

THE PHILOSOPHY OF EDUCATION IN THE DEVELOPMENT OF SCIENCE BASED ON LOCAL WISDOM

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Received : 25 September 2025

Revised : 05 October 2025

Accepted : 23 October 2025

Published : 17 November 2025

DOI : <https://doi.org/10.54443/ijset.v5i1.1319>

Link Publish : <https://www.ijset.org/index.php/ijset/index>

Abstract

The philosophy of education plays a fundamental role in shaping the direction of knowledge development, including science that is grounded in the values of local wisdom. Human beings possess the innate capacity to think and continuously strive to enhance their knowledge. Naturally endowed with curiosity, humans constantly seek answers to their questions through the pursuit of knowledge, which in turn brings intellectual satisfaction in accordance with the demands of the times. Knowledge is not only about understanding facts but also about seeking truth through proper scientific inquiry. Learning through well-founded scientific reasoning is one of the ways humans pursue truth. This study aims to examine the essence of the philosophy of education in the development of science based on local wisdom. The surrounding natural environment gives rise to unique forms of local wisdom that serve as potential foundations for scientific development. Science—encompassing physics, chemistry, and biology—relies on scientific methods, logical reasoning, and systematic frameworks. This is where the philosophy of science becomes essential in studying, revealing, and solving scientific problems in human life. Developing science based on local wisdom strengthens national identity, fosters ecological awareness, and cultivates learners who think scientifically while remaining rooted in their cultural heritage. This study discusses the importance of developing science based on local wisdom as a means of preserving natural resources, traditions, and cultural practices within society. Through a literature review approach, this paper explores the relevance between educational philosophy and the integration of local values in science education. The findings reveal that the philosophy of education plays a crucial role in framing the development of science that is not only oriented toward scientific rationality but also upholds moral, cultural, and spiritual values within society.

Keywords: *philosophy of education; science; local wisdom.*

1. Introduction

The rapid advancement of modern science often neglects the dimensions of values, morality, and culture. As a result, science education tends to focus primarily on cognitive and technological aspects while disregarding the social context and the local wisdom that exists within society (Tilaar, 2015). In the context of Indonesian education, the integration between the philosophy of education and local wisdom has become an urgent necessity to ensure that science does not lose its moral orientation and national identity. Natural Science (IPA), or science in general, originates from human life experiences, encompassing humanity's awareness of its own existence and its relationship with the surrounding natural environment. Humans serve as both the subjects and objects of scientific inquiry. The objects of scientific study include humans, the environment, and their interactions—both with living and non-living elements. Initially, the study of natural phenomena that emerged from natural philosophy focused only on observable and concrete matters. However, because human beings possess a strong sense of curiosity, they continually strive to understand and investigate life phenomena, which eventually leads scientific inquiry to expand into more abstract domains.

In everyday life, people often encounter confusion when attempting to explain natural phenomena. For instance, prior to the 20th century, scientists developed abstract, non-representational theories—such as those concerning gravity, energy, and atoms—which initially posed significant challenges to public understanding and acceptance. Over time, as human life evolved rapidly, science also progressed dynamically. Numerous discoveries have emerged across various branches of science—such as animal husbandry, fisheries, agriculture, textiles, medicine, and more—resulting in transformative changes in human life. This evolution will continue as long as humanity exists. The development of science can be utilized through scientific methods and reasoning to produce innovative and reliable products. Human reasoning, as a divine gift, serves as a means to seek truth, though its application is not always absolute. The dynamic nature of the universe provides a strong foundation for forming authentic concepts of truth. However, truth cannot be comprehended solely through empirical observation. In seeking truth, all aspects of existence must be understood as interconnected; nothing in the universe exists in isolation.

