JPPIPA 9(6) (2023)

Jurnal Penelitian Pendidikan IPA

Journal of Research in Science Education

http://jppipa.unram.ac.id/index.php/jppipa/index

Development of Assessment Instruments in Project-Based Learning to Measure Students Scientific Literacy and Creative Thinking Skills on Work and Energy Materials

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Received: November 10, 2022
Revised: May 19, 2023
Accepted: June 25, 2023
Published: June 30, 2023

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DOI: 10.29303/jppipa.v9i6.2421

Abstract: This study aims to develop a project-based learning assessment instrument to measure scientific literacy and students creative thinking skills on work and energy material that is valid, reliable, and practical to use. The method used is Research and Development (R&D) using 7 development steps adapted from Borg & Gall (1989). The results of the expert validation of the scientific literacy skills assessment instrument and students creative thinking skills were declared valid with a very high category. In the results of the data test analysis, there were 20 questions on the scientific literacy ability instrument and 18 questions on the creative material of the thinking ability instrument which were declared valid. Meanwhile, in the practicality test, this assessment instrument obtained very high criteria. based on the results that have been obtained, the final product is a project-based learning assessment to measure students' scientific literacy and creative thinking abilities in the developed business and energy material that meets the eligibility standards of the instrument, that is valid, reliable and practical.

Keywords: Assessment instruments; Creative thinking skills; Project-based learning; Scientific literacy skills

Introduction

This study aims to develop an assessment instrument for project-based learning to measure students' scientific literacy and creative thinking skills on work and energy materials that are valid, reliable, and practical to use. According to Suyatna et al. (2020) Assessment is one important factor in learning, therefore the implementation of the assessment must be carried out optimally both in terms of technique, method, and the quality of the items. In collecting data for an assessment, an instrument is used as a measuring tool used to obtain quantitative and qualitative information about the characteristics of research variables objectively (Rosidin, 2017). Assessment is the use of assessment tools and methods to obtain information about achievement of competence or the extent to which student learning outcomes (Rosidin, 2017). Education today is the 21st century and is also known as the era of the industrial revolution 4.0 which is marked by the development of science knowledge and technology. The development of science and technology requires students to have some thinking skills (Rosidin et al., 2019). One of the skills that must be possessed by students in the 21st century is literacy skills. Scientific literacy skills have an important role in a learning process (Asrizal et al., 2017). The challenges of 21st century education demand the birth of a superior generation capable of creative thinking. In addressing the challenges of 21st century education, students are expected to be able to solve problems in everyday life through the knowledge they gain in the learning process (Yusnaeni et al., 2017).

One of the basic literacy skills is scientific literacy. These competencies are important to be taught to students in the context of 21st century learning (Rosidin

How to Cite:
Rosidin, U., Herliani, D., & Viyanti. (2023). Development of Assessment Instruments in Project-Based Learning to Measure Students Scientific Literacy and Creative Thinking Skills on Work and Energy Materials. *Jurnal Penelitian Pendidikan IPA, 9*(6), 4484-4494. https://doi.org/10.29303/jppipa.v9i6.2421

et al., 2019). Scientific literacy is one of the seeds that the Education wants to sow to create scientists through scientific thinking (Bang, 2017). Scientific literacy is the ability to understand the concepts, processes of science and use science to solve problems in everyday life. According to PISA (Program for International Student Assessment) scientific literacy is an ability use scientific knowledge, identify questions, and draw conclusions based on scientific evidence to be able to understand and make decisions regarding nature and its changes due to human activities. Scientific literacy is very important for students so that students not only understand science as a concept, but also students are able to apply science in everyday life. Scientific literacy is the main focus in 21st century learning. Science has three inseparable components, namely products, scientific processes, and scientific attitudes (Rusilowati, 2018).

In addition to having scientific literacy skills, students are required to be able to think creatively in describing problems in each subject, including physics subjects. Creative thinking ability is the ability to think that is trained to turn on the imagination, revealing new possibilities by opening a wide perspective to find new ideas (Suripah & Sthephani, 2017). The ability to think creatively can be interpreted as an activity to generate an idea or ideas in solving problems, as well as connecting one thing to another to find the true meaning (Rizal et al., 2020). Skill that needs to be developed is creative thinking skills because creative thinking is one of the important abilities that students must have in physics lessons (Siburian et al., 2019; Batlolona et al., 2019). Through creative thinking, students are expected to be able to see physical phenomena from various points of view. Students are also able to give various answers to the physics problems they face. So that students have many ways or options in solving physics problems or phenomena that are presented. This has a good impact on students, because students can find a way that is most effective and efficient in solving physics subject problems.

