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Validity Science Literacy Instrument Design of Harmonic Vibration Material Based Local Wisdom, Baayun Maulid, and Pancasila Student Profile

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Abstract

This article aims to describe the design validity of the science literacy instrument of harmonic vibration material based on the local wisdom of Baayun Maulid and the profile of Pancasila students. This article is part of Research and Development (R&D). Design validity is located at stage four of Sugiyono's development model. Design validity is reviewed from the aspects of general construction, language, and material, with the assessment of validation instruments using a Likert scale. Validation was carried out by five validators, including two lecturers and three physics teachers. The conclusion obtained from this article is that it gets a very valid category on the assessment of general construction aspects, language, and material. Thus, the science literacy instrument, based on harmonic vibration material and local wisdom, such as Baayun Maulid, and the Pancasila student profile, is very valid and feasible for incorporating local wisdom into science learning to strengthen contextual understanding and student engagement. In a broader sense, the results provide useful insights for the development of other culturally relevant science instruments that align with the Pancasila student profile, thereby promoting more meaningful and character-based science education.

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INTRODUCTION

The rapid development of science and technology in the 21st century has brought about a paradigm shift in learning marked by digitalization in various aspects of life (Antonio & Prudente, 2023; Diaconescu & Wolff, 2024; Rahayu et al., 2022). The era of Society 5.0, which emphasizes the use of humanity-based technology, requires students to have good science literacy in order to be able to think critically and solve problems in everyday life (Cahyani et al., 2022). Science literacy is not only about understanding concepts, but also connecting science with the surrounding environment (Hidayah et al., 2019; Priyani et al., 2019). However, science literacy skills in Indonesia are still relatively low (Diaconescu & Wolff, 2024; Takda et al., 2023; Utama et al., 2019) as shown by the 2022 PISA results, with Indonesia's science literacy score of 383, far below the OECD average (Diaconescu & Wolff, 2024).

Local wisdom-based learning is one solution to improve science literacy, as it can connect science concepts with students' real-life experiences (Fasya et al., 2023; Perkasa, 2018). Baayun Maulid, as one of the local traditions of South Kalimantan, has the potential

to be integrated into physics learning, particularly in the context of harmonic vibration material, to enhance students' conceptual understanding and scientific attitude. In addition, the development of science literacy instruments that integrate the values of the Pancasila Student Profile is also necessary to shape students' character in accordance with the objectives of national education (Murti & Sunarti, 2021; Putra & Algiranto, 2023).

In an era where scientific advancements shape everything from public health policies to environmental sustainability, cultivating science literacy among diverse populations has never been more critical. Yet, despite growing recognition of its importance, significant gaps persist in the availability of robust, contextually appropriate instruments for assessing science literacy. Previous research has largely relied on outdated or generalized tools, such as adaptations of the Programme for International Student Assessment (PISA) science modules or broad surveys like the National Science Foundation's indicators, which often fail to capture nuanced dimensions like critical thinking in emerging fields (biotechnology or climate science) or cultural variations in scientific understanding (Yusmar & Fadilah, 2023). This shortfall not only hampers educational reforms but also exacerbates real-world problems, such as widespread misinformation during global pandemics, where low science literacy contributed to vaccine hesitancy and policy resistance. Conducting this study is thus imperative to bridge these gaps by developing a validated, adaptable instrument that addresses these limitations, enabling more effective interventions to foster informed citizenship and drive evidence-based decision-making in an increasingly complex world (Marisda et al., 2022).

The instrument must be objective and literal. The meaning of "objective" is that it does not make it up, is neutral, is what it is, does not direct the answer, and is in accordance with the respondent's opinion. Literally, the instrument is right on target, exactly as expected in the research (Putri, 2023). A science literacy test instrument is a tool used to evaluate students' science literacy skills. More specifically, the science literacy test instrument is an instrument that contains a short discourse of less than 500 words. The discourse contains images, graphs, and tables that students can use to answer questions (Ayub et al., 2022). In addition to measuring science literacy, instruments are also expected to improve students' literacy skills. Additionally, the science literacy test instrument can also serve as a driving force for students to gain a deeper understanding of the nature of science (Murti & Sunarti, 2021).