In this regard, there must be a philosophical framework capable of filtering inconsistencies or deviations in the development of science. The advancement of technology and civilization cannot be separated from the influence of science in human life. Herein lies the vital role of philosophy. Although many scientists do not consciously engage in philosophical reflection, their scientific endeavors are inevitably shaped by philosophical assumptions. Some, however, pursue scientific advancement merely for material gain without considering the ethical and environmental consequences of their actions. This condition necessitates the role of philosophy in guiding scientific development for the benefit of humanity. Through philosophical inquiry, human beings can seek ultimate truth and utilize science for human welfare without causing harm to the environment or society. The philosophy of education plays a fundamental role in shaping the direction and objectives of education, particularly in the development of science. In Indonesia, the effort to develop science is not only aimed at mastering modern technology but also at internalizing values of wisdom and morality derived from local traditions. The philosophy of education seeks to harmonize scientific rationality with cultural and moral values rooted in local wisdom. Based on this understanding, it is essential to have a clear comprehension of philosophy as the foundation of all disciplines, including science and its development, to ensure that scientific progress remains within ethical boundaries. This study is conducted through a literature review approach and aims to explore diverse perspectives on the development of science and the philosophical reflections of scientists throughout history.

2. Literature Review

a. The Nature of the Philosophy of Education

Philosophy serves as a foundational theory underlying metaphysics and epistemology, which are major branches of philosophical inquiry. According to several scholars, philosophy has been defined in diverse ways. John Dewey stated that philosophy represents a continuous human effort and struggle to reconcile various traditions so that their outcomes may shape moral character, political ideals, and scientific tendencies that often diverge from established authorities. Plato, on the other hand, viewed philosophy as a discipline that seeks the attainment of ultimate truth. Aristotle described philosophy as a science containing truth, encompassing elements such as economics, metaphysics, aesthetics, rhetoric, politics, and logic. Furthermore, philosophy seeks to investigate the causes and principles underlying all existence. Immanuel Kant defined philosophy as the fundamental science from which all knowledge originates, comprising four essential domains: metaphysics, ethics, religion, and anthropology.

Philosophy of education functions as a foundation for determining the direction, purpose, and content of education. It provides guidance on how scientific knowledge should be developed in a humanistic and ethical manner (Sudrajat, 2021). Meanwhile, local wisdom embodies social, ecological, and spiritual values that have proven to be relevant in sustaining communal life (Suryana, 2020). Therefore, the development of science based on local wisdom represents a harmonious integration between scientific rationality and cultural values.

According to Hidayatullah (2006:234), ancient Greece was the birthplace of philosophy. The growth of philosophy within Greek society transformed their worldview from mythocentric to logocentric thinking, marking a transition from myth-based explanations to rational and logical inquiry. Etymologically, the term *philosophy*—translated as *filsafat* in Indonesian and *falsafah* in Arabic—originates from the Greek word *philosophia*. It is a compound of *philos* (meaning love or friendship) and *sophia* (meaning wisdom, knowledge, or insight) (Rapar, 2001:5). Thus, philosophy literally means “the love of wisdom.” From these various definitions, philosophy can be understood as a branch of knowledge concerned with the pursuit of ultimate truth. Philosophical inquiry involves efforts to explore the “what,” “how,” and “why” of phenomena—dimensions that correspond respectively to ontology (the study of what exists), epistemology (the study of how knowledge is obtained), and axiology (the study of the purpose and value of knowledge).

The relationship between philosophy and science has had a profound influence on human understanding of reality. This interaction has shaped the evolution of human civilization, driving it toward a more advanced stage (Tafsir, 2005). From an activity-based perspective, philosophy represents a mode of thinking characterized by distinct intellectual traits. As several scholars have noted : (1) Sutan Takdir Alisjahbana (as cited in Hamdani, 2011:72) emphasized that philosophical thinking requires precision and adherence to rational rules. (2) Sidi Gazalba (1976, in Hamdani, 2011:73) identified the traits of philosophical thought as radical, systematic, and universal. (3) Sudarto (1996, in Hamdani, 2011:73) further described philosophical reasoning as methodical, systematic, coherent, rational, comprehensive, radical, and universal. Thus, philosophy—particularly the philosophy of education—serves not merely as abstract speculation but as a framework that informs ethical reflection and critical reasoning in scientific and educational development.

