

***Tedhak Siten and Iwel-Iwel* Ethnoscience Magazine: Developing Islamic Education Media for Sustainable Science Learning**

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ARTICLE INFO	ABSTRACT
Keywords: Ethnoscience; Science Learning; Sustainable Islamic Education	Science education in Islamic contexts continues to struggle in bridging abstract scientific concepts and students' lived experiences, while ethnoscience-based media rarely integrate Islamic values or draw on Javanese ceremonial traditions as a learning resource. This study develops and validates a Tedhak Siten ethnoscience-based science magazine, <i>Sains Rasa Lokal: Menjelajah Zat, Kalor, dan Alam Lewat Iwel-Iwel</i> , as a culturally responsive Islamic education medium for junior high school science learning. Using a 3D model (Define, Design, Development), the magazine integrates Grade VII concepts of matter structure, heat transfer, physical and chemical change, and convection with the iwel-iwel culinary tradition embedded in the Tedhak Siten ceremony, through local wisdom values such as ecological awareness, communal cooperation (gotong royong), and spiritual reflection aligned with the Pancasila Student Profile within the Merdeka Curriculum. Two validators independently assessed the magazine across three dimensions visual design, content, and instructional utility using a 15-indicator instrument, yielding feasibility scores of 95% and 93.33% (average 94.17%), categorized as Very Feasible. These results indicate that the medium has met the established feasibility criteria based on expert validation and holds potential for classroom implementation, offering a replicable framework for integrating food-based ethnoscience and Islamic educational values into science learning.
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INTRODUCTION

Science education continues to face persistent challenges in developing students' genuine conceptual understanding. According to the PISA 2022 results, Indonesian 15-year-old students scored 383 points in science literacy, well below the OECD average of

485 points, reflecting a systemic issue in how science is taught and learned in schools.¹ At the classroom level, instruction remains largely dominated by conventional approaches centered on memorization and procedural repetition, particularly on abstract topics such as matter and heat. Students frequently struggle to understand concepts including heat transfer, changes in the state of matter, and the physical and chemical properties of substances not because of limited capacity, but because content is presented without meaningful connection to their lived experiences². This condition is particularly pronounced in Islamic education contexts, where science instruction is often disconnected from both cultural practice and spiritual values, contributing to low engagement, persistent misconceptions, and underdeveloped 21st-century thinking skills among learners³.

Contextual learning has been widely recognized as a promising response to these challenges. By anchoring scientific concepts in real-world experiences, contextual approaches have demonstrated positive effects on science literacy, critical thinking, and problem-solving⁴. Within this framework, ethnoscience which integrates local cultural knowledge into science education offers a particularly valuable pathway. Ethnoscience enables students to engage with scientific concepts through culturally familiar practices, improving both conceptual understanding and attitudes toward science learning⁵. In Islamic education settings, this approach resonates deeply with the principle that *tafakkur* reflective contemplation of natural and cultural phenomena constitutes a legitimate form of knowledge acquisition and spiritual development. Scholars of Islamic education have increasingly affirmed that integrating local wisdom into science instruction not only enhances conceptual learning but also cultivates Islamic character values including environmental stewardship, communal responsibility, and gratitude toward divine creation⁶.

¹ Susan L. Robertson, "Provincializing the OECD-PISA Global Competences Project," 2021, <https://doi.org/10.1080/14767724.2021.1887725>.

² Fethiye Karsli Baydere, "Effects of a Context-Based Approach with Prediction–Observation–Explanation on Conceptual Understanding of the States of Matter, Heat and Temperature," no. i (2021), <https://doi.org/10.1039/d0rp00348d>.

³ Samuel Stadler Graesser, Arthur C Greiff, "Collaboration in the 21st Century: The Theory, Assessment, and Teaching of Collaborative Problem Solving," *Computers in Human Behavior* 104, no. xxxx (2019), <https://doi.org/10.1016/j.chb.2019.09.010>.

