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Development of Assessment Instruments in Project-Based Learning to Measure Students Scientific and Numeracy Literacy Ability on Harmonic Vibration Materials

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Abstract: This study aims to develop an assessment instrument in project-based learning to measure Students scientific literacy and numeracy skills on valid, reliable and practical harmonic vibration material. The development design uses the *Research and Development method* with 7 development steps adapting from Borg & Gall (1989) which includes the research and data collection stages, planning, initial product development, initial field trials, revision of test results, field trials, and product revisions. operational. Product validation was carried out by two expert lecturers and one teacher to assess aspects of construction, substance and language, the results of expert validation of the assessment instrument were 90.65% with a very valid category. The results of field trials on 36 students were analyzed using the *Rasch model* with the help of Ministep 4.5.1 software. The results of the analysis of the test data obtained that 19 items of the instrument of scientific literacy ability and 12 items of the instrument of numeracy literacy ability were declared valid. The items on the scientific and numeracy literacy assessment instruments were also declared reliable with *Cronbach's alpha values* of 0.90 and 0.80, respectively, with excellent and good reliability categories. The practicality test of the instrument obtained an average practicality assessment score of 85.83 and was included in the very high criteria. The final product of the assessment instrument developed has met the instrument's eligibility standards, namely valid, reliable and practical.

Keywords: Assessment instrument; Harmonic vibration; Numeracy literacy; Project-based learning; Scientific literacy

Introduction

The 21st century is referred to as the century of knowledge, the century of knowledge-based economy, information technology, globalization, the industrial revolution 4.0, and so on (Prayogi & Estetika, 2019). The development of learning models that are adapted to 21st century learning is very important to provide a learning experience to students. The model used must also increase student involvement in learning (Handayani et al., 2021). One of the appropriate learning models to be applied in 21st century learning is the project-based learning model. Project Based Learning (PjBL) is one of the efforts to changing learning that has been teacher-centered into student-centered learning (Setiani & Priansa, 2015). The stages of the PjBL model according to Cameron et al. (2014), are: Introduction, Essential Questions, Research & Writing, Product Creation, Presentation, Evaluation & Reflection.

The application of the right learning model can hone the skills and abilities of students well. One of the 21st century abilities that students must possess is literacy. Indonesian people are required to have six basic literacy skills, namely cultural and civic literacy, financial literacy, scientific literacy, language literacy, digital literacy, and numeracy literacy (Kemendikbud, 2017). This is in line with the literacy concept proposed by PISA (Program for International Student Assessment).

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Scientific literacy is an individual's scientific ability and the ability to use their knowledge to identify problems, acquire new knowledge, explain scientific phenomena, and draw conclusions based on evidence relate to scientific issues (Wulandari et al., 2016). The indicators of scientific literacy according to the OECD (2019), namely: (1) explaining phenomena scientifically, (2) evaluating and designing scientific investigations, and (3) interpreting data and evidence scientifically. Numerical literacy is the knowledge and skill to: (1) use a variety of numbers and symbols related to basic mathematics to solve practical problems in various contexts of everyday life, (2) analyze information presented in various forms (graphics, tables, charts, etc.), (3) then use the interpretation of the results of the analysis to predict and make decisions (Kemendikbud, 2017).

The average score of Indonesian Students scientific and numeracy literacy skills is in the low category based on the 2018 PISA results released by the OECD (2019). The results of the competition for the low scientific literacy and numeracy abilities of Indonesian students, one of which is because the learning process and evaluation tools (assessments) used are still conventional and focuse on conceptual mastery, so students feel unfamiliar with these abilities at school (Toharudin et al., 2011). An assessment instrument/rubric can measure the quality of Students arguments/answers with clear and measurable criteria (Viyanti et al., 2017). Assessment is the application of various methods and the use of various *assessment* tools to obtain information about the extent to which student learning outcomes or student competency (a series of abilities) are achieved (Rosidin, 2017).

Physics is one of the contexts in science that is measured in PISA. Physics learning, especially harmonic vibration material, requires the right learning model, one of which is Project Based Learning (PjBL). The application of the PjBL model improves student achievement in three domains, namely affective, cognitive, and psychomotor (Cahyaningsih et al., 2020).

