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Philosophy of Science as a Catalyst for Curriculum Change in Response to Global Challenges

Lola Fadhillah[1], Babang Robandi[2]
[1,2]Universitas Pendidikan Indonesia, Bandung, Indonesia
[1]lolafadhillah@gmail.com

ABSTRACT

Global developments characterized by technological advances, social changes, and multidimensional challenges demand a responsive, adaptive, and reflective education system. This article aims to analyze how philosophy of science acts as a catalyst in curriculum change in Indonesia in facing global challenges. This research uses a literature study method by reviewing 22 scientific articles from reputable national and international journals. The results show that philosophy of science plays a strategic role in shaping a transformative curriculum through epistemological, axiological, and ontological approaches. The integration of schools such as pragmatism, progressivism, humanism, and Islamic approaches is proven to strengthen the relevance of the curriculum to the demands of the 21st century. In addition, philosophy of science enables synergy between local values and global competencies, and provides direction for curriculum development that focuses on character, morality and critical skills. Nevertheless, implementation challenges still occur, such as institutional resistance and limited capacity of educators. Therefore, strengthening philosophical literacy, policy reform, and multi-stakeholder collaboration are needed so that curriculum change can take place effectively and sustainably. This article emphasizes that philosophy of science is not only a theoretical framework, but also a driving force for the transformation of national education.

Keywords: philosophy of science, curriculum, global challenges, Merdeka Curriculum, transformative education

Penulis Korespondensi:
Lola Fadhillah,
Universitas Pendidikan Indonesia,
Jl. Dr. Setiabudi No.229, Isola, Kec. Sukasari, Kota Bandung, Jawa Barat 40154
lolafadhillah@gmail.com

1. INTRODUCTION

The rapid development of science and technology in the era of globalization has had a significant impact on various aspects of life, including the education sector. Globalization not only changes the economic and political landscape, but also demands transformation in the education system in order to be able to produce adaptive, creative and critical thinking human resources. The curriculum, as the heart of the education system, is at the forefront in facing these challenges. Therefore, curriculum development must be carried out dynamically and based on a strong conceptual framework. In this context, philosophy of science plays an important role as a theoretical and methodological foundation in designing a curriculum that is responsive to the needs of the times.

Philosophy of science serves as a systematic, critical, and reflective framework in understanding the nature of knowledge, the learning process, and the purpose of education. It not only asks questions about "what is taught", but also "why" and "how" knowledge should be taught. Thus, curriculum development based on the philosophy of science can form an education system that does not only transfer knowledge mechanistically, but also builds the capacity of students in terms of critical reasoning, creativity, character, and moral awareness. As stated by Sholeh & Alirmansyah (2022) , today's education must be able to equip students as a whole-not only as academics, but also as ethical, reflective, and humanist citizens of the world.

As an epistemological foundation, philosophy of science sheds light on how knowledge is constructed, validated, and organized in the curriculum structure. The curriculum is no longer seen as a collection of fragmentary subject matter, but as a value system that reflects a deep understanding of reality, values and life goals. In other words, the curriculum becomes a concrete expression of a society's worldview. Therefore, curriculum development cannot be separated from philosophical reflection on what is considered valid and useful knowledge in a particular social context(Angraeni & Ismail, 2024)

In this case, the philosophy of science determines the direction and content of the curriculum through three main dimensions: ontology, epistemology and axiology. The ontological dimension explains the nature of the reality that is the object of learning; the epistemological dimension regulates how knowledge is acquired and understood; while the axiological dimension assesses the values and ethics in the educational process.

These three dimensions form the normative foundation for curriculum development that is not only pedagogically effective, but also morally and socially meaningful.

Furthermore, the curriculum is also a representation of the values, goals and vision of a nation's education. It reflects the ideological, political and cultural orientations of the society concerned. In this context, philosophy of science plays an important role in articulating the basic values that will be integrated into the curriculum structure. As emphasized by Suparno (2012) , , the philosophy of science bridges between educational ideals and dynamic social realities, thus enabling the curriculum to remain relevant, contextual, and rooted in real life.

