity assessment

instrument was prepared as a test in the form of descriptions with 15 questions. This assessment instrument is prepared based on systematic steps to produce a final evaluation instrument product that can measure student creativity in the C4-C6 knowledge domain for grade IV students, specifically focusing on Chapter 1, Plants, Sources of Life on Earth. This research instrument is a validation sheet to assess the questions of students' creative thinking ability or creativity. Aspects of content, structure, and language adapted to developing question items are part of the validated aspects. Aspects of validation assessment are in Table 1. Referring to (Suhardi & Budiyaningsih, 2022).

Table 1. Aspects of Test Instrument Validation Assessment

No.	Aspects assessed
Material aspects	
1	Suitability of questions with question indicators
2	Questions can measure creativity indicators (*Fluency, flexibility, originality, elaboration, redefinition)*
3	Descriptive questions by the material in the chapter Plants, Sources of Life on Earth
Construction aspect	
1	Clarity of instructions for working on description questions
2	Clarity of purpose of the description question
3	Possibility of the blurb question being resolved
4	Questions are formulated clearly and explicitly
5	The question does not give clues to the answer key
6	Questions are free of double-negative statements
7	Images, graphs, tables, articles, diagrams, or the like are clear and functional
Language aspects	
1	Language by Indonesian language rules
2	Communicative language
3	Does not use local language

Data analysis in this study was both quantitative and qualitative. Quantitatively, the aim was to evaluate the theoretical quality of the questions based on the results of validation by experts for each item. The validation results of each item were analyzed using Aiken's V formula to determine whether the question was feasible based on content, construction, and language. The validity results based on Aiken's formula range from 0 to 1. The formula for Aiken's V is as follows (Istiyono, 2020). The results of the content validity analysis of the creativity assessment instrument using the criteria are presented in Table 2 (Istiyono, 2020).

Table 2. Aiken's V Validity Criteria

Value	Criteria
<0,4	Low
0,4-0,8	Medium
>0,8	High

C. Results and Discussion

Results

Preparing a science creativity assessment instrument is expected to help students get used to working on creative thinking questions. The first stage in identifying potential problems relates to the teacher's ability to make assessment instruments that measure students' creative thinking skills. It was found through observations and interviews with elementary school teachers in Tulungagung that the test questions given to students come from textbooks and agile, intelligent books that contain practice questions and material summaries. As a result, teachers have not developed assessment tools that precisely assess students' creativity, especially in the context of IPAS learning for grade IV science studies.

The planning stage describes the science material for grade IV SD odd-semester students based on the Learning Outcomes (CP), learning objectives, creativity indicators, and the lattice of test questions that have been determined. The main focus of the instrument's development is Chapter 1, Plants, Sources of Life on Earth.

Product design is carried out by adapting steps Abidin (2016) through five stages: 1) determining the standards to be measured; 2) defining the constructs to be assessed; 3) setting authentic tasks for students to carry out; 4) developing assessment criteria; and 5) creating assessment rubrics. The determination of the standards to be measured is depicted in Table 3.

Table 3. Standardized Determination

Subjects	CP	Chapter	Learning Objectives
IPAS grade IV	Learners can make a simulation using simple charts/tools about the life cycle of living things	Chapter 1 Plants, the Source of Life on Earth	1. Identify plant body parts and describe their functions. 2. Describe the process of photosynthesis and relate the importance of this process for living things. 3. Create a simulation using a chart or simple tools about the plant life cycle.

(Source: processed data from the 2024 research)

The second step is to identify the construct. Creativity is the type of construct measured (the ability to think creatively when solving test questions in essay form). The third step is to determine the authentic task to be completed by the students. The fourth step is to develop assessment standards. This step combines the authentic tasks students must complete with the creative domain. For more information, please see Table 4.

The final step is to develop the answer key and scoring rubric. The scoring used in the assessment rubric is holistic. Each student's answer is included in one of the categories, and each answer is given a score according to its quality.

On the validation sheet, the validator conducted validation activities by scoring 1 to 5 on the assessment items on the question design (Likert scale). The approval scores and question content feasibility analysis of the validation sheet are presented in Table 5.

The results of the data analysis showed that the validity index of the creativity assessment instrument, calculated using Aiken's V formula, had an average of high criteria. Product revisions from validators are presented in Table 7. Using Aiken's V formula, further data analysis yielded the following results in Table 6.