The low ability of scientific literacy in Indonesia is influenced by several factors. These factors include the learning model applied by the teacher and the teaching materials used by the students (Fuadi et al., 2020). This is supported by the opinion of Sutrisna (2021) and Rohmah et al. (2021) that is several factors that influence the low scientific literacy of students according to the cause of low scientific literacy, namely the tendency that the learning process does not support students in developing scientific literacy skills.

One model that is seen as being able to improve students scientific literacy skills is a project-based learning model according to Sari dkk (2017). According to Erisa et al. (2021) the project-based learning model can improve student's creative thinking skills. This is in line with the opinion of Markula et al. (2022) and Lin (2017) that one of the learning models that can be applied by teachers in facing the 21st century is the PjBL learning model.

Assessment is carried out as an effort to measure the level of achievement of learning indicators and collect information on the progress of the student learning process (Scaradozzi et al., 2019). Various forms of formative assessment, such as assignments, projects, presentations, and quizzes. Based on the needs analysis carried out at SMA N 1 Kotaagung on December 14, 2021 through a teacher needs analysis questionnaire, it was found that there were still few available assessment instruments or assessment instruments in project-based learning to measure students' scientific literacy and creative thinking skills on work and energy materials. using a special scoring rubric. The assessment used by the new teacher uses observation techniques so that it is not optimal in observing students' scientific literacy and creative thinking skills. Students understanding of scientific concepts, scientific literacy skills and students creative thinking is low. Based on the preliminary research conducted by the researchers, all teachers agreed that an assessment instrument for project-based learning should be developed to measure students' scientific literacy and creative thinking skills on the subject of effort and energy.

Taking into account the reality in schools as an effort to provide solutions to problems experienced by teachers and students, it is important for researchers to develop assessment instruments in physics learning, to measure students' scientific literacy and creative thinking skills. So that in the assessment process there are standards or benchmarks so that the values obtained are valid and objective. In the aspect of evaluation or assessment learning is very important to be carried out properly by the teacher because it can assist in the personal development process of each student and serves to assess the extent to which students can achieve the goals of learning. In process assessment There are 3 aspects of learning that are assessed which include affective, cognitive, and skills aspects. Based on the background of these problems, a study was conducted entitled "Development of Assessment Instruments in Project-Based Learning to Measure Scientific Literacy and Creative Thinking Skills of Students on Business and Energy Materials".

Method

The method used is Research and Development (R&D). The product that the researchers developed in this study was an assessment instrument on project-

based learning to measure students' scientific literacy and creative thinking skills on work and energy materials. The method used is based on the development Borg & Gall (1989) which consists of 10 development steps. This development research using 7 development steps, namely: 1) research (information gathering); 2) planning; 3) initial product development; 4) initial field trials; 5) revision of trial results; 6) field trials; 7) operational product revision. The researcher chose the Borg & Gall model because the development steps were divided in detail and in accordance with the research design to produce a useful assessment instrument. This development only uses seven steps due to time constraints and the COVID-19 pandemic. The following is a picture of the procedure for developing a project-based student's scientific literacy and creative thinking ability assessment instrument.

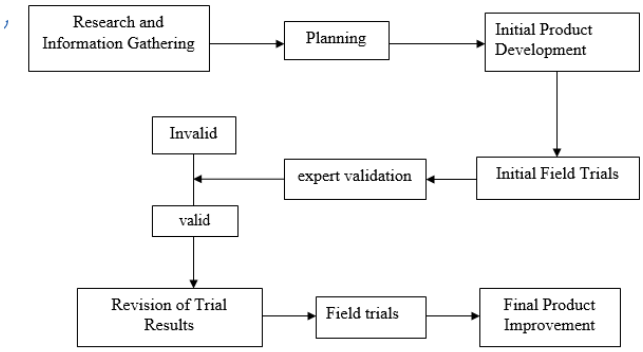

Figure 1. Instrument development procedure

This study used two subjects, namely research subjects and test subjects. The research subject in this development research is an assessment instrument on project-based learning to measure students' scientific literacy and creative thinking skills on work and energy materials. The trial subjects of this development research consisted of three groups. The first group was the subject of a needs analysis consisting of physics teachers. The second group is the subject to test the validity of the product that has been developed, namely expert practitioners. The third group is a test subject to determine the practicality of the product consisting of physics teachers.