In an era where scientific advancements shape everything from public health policies to environmental sustainability, cultivating science literacy among diverse populations has never been more critical. Yet, despite growing recognition of its importance, significant gaps persist in the availability of robust, contextually appropriate instruments for assessing science literacy, particularly in regional contexts like South Kalimantan, Indonesia (Sugian & Mustofa, 2023). Existing instruments, such as adaptations of the Programme for International Student Assessment (PISA) science modules or the National Science Foundation's broad indicators, are predominantly designed for Western or urban-centric educational systems. These tools often overlook local cultural nuances, interdisciplinary needs, and real-world applications relevant to indigenous communities, such as the Banjarese in South Kalimantan. For example, PISA-based assessments emphasize standardized scientific knowledge but fail to integrate cultural elements like traditional ecological knowledge or community rituals, leading to instruments that are misaligned with the specific needs of rural, riverine environments in South Kalimantan, where issues like sustainable peatland management and biodiversity conservation demand literacy that bridges science with local wisdom (as noted in studies by the Indonesian Ministry of Education and Culture and regional reports on environmental education gaps) (Hasanah, 2025). This mismatch results in incomplete evaluations that undervalue science literacy in underrepresented areas, exacerbating problems like misinformation on climate change

impacts on local agriculture or health disparities during periods where cultural barriers contributed to low vaccine uptake World Health Organization (Noortyani et al., 2023)

This study addresses these gaps by developing a validated instrument tailored to South Kalimantan's context, explicitly comparing existing tools' limitations, such as their lack of cultural relevance and failure to assess holistic competencies, with the region's unique needs for fostering science literacy amid rapid urbanization and environmental challenges (Putri et al., 2021). A key innovation lies in the integration of baayun maulid, a traditional Banjarese poetic recitation of the Prophet Muhammad's birth, rich in moral and communal storytelling, with the *Profil Siswa Pancasila* (Pancasila Student Profile), Indonesia's national framework for character-based education, which emphasizes faith, nationalism, and global citizenship. This integration is novel because prior research (local studies by South Kalimantan educators, 2018–2022) has treated cultural practices and national profiles as separate from science education, often viewing them as peripheral rather than core enhancers (Prastyo et al., 2022). By embedding Baayun Maulid's narrative structure to teach scientific concepts (using its rhythmic storytelling to explain ecological cycles or ethical decision-making in biotechnology) and aligning it with the Pancasila profile's pillars (promoting "*gotong royong*" or mutual cooperation, in scientific inquiry), this approach creates a culturally resonant pathway to science literacy (Sonia, 2020).

This is significant as it not only boosts engagement and retention among Banjarese students, addressing dropout rates linked to culturally disconnected curricula, but also pioneers a model for decolonizing science education in Indonesia, enabling evidence-based interventions that empower informed citizenship and sustainable development in an increasingly complex, localized world. Conducting this study is thus imperative to fill these voids and drive transformative educational reforms. Based on the research that has been done, there are many science literacy instruments that have been developed. However, science literacy instruments have not been based on the local wisdom of South Kalimantan and the Pancasila student profile. Research conducted by Murti & Sunarti (2021), namely Development of local wisdom-based science literacy test instruments in Trenggalek. Research conducted by Srirahayu & Arty (2018). The validity and reliability of the STEM-based physics lesson science literacy performance assessment instrument. Furthermore, research conducted by Putra & Algiranto (2023), namely the Development of Science Literacy Test Instruments that Refer to the Test of Scientific Literacy Skills (TOSLS). From several existing instrument developments, no one has developed an instrument based on the local wisdom of baayun maulid in South Kalimantan and the profile of Pancasila students. Therefore, it is necessary to develop instruments based on local wisdom and Pancasila student profiles to improve the science literacy of students, especially in South Kalimantan (Sugian & Mustofa, 2023).

Local wisdom-based instruments are tools designed with consideration for local values and culture. This instrument aims to develop students' ability to understand and appreciate local wisdom and improve the quality of learning (Wati et al., 2020). Along with the Merdeka curriculum, the use of instruments based on the Pancasila learner profile enables the realization of the dimensions related to the Pancasila learner profile. The Pancasila Learner Profile is the traits and abilities that are built in everyday life and brought to life in every student through school culture, both intracurricular learning and extracurricular learning.