b. The Nature of Science and the Philosophy of Education

Before the nineteenth century, there was no clear distinction between the various branches of knowledge, particularly regarding natural phenomena; thus emerged what was then known as *natural philosophy*. It was only after the nineteenth century that the sciences began to separate into independent and increasingly specialized disciplines. According to Amsal Bakhtiar (2012), both philosophy and science have historically played substantial and interrelated roles in shaping human civilization. These two domains cannot be separated, as they are inherently integrated and mutually influential. When traced through history, philosophy and science have jointly driven the transformation of human thought and culture. Natural Science (IPA), as one of the disciplines that developed from the *philosophy of science*, is essential for human existence. For instance, in the field of physics, Bunge (1970) explained that the discipline originated from philosophical inquiries concerning the structure of time, motion, matter, and the nature of the universe. In this sense, philosophy continuously examines natural phenomena, and therefore, the ontological and epistemological dimensions of science remain key philosophical concerns.

The term *science* derives from the Latin word *scientia*, meaning “knowledge.” Knowledge has always been a central component of philosophy; indeed, the branch of philosophy concerned with knowledge is *epistemology*—the study of the nature and scope of human understanding. An example of epistemological inquiry is the philosophical problem of determining whether a belief can be considered true or justified, and thus classified as knowledge. In essence, knowledge relates to understanding that is most likely to be true. Aristotle (384–322 BCE)—a student of Plato (423–347 BCE) and the teacher of Alexander the Great—is widely regarded as one of the early philosophers whose systematic inquiries ultimately laid the foundation for what, nearly two millennia later, evolved into the contemporary scientific method.

According to Usman Samatowa (2011:2–3), Natural Science can be defined as the study of phenomena occurring in nature. Similarly, Joseph Abruscato (1995:2) stated that “*Science is the knowledge gathered through a group of processes that people use systematically to make discoveries about the natural world.*” Wahyana (as cited in Windiantari, 2012) further emphasized that science is a systematically organized body of knowledge, generally limited to observable natural phenomena. The development of science is marked not only by the accumulation of facts but also by the establishment of scientific methods and attitudes. I Made Alit and Wandy (2009:17) conceptualized science as a *body of knowledge* built through continuous inquiry within the scientific community. Science is more than mere knowledge—it is a dynamic interplay among content, process, and context. *Content* includes facts, definitions, concepts, models, theories, and terminology; *process* refers to the skills and activities employed to explore the surrounding environment; and *context* relates to the social and cultural frameworks within which scientific understanding develops. Science is grounded in observation, experimentation, and logical reasoning. However, the philosophy of education reminds us that science must never be detached from ethical and humanistic values (Tilaar, 2015). Therefore, integrating science with local wisdom through a philosophical approach fosters learning that is more meaningful, contextually relevant, and sustainable

3. Research Method

The method employed in this study is the library research approach. The sources used include books, scientific articles, and other relevant literature related to the topic discussed. The analysis applied in this article is content analysis.

The research process was conducted through the following stages:

1. Identification of Sources – Collecting and selecting relevant literature to support the objectives of the study.
2. Content Analysis – Examining the conceptual linkages and synthesizing ideas to identify the central themes and relationships among the reviewed sources.
3. Conclusion Drawing – Summarizing the main findings derived from the literature review to formulate conceptual insights and implications. This methodological approach

allows the researcher to explore philosophical and educational perspectives on science development grounded in local wisdom through critical interpretation of existing literature.