The data sources in this study came from the information collection step, the design validity step, and the product testing step. At the information collection step, data were obtained from filling out questionnaires by teachers regarding the application of indicators of scientific literacy and creative thinking skills, project-based learning, the availability of scientific literacy assessment instruments and creative thinking, as well as the need for the development of assessment instruments in project-based learning to measure scientific literacy skills. and students creative thinking on the matter of effort and energy. At the expert validity step, data were obtained from filling out a questionnaire on the feasibility of construction, substance, and language by expert practitioners. In the trial phase of the product, the data was obtained from filling out the practicality test questionnaire by the physics teacher on the scientific literacy and creative thinking ability assessment instrument developed by the researcher.

Techniques carried out are analysis of validity test results, analysis of reliability test results, and analysis of practicality test results. The empirical validity test in this study uses the Rasch model with Ministep 4.5.4 software developed by Linacre in 2006. This Rasch model is able to see the interaction between respondents and items at once. The parameters used to determine the accuracy or suitability of respondents and questions are: (a) the value of outfit mean square (MNSQ) received: $0.5 < MNSQ < 1.5$. (b) n value of outfit Z-standars (ZSTD) received: $-2.0 < MNSQ < +2.0$. (c) The value of outfit Point Measure Correlation (Pt Mean Corr) received: $0.4 < Pt\ Measure\ Corr < 0.85$ (Boone et al., 2014). This reliability test uses the Rasch model with the help of Ministep 4.5.4 software. In this study, there are two reliability analyzes, namely: item reliability and person reliability. To measure reliability with the rasch model, it is necessary to use the cronbach alpha formula. The practicality test is carried out using the questionnaire provided to the teacher. The teacher response questionnaire aims to determine the teacher's response to the quality of the Project-based scientific literacy ability assessment instrument that has been developed based on practical aspects.

Results and Discussion

The type of research carried out is research and development, with the product being developed, namely an assessment instrument on project-based learning to measure students' scientific literacy and creative thinking skills on work and energy materials. The product of the assessment instrument was developed using research and development procedures according to Borg & Gall (1983), with the results of the following steps.

Research and Information Collection

Research and data collection are divided into namely literature study and analysis of preliminary studies. Relevant literature studies are carried out by researchers through various sources in the form of books, national and international journals, and other sources. As well as the results of the preliminary analysis conducted by the researchers, all teachers agreed that an

assessment instrument for project-based learning would be developed to measure students' scientific literacy and creative thinking skills on work and energy materials.

Planning

The instrument for assessing students' scientific literacy and creative thinking skills is in the form of non-test assessments using observation techniques. The product design in the initial content section consists of student assignment sheets, cover, foreword, table of contents, and rationale. Meanwhile, the content section consists of a grid, instrument form, rubric and final scoring guideline for the instrument. The final content section consists of an assessment sheet, final score recapitulation, recommendations and bibliography. The arrangement of grids, forms of instruments, rubrics and student assignment sheets refers to the physics learning syllabus and indicators of student's scientific literacy and creative thinking abilities. Indicators of scientific literacy and creative thinking skills refer to each aspect that is assessed. Each of these indicators is based on the opinion of experts which is then used as a reference by researchers in development research. The scientific literacy indicators used in the development of this instrument are based on the 2018 PISA indicators, namely explaining phenomena scientifically, evaluating and designing scientific investigations, and interpreting scientific data and evidence. The creative thinking indicators used in developing this instrument are based on indicators according to Munandar (2009), namely fluency, flexibility, originality and elaboration.

Initial Product Development

In this step, initial product development is carried out in the form of scientific literacy assessment instruments and students' creative thinking skills in project-based physics learning, with product development steps, namely from the objectives of the product being developed. The purpose of developing this assessment instrument is to measure students' scientific literacy and creative thinking abilities observed in the project-based physics learning process. Furthermore, the contents of the assessment instrument that has been developed are in the form of a table containing core competencies, basic competencies, PjBL steps, indicators of scientific literacy and students' creative thinking abilities to be identified and statement numbers. The form of the instrument developed is in the form of an assessment sheet equipped with a rubric made according to project-based learning steps. The assessment instrument rubric contains indicators of scientific literacy and students' creative thinking skills that will be identified, PjBL steps, observation statement items, and assessment scores. From the rubric of the instrument, an assessment sheet is then made in which the assessment is carried out at each step of project-based learning. The scientific literacy assessment instrument rubric and students' creative thinking skills have observation statements consisting of three and four indicators respectively. The rating scale is the scale used in the scientific literacy assessment instrument and students' creative thinking skills with four alternative scores namely 4, 3, 2, and 1 by students. The researcher chose the rating scale because it was adjusted to the form of the instrument being developed. The instrument rubric contains scores along with aspect criteria that must be met by students. Finally, the scoring guide contains a formula for calculating the score or value for each assessment step and obtaining a final score conclusion along with the assessment criteria for scientific literacy and students' creative thinking abilities. Based on the scoring guidelines, the steps taken are after assessing each item of the student's scientific literacy and creative thinking ability statement, then calculating the value of each step using the equation 1.

$$\text{Score} = \frac{\sum \text{score obtained}}{\sum \text{score of each item}} \times 100\% \quad (1)$$

Information:

∑score obtained: The number of scores obtained by students in the assessment.