Table 4. Student Creativity Test Instrument Grid

No.	Creativity Indicator Guilford	Problem Indicator	Question Number	Cognitive Level
1	*Fluency*	Presented with a picture, learners can identify plant body parts and describe their functions	1	C4
		Learners can describe a plant complete with plant body parts	2	C6
		Learners can design an experiment to test the factors that affect photosynthesis	3	C6
2	*Flexibility*	Learners can describe the importance of photosynthesis for living things	4	C4
		Presented with a phenomenon, learners can explain how plants perform photosynthesis under certain conditions	5	C4
3	O*riginality*	Learners can illustrate the stages of photosynthesis	6	C6
		Learners can describe and explain the life cycle of known plants	7	C6
		Learners can analyze the effect of temperature/environment on plant growth	8	C4
		Learners can describe and identify the complete flower structure	9	C6
		Learners can describe three types of plants that have different types of roots	10	C6
4	*Elaboration*	Given a picture, learners can compare the two pictures based on the concept of photosynthesis	11	C4
		Learners can determine the relationship between plant structures such as leaves and roots and the process of photosynthesis and describe how they affect each other	12	C5
		Learners can analyze the role of chlorophyll in leaves in the photosynthesis process and its relationship to food production in plants	13	C4

Continued Table 4 Student Creativity Test Instrument Grid

No.	Creativity Indicator Guilford	Problem Indicator	Question Number	Cognitive Level
5	*Redefinition*	Learners can explain the process of photosynthesis	14	C4
		Given a phenomenon, learners can analyze the differences in the conditions of two similar plants placed in different conditions	15	C4

(Source: processed data from the 2024 research)

Table 5. Recapitulation of Validation Results

	Aspects assessed	Validator Score (V)		
		V1	V2	V3
Material				
1	Suitability of questions with question indicators	4	5	4
2	Questions can measure creativity indicators (*Fluency, flexibility, originality, elaboration, redefinition)*	4	3	4
3	Descriptive questions by the material in the chapter Plants, Sources of Life on Earth	5	5	4
Construction				
1	Clarity of instructions for working on description questions	5	5	4
2	Clarity of purpose of the description question	5	4	4
3	Possibility of the blurb question being resolved	5	5	4
4	Questions are formulated clearly and explicitly	5	5	4
5	The question does not give clues to the answer key	4	5	3
6	Questions are free of double-negative statements	4	4	4
7	Images, graphs, tables, articles, diagrams, or the like are clear and functional	4	5	4
Language				
1	Language by Indonesian language rules	5	4	4
2	Communicative language	5	5	4
3	Does not use local language	5	5	5

Table 6. Recapitulation of Aiken's V calculation

No	Content Validity Index	Minimum V count	Maximum V count	Average	Criteria
1	Material aspects	0,67	0,91	0,80	medium
2	Construction aspect	0,75	0,91	0,84	high
3	Language aspects	0,75	0,91	0,83	high

(Source: processed data from the 2024 research)

Table 7. Product Revision by Validators

Advice	Improvement
Question items should be added again, not just ten questions	Added 15 question items
Replace questions with the C2 cognitive domain to C4, C5, or C6	Questions with cognitive domain C2 have been changed to cognitive domain to C4, C5, or C6
Look at the picture on the side! Please explain the difference between the two pictures and relate it to what you know about photosynthesis! Replace it with the picture below	Replaced note the picture beside with "note the picture below"
Provide a description of picture A and picture B in question number 10	Added captions for pictures A and B in question number 10

(Source: processed data from the 2024 research)

Revisions were made to the items listed in Table 7 based on the results of the expert evaluation: the instrument had been trialed to make the test instrument according to the needs and ideas of the experts. However, not all of the questions were considered to have represented the material tested and met the criteria, so they were revised.

Discussion

The problem identification shows that teachers have not yet developed assessment tools specifically evaluating students' creativity, especially in the context of IPAS learning for Grade IV science studies. This method is considered crucial when implementing creative instruction in the IPA program. Identifying a group involves a lot of thought and planning to identify a specific area or group of people in the creative process. This study demonstrates that the instructional techniques were developed to identify a sample efficiently, resulting in a more complex and challenging task to achieve the IPA program's creative goal. Research conducted by (Suwandani, 2020) Teachers face difficulties in several ways, namely making and developing assessment instruments, giving scores, carrying out assessments in the classroom, and processing scores. A lack of appropriate learning media causes low student creativity, students' difficulty in understanding learning materials, and a lack of practice in solving non-routine problems (Mashitoh, 2021).