4. Results and Discussion

In line with the views of the aforementioned scholars, philosophical thinking fundamentally represents a disciplined mode of reasoning that adheres to specific logical principles and seeks comprehensive, in-depth understanding. Engaging in philosophical thought requires continuous practice and habituation so that every issue or subject matter is examined with intellectual rigor and reflective depth to arrive at truth through appropriate reasoning. This process embodies an individual's intrinsic love for truth and wisdom. The philosophy of education provides a conceptual framework for understanding the nature of both science and education. Through philosophical reflection, educators can formulate directions for science development that are responsive to social and cultural contexts. This approach ensures that science is not merely a technological product but a means of cultivating human beings with moral character and integrity.

In philosophy, two principal objects of inquiry exist : the material object and the formal object. The material object refers to the tangible or conceptual entity being examined through philosophical thought, while the formal object concerns the perspective, manner, and nature of thinking used to examine that material object. Thus, philosophical understanding can be approached from different viewpoints—particularly through the dual lens of philosophy as process and philosophy as product. Philosophy as a process refers to the disciplined method of reasoning consistent with philosophical principles, whereas philosophy as a product represents the accumulation of ideas, theories, and reflections articulated by philosophers throughout history. By employing both perspectives, one attains a more comprehensive understanding of the true nature of philosophy.

Donny Gahral Adian (as cited in Hamdani, 2011:71) identifies four principal approaches to understanding philosophy:

1. The Definition Approach,
2. The Systematic Approach,
3. The Biographical (Philosopher) Approach, and
4. The Historical Approach.

From a scientific standpoint, science may be viewed through three interrelated dimensions: as *a body of knowledge*, *a way of thinking*, and *a way of investigating*. In essence, Natural Science represents a collection of knowledge related to the processes by which humans explore and discuss the natural world. Through continuous inquiry and experimentation, human beings seek to explain natural phenomena, fulfill their needs, and preserve the balance of the environment. Science encompasses three fundamental components : scientific attitude, scientific process, and scientific product. The scientific product gains recognition as valid knowledge only after being tested repeatedly and confirmed through empirical validation. These processes reflect the work of scientists in their efforts to formulate reliable explanations for natural phenomena based on observed reality. Natural science, as applied to daily life, serves multiple purposes across diverse domains. As human life evolves and society undergoes constant transformation, science continues to play a vital role in meeting essential human needs and improving quality of life. In this sense, the development of science—guided by the philosophy of education and grounded in ethical reflection—contributes meaningfully to human progress and environmental preservation.

Food Sector

In the field of food science, numerous advancements have been made through the discovery of superior varieties of plants and animals, the development of new food products derived from biological processing, and environmental management through the cultivation of beneficial plants. Scientific progress has also contributed to the discovery of various types of natural pesticides, improved planting techniques, and innovations in fertilizer production. One notable example is the emergence of genetically engineered fruits that differ significantly from their original forms. The seedless watermelon, for instance, represents a tangible outcome of biotechnological development. However, it also raises important philosophical and ethical questions. Seeds are the natural instruments of generative reproduction; thus, when a fruit no longer contains seeds, its capacity for natural regeneration is disrupted. This phenomenon should prompt critical reflection on the need for regulation and limitation in the production of seedless fruits to ensure that natural generative processes can still occur in plant life. In addition, the utilization of traditional medicinal plants in daily life embodies deep biological and chemical knowledge rooted in local culture. For centuries, Indonesian communities have relied on herbal remedies or *jamu* made from various natural spices and roots. This long-standing practice, passed down through generations, reflects

the integration of empirical knowledge, ecological wisdom, and cultural heritage in maintaining human health and environmental harmony.

Clothing Sector

Various types of clothing materials have been developed from plants (such as cotton and tree bark) and animals (such as silk and wool). An example of scientific innovation is the utilization of banana tree fibers as raw material for textiles. This development reflects both technological advancement and environmental awareness, as it promotes the efficient use of agricultural by-products. However, such utilization must be accompanied by sustainable management practices to ensure the preservation of banana plant populations. The processing of banana stems should be balanced with their natural regeneration to prevent species depletion and ecological imbalance.