∑score for each item statement: The maximum number of scores for each statement item that can be obtained by students in the assessment. Total score for each item statement, namely: the number of items x the maximum score for each item.

Initial Field Testing

At this step, an expert validation test was conducted on the assessment instruments and student assignment sheets (LTS) on aspects of construction, substance, and language. This expert validation test was assessed by two expert lecturers from the University of Lampung. Based on the results of the validation by the expert, it was stated that the instrument for assessing students' scientific literacy and creative thinking skills was appropriate to be used with revision. The results of the validation assessment by each expert validator are presented in Table 1.

Based on Table 1, it is known that, in the construction aspect, the assessment scores from expert validation 1 and expert validation 2 are 32 and 26 respectively with an assessment percentage of 80.55%, which means that the assessment instrument for students' scientific literacy and creative thinking skills in project-based learning has construction aspect with very high category. In the substance aspect, the assessment scores from expert validation 1 and expert validation 2 are 51 and 56, respectively, with an assessment

percentage of 89.16%, which means that the assessment instrument for student's scientific literacy and creative thinking skills in project-based learning has a very high category aspect of substance. In the language aspect, the assessment scores from expert validation 1 and expert validation 2 are 9 and 12 respectively with an assessment percentage of 87.50%, which means that the assessment instrument for scientific literacy skills and student's creative thinking in project-based learning has language aspects with a very high category. The average percentage of assessment based on aspects of construction, substance and language is 85.73% with a very high category.

Table 1. Assessment Instrument Validation Results

Aspect	Expert 1	Expert 2	Max Score	Evaluation (%)	Category
Construction	32	26	36	80.55	Very high
Substance	51	56	60	89.16	Very high
Language	12	9	12	87.50	Very high
Average Percentage				85.73	Very high

Revision of Trial Results

Based on expert data validation, the data that has been obtained is used to find out discrepancies, errors or product deficiencies, then product revisions are carried out in accordance with comments and suggestions for improvement from experts. There were several suggestions from the expert validator for the instrument that the researcher developed, including improving the title of the instrument to become an instrument for assessing scientific literacy and students' creative thinking abilities (identification scale), Improved regarding the selection of vocabulary in the introductory content; Improved writing of the number of statement items on the instrument grid and Simplified the final grade recapitulation sheet of scientific literacy and students' creative thinking skills.

Field Trial

The instrument for assessing students' scientific literacy and creative thinking abilities that have been revised and declared valid by the three validators, then the instrument was tested limited to 36 students at SMA Negeri 1 Kota Agung. Researchers assessed students' scientific literacy and creative thinking skills using observational techniques during the learning process. Learning is done face-to-face and has been divided into 7 groups according to the total number of students. The data obtained during field trials were then analyzed using the Rasch model with the help of Ministep 4.5.1. The data analysis was conducted to determine the validity and reliability of the assessment instrument for scientific literacy and creative thinking skills of students.

Validity

Instrument of scientific literacy ability there are 20 questions, while the instrument for students creative thinking ability has 20 questions. The validity or level of suitability of the items is used to identify whether the items function normally or not. If there are questions that do not comply with the provisions of the MNSQ, ZSTD, and Pt Mean Corr criteria, then the question cannot be used or discarded. Valid parameter criteria according to Boone et al. (2014), that is the value of the outfit mean square (MNSQ) received is 0.5 < MNSQ < 1.5, the value of Outfit Z-standard (ZSTD) received is -2.0 < ZSTD < +2.0, the value of Point Measure Corr accepted is 0.4 < Pt Measure Corr < 0.85. As for the results of the analysis of the Ministep 4.5.1 software, the results are obtained as in Table 2 and Table 3.