The need for curriculum change is becoming increasingly urgent in an era of globalization marked by digital technological developments, demographic changes, and environmental sustainability challenges. Philosophy of science provides the analytical framework needed to understand and respond to these changes in a critical and reflective manner. A curriculum built on a philosophical approach can foster adaptive, creative, and solutive attitudes in learners, so that they are able to face the uncertainty and complexity of the modern world(Ariya & Ismail, 2025)

One form of implementation of the philosophical approach in the curriculum in Indonesia is the Merdeka Curriculum. This curriculum emphasizes flexibility, differentiation, and strengthening character, and focuses on developing 21st century competencies. This approach is based on the philosophy of pragmatism which emphasizes the importance of contextual and meaningful learning experiences. Anugrahsari & Ismail (2023) , states that the Merdeka Curriculum is a concrete reflection of philosophical principles, especially pragmatism, in an effort to create relevant, autonomous, and learner-oriented learning.

Furthermore, philosophy of science also plays a role in ensuring that curriculum development does not solely focus on cognitive aspects, but also on affective and psychomotor dimensions. This is especially important in the era of disruption, where mastery of content is no longer enough without the ability to empathize, cooperate, and behave ethically. Gumilar et al. (2025) , that curriculum development must consider the integration of moral and ethical values as a foundation in forming a complete learner personality.

In the context of digital transformation, philosophy of science plays an increasingly important role. Digital technologies have changed the way knowledge is consumed and produced, so a philosophical framework is needed to assess the impact and direction of technology use in education. Philosophy of science enables curriculum designers to design learning systems that use technology wisely, not only as a tool, but also as a vehicle for value and character formation(Mora et al., 2024)

In addition, the philosophy of science provides a strong foundation for curriculum development in a multicultural society. In a plural and heterogeneous society like Indonesia, it is important for the curriculum to reflect the values of tolerance, respect for differences, and the ability to interact in diversity. A philosophical approach enables the formulation of a curriculum that respects the diversity of cultures, languages, and perspectives, and promotes inclusive and equitable education(Ariya & Ismail, 2025)

Overall, philosophy of science can be seen as a catalyst for curriculum innovation and transformation. It encourages the curriculum to be reflective, responsive and adaptive to social change. A curriculum based on philosophical principles is not only able to answer the challenges of the present, but also prepare students for an uncertain future. Astuti & Ismail (2025) , emphasize that sustainable curriculum innovation must be supported by a deep philosophical understanding and integrated in the entire educational process.

However, the development of a philosophy of science-based curriculum also faces various challenges. Among them are resistance to change from educational institutions that are still patterned conservatively, limited human resources who understand the philosophical approach, and lack of in-depth training for teachers and educators. Therefore, it takes a collective commitment from various stakeholders, including the government, academics, educational practitioners, and the wider community, to support and realize curriculum transformation based on the philosophy of science.

By considering all of the above aspects, it can be concluded that philosophy of science has a strategic role as a catalyst for curriculum change in responding to global challenges. Through a comprehensive philosophical approach, the curriculum can be developed holistically, humanistically, and contextually, so as to form a generation that is not only intellectually capable, but also has integrity, open-minded, and ready to face complex global dynamics.

2. LITERATURE REVIEW

One form of implementation of the philosophical approach in the curriculum in Indonesia is the Merdeka Curriculum. This curriculum emphasizes flexibility, differentiation, and strengthening character, and focuses on developing 21st century competencies. This approach is based on the philosophy of pragmatism which emphasizes the importance of contextual and meaningful learning experiences. Anugrahsari & Ismail (2023) , states that the Merdeka Curriculum is a concrete reflection of philosophical principles, especially pragmatism, in an effort to create relevant, autonomous, and learner-oriented learning.

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3. RESEARCH METHODOLOGY

The literature study method or literature review is a qualitative research approach that aims to examine, review, and synthesize various literature sources or scientific documents relevant to a particular topic. In this research, this method is used to explore theoretical understanding of the relationship between philosophy of science and curriculum development in facing global challenges. According to Snyder (2019) , literature study serves as a systematic research method to identify, evaluate, and interpret all available literature related to a particular phenomenon. This approach not only compiles a summary of information, but also allows researchers to formulate new thoughts based on the synthesis of theories and secondary data.

