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Development of STEAM-LW Based Creative Thinking Skill Test Instruments for Grade IX Junior High School Students

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Abstract

Creative Thinking Skill is one of the abilities that must be mastered by students. Based on research 7 Junior High School in Ponorogo Regency, it was found that the Creative Thinking Skill indicators was on average 33,5% in the less category. Creative Thinking skill can be measured by tests or non-tests. This study aims to develop STEAM based Creative Thinking Skill tests instrument integrated with Local Wisdom that is valid acording to experts and reliable. The development prosedure used the ADDIE model. The research design used a pre-experiment. Data analysis was using a decriptive quantitative approach. Aiken index to analyze the validity of instrument. The result test instruments has a validity of 0,88 with a valid category. The reability of the test was 0,81 and the difficulty level of the questions was 4 items in the easy category and 3 items in the medium category. The significance of the correlation of 3 questions is very significant level and 4 questions are significant level. The integration of Local Wisdom to instrument is expected be able to develop student's Creative Thinking Skill as to give birth various ideas and progress of the Pancungan Pottery Industry.

Keywords: Instrument; Creative Thinking Skill; STEAM; Local Wisdom.

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Introduction

Creativity is needed to solve problems in all areas of life. Creativity in the field of education uses the term creative thinking which emphasizes the process itself (Awang & Ramly, 2008). Ability to think creatively mental activity sensitivity to problems with an open mind(Susanto et al, 2015). Creative thinking ability are in the affective domain while creative thinking skills are in the cognitive domain. This view finds a systematic place for the creative thinking skills in the realm of intelligence. The constructions include fluency, flexibility, originality, and elaboration(Guilford, 1975).

Creative thinking skills is categorized as a Higer Order Thinking Skill (HOTS) and is one of the abilities that must be mastered by students(Gais & Afriansyah, 2017). Creative thinking skill plays an important role in the progress of science and technology(Kurnia et al., 2021). In fact, fewer and fewer creative people are found. This is marked by the low level of innovation and creation by the community(Putra et al., 2016). Based on the results of the global creativity index, Indonesia is ranked 115th out of 139 countries(Florida et al., 2015).

Based on research on 7 equivalent junior high schools in Ponorogo Regency, it was found that the average achievement of creative thinking indicators was 33.5%

in the less category. The achievement of fluency indicators is 35%, flexibility is 32%, originality is 39%, and elaboration is 28%. The level of students' creative thinking skills is in the creative category of 2.88%, and the non-creative category is 19.42%. These results are reinforced by the profile of students' creative thinking abilities in one of the junior high schools in Ponorogo district with an average of 55.38%, which is in the moderate category.(Almuharomah & Mayasari, 2018).

Creative thinking skills can be measured by means of tests or non-tests. Globally, creative thinking is tested with a test tool called the Torrance Test of Creative Tinking (TTCT) (Kim, 2011). Test instruments in the form of multiple choice, short entries, descriptions, including matchmaking. Essay questions can be chosen because they provide open answers so that students are free to develop their creative thinking skills(Rahayu et al., 2019). The test instrument is used to determine the profile of creative thinking skills and to train students' higher order thinking skills(Rofiah et al., 2013). Improving the creative thingking skills can be done in various ways, one of which is the STEAM approach.

The STEAM approach encourages students to learn to explore all the abilities they have, in their own way. STEAM also brings out different and unexpected works from each individual or group.(Herlina et al., 2022). The STEAM approach can enhance creative thinking skills, problem solving abilities, collaboration, and argumentation skills, as well as responsibility(Annisa et al., 2018). STEAM supports the change of traditional learning towards modern learning(Milara et al., 2020). Today's learning requires teachers to be able to instill love for local wisdom, critical thinking, and creative thinking in students to solve socio-cultural problems(Oktoriyadi, 2020). Local wisdom needs to be understood from an early age considering the role of humans in cultivating nature to meet life's needs. The introduction of local culture from an early age serves to instill attitudes, behavior, traits, personality, love for the motherland and foster a sense of nationalism in children(Afrianingsih et al., 2020).