Table 2. Analysis of Fit Items Scientific Literacy

Measure	Outfit MNSQ	Outfit ZTSD	Pt-Mean Corr	Items
61	1.27	1.24	.42	LS5
57	98	-.03	.54	LS9
53	89	-.46	.58	LS13
39	75	-1.20	.60	LS14
39	1.25	1.15	.50	LS15
35	1.32	1.42	.53	LS17
31	1.02	.19	.57	LS16
22	95	-.18	.58	LS12
12	79	-.97	.63	LS11
03	1.28	1.21	.45	LS7
03	76	-1.07	.58	LS8
03	1.07	.40	.62	LS10
-02	80	-.87	.61	LS3
-02	1.18	.82	.53	LS6
-43	1.05	.29	.57	LS1
-48	71	-1.21	.66	LS2
-48	79	-.85	.66	LS4
-48	59	-1.88	.67	LS19
-60	1.01	.11	.53	LS18
-1.06	83	-.52	.71	LS20

Table 3. Analysis of Fit Items Creative Thinking Ability Instrument

Measure	Outfit MNSQ	Outfit ZTSD	Pt-Mea Corr	Items
.59	.99	.02	.64	BK13
.55	1.26	1.19	.43	BK5
.55	.92	-.28	.65	BK9
.46	.79	-.95	.65	BK14
.46	1.16	.78	.55	BK15
.42	1.14	.71	.63	BK17
.38	.95	-.15	.64	BK16
.20	1.05	.29	.63	BK12
.16	.80	-.91	.71	BK11
.11	1.09	.49	.71	BK10
.02	.78	-1.01	.63	BK3
-.07	1.09	.49	.59	BK6
-.07	1.36	1.54	.35	BK7

Measure	Outfit MNSQ	Outfit ZTSD	Pt-Mea Corr	Items
-.07	.78	-.98	.54	BK8
-.42	1.23	.98	.03	BK1
-.47	.79	-.85	.66	BK4
-.52	.80	-.78	.57	BK2
-.52	.77	-.93	.58	BK18
-.65	.77	-1.25	.51	BK19
-1.13	.87	-.36	.61	BK20

Based on table 3 there are 2 instrument questions that are not valid, namely item numbers BK1 and BK7. Instrument item number 1 is declared invalid because the Point Measure Corr value is less than the parameter criteria, namely 0.03. Instrument item number 7 is declared invalid because the Point Measure Corr value is less than the parameter criteria, namely 0.35. Therefore, the 18 valid instrument questions can be used. Meanwhile, the 2 items of the invalid instrument were discarded.

Reliability

Based on the analysis of the reliability of the assessment instrument for students' scientific literacy and creative thinking skills, Cronbach's alpha values were obtained at 0.91 and 0.90, respectively, so that they were included in the excellent category (Sumintono and Wudhiarso, 2015). Cronbach's alpha value in reliability is the value of the interaction between person reliability and overall item reliability. The value of person reliability and item reliability that the researcher uses as a reference is REAL RMSE because this value is the worst condition for lower limit reliability based on the instrument used (Sumintono and Widhiarso, 2015). As for the person reliability for the instrument for assessing student's scientific literacy and creative thinking skills, it can be seen in Table 4 and Table 5.

Table 4. Person Reliability Analysis of Scientific Literacy Ability Instruments

Total Score	Infit		Outfit	
	MNSQ	ZTSD	MNSQ	ZTSD
MEAN	.97	-.09	.96	-.09
SEM	.05	.17	.05	.16
P.SD	.30	1.01	.28	.94
S.SD	.31	1.03	.29	.95
MAX.	1.69	1.91	1.161	1.70
MIN.	.43	-1.96	.43	-1.92
Person Reliability .83				
Person Reliability .85				
CRONBACH ALPHA (KR-20) Person Raw Score "Test" Reliability = .91				

Based on Table 4, it is known that the average value of infit MNSQ and outfit MNSQ, respectively, is 0.97 and 0.96, meaning that the quality of the person is getting better because the value is close to the ideal, namely 1.00. The average value of infit ZSTD and outfit ZSTD respectively is -0.9 and -0.9, meaning that the quality of the person is getting better because the value is close to the ideal, which is 0.0. The value of person reliability is 0.83, which indicates that the consistency of the answers from the respondents is good. The person reliability analysis of the creative thinking ability instrument is presented in Table 5.

Table 5. Analysis of Person Reliability of Creative Thinking Skills

Total Score	Infit		Outfit	
	MNSQ	ZTSD	MNSQ	ZTSD
Mean	.97	-.11	.97	-.10
Sem	.06	.18	.05	.17
P.Sd	.33	1.07	.31	1.00
S.Sd	.33	1.09	.32	1.01
Max.	1.92	2.40	1.89	2.25
Min.	.48	-2.26	.48	-2.19
Person Reliability .8 8				
Person Reliability .8 9				
Cronbach Alpha (Kr-20) Person Raw Score "Test" Reliability = .9 0				

Based on Table 5, it is known that the average value of Infit MNSQ and Outfit MNSQ, respectively, is 0.97 and 0.97, meaning that the quality of the person is getting better because the value is close to the ideal, namely 1.00. The average value of Infit ZSTD and Outfit ZSTD, respectively, is -0.11 and -0.10, meaning that the quality of the person is getting better because the value is close to the ideal, which is 0.0. The value of person reliability is 0.88 which indicates that the consistency of the answers from the respondents is good.