The literature study was conducted through several important stages, such as: (1) determining the research question or focus; (2) searching for relevant literature through scientific databases such as Google Scholar, DOAJ, Scopus, and Garuda; (3) selecting sources based on inclusion criteria such as year of publication, academic quality, and theme relevance; and (4) analyzing the content and synthesizing the literature to build an argument or conceptual framework(Boell & Cecez-Kecmanovic, 2015)

In addition, in the context of educational and philosophical research, the literature study method is considered effective for developing conceptual understanding without having to collect primary data. This is in accordance with the views of AR and Damaianti (2015) which emphasizes that literature studies are very useful in formulating the theoretical basis and compiling a research framework based on pre-existing scientific thinking.

By using this method, researchers can produce in-depth and argumentative thoughts, especially in conceptual studies such as philosophy of science and curriculum. Literature review also enables critical reflection on evolving theories and practices, as well as assessing the appropriateness of educational approaches to global dynamics.

4. RESULTS AND DISCUSSION

The results of the literature review on Philosophy of Science as a Catalyst for Curriculum Change in Responding to Global Challenges can be seen in the table below:

Table 1.
Literature Review Results

No.	Author Name	Article Title	Results
1	Jakoep Ezra Harianto	Philosophy of Education and the Challenge of a Multicultural Curriculum	This research shows that philosophical principles such as progressivism, reconstructionism and existentialism provide a strong theoretical basis in shaping a multicultural curriculum that is inclusive, equitable and responsive to cultural diversity. Philosophy of education acts as a catalyst for curriculum change by encouraging

			contextual learning, social transformation, and recognition of individual identity. In the context of global challenges, philosophy of science becomes a guide to creating education that is not only academically transformative, but also socially and culturally relevant.
2	Iin Anugrahsari & Ismail	Transformation of 21st Century Education: Philosophy of Education in the Form of an Independent Curriculum	This article asserts that educational philosophy is the main foundation in the development of the Merdeka Curriculum in response to the demands of the 21st century. This approach emphasizes freedom of learning, differentiation, and strengthening character based on Pancasila values. The curriculum is designed to form individuals who are critical, creative, collaborative and communicative. By making philosophy a catalyst, education is not only adaptive to global changes, but also upholds moral integrity and national identity. This shows the vital role of philosophy of science in reforming the national education paradigm towards a more humanist, dynamic and relevant system.
3	A. Aida Ariya & Ismail	Philosophy of Education in the Era of Globalization: Challenges and Opportunities in a Multicultural Context	This article outlines the central role of philosophy of education in responding to the challenges of globalization that impact on cultural diversity, curriculum, and education systems. Philosophy of education is positioned as an ethical and reflective foundation for building a system that is inclusive, fair and multicultural. In this context, the philosophy of science becomes a catalyst for curriculum change, directing the transformation of the educational paradigm from homogeneous and academic to responsive, humanistic, and contextual. Education is directed not only to form academically intelligent people, but also individuals with empathy and critical thinking in a complex global space.
4	Ade Erma Agustina, Dina Rahmawati, Marsasanda Andarin	Systematic Literature Review: Philosophy of Science in Independent Curriculum Development in Indonesia	This research confirms that philosophy of science acts as a catalyst in changing the Merdeka Curriculum, by providing a conceptual framework from various schools such as constructivism, pragmatism, rationalism, and empiricism. This integration of philosophy allows the curriculum to respond to global challenges through critical, creative, and adaptive learning. However, implementation faces obstacles in teacher readiness and resources, so continuous support is needed to realize optimal curriculum transformation.
5	Salmiyanti & Desyandri	Implementation of Merdeka Belajar Curriculum in the View of Idealism Philosophy	This article shows that the philosophy of idealism is the foundation of the Merdeka Curriculum. This philosophy views education holistically, developing the potential of the soul and student autonomy. The flexible Merdeka Curriculum is in line with idealism, forming adaptive individuals. The teacher as a facilitator helps students understand reality. The philosophy of idealism functions as a catalyst, directing curriculum changes to equip students to face global challenges through spiritual and intellectual development.