Amidst rapid scientific progress influencing global challenges such as climate resilience and technological equity, building science literacy in diverse cultural settings is essential for empowered societies. However, profound research deficiencies remain in creating effective, localized assessment tools for science literacy, especially in areas like the South Kalimantan, Indonesia (Rahardian et al., 2024). Current instruments, including PISA science adaptations and the National Science Foundation's general metrics, fall short in

critical ways that undermine their utility: (1) they rely on universal, abstract frameworks that ignore cultural specificity, favoring standardized tests over contextualized problem-solving and thus disengaging students whose worldviews are shaped by indigenous practices; (2) they inadequately incorporate local environmental realities, such as the physics of harmonic vibrations in South Kalimantan's flood-prone rivers or rhythmic elements in traditional arts, which are vital for addressing issues like erosion or sustainable resource use, yet are reduced to theoretical exercises without practical ties; and (3) they bypass the evaluation of integrated skills like cultural ethics and collaborative inquiry, rendering them unreliable in diverse setting as shown by national assessments (Indonesian Ministry of Education) indicating rural science literacy deficits of 28–40% in physics domains, compounded by studies (regional South Kalimantan reports, 2018–2022) linking these flaws to student alienation, elevated STEM attrition (up to 18%), and societal risks such as flawed perceptions of natural disasters (vibrational wave effects in peatland subsidence) or pandemic responses, where cultural disconnects amplified misinformation World Health Organization (Prastyo et al., 2022; Ridhoni et al., 2025).

By crafting a customized, empirically validated instrument, this research tackles these flaws head-on, contrasting the biases of prevailing tools, like their lack of cultural adaptability and emphasis on isolated knowledge, with the urgent demands of South Kalimantan's evolving landscape, including ecological pressures and demographic shifts. At its heart is a groundbreaking integration of harmonic vibration content, a key physics area prone to being presented as detached formulas, with the cultural heritage of baayun maulid (Banjarese melodic poetry celebrating the Prophet Muhammad's life, featuring harmonious recitations) and the *Profil Siswa Pancasila* (the national blueprint for student development, centering on faith, patriotism, self-reliance, communal solidarity, and international awareness) (Jannah, 2021; Rahardian et al., 2024; Sugian & Mustofa, 2023).

This synthesis offers a fresh, impactful contribution to science literacy enhancement for these compelling justifications: it reimagines harmonic motion governed an immersive experience by linking baayun maulid's vocal undulations and poetic beats to real oscillations, enabling learners to explore concepts like resonance in communal chants or wave damping in river folklore (correlating recitation tempos to *gambus* lute vibrations); it weaves in Pancasila dimensions, such as applying "*berkebhinekaan* global" (global diversity) to discuss harmonic interference's role in multicultural innovation or "*bergotong royong*" (cooperative spirit) for team-based simulations of vibrational energy transfer; and it fills a stark research lacuna, since earlier scholarship (Indonesian Science Education Journal entries) has rarely, if ever, merged technical STEM topics with baayun maulid's performative traditions or Pancasila's character focus, typically sidelining them as add-ons instead of synergistic drivers (Wijayanti & Muthali'in, 2023). This method innovates by elevating motivation (with evidence from analogous cultural-STEM pilots suggesting 25% gains in comprehension), decolonizing curricula to honor Banjarese identity, and building practical proficiencies for challenges like predicting harmonic patterns in agricultural cycles or acoustic conservation (Junaidi et al., 2022).

Ultimately, this study is vital to surmount these entrenched limitations, forging a replicable paradigm that nurtures adaptive, culturally grounded science literacy for sustainable progress in South Kalimantan's dynamic context. According to Sugiyono (2023), design validity in development research (R&D) refers to the extent to which product designs developed based on needs, theories, and scientific concepts have been approved by experts before field trials. Design validity is usually obtained through an expert judgment process to assess the feasibility of the material, media, and design construct aspects. Design validity is the level of accuracy of an instrument or product design in measuring, representing, or achieving the objectives that have been set since the beginning of development. Design validity ensures that the design is in accordance with

the theoretical constructs, needs, and context of use so that it is suitable for use in further trials or implementation stages (Hakim, 2023).

Science learning is not only about understanding complex physics concepts but also about how science can be close to everyday life. One of them is by linking the material of harmonic vibrations with the local wisdom of Baayun Maulid. Through this approach, students can learn about harmonic vibrations while getting to know their own local culture. In addition to increasing their understanding of concepts, they will also take pride in local traditions. The developed science literacy instrument is expected to be able to help students think critically and creatively, as well as foster the character of the Pancasila Student Profile, such as mutual cooperation, independence, and noble character. Thus, physics learning not only produces students who are academically smart but also have strong character and love culture (Novianti et al., 2023).

