

Development of The Iphasis Learning Model To Improve Students' Natural and Social Sciences Literacy At Smkn 1 Pangkep

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Abstract

Scientific and technological developments in the twenty-first century require learning processes that foster scientific literacy, critical thinking, problem-solving skills, and student reflection. However, Natural and Social Sciences (IPAS) instruction in vocational education continues to face challenges in engaging students in scientific investigations, critically interpreting information, developing evidence-based arguments, and reflecting on learning processes. These conditions highlight the need for an integrated learning model that not only strengthens IPAS literacy but also provides meaningful learning experiences and character development grounded in Islamic values. This study aims to develop the IPASIS learning model to improve IPAS literacy among students at SMKN 1 Pangkep, South Sulawesi. The model is designed to integrate scientific literacy, scientific investigation, reflective learning, evidence-based problem-solving, and the internalization of Islamic values within a systematic instructional framework. Specifically, IPASIS is intended to encourage students to observe phenomena, formulate questions, conduct investigations, interpret evidence, develop solutions, communicate findings, and reflect on their learning processes. This study employs a Research and Development (R&D) approach using the ADDIE framework, consisting of analysis, design, development, implementation, and evaluation. An embedded mixed-methods design is used to integrate quantitative and qualitative data throughout model development. The research is conducted at SMKN 1 Pangkep and involves limited trials and field trials with experimental and control groups of Grade 10 students. Data are collected through observations, interviews, questionnaires, documentation, and learning assessments. Quantitative data are used to examine the model's validity, practicality, and effectiveness, while qualitative data are used to understand learning needs, implementation challenges, user responses, and model refinement. The anticipated contribution of this study is an integrated learning model that connects scientific literacy, systematic investigation, reflective learning, and Islamic character values within vocational education. The integration of shiddiq (honesty), amanah (responsibility and trustworthiness), and ta'awun (mutual assistance and cooperation) is expected to help students use scientific knowledge critically, make evidence-based decisions, and demonstrate responsible learning behavior. Accordingly, the IPASIS model is expected to contribute to the development of contextual instructional designs integrated with Islamic values and provide a basis for further empirical research on its effectiveness and application in different educational contexts.

Keywords: IPASIS learning model; IPAS literacy; scientific investigation; reflective learning; Islamic values; vocational education.

1. Introduction

Scientific and technological developments in the twenty-first century require education to focus not only on mastery of subject matter but also on developing critical thinking, problem-solving, evidence-based decision-making, and learning reflection. In vocational education, Natural and Social Sciences (IPAS) instruction plays an important role in helping students understand natural and social phenomena related to everyday life. IPAS literacy enables students to understand information, analyze problems, and use acquired knowledge to identify rational solutions. Therefore, IPAS instruction needs to be designed contextually and participatively so that students not only receive information from teachers but also actively construct their own knowledge.

Efforts to improve IPAS literacy require a learning model that allows students to undertake scientific investigations and reflect on their learning experiences. Through scientific investigation, students can observe phenomena, formulate questions, collect and analyze data, and draw evidence-based conclusions. Learning reflection, meanwhile, helps students evaluate their understanding, recognize difficulties, and improve their problem-solving strategies. Both aspects are important because meaningful learning emphasizes not only final outcomes but also the process through which knowledge is acquired. Thus, IPAS instruction requires an approach that systematically links conceptual mastery, inquiry skills, and evaluation of the learning process.

In addition to developing scientific competencies, learning should attend to character formation and the values underlying student behavior. Within Islamic education, shiddiq (honesty), amanah (responsibility), and ta'awun

(cooperation) are relevant values to integrate into learning activities. Shiddiq can be demonstrated by reporting data and observations honestly, amanah through fulfilling duties and responsibilities during investigations, and ta'awun through teamwork. The integration of these values should extend beyond the delivery of moral content and become part of classroom learning processes and interactions. In this way, IPAS instruction can support the development of scientific knowledge and skills while fostering responsible learning behavior.

Although previous studies have examined scientific literacy, scientific investigation, learning reflection, and the integration of Islamic values, these components have generally been investigated according to their respective research focuses. Based on the literature reviewed in this proposal, there remains scope for developing an IPAS learning model for vocational high schools that systematically integrates all these components within a single instructional framework. This gap highlights the need for a model that not only builds students' capacity to understand phenomena and conduct inquiries but also promotes reflection and the internalization of Islamic values throughout learning. The novelty of this study lies in developing the IPASIS learning model, which integrates IPAS Literacy, Scientific Investigation, Learning Reflection, and Islamic Values into a model tailored to vocational high school learning characteristics.