The results of a preliminary study conducted by researchers at SMA Negeri 1 Tumijajar showed that teachers had not implemented an assessment that could measure Students scientific literacy and numeracy abilities optimally in the learning process, especially in the material of harmonic vibrations. This is because there are no scientific literacy and numeracy assessment instruments that are easy to apply in the learning process. The teacher also has not carried out the entire syntax or steps in PjBL optimally. Therefore, the researchers conducted research on the development of assessment instruments in project-based learning to measure students scientific literacy and numeracy skills on the material of harmonic vibrations.

Method

This research is a research development or Research and Development (R&D). The product developed in this research is an assessment instrument in project-based learning to measure scientific literacy and numeracy skills on harmonic vibration material. The development of this assessment instrument aims to measure Students scientific literacy and numeracy skills. Therefore, the assessment instrument developed using assessment for learning is an assessment carried out during the learning process. The method used is based on the development model of Borg & Gall (1989).

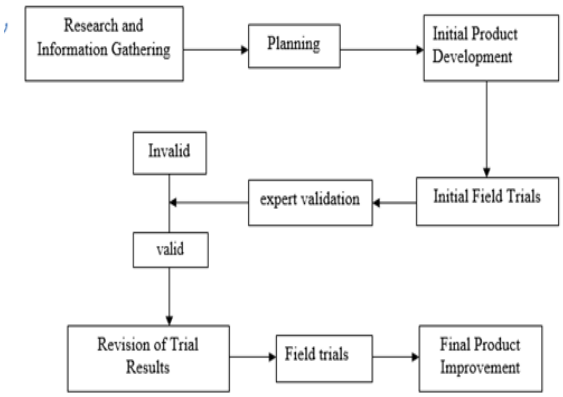

Figure 1. Instrument development procedure

The Borg & Gall development model consists of 10 development steps. However, this development research only uses 7 steps, namely: (1) Research and information gathering; (2) Planning; (3) Initial product development; (4) Initial field trials; (5) Revision of trial results; (6) Field trials; (7) Revision of operational products. The steps of operational field testing, final product revision, and dissemination on the Borg & Gall development model were not carried out because this development research was carried out on a small scale.

This development research uses two subjects, namely research subjects and test subjects. The research subject in this study is an assessment instrument on project-based learning to measure scientific literacy and numeracy skills in harmonic vibration material. Meanwhile, the trial subjects in this study consisted of three groups. The first group is the subject used to conduct a needs analysis, namely physics teachers. The second group is the subject used to test the validity of the product to be developed, namely expert lecturers and teachers. Furthermore, the third group is a test subject to determine the practicality of the product, namely the physics teacher. The data analysis techniques carried out are as follows.

Validity Test

In this study, the validity test was carried out by covering three aspects, namely: substance, construct, and language. The validity test was carried out by material experts and evaluation experts. This validity test aims to assess whether or not a product is feasible to be used as a guide for teachers in measuring Students scientific literacy and numeracy during the learning process. The data obtained through this validation test is in the form of quantitative data using scores on a Likert scale with levels 1, 2, 3, and 4. The results of these scores are then analyzed using calculations as equation 1 where.

$$Percentage\ of\ eligbility = \frac{sumarize\ of\ skor}{maximum\ skor}\ x\ 100\% \quad (1)$$

The average value of the validity of the test instrument is further categorized according to the eligibility criteria in Table 1.

Table 1. Criteria for the Percentage of Eligibility Results (Octavia, 2017)

Percentage	Criteria
25% – 43.75%	Invalid
43.76% – 62.50%	Quite valid
62.51% – 81.25%	Valid
81.26% – 100%	Very Valid

The empirical validity test in this study uses the Rasch model with Ministep 4.5.4 software developed by Linacre in 2006. The 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, include: (1) Mean square (MNSQ) outfit value : 0.5 < MNSQ < 1.5; (2) Outfit Z-standars (ZSTD) value: -2.0 < MNSQ < +2.0; (3) Value of Point Measure Correlation (Pt Mean Corr) received: 0.4 < Pt Measure Corr < 0.85 (Boone et al., 2014).

Outfit means-square, outfit z-standard, and point measure correlation are the criteria used to see the level of suitability of the questions (item fit). If the questions in the three criteria are not met, it can be ascertained that the questions are not good enough so they need to be repaired or replaced.