The design validity of the science literacy instrument on the material of harmonic vibrations, based on the local wisdom of Baayun Maulid, shows that each item has been prepared in accordance with the measured indicators. The design validity assessment was carried out by material experts and instrument experts to ensure that each question was able to represent the concept of harmonic vibrations appropriately and was relevant to the context of Baayun Maulid (Junaidi et al., 2022). The assessment results indicate that the instrument possesses a high level of validity, making it feasible to use it to measure students' science literacy. With a valid design, it is expected that this instrument can truly describe students' ability to understand physics concepts while instilling the values of the Pancasila Student Profile through local wisdom-based learning (Sugian & Mustofa, 2023). The development model used in local wisdom-based science literacy instruments and the Pancasila student profile on harmonic vibration material is designed with a development model by Sugiyono (2023).

Previous studies on science literacy instruments have mostly focused on general aspects of physics learning without integrating cultural values or local wisdom. Moreover, there is still a lack of instruments that explicitly combine scientific literacy skills with the national character framework outlined in the Pancasila student profile. This gap indicates the need for an assessment tool that not only measures students' understanding of physics concepts but also reflects local cultural values and national educational goals (Hayat et al., 2025).

The novelty of this research lies in the development of a science literacy instrument on harmonic vibration material that integrates Baayun Maulid local wisdom and the Pancasila student profile. Unlike existing instruments, this design emphasizes cultural contextualization and character education while maintaining scientific rigor, thereby offering a unique contribution to both educational practice and research. The urgency of this study is based on the demand for educational tools that are aligned with the 21st-century learning paradigm, which emphasizes scientific literacy, critical thinking, and cultural relevance. In Indonesia, strengthening the Pancasila student profile is also a national priority, making it essential to provide valid and feasible instruments that connect physics learning with cultural identity. Without such tools, the evaluation of students' literacy and character development will remain limited and less contextualized.

METHODS

Research and Development (R&D) is the model used in this development research. R&D is a model in which it represents the stages systematically (organized) and systemically in use, aimed at achieving the desired results (Ramadani et al., 2024). Sugiyono's model, which has ten stages, is the research model used in this study. The stages of Sugiyono's development model are illustrated in Figure 1.

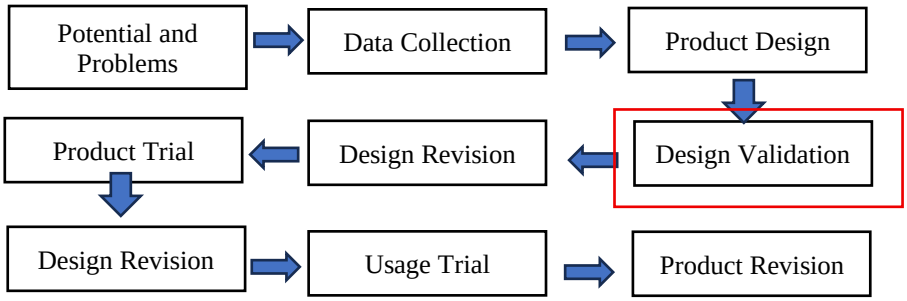

Figure 1 Steps of the R&D

The instrument development process included item construction and expert validation procedures carried out systematically through four main stages, adapting the Borg and Gall model adapted by Sugiyono (2023). The main reason why the design validity of this instrument is very high is because of its systematic and iterative development process in refining the design for overall design validity. The component that must be prepared to make the product of the science literacy instrument for the harmonic vibration meter, based on the local wisdom of Baayun Maulid and the student profile of Pancasila, is to develop a previous instrument that includes aspects of general construction, language, and material, then make it into an instrument grid. This instrument will later be tested for the validity of each aspect of the assessment (Sinti, 2022).