⁴ Novita Oktaviani and Ulinnuha Nur Faizah, "Integrative Science Education and Teaching Activity Journal The Effect of Science Literacy Skills to Contextual Thinking Skills on Science Literacy-Based Learning" 5, no. 1 (2024): 1–10.

⁵ I Wayan Suastra and Ni Made Pujani, "Ethnoscience-Based Science Learning Model to Develop Critical Thinking Ability and Local Cultural Concern for Junior High School Students in Lombok" 7, no. 20 (2021), <https://doi.org/10.29303/jppipa.v7i1.530>.

⁶ Syed Zubair Ahmed Khan, Sumbul Ansar, "The Critical Review of Social Sciences Studies Cultivating Minds , Inspiring Change : Transformative Paradigms in Islamic," *The Critical Review of Social Sciences Studies* 3, no. 1 (2025): 3204–14.

A more specific application of this approach involves food-based ethnoscience learning, which uses traditional culinary practices as contextual resources for science instruction, connecting food preparation with scientific phenomena such as heat transfer, phase transitions, and material transformation⁷.

One culturally rich example of food-based ethnoscience is the making of iwel-iwel, a traditional Javanese food prepared as part of the tedhak siten ceremony, which remains practiced in East Javanese communities. Scientifically, the preparation process encompasses multiple concepts directly relevant to matter and heat topics. The steaming process illustrates principles of heat convection and thermal energy transfer. Banana leaves used as wrappers help regulate heat distribution during cooking, offering a tangible example of material properties in thermal contexts. The gelatinization of glutinous rice flour represents a physical-chemical transformation involving changes in particle arrangement and substance properties. Additionally, the transition from raw ingredients to a cohesive solid food product reflects principles of phase change and mixture composition⁸. Beyond its scientific dimensions, the tedhak siten ceremony embodies Javanese-Islamic values including communal cooperation (*gotong royong*), reverence for nature, and spiritual reflection values that position this tradition as an integrated vehicle for both conceptual and character-based science learning⁹.

The tedhak siten tradition also holds significant relevance for Education for Sustainable Development (ESD), which calls for the integration of environmental, cultural, and social dimensions into learning¹⁰. The use of natural materials such as banana leaves in the iwel-iwel preparation reflects ecological awareness and environmental responsibility. The practice of *gotong royong* embedded in the ceremony mirrors the social sustainability principles central to ESD frameworks. Furthermore, the deliberate inclusion of this tradition as a science learning resource constitutes an act of cultural sustainability preserving intangible Javanese-Islamic heritage through formal education rather than allowing it to be displaced by decontextualized, globally standardized curricula. In this

⁷ Fita Nelyza et al., “Development of Discovery Learning and Ethnoscience-Based Learning Tools Integrated With Digital Media to Improve the Science Literacy of Elementary School Students” 9, no. 4 (2025): 1266–76.

⁸ Aulia Hana Faradiba et al., “Ethnosociofood Iwel-Iwel Cuisine in the Tedhak Siten Tradition of East Java Society “ Educational Tools for Grounding Science through Local,” *PISCES Proceeding of Integrative Science Education Seminar* 5, no. 1 (2025): 252–60.

⁹ Prima Hariyanto et al., “Linguistic and Symbolic Meanings in Ethnic Communities: A Case Study of Tedhak Siten Traditional Ceremony,” 2024.

¹⁰ Vasiliki Kioupi and Nikolaos Voulvoulis, “Education for Sustainable Development: A Systemic Framework for Connecting the SDGs to Educational Outcomes,” 2019.

sense, developing instructional media grounded in the tedhak siten tradition directly supports sustainable science learning by connecting scientific literacy with cultural continuity and social responsibility.