			Philosophical understanding by educators is essential for effective implementation.
6	Agus Salim	Curriculum in the Perspective of Islamic Education Philosophy	The Islamic education curriculum is built on the Qur'an and Hadith, aiming to produce people with knowledge, character and skills. The curriculum must be dynamic, relevant to the times. Its characteristics include religious/ moral goals, intellectual/spiritual development, individual/community balance, and taking into account the talents and needs of the learner/community. The philosophy of Islamic education, grounded in revelation, acts as an essential catalyst, ensuring the curriculum evolves to not only equip learners with knowledge, but also adaptive morals and skills, relevant to global challenges with a holistic perspective and solid values. Its orientation includes value preservation, social needs, the workforce, learners, and the future and development of science.
7	Fathurohim	Independent Curriculum in the Perspective of Islamic Education Philosophy	This article discusses the Merdeka Curriculum from the perspective of Islamic education philosophy. The Merdeka Curriculum emphasizes the potential, talents, interests, and skills of students through technology and digitalization. Islamic education philosophy plays an important role in curriculum preparation, integrating Islamic and general sciences, and developing life skills and character. Islamic values, the Qur'an and Hadith are the integral basis of this curriculum. The philosophy of Islamic education becomes a catalyst, ensuring that the curriculum does not only focus on academics, but also builds character and morality, crucial to equip students to face global challenges with a solid ethical foundation.
8	Imanuel A. W. Chrismastianto, I Wayan Lasmawan, I Gusti Putu Suharta, I Wayan Kertih	Review of the Nature, Purpose, and Genre of Educational Philosophy in the MBKM Curriculum	This article examines the role of educational philosophy in the MBKM Curriculum, focusing on the schools of humanism, pragmatism, existentialism, and critical pedagogy. This curriculum emphasizes independent learning, flexibility, and orientation to student needs. Philosophy of science catalyzes curriculum change by providing an adaptive framework to global dynamics. Through the integration of philosophy, the curriculum is able to respond to 21st century challenges, such as demands for critical thinking, innovation, and contextual relevance. However, its implementation still faces obstacles such as the readiness of human resources and infrastructure, so it requires strengthening policies and systemic support to achieve effective educational transformation.
9	Ikfina Nurul Izzah and Mulyawan Safwandy Nugraha	Philosophy of Science and its Influence on Islamic Education Curriculum Development	This research shows that philosophy of science plays an important role in designing an integrative Islamic education curriculum, combining religious and general sciences. With this approach, the curriculum not only focuses on intellectual aspects, but also shapes the moral and spiritual character of students. However, challenges arise due to the dichotomy between religious and

			general sciences and the influence of modernization which tends to ignore spiritual values. For this reason, a philosophy of science-based curriculum is needed that is able to harmonize academic needs and character building, so that students can face global challenges with balanced integrity and competence.
10	Ali Muttaqin	Implications of the School of Education Philosophy in Islamic Education Curriculum Development	This article discusses the influence of schools of education philosophy such as idealism, realism, pragmatism and existentialism in the development of Islamic education curriculum. Philosophy of science acts as a catalyst for curriculum change by providing a conceptual framework that is adaptive to global dynamics. The integration of these philosophical values allows the curriculum to respond to global challenges through innovative and contextualized learning. However, implementation faces challenges such as the readiness of human resources and infrastructure, so that continuous support is needed to realize optimal curriculum transformation.
11	Istifatun Zaka	Progressivism Education Philosophy in Indonesian Language Education Curriculum	This article discusses the contribution of the philosophy of progressivism in the development of Indonesian language education curriculum. Through a descriptive qualitative approach, this research highlights how progressivism influences aspects such as syllabus, methodology, learning strategies, assessment and evaluation. The philosophy of progressivism, which emphasizes active learning and relevance to real life, becomes a catalyst for curriculum change in response to global challenges. The integration of progressivism values allows the curriculum to be more adaptive to global dynamics and learners' needs. However, its implementation faces challenges such as the readiness of educators and infrastructure, so continuous support is needed to realize the transformation.
12	Dewi Wijayanti & Sugianti	Philosophy of Science in the Perspective of Islamic Education	This article highlights the role of philosophy of science in Islamic education, particularly through the integration of epistemology, ontology and axiology. This approach allows the curriculum to respond to global challenges by combining religious values and science. With the foundation of philosophy of science, the curriculum can be developed to form individuals who are not only knowledgeable, but also noble and adaptive to changing times. This makes philosophy of science a catalyst in holistic and contextual curriculum transformation.
13	I Made Dharma Atmaja	Philosophy of Science as Shaping the Characteristics of Mathematics Learning Media Development	This article emphasizes that philosophy of science plays an important role in designing effective mathematics learning media. By integrating aspects of ideas and facts as well as abstract and concrete dimensions, philosophy of science helps create media that suit learning needs. In the context of global challenges, philosophy of science serves as a catalyst for curriculum change, encouraging innovation in the development of adaptive and