The development of a STEAM-based test instrument to improve creative thinking skills has been developed and the results obtained are 10 items that are valid, reliable, have differentiating power and the right level of difficulty(Rofiah et al., 2013). However, this test instrument can only be used by elementary school students. The development of a test instrument for creative thinking skills integrated with local wisdom has been developed with validity in the very proper category and all questions are accepted(Almuharomah et al., 2018). This instrument is not yet based on the STEAM approach, so it is necessary to develop instruments for creative thinking skills integrated with STEAM-based local wisdom integrated with local wisdom. This study aims to develop a STEAM-based creative thinking skills test instrument integrated with local wisdom that is valid according to experts and reliable.

Methods

This research uses the development method or often referred to as development research. The development procedure used refers to the ADDIE model which can be carried out continuously(Graphinger, 1988).

The analysis phase was carried out to determine the needs of the instrument, analyze students' creative thinking skills, material analysis, and environmental analysis. The design stage is carried out after the analysis stage, such as determining the appropriate material, the form of the test, and the learning approach chosen. The development stage is carried out by developing the question grid into items by adhering to a predetermined approach. The results of developing the items

were then validated by experts and revised according to the validator's suggestions. The implementation was carried out at MTS Miftahul Ulum Ngraket, Balong, Ponorogo in October 2022. The small class test was carried out in Class IX B with 9 students. Limited class tests were conducted in classes IX A and implementation in classes IX C with a total of 32 students. The evaluation was carried out after the instrument was tested.

Research design using *pre-experiment*(one group pretest- posttest). Pre-experimental studies where there is no control group or random assignment procedure(Sung et al., 2019). Data analysis was carried out using a descriptive quantitative approach to students' creative thinking skills. Aiken index to analyze the feasibility of the developed instrument.

Results And Discussion

The instruments used in the experiment have gone through the ADDIE development procedure as follows:

1. Analysis

The analysis phase is carried out by analyzing the needs of the instrument first by means of a literature study.The development of this instrument refers to PP No. 57 2021 Article 38 Paragraph 2 Concerning Education Unit Curriculum Development in accordance with the Education Unit, regional potential, and students. The demand for implementing a project to strengthen the profile of Pancasila students in KEPMEN 56 2022 in the structure of the Primary and Secondary Education curriculum through 3 ways including through subjects. So that in science learning it is necessary to integrate regional potential.One of the local potentials that still exists and is developing today in Ponorogo Regency is the Plancungan pottery industry.

Based on the interviewThe pottery craft of Plancungan Village is a relic from the Mataram era. This is related to the founder of Plancungan Village who comes from Bayat, Central Java and has provided guidance for community welfare in the form of pottery crafts. This local potential is then analyzed based on STEAM and an analysis of the value of local wisdom contained in the process of making pottery. The results in the process of making pottery contain local wisdom values including character values, historical values, aesthetic values, and environmental governance values. Based on STEAM analysis in science, the process of making pottery requires a tool called "perabot". The turntable applies the simple machine principle. A simple machine is a tool that can facilitate human work. The math is in the mechanical advantage of the turntable, namely by dividing the wheel radius by the axle radius. Engineering can be seen in the comparison of the pottery body which is the largest part of the whole. Pottery burning technology uses traditional stoves with straw, husk, and bamboo as fuel. Art on pottery can be seen from its shape, color and function.

The development of a STEAM-based test instrument to improve creative thinking skills has been developed and the results obtained are 10 items that are valid, reliable, have differentiating power and the right level of difficulty(Rofiah et al., 2013). However, this test instrument can only be used by elementary school students. The development of a test instrument for creative thinking skills integrated with local wisdom has been developed with validity in the very proper category and all questions are accepted(Almuharomah et al., 2018). This instrument is not yet based on the STEAM approach, so it is necessary to

develop instruments for creative thinking skills integrated with STEAM-based local wisdom integrated with local wisdom.

Based on research on 7 equivalent junior high schools in Ponorogo Regency, it was found that the average achievement of creative thinking indicators was 33.5% in the less category. Fluency indicator analysis is 35%, flexibility is 32%, originality is 39%, and elaboration is 28%. The level of students' creative thinking skills is in the creative category of 2.88%, and the non-creative category is 19.42%. Improving students' creative thinking skills can be done in various ways such as learning activities, subject matter, and test instruments that contain indicators of creative thinking skills.