Despite this growing interest in ethnoscience-based learning, the literature reveals a clear and specific research gap. Existing ethnoscience instructional media have predominantly taken the form of learning models, worksheets, and teaching tools, with comparatively little development in magazine-based formats within ethnoscience contexts. Building on this body of work, no prior study has specifically examined the tedhak siten tradition or the iwel-iwel culinary practice as an integrated learning resource for matter and heat topics, confirming a clearly bounded and previously unaddressed research gap. Critically, the intersection of food-based ethnoscience, Islamic educational values, and sustainable science learning has not been systematically explored in the development of science instructional media. Furthermore, few studies have conducted comprehensive pedagogical validation encompassing content accuracy, visual design, and instructional utility within the framework of Indonesia's Merdeka Curriculum, which explicitly emphasizes the Pancasila Student Profile as a standard for culturally and spiritually grounded learning.

To address this gap, the present study develops and validates a contextual science magazine grounded in the food-based ethnoscience of the iwel-iwel tradition for matter and heat topics at the junior high school level, positioned as an Islamic education medium for sustainable science learning. A science magazine was selected as the development medium due to its capacity to present content in a visually engaging, narrative, and interactive format, which has shown potential in supporting active student engagement and concrete concept construction. The novelty of this study is fourfold. First, it repositions a traditional Javanese-Islamic culinary practice as a vehicle for contextual conceptual reconstruction in science learning. Second, it introduces a magazine-based ethnoscience medium integrating Islamic educational values that has not previously been developed in the existing literature. Third, it operationalizes the Merdeka Curriculum's cultural and character-based learning goals through locally grounded instructional media. Fourth, it provides a culturally grounded model for integrating local wisdom and Islamic educational values into science instructional media, supporting future efforts toward sustainable science learning.

RESEARCH METHOD

This study employed a Research and Development (R&D) design aimed at designing and producing an instructional medium in the form of a food-based ethnoscience magazine entitled *SAINS RASA LOKAL: Menjelajah Zat, Kalor, dan Alam Lewat Iwel-Iwel* (Local Flavor Science: Exploring Matter, Heat, and Nature through Iwel-Iwel). The development model adopted was the 3D model, comprising three sequential stages: Define, Design, and Development. The 3D model was selected on the basis of its systematic orientation toward instructional media development and its capacity to accommodate a structured expert validation process within the Development stage¹¹. Although the original 4D model encompasses a fourth Disseminate stage, the present study was deliberately limited to the Define, Design, and Development stages. This decision was grounded in the study's primary objective: establishing the feasibility and validity of the prototype through structured expert validation before proceeding to broader classroom trials. Since the Disseminate stage typically requires access to multiple classrooms, teachers, and a longer observation period to assess adoption and impact at scale, it was considered premature to pursue at this stage of development, where establishing a psychometrically sound and content-valid product was the necessary first step¹². The Disseminate stage even in a limited-trial form is therefore recommended as the immediate priority for follow-up research.

The Define stage began with a curriculum analysis of the Grade VII science syllabus to identify core competencies related to matter and heat. Needs data were subsequently collected through a questionnaire administered to two science teachers/practitioners. The results revealed that students frequently struggled to distinguish between physical and chemical changes, and that no ethnoscience-based instructional medium had previously been used to address this difficulty, which directly informed the selection of the iwel-iwel preparation process as the contextual anchor for the instructional content. The Design stage involved planning the content structure, visual layout, and ethnoscience integration framework of the magazine. The Development stage constituted the primary phase of expert validation, product revision, and finalization of the instructional medium. Within this stage, the developed prototype underwent a systematic

¹¹ Richard A Pappas et al., "Measuring R & D Productivity MEASURING R & D PRODUCTIVITY" 5334, no. 1985 (2016), <https://doi.org/10.1080/00345334.1985.11756896>.

¹² Rosita Budi Indaryanti, Budi Murtiyasa, and Bambang Soemardjoko, "4D Research and Development Model : Trends , Challenges , and Opportunities Review" 25, no. 1 (2025): 91–98.

review-revise cycle: validators provided written assessments and qualitative feedback, after which the product was revised accordingly before reaching its final form.