On this basis, the study aims to develop the IPASIS learning model to improve students' IPAS literacy at SMKN 1 Pangkep. Model development follows a Research and Development (R&D) approach using the ADDIE framework, comprising analysis, design, development, implementation, and evaluation. The model is expected to offer an instructional alternative that integrates conceptual mastery, scientific investigation, learning reflection, and Islamic character formation. Theoretically, the study is expected to enrich research on IPAS learning models that connect scientific competencies with Islamic values. Practically, IPASIS is expected to help teachers design more active and meaningful instruction and support students in using knowledge critically, responsibly, and collaboratively.

Theoretical Review

IPAS Literacy in Vocational High School Learning

Natural and Social Sciences (IPAS) literacy refers to students' ability to understand concepts, interpret information, analyze phenomena, and use knowledge to explain and solve real-life problems. IPAS literacy emphasizes not only recalling facts and concepts but also applying knowledge in authentic situations. In education, IPAS literacy is an important element of learning because it helps students connect the subject matter with natural and social phenomena in their surroundings.

IPAS instruction in vocational high schools (SMK) has distinctive characteristics arising from students' need to understand phenomena contextually. Students are expected not only to master learning content but also to connect their knowledge to problems encountered in everyday life and the workplace. Accordingly, IPAS instruction should provide opportunities to observe phenomena, identify problems, process information, and draw conclusions from available evidence. These processes can help students develop a more meaningful understanding of the learning material.

The development of IPAS literacy is also closely related to critical thinking and decision-making. Students need practice distinguishing evidence-supported information from opinions that lack adequate justification. They also need to develop the ability to interpret data, connect different pieces of information, and explain the reasoning behind conclusions. Such abilities are essential if students are to move beyond passively receiving information and use it rationally to address a range of problems.

In practice, IPAS literacy should be developed through learning activities that actively engage students. Observation, discussion, data analysis, problem-solving, and the preparation of investigation reports can encourage students to apply acquired knowledge. Teachers act as facilitators who provide guidance, learning resources, and support in understanding the relationship between concepts and the phenomena being studied. Thus, IPAS instruction is concerned not merely with delivering content but also with developing the skills needed to use knowledge.

Based on this discussion, IPAS literacy is positioned as a central component of the IPASIS learning model. It represents the competency to be developed through students' involvement in scientific investigation and learning reflection. Integrating IPAS literacy with these two components is expected to help students understand phenomena, analyze information, and formulate evidence-based solutions. IPAS literacy therefore provides a foundation for learning that systematically connects knowledge mastery with thinking and problem-solving skills.

Scientific Investigation and Learning Reflection

Scientific investigation is a systematic inquiry process undertaken to obtain information, understand phenomena, and answer questions based on evidence. In educational settings, scientific investigation allows students to participate directly in acquiring knowledge rather than merely receiving explanations from teachers. Activities may include observation, question formulation, data collection, information analysis, conclusion drawing, and communication of findings. Through this process, students can develop curiosity, accuracy, analytical ability, and problem-solving skills.

The application of scientific investigation in IPAS learning should be adapted to the characteristics of the subject matter, learning objectives, and students' abilities. The problems investigated should relate to phenomena that can be observed or examined through relevant information sources. Students are then guided to identify problems, determine the information required, conduct investigations, and interpret the results obtained. Teachers provide guidance to ensure that investigations are well directed and conclusions are clearly supported. In this way, learning helps students understand how knowledge is constructed through inquiry.

Alongside scientific investigation, learning reflection is an important component that helps students evaluate their learning experiences. Reflection can be understood as reviewing the activities, understanding, strategies, and outcomes developed throughout learning. Through reflection, students can recognize what they have understood, identify difficulties, and consider improvements for subsequent activities. Reflection also helps students recognize that mistakes and learning difficulties can become opportunities for evaluation and deeper understanding.

Learning reflection can be carried out by writing about learning experiences, discussing investigation findings, evaluating group-work processes, and explaining the reasoning behind conclusions. Students may be guided to respond to questions about what they have learned, the evidence supporting their conclusions, the difficulties encountered, and ways to improve the problem-solving process. In these activities, teachers should create an environment that encourages students to express their views openly and assess the learning process honestly. Reflection thus becomes more than a closing activity; it forms part of the process of constructing and refining understanding.

Within the IPASIS learning model, scientific investigation and learning reflection serve complementary functions. Investigation is the primary process through which students collect and analyze evidence, while reflection helps them evaluate the process and outcomes of inquiry. Reflective insights can be used to refine understanding, develop solutions, and improve the quality of subsequent learning activities. The relationship between these components is expected to support IPAS literacy through active, systematic, evidence-based problem-solving.