2. Design

Learning material that is in accordance with the STEAM approach, namely Science material for Class IX semester 2. Environmental Friendly Technology Chapter KD 3.10 Analyzing environmentally friendly technology processes and productsand KD. 4.10. Presenting works on simple technological processes and products that are environmentally friendly. The STEAM approach was chosen because it can integrate elements of art in it so that it is in accordance with the Local Wisdom of pottery.

The form of the test that will be developed is a description. The essay test allows students to answer questions with long explanations. The form of the description also makes it easier for students to design products and arrange pictures. So it is more appropriate if students' creative thinking skills is measured by a description test. The question grid is made in advance to facilitate the development of questions so that they are in accordance with the indicators and Sub. Indicator of creative thinking skills. The design of the test instrument can be seen in Table 1. The following:

Table 1.Creative Thinking Skills Test Instrument Design

STEAM aspect	Material	Traditional	Indicator	Sub. indicator	Questions and answers
Science	Pottery products are products that can be recycled because they are made from soil. Environmentally friendly products (green products) include the use of technology that does not pollute the environment, raw materials and packaging made from recycled materials.	Pottery is made from a mixture of clay and sand and water. Pottery in Plancungan Village is made with a tool known as furniture. Layah sales in the market are usually wrapped in newsprint.	Original Thinking (Origina-lity)	Writing drawings, reinterpret ations, and new emphases define individual differences	Question: Design your innovative pottery products then promote the advantages of your pottery products by making posters! Answer: Designing unique earthenware products that are of interest to students and making posters
Engineer -ing	Appropriate Technology is technology that can answer problems, is small-scale, labor-intensive and energy efficient.	Furniture is arranged by combining wooden planks and a wooden base whose shaft is given a klaker so that the	Think Flexible (Flexibi-lity)	Spontan by involving a change in direction in thinking	Question: Pay attention to the following tools and materials!  tools and materials above and give an

STEAM aspect	Material	Traditional	Indicator	Sub. indicator	Questions and answers
		wooden planks can rotate.the use of moving by rope.			explanation! Answer: Tools and materials (C, E, F, G) E and F are arranged first then above them C, E are connected to G and G is connected to electricity.

3. Development

This stage develops an instrument validation sheet. The validity of the test is known by conducting expert validation based on the content criteria which consists of sub suitability. Indicators with questions, suitability of questions with answers, and suitability of questions with Bloom's Taxonomy, as well as feasibility of language and presentation. Expert validation is carried out to determine the feasibility of the instrument that has been developed. The results are then analyzed based onIndex aiken' v with the provisions of the rater as many as 5 experts consisting of two teachers and 3 lecturers, and using 5 scales or ratings. The instrument is said to be feasible if the aiken index is greater than 0.80 and is said to be infeasible if the aiken index is less than 0.80.The results of the expert validation were analyzed based on the Aiken V Index as shown in Table 2 below:

Table 2. Results of Content Validity with Aiken V

Appropriateness	V	Information
1. Average Content Eligibility a. Sub suitability. Indicator with questions b. Conformity of questions with Bloom's Taxonomy c. Conformity of questions with answers	0.88	Valid
2. Language Eligibility	0.9	Valid
3. Eligibility of Presentation	0.86	Valid
Average	0.88	Valid

Validation results obtained some suggestions for improvement. Revisions were made as in Table 3. As follows:

Table 3. Revision Instrument

Indicator	Sub. Indicator	Before	Revision	Information
Fluency	Association Smoothness	C5 evaluates	C4 analyze	C5 assesses strengths and weaknesses and then generates new ideas or suggestions
	Fluency of Expression	C4 analyze	Question not used	Deleted
Flexibility	Spontaneous by involving a change in direction in thinking	C6 designs	C4 hooked	Because the picture is already provided

Small Class Test was conducted in Class IX B as many as 9 students. Achievement of Creative Thinking Ability Indicators as shown in Table 4 below:

Table 4.Results of Achievement of Creative Thinking Skills Indicators

Indicator	Percentage (%)	Category
1. Fluent Thinking *(Fluency)*	73,61	Good
2. Think Flexible *(Flexibility)*	68.06	Good
3. Original Thinking *(Oiginality)*	66,67	Good
4. Thinking in Detail *(Elaboration)*	73,61	Good