Validators and Ethical Considerations

Validation was conducted by two content validators with relevant academic backgrounds in science education: Novita Oktaviani, S.Pd. and Latifa Dwiani Masrurah, S.Pd., both alumni of the Natural Science Education Study Program (*Tadris IPA*) at UIN Kiai Ageng Muhammad Besari Ponorogo. Both validators were selected on the basis of science content at the junior high school level and their prior engagement with science instructional material evaluation. It is acknowledged that this validator composition does not constitute a full expert panel in the conventional sense; the validators serve as subject-matter reviewers rather than credentialed domain experts, and this distinction represents a methodological boundary of the present study.

Validation Instrument

Data were collected using a structured Likert-scale questionnaire developed specifically for this study, adapted from established media feasibility frameworks in science education research. The instrument comprised 15 indicators organized across three key dimensions: (1) visual design and presentation quality, (2) content accuracy and subject matter validity, and (3) instructional utility and pedagogical appropriateness. Validators rated each indicator on a four-point scale: 1 = Not Satisfactory, 2 = Satisfactory, 3 = Good, and 4 = Excellent.

Data Analysis

The feasibility level of the developed medium was determined through percentage score analysis using the following formula:

$$P = \left(\frac{\text{Total Score Obtained}}{\text{Maximum Possible Score}} \right) \times 100\%$$

The resulting percentage was then interpreted against categorization criteria as presented in Table 1 .

Table 1. Percentage categorization criteria

Percentage Range	Feasibility Category
78,84%–100%	Very Feasible
55,76%–76,92%	Feasible
32,69%–53,84%	Less Feasible

0%–30,76%

Not Feasible

In addition to quantitative scores, qualitative feedback provided by validators in the form of written comments and suggestions was systematically documented and used as the primary basis for product revision. The revision process was carried out iteratively until the medium reached a level of feasibility sufficient for use in junior high school science learning. This combination of quantitative feasibility scoring and qualitative expert feedback constitutes the analytical framework through which the validity and appropriateness of the developed instructional medium were established.

RESULT AND DISCUSSION

Result

The developed instructional medium is entitled "*Sains Rasa Lokal: Majalah Edukasi Berbasis Tradisi Iwel-Iwel sebagai Sarana Belajar Zat, Kalor, dan Keberlanjutan Lingkungan*" (Local Flavor Science: An Educational Magazine Based on the Iwel-Iwel Tradition as a Learning Medium for Matter, Heat, and Environmental Sustainability). The medium takes the form of an educative magazine grounded in an ethnoscience-based approach, integrating scientific concepts including the structure of matter, heat, and material transformation with local cultural values through the traditional culinary practice of iwel-iwel.

To assess the feasibility of this medium, a validation process was conducted by two instructional media experts: Novita Oktaviani, S.Pd. and Latifa Dwiani Masruroh, S.Pd., on June 4, 2025 and June 25, 2025, respectively. The validation was carried out based on 15 indicators organized across three assessment dimensions: (1) visual design and presentation, (2) content and subject matter, and (3) function and instructional utility. Scores were assigned on a four-point scale, with 4 indicating Very Good, 3 indicating Good, 2 indicating Fair, and 1 indicating Poor. Each validator assigned scores independently and proportionally based on their observation of the medium's overall quality.

The validation data processing results from both validators are presented as follows:

Table 2. Validation Result

The validation results obtained from Validator Novita Oktaviani, S.Pd	
Visual Design and Presentation	$5 \times 4 = 20$
Content and Subject Matter	$(4 \times 4) + (1 \times 3) = 16 + 3 = 19$

Function and Instructional Utility	$(3 \times 4) + (2 \times 3) = 12 + 6 = 18$
Total Score	$20 + 19 + 18 = 57$
Maximum Possible Score	$15 \times 4 = 60$
Feasibility Percentage	$\frac{57}{60} \times 100\% = 95\%$

The validation results obtained from Validator Latifa Dwiani Masruroh, S.Pd	
Visual Design and Presentation	$(3 \times 4) + (2 \times 3) = 12 + 6 = 18$
Content and Subject Matter	$(4 \times 4) + (1 \times 3) = 16 + 3 = 19$
Function and Instructional Utility	$(4 \times 4) + (1 \times 3) = 16 + 3 = 19$
Total Score	$18 + 19 + 19 = 56$
Maximum Possible Score	$15 \times 4 = 60$
Feasibility Percentage	$\frac{56}{60} \times 100\% = 93,33\%$