Reliability Test

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. Cronbach's alpha value is used to measure the reliability between person interaction and the items as a whole. Table 2 contains Cronbach's alpha criteria, while Table 3 contains criteria for item reliability and person reliability values according to Sumimonto et al. (2015).

Table 2. Cronbach's Alpha Criteria (Sumintono et al., 2015)

Score	Criteria
> 0.8	Very good
0.7 – 0.8	Good
0.6 – 0.7	Enough
0.5 – 0.6	Bad
< 0.5	Very Bad

Table 3. Item Reliability and Person Reliability Criteria (Sumintono et al., 2015)

Earned Score	Criteria
> 0.94	Special
0.91 – 0.94	Very good
0.81 – 0.90	Good
0.67 – 0.80	Enough
< 0.67	Weak

Product Practicality Test

This practicality test uses a questionnaire given to the teacher. The teacher's response questionnaire aims to determine teacher responses that can be used as a benchmark for the quality of assessment tools that have been developed from the practical aspect. In this response questionnaire there are four answer choices with the assessment criteria as in Table 4.

Table 4. Statement Rating Scale

Positive Statement Score	Statement
4	Strongly agree
3	Agree
2	Don't agree
1	Strongly disagree

The practicality of the assessment instrument by teachers (practitioners) is analyzed through calculations as equation 2 where:

$$P = \frac{f}{N}\ x\ 100 \quad (2)$$

Information: P = Final value, f = Score, and N = Maximum score.

Table 5. Criteria for Practicality of Learning Devices (Riduwan, 2012)

Score	Criteria
81 – 100	Very high
60 – 80	Tall
40 – 60	High enough
20 – 40	Low
0 – 20	So low

The analysis of the practicality criteria was carried out with the same steps as the validity analysis. The

practicality criterion interval is viewed from the teacher response questionnaire described in Table 5.

Result and Discussion

The research carried out is research and development with the resulting product, namely an assessment instrument in project-based learning to measure Students scientific literacy and numeracy skills on the material of harmonic vibrations. The resulting assessment instrument product was developed using research and development procedures according to Borg & Gall (1989) which was carried out by the researcher as follows.

Research and Data Collection

The research and data collection stages were carried out in the form of literature studies 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. Preliminary research was conducted at SMA Negeri 1 Tumijajar through the distribution of questionnaires. The questionnaire used to obtain preliminary study data contains 3 aspects. In the results of the preliminary study that has been carried out, obtained data relating to conditions in the field that support research. The results of research and information collection in the form of problems and potentials are presented in Table .

Table 6. Analysis of Potential and Problems

Observation Aspect	Potency	Problem
Assessment of scientific and numeracy literacy	Teachers have used assessment tools in accordance with the 2013 curriculum to assess student learning outcomes	Teachers have not implemented an assessment that can measure Students scientific literacy and numeracy abilities optimally in the learning process, especially on harmonic vibration material due to the absence of scientific literacy and numeracy assessment instruments that are easy to apply in the learning process.
Project-based learning process	Physics teacher has implemented a project-based learning model	The teacher has not implemented the overall syntax or steps in PjBL optimally when applying it to classroom learning
Assessment instrument development needs	The teacher agrees to develop an assessment instrument for project-based learning to measure Students scientific literacy and numeracy skills	

Planning

The planning carried out by the researcher is related to the product of the assessment instrument developed which consists of student assignment sheets, covers, prefaces, table of contents, and rationale. While the content section consists of instrument grids, instrument working instructions, instrument forms, and instrument rubrics. At the end consists of a summary of the final grades, recommendations, and bibliography. Indicators of scientific literacy and numeracy skills are compiled based on the opinions of experts which are then used as a reference by researchers in developing assessment instrument products. The scientific literacy indicators used by researchers refer to the OECD (2019), that is: (1) explaining phenomena scientifically, (2) evaluating and designing scientific investigations, and (3) interpreting data and evidence scientifically. The numerical literacy indicators used by researchers refer to the Ministry of Education and Culture (2017), namely: (1) using various numbers and symbols related to basic mathematics to solve practical problems in various contexts of daily life, (2) analyzing information displayed in various form (graphs, tables, charts, diagrams, etc.), (3) use the interpretation of the analysis results to predict and make decisions.