Table 6. Analysis of Item Reliability of Scientific Literacy Skills

Total Score	Infit		Outfit	
	MNSQ	ZTSD	MNSQ	ZTSD
Mean	.97	-.12	.96	-.12
Sem	.05	.24	.05	.21
P.Sd	.22	1.03	.21	.94
S.Sd	.23	1.05	.21	.96
Max.	1.36	1.59	1.32	1.42
Min.	.57	-2.10	.59	-1.88
Person Reliability. 75				
Person Reliability. 75				

Based on Table 6, it is known that the average value of Infit MNSQ and Outfit MNSQ, respectively, is 0.97 and 0.96, meaning that the value is getting better because the value is close to the ideal, namely 1.00. The average value of Infit ZSTD and Outfit ZSTD, respectively, is -0.12 and -0.12, meaning that the quality of the items is getting better because the value is close to ideal, which

is 0.0. The value of item reliability is 0.75 which indicates that the quality of the items is sufficient, meaning that the items on the scientific literacy ability assessment instrument can measure what they want to measure. The item reliability analysis of the creative thinking ability instrument is presented in Table 7.

Based on Table 7, it is known that the average value of Infit MNSQ and Outfit MNSQ, respectively, is 0.96 and 0.97, meaning that the value is getting better because the value is close to the ideal, namely 1.00. The average value of Infit ZSTD and Outfit ZSTD, respectively, is -0.13 and -0.10, meaning that the quality of the items is getting better because the value is close to ideal, which is 0.0. The value of item reliability is 0.77 which indicates that the quality of the items is sufficient, meaning that the items on the creative thinking ability assessment instrument can measure what they want to measure.

Table 7. Analysis of the Instrument Reliability of Creative Thinking Skills

Total Score	Infit		Outfit	
	MNSQ	ZTSD	MNSQ	ZTSD
Mean	.96	-.13	.97	-.10
Sem	.05	.21	.04	.19
P.Sd	.20	.94	.19	.83
S.Sd	.21	.96	.20	.86
Max.	1.28	1.33	1.36	1.54
Min.	.67	-1.51	.70	-1.25
Person Reliability. 77				
Person Reliability. 78				

Based on the reliability test of the creative thinking ability assessment instrument that has been tested it has a person reliability value as shown in Table 4. Person reliability criteria for scientific literacy assessment instruments are in a very good range (Sumintono et al., 2015) which indicates that the overall student assessment is carried out seriously and not carelessly. While Table 6 shows the value of item reliability for the creative thinking ability assessment instrument is in the sufficient range (Sumintono et al., 2015) which shows that, the items on the creative thinking ability assessment instrument have been able to measure what is intended to be measured.

The creative thinking ability assessment instrument that has been tested it has a person reliability value as shown in Table 5. The person reliability criteria for the creative thinking assessment instrument are in a very good range (Sumintono et al., 2015) which shows that the overall student assessment is carried out seriously and not carelessly. While Table 7 shows the value of item reliability for the creative thinking ability assessment instrument is in the sufficient range (Sumintono et al., 2015) which shows that the items on the creative thinking ability assessment instrument have been able to measure what is being measured.

The items on the assessment instrument for students' scientific literacy and creative thinking abilities are declared reliable with Cronbach's alpha values of 0.91 and 0.90 so that they are included in the category of instruments with excellent reliability (Sumintono et al., 2015). The assessment instrument is said to be good if it has high validity and reliability values (Rosidin et al., 2022). The higher the value of the validity and reliability of the assessment instrument, the better the data obtained from the research results (Rosidin, 2017). Because the assessment instrument developed has met the feasibility aspect of the instrument, it can be stated that the assessment instrument to measure students' scientific literacy and creative thinking skills in project-based physics learning is valid and reliable to use.

Practicality

The practicality test was tested on one of the physics subject teachers at SMAN 1 Kotaagung as a practitioner. The average results related to the practicality of the assessment instrument for scientific literacy and creative thinking skills of students who have been assessed by practitioners are presented in Table 8.