Table 3. Average feasibility score

Validator 1 (Novita Oktaviani, S.Pd.)	95%
Validator 2 (Latifa Dwiani Masruroh, S.Pd.)	93,33%
Average Feasibility Score	$\frac{95\% + 93,33\%}{100} = 94,17\%$

Accordingly, based on the established instructional media feasibility criteria, the developed medium is categorized as Very Good (Very Feasible) and requires no further revision.

With respect to the visual design and presentation dimension, both validators assessed five primary indicators: alignment of visuals with local cultural context, visual attractiveness, text readability, color composition and layout, and contextual illustration quality. The scores obtained across all indicators demonstrate that the medium has been aesthetically designed to a high standard. Local ingredients such as glutinous rice flour, grated coconut, palm sugar, and banana leaves are visually represented in an informative and visually engaging manner. The consistent page design and harmonious yet contrasting color scheme effectively support students' comprehension of the content.

Regarding the content and subject matter dimension, both validators confirmed that the magazine's content aligns with the junior high school science curriculum, is

presented in accessible and student-friendly language, and maintains strong connections to the cultural realities of the community. All indicators within this dimension received favorable scores from both validators, demonstrating that the medium is capable of explicitly linking scientific concepts to local cultural contexts. For instance, the concepts of physical and chemical change are illustrated through the gelatinization of starch and the caramelization of palm sugar, as well as heat transfer principles demonstrated through the steaming process. The use of simple language, visual illustrations, and communicative narrative makes the medium readily accessible to learners.

With regard to the function and instructional utility dimension, each indicator also received strong scores from both validators. This indicates that the medium is highly capable of enhancing student engagement, motivating exploration of local phenomena, strengthening science understanding within a cultural context, and supporting a variety of instructional methods. Furthermore, the medium was assessed as making a significant contribution to reinforcing cultural identity through science learning. Learning becomes more meaningful as students are not merely recipients of scientific information, but are invited to reflect on their own lived experiences within a familiar local context.

The scores assigned by Validator Novita Oktaviani, S.Pd. (57/60) on June 4, 2025, and by Validator Latifa Dwiani Masruroh, S.Pd. (56/60) on June 25, 2025, indicate that the medium satisfactorily meets the key assessment dimensions required in instructional media validation. No indicator received a low score, confirming that the medium is pedagogically sound, visually appropriate, and substantively valid for field implementation without the need for technical revision.

The validation results from both experts collectively demonstrate that the *Sains Rasa Lokal* educational magazine is highly appropriate for use as a culturally grounded contextual learning medium in junior high school science education. The ethnoscience-based approach offers added value beyond conventional instructional media, as it not only teaches scientific concepts but also cultivates character, ecological awareness, and a sense of pride in local cultural heritage. Given the very strong validation outcomes, this medium is not only suitable for classroom use but also holds potential for broader adoption within curriculum enrichment programs grounded in local wisdom.

Media Description

The ethnoscience-based interactive magazine instructional medium entitled "*Menjelajah Zat, Kalor, dan Alam Lewat Iwel-Iwel*" (Exploring Matter, Heat, and Nature through Iwel-Iwel) represents an innovation in the development of science instructional materials that integrates scientific knowledge with local culture, particularly the traditional culinary heritage of East Java. The magazine is designed in a full-color A4 printed format with an visually engaging and informative layout. Key features of the magazine include illustrations of local food ingredients such as glutinous rice flour, palm sugar, grated coconut, and banana leaves presented not merely as culinary information, but as entry points for exploring scientific concepts. Additional features include simple experiment sections, interactive quizzes such as crossword puzzles, reflective narratives, and QR codes linking to supplementary multimedia content. Through this approach, learning is no longer one-directional and abstract, but becomes concrete, interactive, and enjoyable.