Housing Sector

In response to the growing human population, some aquatic areas have been converted into habitable lands to meet housing needs. One of the best examples of local wisdom integrated with scientific principles is the Subak irrigation system in Bali, which embodies the *Tri Hita Karana* philosophy—emphasizing harmony between humans, nature, and the divine. Traditional Indonesian architecture also demonstrates a deep understanding of physics and tropical ecology. The design of vernacular houses, which adapts to the local climate, materials, and environment, represents the harmonious integration of empirical knowledge, aesthetic values, and environmental ethics.

Health and Medical Sector

Advancements in medical science have led to the development of sophisticated medical equipment, various types of drugs, genetic engineering, and innovative therapeutic methods. The discovery of new medicines aims not only to cure diseases but also to minimize adverse side effects on other organs or body systems. Furthermore, ethical reflection rooted in philosophical and cultural values is crucial to prevent the misuse of medical technology for harmful purposes that could endanger human life or the environment.

Astronomy Sector

In the field of astronomy, science enables humans to predict and understand natural phenomena such as solar and lunar eclipses, as well as the potential for life on other planets. These studies reflect the continuous human pursuit of truth and understanding about the universe. Such explorations not only expand scientific knowledge but also reinforce the philosophical insight that humans are an integral part of the cosmos, bound by universal natural laws.

Philosophy and the Development of Science Based on Local Wisdom

The rapid development of science has significantly influenced human life, providing numerous conveniences that help fulfill most human needs. However, amid these benefits, people often overlook the negative consequences of scientific advancement, such as the gradual erosion of local wisdom—both in ecosystems and natural resources, as well as in cultural heritage, traditions, and social ethics. Science, at times, operates independently of moral and cultural values in society, which is inherently diverse. The ethical dimension of science therefore depends not on science itself, but on humans who create and apply it. Philosophy plays a crucial role in guiding the development of science, especially as scientific disciplines become increasingly specialized. Scholars who cultivate a philosophical understanding are expected to be aware of their own limitations and the boundaries of their environment, thus avoiding intellectual arrogance. Open-mindedness among scientists is essential, enabling dialogue, mutual correction, and the alignment of scientific knowledge with the greater good of humanity.

Since ancient times, indigenous societies have developed forms of traditional or local science, expressed in various cultural practices. This *indigenous science* evolved from the need to survive and adapt to nature, based on empirical experience and collective reasoning, even without formal documentation (Assefa & Shiren, 2022). Such indigenous knowledge has contributed significantly to vital sectors such as food, clothing, and shelter. Across different regions of the world, variations in flora and fauna have influenced the diversity of local cuisines and dietary habits. Traditional societies have also long understood natural cycles, medicinal plants, pest control, and soil fertility—knowledge that reflects the early integration of scientific thinking and local culture. In the textile sector, traditional communities have long produced clothing materials from plants (cotton, bark fibers) and animals (silk, wool). The utilization of banana tree fibers, for instance, represents a modern adaptation of traditional practices that

aligns with scientific innovation. Yet, this practice must remain balanced with sustainable ecological management to ensure that banana plant populations are not depleted. Similarly, in the housing sector, people have historically utilized locally available materials and modified landscapes to accommodate growing populations. The Subak irrigation system in Bali, for example, embodies the *Tri Hita Karana* philosophy, symbolizing harmony between humans, nature, and the divine. Even in astronomy, traditional communities have shown remarkable empirical knowledge—predicting natural phenomena such as solar and lunar eclipses, determining seasons, and understanding cosmic patterns—all derived from careful observation and generational transmission.