Table 8. The Results of the Practicality Assessment of the Instrument for the Ability of Student's Scientific Literacy and Creative Thinking Skills

Aspect	Practicality Test Results (%)	Criteria
Ease of use	81.11	Very Practical
Suitability	83.33	Very Practical
Benefits	92.50	Very Practical
Total score obtained	85.64	Very Practical

Based on Table 8, it is known that in the aspect of ease of use the results of the practicality test get a percentage score of 81.11% with very practical criteria. In the aspect of the suitability of the practicality test results, the percentage score is 83.33% with very practical criteria. In the aspect of usefulness, the results of the practicality test get a score percentage of 92.50% with very practical criteria. The total score of the average percentage of practicality assessment instruments for students' scientific literacy and creative thinking abilities is 85.64% with very practical criteria. The practical assessment of the instrument for assessing students' scientific literacy and creative thinking skills in detail can be seen in Appendix 12. Based on the results of the practicality test by practitioners, the instrument for assessing students' scientific literacy and creative thinking abilities is declared practical without revision.

Validity test of the product developed are in the valid and reliable category. Meanwhile, the results of the practicality test into the practical category. The instrument can be said to be practical because the description of the aspects and indicators of observing students' scientific literacy and creative thinking abilities in each step of learning is easy to understand; the assessment instrument is equipped with illustrations in the form of pictures, graphics, and video links according to the material; assessment instruments can replace student learning notes during the activity, by applying an assessment for learning approach. Where this helps and facilitates the teacher in maximizing the assessment of students, because the assessment is carried out during the learning process by adjusting the steps of the project-based learning model.

Based on this description, the assessment instrument that the researcher developed is feasible to use. This instrument can help and make it easier for teachers to maximize student assessment by adjusting the steps of project-based learning. This is also in line with the statement of Bari et al. (2020) that the practicality of an instrument is meaningful if there are conveniences in the evaluation instrument both in preparing, using, interpreting, obtaining results, and convenience in storing. This is supported by the opinion of Hasana et al. (2017) and Zhuang et al. (2019) who reveal that the assessment instrument developed is said to be feasible if the assessment instrument developed is valid, reliable and practical.

Operational Product Revision

Operational product revision carried out to improve the product so that the instrument has new parameters. Based on the results of the analysis on the creative thinking ability assessment instrument, two invalid instrument items were obtained, namely item numbers BK1 and BK7. Instrument item number 1 is declared invalid because the Point Measure Corr value is less than the parameter criteria, namely 0.03. Instrument question item number 7 is declared invalid because the Point Measure Corr value is less than the parameter criteria, namely 0.35. Thus, the item of the instrument was decided to be discarded because it did not meet the requirements of the item parameters standard instrument. In addition, without the two instrument questions in the creative thinking ability assessment instrument, other indicators to measure creative thinking skills are still fulfilled. After being revised, the instrument for assessing students' scientific literacy and creative thinking abilities consisted of 20 and 18 instrument items, respectively.

Based on field trials, analysis of validity or level of suitability of items (item fit), analysis of the value of person reliability and item reliability and practicality test, the following is the result of the final revision of the assessment instrument for student's scientific literacy and creative thinking skills in project-based learning.