The level of students' Creative Thinking Ability is shown in Table 5 below:

Table 5. Level Results Creative Thinking Ability

Criteria	Percentage (%)
1. Very creative	33,33
2. Creative	33,33
3. Creative Enough	33,33

At this small class test stage, no problems were found in carrying out the test so that it could be continued in other class tests. At this development stage, the instrument was tried out in Class IX A as many as 18 students. Achievement of creative thinking skills indicators as shown in Table 6. below:

Table 6.Results of Achievement of Creative Thinking Skills Indicators

Indicator	Percentage (%)	Category
1. Fluent Thinking *(Fluency)*	97,22	Very good
2. Think Flexible *(Flexibility)*	61,11	Good
3. Original Thinking *(Originality)*	72,22	Good
4. Thinking in Detail *(Elaboration)*	92.36	Very good

The Level of Students' creative thinking skills in the class IX A tryout is shown in Table 7. the following:

Table 7. Results of the Level of Creative Thinking Skills

Criteria	Percentage (%)
1. Very creative	72,22
2. Creative	27,78

The creative thinking ability level of the small test students in Classes IX B and IX A is different because there are more students in Class IX A, and Class IXA students have more ability to provide different solutions according to the circumstances requested, as well as the ability to detail designs well. The next development is Implementation in Class IX C so that the results can be used as a comparison.

4. Application

Based on the implementation results in Class IX C of 14 students, the achievement of the indicators of creative thinking skills was obtained as shown in Table 8. below:

Table 8.Results of Achievement of Creative Thinking Skills Indicators

Indicator	Percentage (%)	Category
1. Fluent Thinking *(Fluency)*	77,67	Good
2. Think Flexible *(Flexibility)*	55,93	Good
3. Original Thinking *(Originality)*	58,93	Good
4. Thinking in Detail *(Elaboration)*	86,61	Very good

The level of students' creative thinking skills in the small class test can be seen in Figure 1. The following:

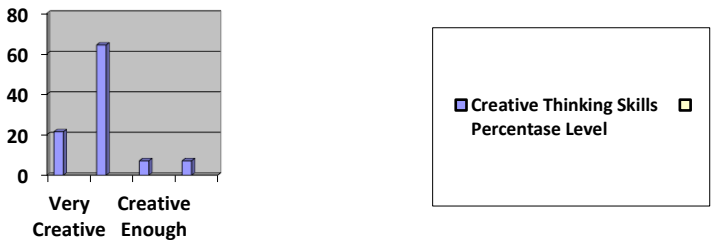

Figure 1. Level of Creative Thinking Skills Class IX C Limited Class Test

The distribution of creative thinking skills in class IXC is more even compared to Class IX B and IXA, but in Class IX C students with very creative criteria are only 21.43% or 3 students. This STEAM-Based creative thinking skills test instrument integrated with Local Wisdom has a validity of 0.88 with a valid category. The test reliability was 0.81, the standard deviation was 4.91, and the XY correlation was 0.68. The instrument's ability to carry out assessments will ensure the effectiveness of learning so that it can provide higher quality education to students(Babinčáková et al., 2020). Instruments that are valid and reliable will produce good data and can be accounted for.The results are in Table 9. As follows:

Table 9. Results of Item Analysis with ANATES Description

No. Items	Q	DP(%)	Difficulty Level	Correlation	sign. Correlation
1	5,72	35.00	Easy	0.615	Significant
2	3,16	25.00	Currently	0.784	Very Significant
3	1.50	30.00	Easy	0.779	Very Significant
4	2.56	35.00	Easy	0.650	Significant
5	3,16	50.00	Easy	0.804	Very Significant
6	1.39	25.00	Currently	0.621	Significant
7	3.09	50.00	Currently	0.698	Significant

The results of the analysis of the test instruments that have been developed are as follows:

Adding art to a STEM approach not only provides an interesting approach, but also the opportunities for self-expression and personal relationships that young people crave. The arts can help develop STEM skills because the approach is broader and different(Land, 2013). Problem no.7 Design a kiln so that the pottery produced is of high quality. Then incorporate STEAM aspects to your design. Science = tools and materials used. Technology = Technology used. Engineering = shape of the stove, Mathematics = size of the stove, Art = artistry of the stove! This question integrates STEAM on the adaptive sub-indicator flexibility indicator by generating alternative formations. Student answers can be seen in Figure 2. As follows:

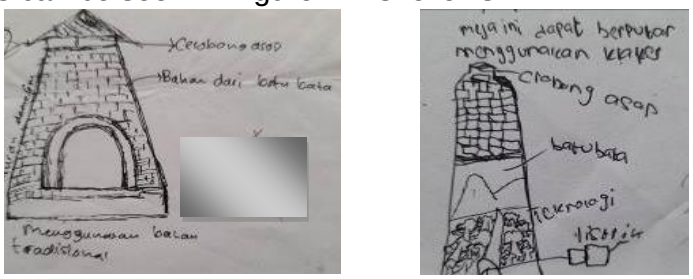

Figure 2. Student Answers on the Flexibility Indicator

The questions and answers on the flexibility indicator were as expected, but not all students could mention the STEAM components in detail. The design task is in accordance with the scenarios and specifications in the STEAM activity, namely the task of building an ideal beach house for a family. The expected design includes the area of the house, the number and important areas, the materials and designs of the walls, windows and roof of the house(Thomas & Yousef Mahmoud, 2022). The questions on the flexibility indicator also contain elements of novelty or original thinking which can be seen in the design of the furnace shape. This instrument is better in terms of giving students freedom in determining the stove material, shape, size, and

technology chosen when compared to similar indicators on different instruments. The instrument is: "Presented data about base with the same mass then dissolved into distilled water until the volume is exactly 100 mL. Which is the most appropriate solution to neutralize 20 mL of H2SO4, 0.2 M solution so that the titrant volume is made to a minimum?"(Hidayat et al., 2018).

This problem can lead students to think flexibly by using operational verbs from Bloom's Taxonomy C6 to make a design. This question can calculate the Level of Students' Creative Thinking Ability based on the score that has been compiled on the flexibility indicator as shown in Table 10. The following:

Table 10 . Frequency of Flexible Thinking (Flexibility)

Score	Description	frequency (f)
0	Students do not answer	2
1	Students are only able to design or explain	0
2	Students are able to design and explain pictures or explain 1 aspect of STEAM	16
3	Students are able to design stoves artistically and are able to explain based on 2 aspects of STEAM, or students are only able to design and be able to explain 3 or 4 aspects of STEAM	19
4	Students are able to design stoves artistically and are able to explain STEAM aspects in full	4

The originality indicator is found in question number 2. Design your innovative pottery product and then promote it by making flyers and posters! Student answers can be seen in Figure 3 as follows:

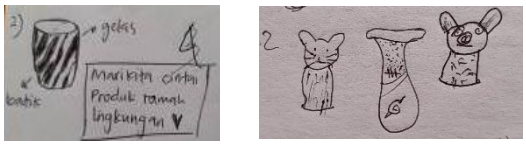

Figure 3. Student Answers on the Originality Indicator

This problem is able to develop students' imagination in various perspectives on art. This is because the problem uses the operational verb from Bloom's Taxonomy C6 to make a design. This question can calculate the level of Students' creative thinking skills based on the score that has been compiled on the originality indicator as shown in Table 11. below:

Table 11. Frequency of Think Originally (Originality)

Score	Description	frequency (f)
0	Students do not answer	1
1	Students are only able to design or make posters	1
2	Students are able to design and explain pictures or make posters	11
3	Students are able to design pottery artistically and are able to make posters according to the theme, or students are only able to design and be able to make posters	26
4	Students are able to design pottery in an innovative way and are able to make posters according to the theme	2

This question is able to lead students to think original by producing various pottery designs, but the students' creative thinking skills is limited to modifying activities and has not yet reached the stage of producing innovative pottery designs. This is evidenced by the acquisition of a score of 3 by most students and only 2 students who received a score of 4. The questions on the originality indicator are in accordance with the development carried out in the following math problem: "Make a different flat shape from the points provided with an area of 4 units and each point can only be used once!"(Priyandani et al., 2018).