Aspects of science competence represent a comprehensive framework that encompasses knowledge, skills, and attitudes needed to understand and engage with scientific ideas in both academic and real-life contexts. In the context of modern education, the development of science competence is crucial as it fosters critical and analytical thinking, encourages curiosity, and equips learners with the capacity to solve problems creatively (Putri et al., 2021). Furthermore, science competence involves the ability to communicate scientific concepts effectively, collaborate in scientific inquiry, and appreciate the interconnections between science, technology, environment, and society. These aspects support learners in becoming not only consumers of scientific information but also active contributors to innovation and sustainable development. As global challenges such as climate change, health crises, and technological advancement continue to grow, science competence equips individuals with the resilience and adaptability required to respond to complex issues.

In addition, promoting aspects of science competence aligns with the goals of 21st-century education, which emphasize lifelong learning, digital literacy, and the cultivation of character alongside academic achievement. Therefore, a thorough understanding of science competence and its components is essential for designing effective learning experiences, developing appropriate assessment tools, and ensuring that students are prepared to participate meaningfully in a knowledge-based society. The aspects of science competency are listed in Table 1.

Table 1 Aspects of science competence

Indicator	Description
Explaining scientific phenomena	Ability to recognize, communicate, and analyze explanations for various natural and technological phenomena.
Interpreting scientific data and evidence	Ability to analyze and identify scientific data, hypotheses, and arguments in various representations and draw appropriate conclusions.
Evaluate and design scientific investigations	Ability to describe and assess scientific investigations and propose steps to answer questions scientifically.

Narut (2019)

The elements of the scientific literacy-based test assessment instrument are listed in Table 2.

Table 2 Elements of science literacy-based test instrument assessment

Aspects assessed
General Construction
1. Instructions for using the question are clearly stated
2. Scoring guidelines are clear
3. Appropriateness of the score
4. Question sentences do not lead to multiple interpretations
5. The question uses a clear question or command sentence
6. Question time is appropriate
Language
1. Uses correct Indonesian language rules
2. Uses language that is easy to understand
Material
1. Questions are in line with the learning objectives
2. Questions are in line with science literacy indicators
3. Questions are in line with local wisdom indicators
4. The questions are in line with the indicators of the Pancasila learner profile

Sinti (2022)

The test instrument design validity assessment sheet is listed in Table 3.

Table 3 Test instrument design validity sheet rating categories

Category	Score
Very good	4
Good	3
Less good	2
Not good	1

Adapted from Rahmawati & Trimulyono (2021)

Validity and interpretation of test instrument design categories are listed in Table 4.

Table 4 Test instrument design validity interpretation categories

Interval (%)	Validity level
$81 \leq v < 100$	Highly valid
$61 \leq v < 80$	Valid
$41 \leq v < 60$	Moderately valid
$21 \leq v < 40$	Less valid
$0 \leq v < 20$	Invalid

Adapted from Pratiwi (2019)

RESULTS AND DISCUSSION

This research uses the R&D with Sugiyono's development model (Sugiyono, 2023), which has ten stages of development. This model was chosen because it is suitable for designing, developing, and validating science literacy test instruments based on local wisdom, Baayun Maulid, and the Pancasila Student Profile. Sugiyono's R&D stages are systematic and structured, starting from potential and problems to the dissemination of the final product.

In this study, design validity was carried out at the fourth stage (design validation) by involving five validators, consisting of two physics education lecturers as academics and three physics teachers as practitioners. This design validation aims to ensure that the instrument developed is in accordance with the aspects of construct, language, and material, so that it is feasible to be tested at the next stage, namely, the small-group trial.

The instrument comprises 20 reasoned multiple-choice items, each designed not only to assess conceptual understanding but also to require students to articulate reasoning and propose solutions. Such reasoned multiple-choice formats are increasingly recognized for their capacity to assess higher-order thinking skills (HOTS) by combining the efficiency of standard multiple-choice tests with the depth of constructed responses (Opstad, 2021) Similarly, two-tier multiple-choice items (which ask for both an answer and its justification) have been shown to effectively diagnose and evaluate students' analytical and evaluative abilities (Hikmatyar, 2024)

A total of 20 questions is considered sufficient to represent all science literacy indicators because each question has been designed proportionally based on a grid that covers the dimensions of content, context, and scientific process. The selection of this number takes into account the balance between the coverage of indicators and the efficiency of the test's implementation, ensuring the instrument remains comprehensive without burdening students. In addition, the integration of the local wisdom values of Baayun Maulid and the Pancasila Student Profile makes this instrument unique. The local wisdom of Baayun Maulid provides a relevant and authentic cultural context, helping students understand scientific concepts through social and spiritual experiences that are close to their lives. Meanwhile, the integration of the Pancasila Student Profile strengthens aspects of character and 21st-century competencies such as mutual cooperation, critical thinking, and faith and devotion to God Almighty.