Early Product Development

The initial product development stage of the assessment instrument in project-based learning is to measure students' scientific literacy and numeracy abilities in harmonic vibration material, namely by compiling the Assessment Instrument Specifications. Assessment instruments in project-based learning to measure students' scientific literacy and numeracy skills in harmonic vibration material include: student assignment sheets, instrument grids, instrument work instructions, instrument shapes, and instrument rubrics to obtain the final grades of students' scientific literacy and numeracy.

Student worksheets are a learning tool, so students are able to design, create, evaluate and reflect on lessons or topics related to their project, namely a simple pendulum. This assessment instrument contains aspects of observation in accordance with the ability indicators contained in the grid. The rubric of the instrument contains the score along with the aspect criteria that

must be met along with the calculation formulas to obtain the final score of students' scientific literacy and numeracy abilities along with the predicate or value criteria obtained. Then, writing an assessment instrument for project-based learning to measure students' scientific literacy and numeracy skills in harmonic vibration material is carried out in several stages. First, the measurement instrument developed is an assessment instrument to measure students' scientific literacy and numeracy skills which can be observed in the project-based learning process, especially in harmonic vibration material. second, the product grid of the assessment instruments contains indicators of scientific literacy and numeracy skills that will be observed during the learning process. The scientific literacy ability assessment instrument grid consists of 22 questions and 13 questions for numeracy literacy skills.

The form of the instrument is in the form of an assessment sheet containing student identity, core competencies and basic competencies used in the learning process, aspects of observation and teacher notes during observations to measure scientific literacy and numeracy abilities in project-based physics learning.

The rubric of the instrument contains the score along with the aspect criteria that must be met along with the calculation formulas to obtain the final score of students' scientific literacy and numeracy abilities along with the predicate or value criteria obtained. The scale used in the scientific literacy and numeracy assessment instrument is a rating scale with four alternative scores. This scale is arranged in the form of an aspect of observation followed by a choice of scores that indicate the level of ability aspects that have been successfully demonstrated by students. The score options are 4, 3, 2, 1.

Initial Field Trial

The initial field trial stage in this research is expert validation tests on the results of the assessment instrument design on aspects of construction, substance, and language. The expert validation test was carried out by two expert lecturers of Physics Education at the University of Lampung, and one of the physics teachers of SMA Negeri 1 Tumijajar. The results of the validation assessment by each validator are presented in Table 7.

Table 7. Expert Validation Results of Assessment Instruments

Aspect	Expert			Score Max	%	Category
	1	2	3			
Construct	31	27	36	108	87.04	Very Valid
Substance	49	51	52	168	90.48	Very Valid
Language	12	11	11	36	94.44	Very Valid
Average rating percentage					90.65	Very Valid

Based on the results of validation by experts, the scientific literacy and numeracy assessment instruments are suitable for use with revisions.

Revision of Trial Results

Revision of test results of initial products that have been tested by expert validation. Product revisions are based on the results of data, notes, and suggestions for improvement that have been obtained from expert validation tests.

Field Trial

The field trial phase was carried out by testing this assessment instrument that had been revised and declared valid by the three validators. This field trial is divided into two parts, namely the test conducted on students and the test conducted on the physics teacher. The test was conducted on students to determine the validity and reliability of the instrument, while the test to the physics teacher was conducted to determine the practicality of the instrument.

Field trials to determine the validity and reliability of the assessment instrument were limited to 36 students at SMA Negeri 1 Tumijajar. The data obtained during field trials to students were then analyzed using *the Rasch Model* with the help of Ministep 4.5.1 software. Based on the results of the analysis using the *Rasch Model*, the following information was obtained.

Validity

Researchers conducted a validity analysis in accordance with the items on the instruments used in the assessment. In the scientific literacy ability instrument there are 22 questions, while for the numeracy literacy ability instrument there are 13 questions. The validity or level of suitability of the items (item fit) is used to identify whether the items function normally or not. If there are questions that do not fit and do not comply with the provisions of the MNSQ, ZSTD and Pt Mean Corr criteria, the questions cannot be used or discarded. The results of the analysis of the Ministep 4.5.1 software then obtained the results as shown in Table 8.