This problem gives students a limit in determining the flat shape to be made, but in the question of designing innovative pottery it gives students freedom in determining the shape, decoration, and function of the pottery design. Students can give birth originality related to the originality or uniqueness of the answer with the criterion of how rare an idea is generated(Ernawati et al., 2019). The drawback of question no.2 lies in determining the score that depends on the rater himself, so subjectivity is higher.

Every student has the potential to have creative thinking skills that can be developed and expressed in learning(Suryaningsih & Nisa, 2021). One indicator of Creative thinking skills that can be easily trained in learning is fluency (Fluent Thinking). Question no.5 students are given a case study of the current experiences of pottery craftsmen in Plancungan Village. Students are then asked to a) analyze the advantages and disadvantages of using an electric turntable, and b) what must be done by the pottery craftsmen so that a large amount of pottery is produced in a short time? Student answers for this fluency indicator can be seen in Figure 4 as following:

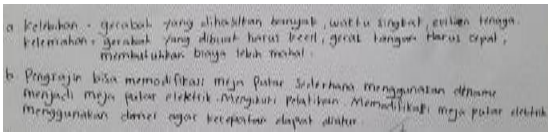

Figure 4. Students' Answers on the Fluency Indicator

This question is able to make students analyze (C4) the situation according to the problems presented. This is in accordance with the development of the problem, namely: "A laboratory assistant conducted an experiment by reacting solid NaOH into distilled water until the volume of the solution reached 100 mL, and the pH of the solution changed from 2 to 4. Based on the description, write the problem into a question and give a conclusion based on your answer!"(Hidayat et al., 2018). However, question number 5 is still below when compared to the following fluency indicator of creative thinking skills: "To minimize accidents, the government sets a maximum speed limit of 50 km/hour for urban areas. Describe some of the other benefits besides reducing accidents. Write your answers in the form of a mind map(Tiadarma et al., 2022). This question contains instructions for designing a mind map while the questions in Figure 4 are only in the realm of analysis. The problem in the form of a case study can calculate the level of students' creative thinking ability based on the score that has been compiled on the Fluency indicator as shown in Table 12 below:

Table 12 . Frequency of Fluent Thinking (Fluency)

Score	Description	frequency (f)
0	Students do not answer	0
1	Students are only able to mention their strengths or weaknesses or students are only able to mention solutions to question 5.b	5
2	Students are able to mention their strengths and weaknesses but are unable to name solutions or are able to name at least 2 solutions but are only able to state their strengths or weaknesses	2
3	Students are able to mention 2 strengths and weaknesses but are unable to name solutions or are able to name at least 3 solutions but are only able to state 2 strengths and weaknesses	10
4	Students are able to mention more than 3 strengths and weaknesses and are able to name 3 solutions	26

Based on the table it is known that many students are able to answer with a perfect score because the questions are in the easy category. Questions with elaboration indicators are in number 4. Write detailed steps based on STEAM analysis on the process of making pottery from clay until the pottery is ready for market. Student answers can be seen in Figure 5 as follows:

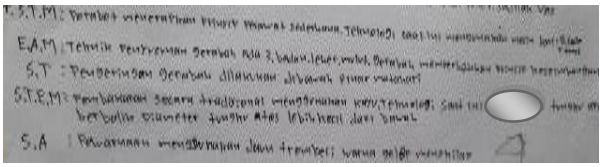

Figure 5. Student Answers on the Elaboration Indicator

Most students have been able to write down the steps for making pottery in detail, but to explain based on the STEAM approach still needs to be deepened. Another factor, the description of the score 4 has not been able to fully describe the assessment criteria. This is in accordance with the answers of the most students who get a score of 4 based on Table 13. This question can calculate the Level of Students' creative thinking skills based on the score that has been compiled on the elaboration indicator as shown in Table 13 below:

Table 13 . Frequency to Think Detailed (Elaboration)

Score	Description	frequency (f)
0	Students do not answer	1
1	Students are only able to mention the process of making pottery	2
2	Students are able to arrange work steps only	8
3	Students are able to arrange work steps based on STEAM aspects	6
4	Students are able to arrange detailed work steps based on STEAM aspects precisely	24

The questions in Figure 5 correspond to the question "What kind of wood can be used to make drums like the Pandowo drum? Why is that?"(Almuharomah et al., 2019). This is also in accordance with the problem "A laboratory assistant conducted an experiment by reacting solid NaOH into distilled water until the volume of the solution reached 100 mL, and the pH of the solution changed from 2 to 4. Based on the description, write down the data needed and describe the steps to solving the problem!"(Hidayat et al., 2018).