			relevant learning media. This approach allows the mathematics curriculum to be more responsive to technological developments and the needs of learners in the era of globalization.
14	Raisul Burhani	A Philosophical Overview of the Curriculum	This article emphasizes the importance of curriculum as the core of education that must be designed carefully and continuously. Philosophy of science provides a foundation in formulating curriculum objectives, content, methods and evaluation, ensuring harmony between educational values and community needs. In facing global challenges such as technological developments and social dynamics, philosophy of science acts as a catalyst for curriculum change, encouraging integration between religious and general sciences, and adaptation to changing times. This approach allows the curriculum to be more responsive, relevant and contextual in shaping individuals with integrity and competence.
15	Ika Purnama Alam, Diansyah Permana, Adang Hambali	Philosophy of Science and its Correlation with Islamic Teachings /	This article emphasizes the importance of philosophy of science in connecting revelation and rationality, forming an integral scientific understanding in the Islamic context. This integration encourages the Islamic education curriculum to not only focus on spiritual aspects, but also rational and scientific. In facing global challenges, philosophy of science acts as a catalyst for curriculum change, allowing adaptation to the development of science and technology without ignoring Islamic values. This approach produces a holistic curriculum, capable of forming individuals who are faithful, critical, and ready to face global dynamics.
16	Didit Haryadi, Kerwanto, Arifin Ilham, Zaenal Mutakin	The Important Role of Philosophy of Science for Islamic Education Curriculum Development	This article asserts that philosophy of science has an essential contribution in developing a transformative Islamic education curriculum structure. By reconstructing the epistemological foundation, the curriculum is directed not only to transmit knowledge, but also to foster reflective awareness and intellectual ethics of students. In the context of globalization, which is full of complexity and ambiguity of values, philosophy of science functions as a paradigmatic driver that allows the curriculum to adapt dynamically, maintaining the value of Islamic spirituality while responding to technological challenges, multiculturalism, and information disruption critically, creatively, and solutively.
17	Mardinal Tarigan, Affiq Faeyza, Said Hasian Simanjuntak	The Role of Philosophy in the Development of Education	This article emphasizes that philosophy not only provides a framework for critical thinking in education, but also shapes the direction of curriculum development through a deep understanding of human nature, knowledge, and values. In a global context that demands flexibility, innovation and integrity, philosophy of science acts as a catalyst for curriculum change. It integrates local and universal dimensions, enabling education to respond to technological challenges, cultural pluralism, and humanitarian crises with a

			reflective, ethical, and visionary approach. Curricula built on the basis of philosophy of science become more contextual and transformative.
18	Austina Retnoasih & Purwanto	The Role of Philosophy of Science in Independent Curriculum Development in Indonesia	This article emphasizes that philosophy of science, especially aspects of epistemology and axiology, plays a role as a conceptual foundation for the Merdeka Curriculum. Philosophy of science allows the curriculum to respond to global disruption and the demands of the 21st century with a reflective, contextual, and dynamic approach. With this framework, education is directed towards the formation of awareness of national identity as well as global competence. The Merdeka Curriculum is positioned as a strategic instrument that not only supports post-pandemic recovery, but also strengthens the character of Pancasila students through critical, creative, and collaborative learning.
19	Hesti Apala, Rahmat Hidayat, Mahdatul Aini Putri, Muhammad Nurwahidin	The Influence of Educational Philosophy on the Implementation of the Merdeka Curriculum for Primary Education Teachers and Learners	The philosophy of education, through the schools of constructivism, humanism, and progressivism, is the main driver in the learning paradigm shift of the Merdeka Curriculum. In a global context, the philosophy of science strengthens an adaptive, reflective, and learner-centered curriculum orientation. Teachers who understand philosophical principles are able to create a contextual, dialogical, and meaningful learning process. However, the success of this transformation requires intensive training and policy support, so that the curriculum truly becomes a catalyst for character building and competitiveness of future generations.
20	Mutiara Citra Amalia, Desty Endrawati Subroto, Intan Nurmaliya, Risti Fauziah, Putri Robiatul Aliyah	Philosophy of Education as a Concept for Educational Curriculum Development at SD 1 Panggarangan	The philosophy of education at SD 1 Panggarangan is the foundation for curriculum development based on the values of humanism, idealism and pragmatism. This allows the curriculum not only to focus on academics, but also to shape the character of students who are adaptive, critical, and contextual. In responding to global challenges, philosophy of science acts as a strategic catalyst, harmonizing local values and the needs of the times. The curriculum is built dynamically - open to change - and designed to produce a generation that is not uprooted from cultural roots but is ready to face global realities.
21	Ummul Mujaahidah & Ismail	Relevance of Education Philosophy in 21st Century Learning Transformation	Through approaches such as constructivism and pragmatism, philosophy of science encourages a paradigm shift from static learning to dynamic, participatory and ethical models. In a global context, philosophy of science acts as a catalyst for educational transformation, strengthening the integration of 21st century values, technology and skills in the curriculum to produce adaptive, collaborative and critical thinking individuals.
22	Erlan Muliadi & Ulyan Nasri	Future Oriented Education: The	This article emphasizes that philosophy of education provides the ethical and moral