Table 8. Analysis of Item Fit for Scientific Literacy Ability Assessment Instruments

Measure	Outfit		Pt-Measure Corr	Items
	MNSQ	ZSTD		
-2.81	2.85	2.19	.59	S1
-.76	1.45	1.57	.42	S7
.42	1.32	1.44	.51	S17
.68	1.32	1.47	.38	S5
.46	1.24	1.14	.48	S15
.10	1.12	.62	.58	S10
.19	1.15	.72	.52	S22

Measure	Outfit		Pt-Measure Corr	Items
	MNSQ	ZSTD		
.05	1.14	.67	.52	S5
.37	1.02	.18	.55	S16
.28	.97	-.08	.55	S12
.63	.95	-.16	.53	S9
-.52	.98	.01	.52	S18
1.71	.90	-.37	.42	S13
.05	.83	-.76	.58	S3
-.97	.81	-.61	.69	S20
.19	.78	-1.05	.61	S11
-.41	.71	-1.24	.64	S2
-.41	.75	-1.04	.65	S4
.10	.71	-1.42	.58	S8
.59	.72	-1.41	.51	S21
.46	.67	-1.68	.60	S14
-.41	.55	-2.14	.67	S19

Table 9. Item Fit Analysis of Numerical Literacy Ability Assessment Instruments

Measure	Outfit		Pt-Measure Corr	Items
	MNSQ	ZSTD		
2.74	3.13	4.04	-.14	N3
-1.53	1.18	.63	.26	N5
.15	1.02	.17	.59	N6
.05	1.05	.30	.67	N10
-.32	1.05	.28	.57	N7
.48	.96	-.11	.61	N9
-.37	.97	-.07	.60	N1
.05	.89	-.44	.62	N12
-.26	.92	-.29	.64	N8
-.26	.78	-1.02	.63	N2
-.66	.82	-.73	.71	N4
-.06	.81	-.88	.68	N11

Reliability

In the analysis of the reliability of the assessment instrument for scientific literacy and numeracy, Cronbach's alpha values were obtained at 0.97 and 0.89, respectively, so that they were included in the excellent category (Sumintono & 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 used is REAL RMSE where this is the lower limit of the worst condition for the reliability of the instrument used (Sumintono & Widhiarso, 2015).

As for person reliability for the scientific literacy ability assessment instrument, the average value of INFIT MNSQ and OUTFIT MNSQ, respectively, is 0.97 and 1.04, meaning that the value is getting better because the value is close to the ideal, which is 1.00. The average value of INFIT ZSTD and OUTFIT ZSTD respectively is -0.13 and -0.01, 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 0.82 which indicates that the consistency of the answers from the respondents is good.

Person reliability for the instrument for assessing numeracy literacy skills is known to have the average value of INFIT MNSQ and OUTFIT MNSQ respectively 0.95 and 1.13, meaning that the value is getting better because the value is close to the ideal, which is 1.00. The average value of INFIT ZSTD and OUTFIT ZSTD respectively is -0.12 and 0.09, 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 0.79 which indicates that the consistency of the answers from the respondents is quite good.

As for item reliability for scientific literacy instruments, it is known that the average value of INFIT MNSQ and OUTFIT MNSQ, respectively, is 0.99 and 1.04, meaning that the value is getting better because the value is close to the ideal of 1.00. The average value of INFIT ZSTD and OUTFIT ZSTD, respectively, is -0.12 and -0.09, meaning that the quality of the items is getting better because the value is close to the ideal, which is 0.0. The value of item reliability is 0.90 which indicates that the quality of the items is good, meaning that the items on the scientific literacy assessment instrument can measure what they want to measure.

Item reliability for numeracy literacy instruments is known that the average value of INFIT MNSQ and OUTFIT MNSQ, respectively, is 0.96 and 1.13, 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 -0.14 and 0.16, meaning that the quality of the items is getting better because the value is close to the ideal, which is 0.0. The value of item reliability is 0.93 which indicates that the quality of the items is very good, meaning that the items on the numeracy literacy assessment instrument can measure what they want to measure.

Practicality

Field trials to determine the practicality of the assessment instruments. Practical tests of scientific literacy and numeracy assessment instruments on aspects of ease of use, attractiveness of presentation, and usefulness. This test was conducted on two physics teachers as expert practitioners. The practical test was carried out on two teachers at SMA Negeri 1 Tumijajar. The average results related to the practicality of the assessment instruments for scientific literacy and numeracy skills that have been assessed by each practical are presented in Table 10.