Evaluation

This STEAM Integrated Local Wisdom-Based Creative Thinking Skills Instrument based on expert assessment has fulfilled the elements of local wisdom and STEAM aspects but needs to be developed further. This instrument also needs to be applied in learning in other schools so that it can be improved even better. Scoring needs to be standardized based on a scale that has been developed by experts to avoid subjectivity in determining innovative design criteria.

Conclusion

The STEAM-LW based creative thinking skills test instrument was developed with reference to the ADDIE model development procedure. This test instrument was developed based on indicators of Creative Thinking Ability namely fluency, flexibility,

originality, and elaboration. This instrument was also developed based on the STEAM approach which is integrated with the local wisdom of Plancungan pottery.

This STEAM-Based Creative Thinking Skills test instrument integrated with Local Wisdom has a validity of 0.88 with a valid category. Test reliability of 0.81 and has the difficulty level of the questions in the easy category is 4 items and the medium category is 3 items. The significance of the correlation of 3 questions is at a very significant level, and 4 questions are at a significant level. This test instrument is proven to be able to improve students' creative thinking skills.

It is hoped that the STEAM-Based Creative Thinking Skills test instrument integrated with Local Wisdom can be used by teachers in learning in the Independent Curriculum. This research is expected to be a reference for the development of similar test instruments in the future.

References

Afrianingsih, A., Salsabila, AP, Hidayah, FN, & Farida, N. (2020). Growth and Development: Theory Study and Early Childhood Learning Journal of PG-PAUD FKIP Sriwijaya University The Effect of Using Flashcard Media on. Https://Ejournal.Unsri.Ac.Id/Index.Php/Tumbuhkembang/Index, 7, 97–105.

Almuharomah, FA, & Mayasari, T. (2018). Profile of Physics Creative Thinking Ability of Junior High School Students. Quantum National Seminar #25 (2018), 2, 2477–1511.

Almuharomah, FA, Mayasari, T., & Kurniadi, E. (2018). The Role of Educators and Science Scientists in Welcoming the Revolution ISSN : 2527-6670 Development of Science-Based Literacy Instruments. Unipma Journal, 204–213.

Almuharomah, FA, Mayasari, T., & Kurniadi, E. (2019). Development of Integrated STEM Physics Module "Beduk" Local Wisdom to Improve Creative Thinking Ability of Junior High School Students. Physics Education Scientific Periodical, 7(1), 1. https://doi.org/10.20527/bipf.v7i1.5630

Annisa, R., Hsb, MHE, & Damris, M. (2018). Improving Students' Creative Thinking Ability by Using the STEAM (Science, Technology, Engineering, Arts and Mathematics) Based Project Based Learning Model on Acids and Bases at SMAN 11 Jambi City. 10(2), 42–46.

Awang, H., & Ramly, I. (2008). Creative thinking skill approach through problem-based learning. World Academy of Science, Engineering and Technology, 16(1), 635–640.

Babinčáková, M., Ganajová, M., Sotáková, I., & Bernard, P. (2020). Influence of formative assessment classroom techniques (Facts) on student outcomes in chemistry at secondary school. Journal of Baltic Science Education, 19(1), 36–49. https://doi.org/10.33225/jbse/20.19.36

Ernawati, MDW, Muhammad, D., Asrial, A., & Muhaimin, M. (2019). Identifying creative thinking skills in the subject matter of bio-chemistry. International Journal of Evaluation and Research in Education, 8(4), 581–589. https://doi.org/10.11591/ijere.v8i4.20257

Florida, R., Mellander, C., & King, K. (2015). The Global Creativity Index 2015. Martin Prosperity Institute.

Gais, Z., & Afriansyah, EA (2017). a K ERROR ANALYSIS OF K ERROR CONCEPT OF SOLVING IN CLASS VII STUDENTS a. Mosharafa : Journal of Mathematics Education, 7(1), 199–206.

Grafinger, DJ (1988). Basics of instructional systems development. Alexandria: American Society for Training and Development. In American Society for Training and Development.