Figure 1. *Sains Rasa Lokal Magazine*: (a) Magazine cover dan (b) Magazine Contents

The core content of the magazine covers Grade VII junior high school science topics, including the structure and properties of matter, classification of pure substances and mixtures, physical and chemical changes, heat transfer, and convection phenomena. These concepts are presented through the case study of the iwel-iwel preparation process a traditional food made from glutinous rice flour, coconut, and palm sugar, wrapped in banana leaves and steamed. For example, in explaining starch gelatinization, the medium connects the heating process of the dough to physical changes occurring within starch granules. The caramelization of palm sugar is explained as a chemical change resulting from complex molecular reactions among sugar molecules upon heating. Furthermore, the magazine explains how convective heat transfer operates during the steaming process, and

how banana leaves function as a natural thermal regulator that also contributes a distinctive aroma to the food.

The distinctive quality of this magazine lies in its capacity to integrate scientific content with local cultural approaches and everyday life contexts. Every feature presented whether illustrations, experiments, or reflective narratives maintains a strong connection to the subject matter. For instance, students are not merely asked to read about the difference between pure substances and mixtures; they are invited to directly observe the ingredients of *iwel-iwel* in a kitchen setting and classify them based on their physical and chemical properties. Similarly, the use of QR codes directs students to cooking practice videos or science infographics that reinforce the visualization of concepts being studied. This integration has the potential to support contextual and transformative learning, in which students not only understand concepts theoretically but also recognize their connection to their own lives and cultural environment.

Discussion

The magazine explicitly incorporates local cultural values within the learning process in a manner that goes beyond mere decoration or contextual illustration. *Iwel-iwel* is positioned not only as an object of scientific inquiry, but also as a living symbol of local wisdom, cultural identity, and Islamic-Javanese heritage that carries deep pedagogical significance. The cultural values embedded in the medium include the preservation of traditional culinary practices, the use of locally sourced food ingredients, the utilization of natural banana leaf wrapping, and an awareness of environmentally sustainable practices¹³. These elements resonate profoundly with Islamic educational philosophy, which regards the natural world as *ayat kawniyyah* signs of divine creation that invite believers to engage in *tafakkur* (reflective contemplation) and *tadabbur* (deep reflection upon natural phenomena) as acts of worship¹⁴. From this perspective, science learning is not merely an academic exercise but a form of spiritual engagement, in which students come to recognize the wisdom of Allah embedded within the physical and chemical processes they observe¹⁵. This framing gives the magazine a distinctive theological grounding that conventional

¹³ Aruna Jyothi Kora, "Leaves as Dining Plates , Food Wraps and Food Packing Material : Importance of Renewable Resources in Indian Culture" 6 (2019).

¹⁴ U Abdullah Mu, Budi Munawar Khutomi, and Azizi Abu Bakar, "Planting Environmentally Friendly Religiosity Awareness : PAI Learning Innovation Based on Mindfulness Eco Theological Perspective in SMPIT Sahabat Alam" 10, no. 2 (2025).

¹⁵ Saepul Bahri and Muhammad Zuhdi, "Integrating Naqli and Aqli Science in Islamic Education : Toward a Comprehensive Learning Model" 11, no. 2 (2025): 82–96.

ethnoscience media do not possess, and positions it firmly as an Islamic education medium in the fullest sense of the term. These elements simultaneously align with the framework of Education for Sustainable Development (ESD), which emphasizes that learning environments should cultivate ecological consciousness alongside academic competencies, demonstrating that Islamic educational values and ESD principles are not in tension but are in fact mutually reinforcing¹⁶.