Philosophy of science views scientific development as a continuous and evolving process. Science represents a structured human endeavor aimed at answering questions or solving problems accurately and systematically. Therefore, science education should utilize local potential to make learning contextual and meaningful. It is ineffective to study science detached from the learners' own cultural and environmental realities. According to Sulhatul Habibah, the scientific method and attitude should serve several philosophical purposes :

1. **Philosophy as a tool of critique** — to evaluate and refine scientific reasoning so that scientists remain critical and avoid solipsism or the belief that their own views are infallible.
2. **Philosophy as reflection** — to examine and critique the assumptions and methodologies underlying science, ensuring that scientific inquiry follows logical and ethical standards rather than personal whims.
3. **Philosophy as a logical foundation** — to guarantee that every scientific method developed can be rationally justified and universally understood. The broader the acceptance of a scientific method, the more valid it becomes.

The philosophical implications for developing science based on local wisdom provide learners with a strong epistemological foundation. Through this understanding, students and researchers can engage in scientific inquiry that not only advances knowledge but also respects local contexts. Scientific studies must be conducted with logical reasoning and correct procedures to yield results beneficial to humanity and the environment. Moreover, scientific learners should cultivate scientific attitudes—critical, open-minded, and ethical thinking—so as not to fall into intellectual arrogance or dismiss the validity of other forms of knowledge. In its evolution, science inevitably requires ethical and aesthetic dimensions, which are inherent in philosophy, to guide its responsible use. Ethical responsibility encompasses the conduct of research and the application of its outcomes for human welfare, environmental sustainability, and cultural preservation. The development of science must uphold human dignity, maintain ecological balance, and ensure responsibility toward future generations. These principles reflect the universal and moral obligations of scientific inquiry. Ethical responsibility thus extends beyond serving human interests—it also aims to elevate human dignity and strengthen social harmony, as well as humanity's relationship with the divine. Ethical control is essential to prevent the misuse of science and to mitigate its potential destructive effects. Harmonious collaboration between scientists and society is vital so that scientific advancements remain aligned with truth, human welfare, and cultural integrity.

5. CONCLUSION AND RECOMMENDATIONS

5.1. Conclusion

The philosophy of education plays a strategic role in framing the development of science so that it remains grounded in humanistic and cultural values. Through the integration of educational philosophy and local wisdom, science can evolve in a more holistic, contextual, and ethical manner. Philosophy serves as the foundation of various disciplines that exist today, with its core dimensions—epistemology, ontology, and axiology being essential in the development of science based on local wisdom. A sound understanding of philosophy enables individuals to address fundamental human questions and to move beyond rigid paradigms that no longer align with the progress of time. The philosophical domains of epistemology, metaphysics, logic, aesthetics, and ethics guide human beings in developing science that benefits life, environmental sustainability, and sociocultural harmony, as an expression of moral responsibility to God. The development of science rooted in local wisdom not only enriches scientific knowledge but also strengthens national identity amid globalization. Therefore, scientific development based on educational philosophy and local wisdom represents an essential step toward creating an Indonesian education system that is character-driven, competitive, and sustainable.

5.2. Recommendations

Based on the findings of this study on *The Philosophy of Education in the Development of Science Based on Local Wisdom*, the following recommendations are proposed :

1. For Educational Institutions :

Schools are encouraged to integrate local wisdom values into science curricula and learning activities. This effort will not only enhance students' understanding of scientific concepts but also foster appreciation for local

culture and the surrounding environment. Schools should also provide teacher training programs to develop creative and contextually relevant local wisdom-based science instruction.

2. For Teachers:

Teachers should emphasize that science does not originate solely from Western knowledge traditions but can also grow from traditional community experiences and practices. Therefore, teachers are advised to develop learning models that connect modern scientific concepts with local practices such as agriculture, traditional medicine, and environmental management. This approach will help students perceive science as an integral part of their real-life experiences.

3. For the Community:

Communities are expected to support educational processes that promote the preservation and development of local wisdom. The involvement of community leaders, cultural practitioners, and local experts in the learning process can serve as authentic sources of knowledge that reinforce moral, social, and ecological values within the community.

4. For Future Researchers:

Further research should expand this study by exploring the implementation models of local wisdom-based science learning across different regions in Indonesia. This would provide a more comprehensive understanding of the effectiveness of such approaches in improving the quality of national education

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