Guilford, J.P. (1975). Varieties of creative giftedness, their measurement and development. Gifted Child Quarterly, 19(2), 107–121. https://doi.org/10.1177/001698627501900216

Herlina, H., Ramlawati, R., & Hasri, H. (2022). Development of STEAM-Based Electronic Learning Devices to Increase Interest and Learning Outcomes. Chemistry Education Review (CER), 5(2), 198. https://doi.org/10.26858/cer.v5i2.32731

Hidayat, T., Susilaningsih, E., & Kurniawan, C. (2018). The effectiveness of enrichment test instruments design to measure students' creative thinking skills and problem solving. Thinking Skills and Creativity, 29, 161–169. https://doi.org/10.1016/j.tsc.2018.02.011

Kim, KH (2011). (2011). The Creativity Crisis : The Decrease in Creative Thinking Scores on the Torrance Test of Creative Thinking. Creativity Research Journal , 285–295.

Kurnia, A., Sukarmin, & Sunarno, W. (2021). Profile of Students' Creative Thinking Ability Using Multiple Choice Test Questions in Learning Natural Sciences. Indonesian Journal of Educational Science (IJES), 4(1), 27–32. https://doi.org/10.31605/ijes.v4i1.1147

Land, MH (2013). Full STEAM ahead: The benefits of integrating the arts into STEM. Procedia Computer Science, 20, 547–552. https://doi.org/10.1016/j.procs.2013.09.317

Milara, IS, Pitkänen, K., Laru, J., Iwata, M., Orduña, MC, & Riekki, J. (2020). STEAM in Oulu: Scaffolding the development of a Community of Practice for local educators around STEAM and digital fabrication. International Journal of Child-Computer Interaction, 26, 100197. https://doi.org/10.1016/j.ijcci.2020.100197

Oktoriyadi, O. (2020). The Implementation of Steam Integrated Thematic Learning Based on Local Wisdom of Kapuas Hulu in Elementary School. JP2D (Basic Education Research Journal) UNTAN, 3(1), 42. https://doi.org/10.26418/jp2d.v3i1.97

Priyandani, CA, Indrawatiningsih, N., & Afifah, A. (2018). Profile of the Level of Creative Thinking of Class VII Middle School Students in Solving Problems on the Subject of Triangles and Quadrilaterals. Journal of Mathematics and Science Education, 6(2), 50. https://doi.org/10.25273/jems.v6i2.5329

Putra, RD, Rinanto, Y., Dwiastuti, S., & Irfa, I. (2016). Improving Students' Creative Thinking Ability through Guided Inquiry Learning Model for Class XI MIA 1 Students of SMA Negeri Colomadu Karanganyar Academic Year 2015/2016. Proceedings of Biology Education Conference, 13(1), 330–334.

Rahayu, VA, Haryani, S., & Dewi, SH (2019). The Effectiveness of Developing a Test Instrument to Measure Students' Creative Thinking Ability. School Science and Mathematics, 2(3), 133–139.

Rofiah, E., Aminah, NS, & Ekawati, EY (2013). Preparation of Physics Higher Order Thinking Ability Test Instruments for Junior High School Students. 1(2), 17–22.

Sung, YT, Lee, HY, Yang, JM, & Chang, KE (2019). The quality of experimental designs in mobile learning research: A systemic review and self-improvement tool. Educational Research Review, 28(May), 100279. https://doi.org/10.1016/j.edurev.2019.05.001

Suryaningsih, S., & Nisa, FA (2021). The Contribution of Steam Project Based Learning in Measuring Science Process Skills and Creative Thinking of Students. Indonesian Journal of Education Education, 2(6), 1097–1111.

Susanto et al. (2015). Development of Mathematical Creative Thinking Ability Instruments for Middle School Students. 2017, 4(April), 27–41.

Thomas, R., & Yousef Mahmoud, E. (2022). Theoretical and Conceptual Framework for A STEAM-Based Integrated Curriculum. Article in The Journal of Positive Psychology, June, 5045–5067.

Tiadarma, MA, Sahyar, & Bunawan, W. (2022). Development of Creative Thinking Skills Test Instruments on Kinematics Materials for SMA/MA Students in Medan. AIP Conference Proceedings, 2659(November). https://doi.org/10.1063/5.0113166