In the social dimension, the magazine foregrounds the practice of *gotong royong* (communal cooperation) through group-based preparation of *iwel-iwel*, thereby extending the learning process beyond cognitive acquisition to encompass students' affective and social development. Within Islamic education, *gotong royong* finds its spiritual parallel in the Quranic principle of *ta'awun* mutual assistance and cooperation as a religious obligation suggesting that the social values embedded in this tradition are not merely cultural but are theologically affirmed¹⁷. Ethnoscience-based media significantly enhance students' collaborative attitudes and cultural appreciation when learning is situated within familiar community practices¹⁸. Furthermore, the pyramid shape of *iwel-iwel* is explicitly connected to the five pillars of Islam (*rukun Islam*), demonstrating that this instructional medium is capable of contextually internalizing spiritual and religious values within a science learning framework¹⁹. This integration reflects the Islamic educational ideal of *tawazun* balance between intellectual, spiritual, and social development and distinguishes this magazine from existing ethnoscience media that address cultural but not spiritual dimensions. The explicit connection between a traditional food form and Islamic theological structure is particularly meaningful for students in Islamic education settings, as it affirms that their cultural practices and religious identity are not separate from, but are deeply intertwined with, their scientific education²⁰.

The primary strength of this instructional medium lies in its ethnoscience-based approach, which repositions students from passive recipients of decontextualized

¹⁶ Elena Arbuzova and Natalia Alexandrova, "ECOLOGICAL MINDSET IN EDUCATION: INTEGRATING SUSTAINABLE PRACTICES INTO EDUCATIONAL PROGRAMS" 19, no. December (2024): 1194–1201.

¹⁷ Naufal Bachri, Rizki Yunanda, and Iromi Ilham, "Strengthening Reintegration through Social Capital: Learning from Aceh, Indonesia," 2023, 141–56.

¹⁸ Li Peng and Fadzilah Abd Rahman, "The Role of Community Collaboration in Enhancing Student Engagement and Learning in China Local Culture" 2024 (2024): 202–15.

¹⁹ Luluk Ernawati, Nur Kholis, and Husniyatus Salamah Zainiyati, "Development of Integrated Spiritual, Moral, and Scientific (SMS) Islamic Education Instructional Materials for High School Students," n.d.

²⁰ Hamdan Rahmadi, "RELIGIOUS MODERATION IN THE CONTEXT OF ISLAMIC EDUCATION: A MULTIDISCIPLINARY PERSPECTIVE AND ITS APPLICATION IN ISLAMIC" 21, no. 1 (2023): 59–82, <https://doi.org/10.18592/khazanah.v20i1.8487>.

knowledge to active participants in a learning process embedded within their own social, cultural, ecological, and spiritual environments. This positioning reflects the Islamic educational vision of the *insan kamil* the whole and complete human being whose development encompasses intellectual, moral, spiritual, and social dimensions simultaneously²¹. Learning becomes more authentic because it originates from real experiences and local cultural practices that students have been familiar with since childhood, a condition that constructivist learning theory identifies as essential for the formation of durable conceptual understanding. Empirically, studies on ethnoscience-based learning in Indonesian junior high school contexts have consistently reported improvements in students' conceptual mastery, science literacy, and learning motivation when scientific instruction is grounded in culturally proximate contexts²². The present medium extends this line of evidence by demonstrating that a magazine format previously underexplored in ethnoscience media development can effectively serve as a vehicle for this integration while simultaneously carrying Islamic educational values. Furthermore, this medium operationalizes the *Profil Pelajar Pancasila* (Pancasila Student Profile) within the Merdeka Curriculum across multiple dimensions simultaneously: critical thinking through concept exploration, noble character (*akhlak mulia*) through cultural and spiritual reflection grounded in Islamic values, global diversity appreciation through the recognition of local wisdom as legitimate scientific context, and environmental awareness through the foregrounding of ecologically responsible practices drawn from both Islamic environmental ethics (*fiqh al-bi'ah*) and ESD principles²³. The literacies cultivated through engagement with this magazine thus have the potential to be genuinely multidimensional, encompassing science literacy, cultural literacy, ecological literacy, spiritual literacy, and digital literacy the latter supported through QR code integration that connects print-based content with multimedia resources. Empirical verification of these literacy outcomes, however, awaits future classroom-based practicality and effectiveness studies²⁴. This convergence of literacies reflects the holistic competency profile increasingly demanded by both 21st-century science education frameworks and contemporary Islamic education discourse.