Based on Table 10, it can be seen that the average acquisition score of the assessment instrument is 85.83 with very high criteria (Riduwan, 2012). This shows that the assessment instrument in project-based learning to

measure Students scientific literacy and numeracy skills on harmonic vibration material is practical to use.

Table 10. The Results of the Average Score of the Practicality of the Student's Science Literacy and Numerical Assessment Instruments

Aspect	Practitioner		Score Average
	1	2	
Ease of Use	83.33	86.11	84.72
Serving Interests	93.75	87.50	90.63
Usefulness	85.71	78.57	82.14
Earning Score			85.83

Operational Product Revision

Operational product revisions are carried out to improve the assessment instrument products that have been developed. After conducting field trials, researchers made improvements to the final product based on input and suggestions from the teacher.

The product of an assessment instrument for project-based learning to measure scientific literacy and numeracy skills at the initial field trial stage has been through expert validation tests. Expert validation tests were conducted to assess the feasibility of the instrument from the aspects of construction, substance and language. Construct validity focuses on the extent to which a measuring instrument shows measurement results that match its definition. If the definition is based on the right theory, and the question or statement of the instrument item is appropriate, then the instrument is declared valid by construct validity (Yusup, 2018). In line with Hidayat et al. (2017) that the value of the validity of an instrument can also be seen from the suitability between the statement and the statement indicator. This is in line with Matondang's opinion in Sukmawa, Rosidin, and Sesunan (2019), that the feasibility of the instrument in terms of language must meet three things, namely communicative language according to the respondent's education level, using standard Indonesian, and not using the locally applicable language or language taboo.

The data in Table 7 shows the results of expert validation on three aspects of the assessment instrument, namely: construction, substance, and language. In these three aspects, an average value of 90.65% was obtained with very valid criteria (Octavia, 2017). The results of this validation are declared valid if after revisions have been made to the writing and readability in accordance with the Enhanced Spelling (EYD) and the suitability of the indicators with the activities on the student assignment sheet.

Based on the statement above, the assessment instrument on project-based learning to measure scientific literacy and numeracy skills on harmonic vibration material has met the requirements of a good instrument. This is supported by the opinion of Nuroniyah (2018) which states that the terms of a good instrument are valid in content and valid in constructs. This is in line with Permendikbud Number 23 of 2016 concerning Educational Assessment Standards that the assessment instruments used by education units meet the requirements of substance, construction, and language, and have evidence of validity. Thus, it can be seen that the assessment instrument developed is suitable for use for field trials with improvements according to suggestions from experts.

After the assessment instrument product was declared valid and suitable for use, then the assessment instrument was tested in a limited field to 36 students at SMA Negeri 1 Tumijajar who studied harmonic vibration material to determine the validity and reliability of each item of the assessment instrument. The field trial was conducted in August 2022. The results of the trial were limited to 36 students, then analyzed using the Rasch model assisted by Ministep 4.5.1 software to obtain information about the validity and reliability of the items on the assessment instrument developed.

Based on the results of the analysis in Table 8, information is obtained that 19 of the 22 items of the scientific literacy assessment instrument have met the valid parameter criteria according to Boone et al. (2014). While the other 3 items, numbers 1, 5, and 19 were declared invalid because they exceeded the parameter criteria. So, based on the data from the analysis of Table 8, the decision on the assessment instrument to measure scientific literacy ability has 19 items that are valid and can be used. Meanwhile, 3 items are invalid, so they cannot be used or discarded.

Based on the results of the analysis in Table 9, information is obtained that 12 of the 13 items of the numeracy literacy ability assessment instrument are declared valid because they have met the parameter criteria according to Boone et al. (2014). While one item is declared invalid because it exceeds the parameter criteria. So, based on the data from the analysis of Table 9, the decision on the assessment instrument to measure numeracy literacy ability has 12 items that are valid and can be used. While one item is invalid, so it cannot be used or discarded.

In the reliability test of the scientific literacy ability assessment instrument that has been tested has a person reliability value of 0.82. The person reliability criteria for the scientific literacy ability assessment instrument are in the good range (Sumintono & Wudhiarso, 2015) which indicates that the overall student assessment is carried out seriously and not carelessly. In addition, the value of item reliability for the scientific literacy ability assessment instrument is 0.90 which is in the good range

(Sumintono & Wudhiarso, 2015) which indicates that the items on the scientific literacy ability assessment instrument have been able to measure what is intended to be measured.