Integration of Islamic Values into the IPASIS Learning Model

Education aims not only to develop students' intellectual abilities but also to shape character and behavior in accordance with values that guide life. From an Islamic educational perspective, knowledge and moral character are interconnected dimensions that should be developed together. Learning can therefore provide opportunities to instill Islamic values through educational experiences, social interactions, task completion, and problem-solving. Value integration is expected to help students not only understand subject matter but also apply moral principles in academic activities and everyday life.

The IPASIS learning model integrates three core values: shiddiq, amanah, and ta'awun. Shiddiq refers to honesty and truthfulness in thought, speech, and action. In IPAS instruction, it can be expressed through honesty in observation, data recording, use of information sources, and presentation of investigation results. Students should develop the habit of reporting findings according to the evidence obtained rather than altering data to match a desired conclusion. In this way, shiddiq supports an honest and responsible scientific attitude.

The second value, amanah, refers to trustworthiness and responsibility in carrying out duties. In learning activities, it can be applied through students' commitment to completing individual and group assignments, using equipment and materials appropriately, and following agreed investigation procedures. Amanah also entails students' willingness to be accountable for their work processes and outcomes. Strengthening this value is expected to foster disciplined, responsible, and trustworthy learning habits in both academic and social contexts.

The third value, ta'awun, means helping one another in doing good. This value is particularly relevant to learning activities involving discussion, teamwork, investigation, and the development of solutions to problems. Ta'awun can be practiced by helping group members who experience difficulties, respecting others' opinions, distributing tasks fairly, and working together to achieve learning objectives. Through such activities, students learn that problems need not always be solved individually but can be addressed through cooperation grounded in responsibility and mutual respect.

The integration of shiddiq, amanah, and ta'awun into the IPASIS learning model is not treated as moral content separate from instruction; rather, these values are internalized throughout the learning process. They are practiced when students conduct scientific investigations, analyze information, develop solutions, work in groups, and reflect on learning outcomes. By integrating IPAS literacy, scientific investigation, learning reflection, and Islamic values, IPASIS is designed to develop both scientific competencies and student character. This integration provides the conceptual foundation for active, meaningful, responsible IPAS learning suited to vocational education.

2. METHOD

This study adopts a Research and Development (R&D) method, which aims to develop an instructional product and assess its feasibility. The product is the IPASIS learning model, integrating IPAS Literacy, Scientific Investigation, Learning Reflection, and Islamic Values. Model development is intended to improve IPAS literacy among students at SMKN 1 Pangkep.

The development procedure follows the ADDIE model, which consists of five stages: Analysis, Design, Development, Implementation, and Evaluation. The analysis stage identifies learning needs and problems related to IPAS literacy. The design stage involves preparing the model framework, while the development stage includes producing and refining instructional materials. The model is subsequently implemented in learning activities and evaluated to determine its feasibility and the outcomes of its application.

The research participants are Grade 10 students at SMKN 1 Pangkep. Model testing is planned through limited trials and field trials involving experimental and control groups. Effectiveness testing uses a nonequivalent control group design, which compares the outcomes of the two groups through pretests and posttests without individually randomizing students.

Data are collected through interviews, questionnaires, observations, tests, and documentation. Interviews are used to explore learning needs and challenges, while questionnaires obtain expert validators' assessments and user responses. Observations document model implementation, student activities, scientific investigations, learning reflection, and the application of Islamic values. IPAS literacy tests are administered as pretests and posttests, while documentation provides supplementary research data.

Data are analyzed using quantitative and qualitative approaches. Quantitative analysis is used to assess the validity of the product and instruments, the model's practicality, and its effectiveness in improving IPAS literacy. Qualitative analysis examines interview findings, validators' comments, observational notes, and documentation to explain development needs and the model implementation process. Findings from both forms of analysis are integrated to evaluate the quality of the IPASIS learning model.

3. RESULTS

Needs Analysis for Developing the IPASIS Learning Model

The preliminary analysis indicates that Natural and Social Sciences Project (IPAS) learning at SMKN 1 Pangkep still faces several challenges. These include less-than-optimal student engagement in scientific investigations, limitations in expressing ideas, and the use of information without consistently demonstrating understanding or verifying evidence. Furthermore, learning reflection and the reinforcement of Islamic values have not yet been systematically integrated into a single learning model.

These conditions demonstrate the need for a learning model that helps students understand information, conduct investigations, and use evidence to solve problems. IPAS instruction should address not only mastery of subject matter but also students' ability to connect knowledge with real-world situations. Model development must therefore consider the instructional needs of vocational high schools.