²¹ Iqbal Amar Muzaki et al., "Insan Kamil at the Crossroads of Time : Transformative Islamic Education Model to Face Global Challenges" 15, no. 1 (2025): 219–52, <https://doi.org/10.33367/ji.v15i2.7217>.

²² Sukma Yanti Putri Ayu Suwandi, "Ethnoscience Approach to Improve Science Literacy on Chemical Bonding: A Thematic Synthesis" 26, no. July (2025): 1909–31.

²³ Dwi Rahmad Julianto et al., "How the Merdeka Curriculum Enhances the Pancasila Student Profile in Education" 8 (2025): 15–34.

²⁴ Indaryanti, Murtiyasa, and Soemardjoko, "4D Research and Development Model : Trends , Challenges , and Opportunities Review."

The overall feasibility scores yielded by expert validation 95% and 93.33% from two independent validators, with a combined average of 94.17%, categorized as Very Feasible provide empirical substantiation for the claims above. These scores indicate that the magazine is not only pedagogically sound in terms of content accuracy and instructional utility, but also visually and communicatively appropriate for its intended audience of junior high school students in Islamic education settings. The Very Feasible categorization is particularly meaningful in light of the instrument's multidimensional structure, which assessed the medium across visual design, content validity, and instructional quality simultaneously, affirming that the integration of Islamic values, cultural context, and scientific content does not compromise the medium's academic rigor but rather enriches it. These findings are consistent with broader evidence in the Islamic science education literature suggesting that instructional media which align with students' religious worldview and cultural identity tend to produce stronger engagement, reduced cognitive dissonance between scientific and spiritual frameworks, and more meaningful conceptual learning. It is, however, important to contextualize these findings within the study's methodological boundaries. The current validation was conducted at the expert review stage involving two validators, representing a necessary but preliminary form of feasibility evidence. A more comprehensive assessment would require classroom implementation trials to evaluate the medium's actual impact on students' conceptual understanding, science literacy, motivation, cultural appreciation, and Islamic character development. The high validation scores nonetheless provide a strong empirical foundation for proceeding to implementation and dissemination phases in future research, and affirm that the integration of food-based ethnoscience, Islamic educational values, ESD principles, and sustainable learning within a magazine format constitutes a viable, innovative, and replicable model for contextual science media development across Islamic education institutions.

CONCLUSION

This study successfully developed and validated a food-based ethnoscience science magazine entitled *Sains Rasa Lokal: Menjelajah Zat, Kalor, dan Alam Lewat Iwel-Iwel* as an Islamic education medium for sustainable science learning at the junior high school level, employing the 3D development model (Define, Design, and Development). The developed medium integrates Grade VII science concepts including matter structure, heat transfer, physical and chemical changes, and convection with the iwel-iwel culinary tradition

embedded in the Javanese-Islamic Tedhak Siten ceremony, thereby situating abstract scientific content within a culturally meaningful, spiritually grounded, and ecologically conscious learning context. Expert validation conducted independently by two subject-matter validators yielded feasibility scores of 95% and 93.33%, with an overall average of 94.17%, categorized as Very Feasible across all three assessed dimensions: visual design and presentation, content and subject matter, and instructional utility. These findings demonstrate that the integration of Islamic educational values including *tafakkur*, *ta'awun*, *tawazun*, and the vision of *insan kamil* with food-based ethnoscience and Education for Sustainable Development (ESD) principles does not compromise academic rigor but rather produces a richer, more holistic instructional medium capable of cultivating science literacy, cultural literacy, ecological literacy, spiritual literacy, and digital literacy simultaneously.

This study contributes an innovative and replicable framework for developing contextual science instructional media grounded in local wisdom and Islamic educational philosophy, offering a model applicable to other traditional practices across Muslim societies. Future research is recommended to extend this work through classroom implementation studies to empirically evaluate the medium's impact on students' conceptual understanding, science literacy, Islamic character development, and cultural appreciation, as well as to involve a broader and more diverse panel of validators encompassing senior content experts, instructional media specialists, and Islamic education scholars.

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