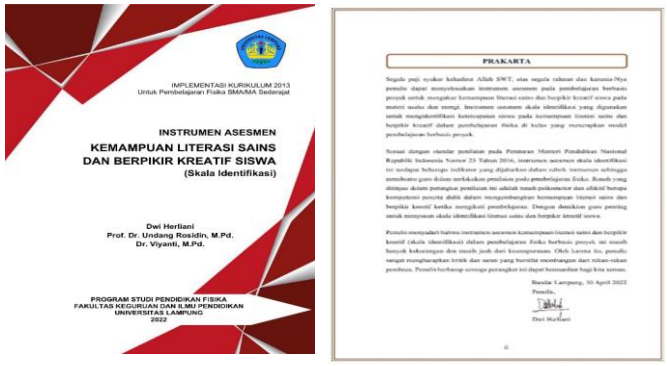

Figure 2. Cover and preface of the instrument

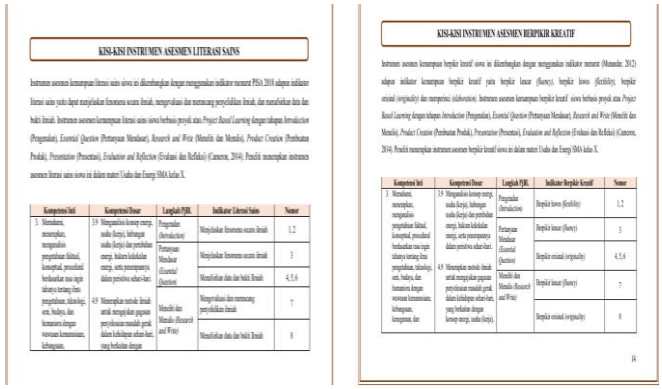

Figure 3. Grid of scientific literacy and creative thinking skills

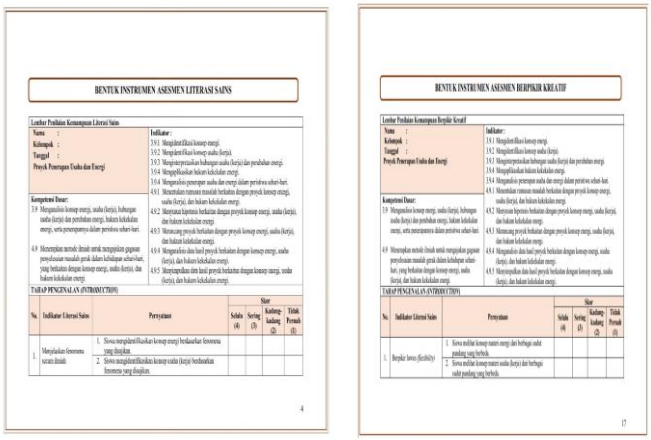

Figure 4. The form of the instrument for scientific literacy and creative thinking

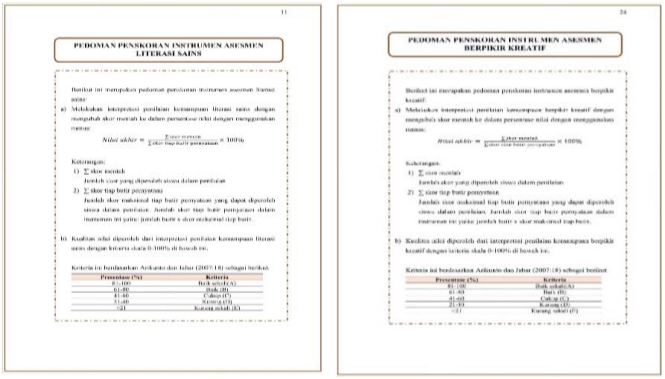

Figure 5. Instrument scoring guidelines

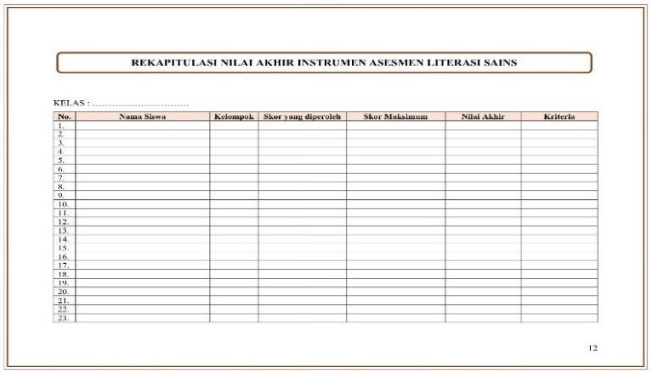

Figure 6. Recapitulation of the final score of the instrument

Conclusion

It can be concluded that the assessment instrument for project-based learning to measure students' scientific literacy and creative thinking skills on the work and energy materials developed is a non-test instrument with a systematic observation technique in the form of an assessment instrument filled out by the teacher. The assessment instrument was developed into two separate instruments, namely an assessment instrument to measure students' scientific literacy skills in project-based physics learning and students creative thinking assessment instruments in project-based physics learning. The assessment instrument consists of three parts, namely the initial part of the instrument consisting of cover, preface, table of contents and rationale. The contents of the instrument consist of a grid, instructions for working on the instrument, the form of the instrument, the rubric of the instrument, guidelines for scoring the instrument, and the recapitulation of the final score. And the closing part of the instrument consists of recommendations and a bibliography. The assessment instrument for project-based learning to measure students' scientific literacy and creative thinking skills on work and energy materials was declared valid, reliable and practical to use.

Acknowledgements

Thank you to expert validation lecturers, University of Lampung lecturers who have helped researchers in validating the instrument products developed. And the school where the researcher conducted the research, namely SMAN 1 Kotaagung which has provided the opportunity for researchers to carry out field tests at X MIA 2 with a total of 36 students.

Author Contributions

The contribution of each author in this research is Conceptualization, Undang Rosidin; methodology, Viyanti; software, Undang Rosidin, Viyanti and Dwi Herliani; ratification, Invite Rosidin and Viyanti; formal analysis, Undang Rosidin; investigation, Undang Rosidin, Dwi Herliani and Viyanti; data curation, Undang Rosidin and Dwi Herliani; writing—original drafting, Dwi Herliani; writing—reviewing and editing, Undang Rosidin and Viyanti; visualization, Dwi Herliani; supervision, Law Rosidin and Viyanti; project administration, Undang Rosidin. All authors have read and agree to the published version of the manuscript.

Funding

This research was independently funded by researchers.

Conflicts of Interest

No Conflicts of interest.

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