The planning and design phase continues after the problem identification stage. Planning begins with examining the learning outcomes (CP) from Grade 4 IPAS instruction corresponding to the content to be incorporated into the instrument. Table 3 displays the results of the CP and learning objectives analysis. The significance of this investigation is to guarantee that the instrument created mirrors the understudies' requirements, qualities, and the topic being taught. Educators can design relevant and effective instruments to measure students' creative thinking abilities by comprehending their Constructs in the context of IPA learning. The next step is to use the predetermined creativity indicators to design a test grid with 15 items in the form of essay questions. Following this, test questions and rubric writing are developed. A rubric is an evaluation tool that provides an overview of the expected performance for each criterion to achieve a specific score. According to research conducted by (Tangkin, 2019), the importance of the assessment rubric includes helping students understand the criteria used to evaluate their activities. Students are aware of the scores associated with each criterion in the rubric and aim to achieve the highest possible score. They use various sources to complete the task or test effectively. Scientific creativity remains a key focus and challenge for experts, given its significance as an essential skill in the twenty-first century (Xu, Reiss, & Lodge, 2024). The research conducted by (Greenier , Fathi, & Behzadpoor, 2023) It also shows that promoting creativity and critical thinking supports 21st-century skills.

The next step involves evaluating the instrument experts after preparing the grids, questions, and assessment rubrics. The validation results indicate that the developed instrument is valid and suitable for assessing students' creativity. The substance category met the medium criteria, demonstrating that the instrument aligns with the dimensions of creativity and the established indicators and framework. The instrument primarily uses narrative content but incorporates diagrams, pictures, and symbols to enhance student understanding. The construction category achieved high criteria, and the language used is clear, informative, and easy to understand. Developing and implementing instruments that effectively assess students' creativity is essential. Research by Ani (2020) emphasizes the need to improve Indonesia's curriculum to foster an optimal learning environment for creative thinking, as supported by Musdi, As'ari, Harisman, Syaputra, and Hevardani (2024).

According to Akbar (2013), the instrument is considered very suitable for use and testing if the validity index is 81%-100%. The overall result of the validity by the three expert validators showed an average score of 82%. The test instrument, approved by the three validators, was modified based on their comments and suggestions. Aiken's V validity test scale was used to calculate and process the total scores obtained from each validator for each test instrument item assessment aspect. The results in Table 6 show that the validity of the test instrument is high because the average result of Aiken's V validity test is 0.82, and the values obtained exceed 0.800. Aiken's V scale values above 0.800 fall within the criteria of high validity and are suitable for use in testing (Akbar, 2013). Based on this data, each of the 15 test items can be used for testing. According to Setiani,

Sanjaya, & Jatmiko (2019) Based on the validation results, the elementary science creativity assessment instrument can be considered capable of meeting the needs of the 21st century, as the findings demonstrate that the ARICESA model's content validity is pertinent to the skill requirements of students in this era.

Revisions were made based on the suggestions in Table 7 prior to receiving a valid assessment from validators. The revision phase of the Science Creativity Assessment Instruments ensures that the instrument has been improved and modified based on validator feedback and evaluations. These revisions demonstrate the instrument's reliability and accuracy in assessing students' creative thinking abilities, which helps increase its validity. The research ensures that the developed instrument is relevant to the context of elementary school science education by engaging in meticulous revision stages. This is consistent with the findings of research carried out by Herpiana and Rosidin (2018), which asserts that the assessor provides numerical results and a few suggestions for raising the quality of the questions. After the update, 18 items were pronounced legitimate for testing.

To develop a practical instrument, it is crucial to deepen the understanding of Guilford's indicators, namely fluency, flexibility, originality, elaboration, and redefinition. A thorough understanding of these indicators will ensure that the developed instrument can be accurately applied in creative evaluation. Therefore, future research should strengthen the understanding of Guilford's indicators to design a more accurate and comprehensive instrument for measuring creative thinking abilities.

D. Conclusion

After conducting in-depth content and item validity analyses, the descriptive test questions that form the creativity evaluation instrument were successfully developed. Based on the research findings, the developed test instrument demonstrates high validity, with an Aiken V value of 0.82 and a quality score exceeding 0.800. The Aiken's V scale value above 0.800 meets the criteria for high validity, ensuring that the instrument adheres to the required standards. This instrument consists of creative thinking test questions for 4th-grade students on Chapter 1, Sources of Life on Earth, with 15 questions. Of these, three questions represent Guildford's creativity indicators for fluency, two questions for flexibility, 5 for originality, 3 for elaboration, and 2 for redefinition. All questions representing these indicators are categorized as valid. Therefore, the results of this study indicate that the instrument is reliable and suitable for assessing students' creative thinking skills and achieving the research objectives. The next step is to test these questions to determine how well and thoroughly they measure students' creative thinking skills. Additionally, the remaining stages outlined by Borg and Gall need to be completed, but they have not yet been implemented in this study. The implications of this study highlight the importance of developing robust evaluation tools to support creativity-based science education. Implementing and validating this instrument in various educational

settings and conducting further testing to assess its effectiveness in improving students' creative thinking skills are suggestions for future research.

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