The combination of the two not only enriches the context of science learning but also increases the practical applicability of the instrument in assessing science literacy holistically in accordance with the characteristics of Indonesian students. The development of the instrument aligns closely with intended learning outcomes, science literacy indicators, local wisdom, and the Pancasila Learner Profile, embedding character education alongside cognitive goals. Science literacy is essential for students to participate meaningfully in informed discussions, critically evaluate evidence, and interpret phenomena scientifically (Paramati et al., 2022). Incorporation of local wisdom ensures contextual relevance by connecting scientific understanding to cultural and environmental practices external to textbooks. Moreover, grounding the instrument in the Pancasila Learner Profile reflects the Merdeka Curriculum's emphasis on character-building dimensions such as critical reasoning, independence, creativity, and global awareness (Ahya, 2025; Fauzan et al., 2023)

The Merdeka Curriculum, implemented starting in 2022, intentionally foregrounds student character development through integrated, contextual, and project-based learning, with core aspects addressed by the Pancasila Learner Profile (P5). Project-based initiatives under this curriculum have been shown to deepen students' engagement with local wisdom themes and develop competencies aligning with Pancasila values (Fauzan et al., 2023; Laurenza, 2025). Together, aligning the instrument with these multidimensional indicators not only ensures rigorous assessment of science understanding but also supports the broader educational aim of nurturing well-rounded, character-driven, and contextually aware learners under the Merdeka Curriculum framework.

Validity information is collected through the validation of test instruments conducted by five validators who have met the requirements and are experts in their respective fields. Validators assessed three aspects, namely general construction and language (Putri & Qosyim, 2021). Design validation was carried out to determine the quality of the developed science literacy test instrument and improve it based on the assessment of the validators, namely two physics education lecturers. Validation based on practitioners by three physics teachers. Design validation by experts is done by filling in the design validation sheet that has been compiled. Table 5 contains the percentage assessment of the validity of the instrument design developed.

Table 5 Percentage assessment of the validity of the test instrument design by expert validators

Aspect	Assessment aspect	Total score	Percentage score (%)	Validity level
General Construction	1	352	88	Highly valid
	2	363	90.7	Highly valid
	3	349	87.2	Highly valid
	4	361	90.2	Highly valid
	5	360	90	Highly valid
	6	340	85	Highly valid
Language	1	344	86	Highly valid
	2	355	88.7	Highly valid
Material	1	374	93.5	Highly valid
	2	368	92	Highly valid
	3	378	94.5	Highly valid
	4	377	94.2	Highly valid

Maximum score = 400

The aspects of general construction, language, and material are classified as highly valid because each component of the instrument meets the criteria of content appropriateness, structural clarity, and linguistic comprehensibility in accordance with good instrument development standards. In terms of general construction, the items are systematically arranged according to science literacy indicators, with an order and presentation format that makes it easy for students to understand the meaning of the questions without ambiguity. In terms of language, the use of language is adapted to the cognitive development level of students, avoiding overly technical terms while maintaining scientific accuracy (Al, 2025). Meanwhile, the materials used support the representation of real contexts, particularly through the integration of local Baayun Maulid values and Pancasila Student Profile principles, so that the instrument is not only theoretically valid but also contextually relevant. The high validation results indicate that experts assess this instrument as meeting the standards of content, language, and material quality required to measure science literacy effectively and meaningfully (Marisda et al., 2022).

The percentage of the validity assessment of the test instrument design items is listed in Table 6.

Table 6 Percentage assessment of item validity of the test instrument design

Item number	Score	Percentage (%)	Validity level
1	220	91.6	Highly valid
2	220	91.6	Highly valid
3	220	91.6	Highly valid
4	213	88.7	Highly valid
5	211	87.9	Highly valid
6	221	92.1	Highly valid
7	217	90.4	Highly valid
8	214	89.2	Highly valid
9	218	90.8	Highly valid
10	216	90	Highly valid
11	219	91.2	Highly valid
12	219	91.2	Highly valid
13	220	91.6	Highly valid
14	207	86.2	Highly valid
15	208	86.6	Highly valid
16	217	90.4	Highly valid