In the reliability test of the numeracy literacy ability assessment instrument that has been tested has a person reliability value of 0.79. The person reliability criteria for the assessment instrument for numeracy literacy skills are in the pretty good range (Sumintono & Wudhiarso, 2015) which indicates that the overall student assessment is carried out quite seriously. In addition, the item reliability value for the numeracy literacy ability assessment instrument is 0.93 which is in the good range (Sumintono & Wudhiarso, 2015) which indicates that the items on the numeracy literacy ability assessment instrument have been able to measure what is intended to be measured.

The items on the scientific literacy ability assessment instrument are declared reliable with Cronbach's alpha value of more than 0.8 so that it is included in the category of instruments with excellent reliability (Sumintono & Wudhiarso, 2015). This means that the assessment instrument developed to measure scientific literacy ability has a very good reliability coefficient value. While the items on the numeracy literacy ability assessment instrument were declared reliable with Cronbach 's alpha value equal to 0.8 so that it was included in the category of instruments with good reliability. This is in line with Putriyani and Mutmainnah (2018), namely that in order to obtain information that is in accordance with the actual reality, the tools or instruments used must be requisite and accountable for their reliability. Reliability is very important in a study because it can be a benchmark for the consistency of measurement results. The higher the reliability value of the assessment instrument, the better the data obtained from the assessment results (Rosidin, 2017).

The practicality test aims to see whether this product assessment instrument is practically used to measure student attitudes (Zubir & Junaidi, 2021). Based on the practicality test data according to Table 10, the scientific literacy and numeracy ability assessment instrument in the ease of use aspect obtained an average score of 84.72, the attractiveness of the presentation of 90.63 and the usefulness of the use of the instrument of 82.14. Thus, the average score of the instrument's practicality assessment is 85.53 and is included in the very high criteria. The instrument for assessing scientific literacy and numeracy skills is seen from three aspects, namely ease of use, attractiveness of presentation, and the usefulness of using the instrument. In line with the statement (Alfiriani et al., 2017) that the practicality of the instrument is meaningful if there are conveniences in the evaluation instrument both in preparing, using, interpreting, obtaining results, as well as convenience in storing with the aim of so that the learning carried out is meaningful, interesting, fun, and useful for Students lives, and can increase creativity. In addition, an instrument is declared practical if it has a positive response from teachers and students (Zakaria & Fadhilah, 2017) and gets a positive response for its users (Khotimah et al., 2018). So that the scientific literacy and numeracy ability assessment instruments were practically used with improvements according to suggestions from the two practitioners.

Based on the description of the discussion above, the results of the validity test of the product developed are in the valid and reliable category. Meanwhile, the results of the practicality test fall into the practical category. This shows that the assessment instrument for project-based learning to measure scientific literacy and numeracy skills in the harmonic vibration material that the researcher developed is feasible to use. This is supported by the opinion of Hasana et al. (2017) which reveal that if the assessment instrument developed is valid, reliable and practical, then the assessment instrument is said to be feasible to use.

Conclusion

Based on the results of the development research that has been carried out, it is concluded that the assessment instrument in project-based learning to measure Students scientific literacy and numeracy skills on the harmonic vibration material that has been developed contains an instrument grid, instrument working instructions, instrument form, instrument rubric, recapitulation of scores. the end of the instrument, and is equipped with a student assignment sheet. The assessment instrument on project-based learning to measure Students scientific literacy and numeracy skills on harmonic vibration material was declared valid, reliable, and practical with high criteria.

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The contribution of each author in this research is Conceptualization, Viyanti; methodology, Viyanti; software, Viyanti, Undang Rosidin and Deka Luffi Ramayani; ratification, Invite Viyanti and Undang Rosidin; formal analysis, Viyanti; investigation, Viyanti, Deka Luffi Ramayani and Undang Rosidin; data curation, Viyanti and Deka Luffi Ramayani; writing—original drafting, Deka Luffi Ramayani; writing—reviewing and editing, Viyanti and Undang Rosidin; visualization, Deka Luffi Ramayani; supervision, Law Viyanti

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