In response to these needs, the IPASIS learning model was developed by integrating four main components: IPAS Literacy, Scientific Investigation, Learning Reflection, and Islamic Values. These components are designed to operate as a unified whole, enabling students not only to acquire knowledge but also to investigate problems, evaluate their learning processes, and practice honesty, responsibility, and cooperation.

The findings of the needs analysis provide the basis for designing a learning model suited to Grade 10 students at SMKN 1 Pangkep. The integration of the four components is the key distinction between IPASIS and approaches that emphasize only one aspect of learning. Thus, the model is designed to address the need to develop scientific competencies while fostering student character within IPAS instruction.

ADDIE-Based Development of the IPASIS Learning Model

The IPASIS learning model is developed using the ADDIE framework, comprising Analysis, Design, Development, Implementation, and Evaluation. During analysis, instructional needs and student characteristics are identified as a basis for product development. The design stage is then used to formulate the model's foundations, instructional syntax, social system, principles of reaction, support system, and instructional and nurturant effects.

At the development stage, the model design is translated into instructional products, including the IPASIS Learning Model Book, Teacher's Guide, and IPASIS Student Book. These products are planned to undergo validation by three experts with expertise in instructional design, science/IPAS education or curriculum, and teaching practice. Their feedback and recommendations will inform revisions before the model is implemented in classroom instruction.

The implementation stage is designed to include limited and field trials. The limited trial is conducted in Grade 10 MPLB 1 to obtain information on implementation fidelity, readability, user responses, and initial challenges. Following revisions, the field trial is planned for Grade 10 TJKT 1 as the experimental group and Grade 10 TJKT 2 as the control group. The two groups will be used to compare learning outcomes while taking students' initial abilities into account.

Evaluation is conducted formatively throughout development and summatively at the end of the development process. It covers product validity, model implementation, practicality, and effectiveness in supporting improvements in IPAS literacy. Evaluation also informs product refinement so that the developed model responds to learning needs. However, the validity, practicality, and effectiveness of IPASIS can only be determined after the validation and trial data have been analyzed.

Potential of the IPASIS Model to Improve IPAS Literacy and Islamic Character

The IPASIS learning model is designed to improve IPAS literacy through activities that encourage students to observe phenomena, formulate problems, plan and conduct investigations, develop evidence-based solutions, and communicate and reflect on learning outcomes. This sequence of activities provides opportunities for students to participate actively in acquiring and applying knowledge. Nevertheless, improvements in IPAS literacy resulting from the model's implementation must be demonstrated by comparing the pretest and posttest outcomes of the experimental and control groups.

In addition to IPAS literacy, scientific investigation and learning reflection are important elements of the model. Scientific investigation helps students evaluate information and formulate evidence-based conclusions, while reflection encourages them to review their experiences, evaluate processes, and plan improvements. Integrating these components is expected to help students construct a deeper understanding rather than simply memorize instructional content.

Another distinctive feature of IPASIS is the integration of Islamic values, particularly shiddiq, amanah, and ta'awun. Shiddiq relates to honesty in communicating information and investigation findings; amanah concerns responsibility in carrying out tasks; and ta'awun emphasizes cooperation throughout learning. These values are designed to accompany scientific activities so that knowledge development proceeds alongside character formation.

Conceptually, integrating IPAS literacy, scientific investigation, learning reflection, and Islamic values contributes to a learning model that combines scientific competencies with Islamic character. Its contribution lies in unifying these four components within a systematic instructional sequence and accompanying materials. IPASIS therefore has the potential to serve as an alternative learning model for IPAS Projects in vocational high schools. This potential nevertheless requires confirmation through validation results, teacher and student responses, observations of implementation, and data-based effectiveness testing.

4. CONCLUSION

The IPASIS learning model was developed as an alternative approach to Natural and Social Sciences Project (IPAS) instruction at SMKN 1 Pangkep. It integrates four primary components: IPAS Literacy, Scientific Investigation, Learning Reflection, and Islamic Values. Model development is based on the need for learning that promotes active student participation, the use of scientific evidence, reflection on learning processes, and the strengthening of Islamic character.

Development of the IPASIS learning model follows the ADDIE framework, comprising analysis, design, development, implementation, and evaluation. Each stage is designed to produce a model and instructional materials that respond to teachers' and students' needs. The model's quality must subsequently be assessed in terms of validity, practicality, and effectiveness through expert validation, instructional trials, and analysis of the resulting data.

Conceptually, IPASIS has the potential to improve IPAS literacy while reinforcing shiddiq, amanah, and ta'awun in learning. The integration of scientific competencies with Islamic character constitutes the model's principal contribution to IPAS instruction in vocational high schools. Nevertheless, conclusions about the model's success and effectiveness must be based on the results of validation and empirical testing after the research has been conducted.

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