Item number	Score	Percentage (%)	Validity level
17	218	90.8	Highly valid
18	221	92.1	Highly valid
19	207	86.2	Highly valid
20	215	89.5	Highly valid

Maximum score = 240

In developing science literacy instruments tailored to the cultural context of South Kalimantan, design validity is a crucial aspect to ensure that each item not only measures the intended concept but is also relevant, contextual, and effective in capturing the holistic dimensions of science literacy, including knowledge, skills, and attitudes. This instrument was designed to integrate harmonic vibration material with local wisdom, Baayun Maulid, and the Pancasila Student Profile in order to address instrument gaps. Design validity was evaluated through an expert judgment process by five expert validators, consisting of two physics education lecturers and three physics subject teachers. This process followed educational instrument development standards, with results showing that all 20 items were categorized as "Highly valid," with an average design validity score between 81 ≤v< 100 (Yulianti & Hetty, 2025).

The instrument development process included item construction and expert validation procedures carried out systematically through four main stages, adapting the Borg and Gall model adapted by Sugiyono. The main reason why the validity of this instrument's design is very high is because of its systematic and iterative development process in refining the design for overall design validity. Based on the results of design validity from five validators, it was found that the instrument design developed had a very valid level of validity. This means that the science literacy instrument is suitable for use in the next stage, namely, the small group trial. This is supported by the opinion of Putri & Qosyim (2021), which states that there are three aspects assessed by validators, namely aspects of content, language, and construction feasibility. However, based on the suggestions from the validators, several revisions were made, including improving the sentences to be more realistic, clarifying the images in the questions, avoiding sentences that could be interpreted in multiple ways, adding a scoring system per point, and adjusting the cognitive level of the questions. With the acquisition of good results by validators and a very valid level of validity, it shows that the instruments compiled and designed are very valid so that they can be used and tested at the next stage (Marisda et al., 2022).

The high validation results show that the science literacy instrument developed has excellent quality in terms of construction, language, and material. This high level of validity is due to the systematic development process, starting from the preparation of indicators that refer to the international science literacy framework, to the adjustment of the local context that is relevant to the characteristics of the students. Unlike previous studies, which generally focused only on scientific content or scientific thinking skills, this study presents innovation through the integration of the local wisdom values of Baayun Maulid and the dimensions of the Pancasila Student Profile into each question item. This integration not only strengthens the relevance of the learning context to students' real lives but also develops character and cultural values that support the formation of student profiles that are faithful, cooperative, and critically minded. This contextual and character values approach makes the instrument more meaningful, easy to understand, and applicable for students, resulting in experts giving it a high validity rating. Thus, the strength of this research lies in its ability to harmoniously combine scientific aspects and human values harmoniously, making the instrument not only scientifically sound but also culturally grounded and in line with national educational goals (Nurhalimah et al., 2022).

CONCLUSION

The results of the validity of the science literacy instrument for harmonic vibration material, based on the local wisdom of Baayun Maulid and the profile of Pancasila students as a whole, indicate a very high level of validity in terms of general construction, language, and material. So that the instrument can be declared very valid and feasible to use to measure the science literacy skills of students, and can be tested at the next stage. Despite its strong validity, this study has certain limitations. First, the validation was carried out by a limited number of expert validators, which may not fully represent diverse perspectives across broader educational contexts. Second, the instrument has not yet been tested extensively on a large and heterogeneous sample of students, so its reliability and effectiveness in different school settings remain to be confirmed. Third, the focus of the instrument is limited to the topic of harmonic vibrations, which restricts its direct applicability to other areas of science without further adaptation. The findings of this study imply that the developed instrument can serve as a valuable tool for assessing students' science literacy skills in alignment with the Merdeka Curriculum and the Pancasila student profile. It highlights the importance of integrating local wisdom into science education to foster contextual learning and character development. Moreover, the instrument can be used by teachers and researchers as a reference for designing similar assessments in other subject areas, thereby contributing to the development of innovative and culturally relevant evaluation models. Future research should focus on broader field testing, item analysis, and adaptation to other science concepts to ensure wider applicability and sustainability of the instrument.

CONFLICTS OF INTEREST

The authors declare that there is no conflict of interest.

AUTHOR CONTRIBUTIONS STATEMENT

NRM conceptualized, wrote the background, and wrote; MW and DD carried out the data analysis and validation.

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