Contribution of Philosophy of Education in Facing Global Challenges	foundation for 21st century education. Values such as critical thinking, character, human rights and pluralism are integrated in the curriculum as a response to global challenges. Philosophy of science encourages curriculum transformation to be more reflective, adaptive and transformative. As a catalyst, philosophy of science bridges educational ideals with the real needs of the global community, creating a generation that is competitive, inclusive, and resilient in changing times.

Literature review The purpose of this research is to analyze the philosophy of science as a catalyst for curriculum change in response to global challenges, which is carried out by reviewing 22 research articles from Indonesian and English journals and accredited journals DOAJ, Sinta, Google Scholar and so on. The research results below are the context of the research summarized as reference material for the writing conducted. In addition, related research can assist researchers in developing an understanding of the research that has been conducted. The results of the journal analysis are presented as follows:

1. Epistemological and Transformative Approaches to Philosophy of Science in Curriculum

Philosophy of science as a structure of knowledge provides a fundamental direction for the formation and reconstruction of the curriculum in a changing global context. As stated by Retnoasih & Purwanto (2024), the epistemology and axiology aspects of the philosophy of science not only build the theoretical framework of the Merdeka curriculum, but also formulate a reflective, contextual, and dynamic direction of praxis in facing the challenges of the times. The Merdeka curriculum was constructed in response to global disruption, including changes in the post-pandemic economic, social, and cultural order. This is in line with Agustina et al., (2024) which shows that the philosophy of science approach through constructivism, rationalism, and pragmatism strengthens the conceptual foundation of the Merdeka curriculum. Constructivism emphasizes that knowledge is built by learners based on real experiences, while pragmatism encourages problem solving as the essence of learning. Rationalism provides a logical framework in formulating curriculum objectives and evaluation. This combination proves that philosophy of science is not just a conceptual basis, but a driving force for educational reform.

2. The Dominance of Progressivism and Existentialism in Building a Responsive Curriculum

The philosophies of progressivism and existentialism have emerged as dominant approaches in shaping a curriculum that is responsive to diversity and global dynamics. Harianto, 2025) emphasizes the importance of reconstructionism and existentialism in directing a multicultural curriculum that is not only academic, but also socially and culturally transformative. Education in this view functions as an agent of social change, building critical consciousness, and strengthening local cultural identity. According to Zaka (2022) that the influence of progressivism on the development of Indonesian language education curriculum. Through qualitative descriptive analysis, he shows that progressivism influences the syllabus, methods, learning strategies, and evaluation, by emphasizing students' active participation in contextual learning. This approach is considered important in shaping learners who are ready to face real life, think critically, and have 21st century skills.

3. Islamic Philosophy as an Ethical and Transcendent Force in the Curriculum

In contrast to the western approach, Islamic education philosophy integrates revelation and reason in forming the curriculum structure. According to Salim (2019), that the philosophy of Islamic education bases the curriculum on the Qur'an and Hadith, directing the purpose of education to produce people with knowledge, character and skills. This kind of curriculum not only answers the needs of the world of work, but also maintains the moral integrity of students.

Furthermore, Fathurohim ( )2023 emphasizes the importance of integrating technology and Islamic values in the Independent Curriculum. In this case, Islamic education philosophy facilitates the formation of individuals who are balanced between mastery of science and faith. Meanwhile, Izzah & Nugraha (2025), identify the problem of dichotomy between religious and general sciences as a serious challenge, so an integrative curriculum model based on a harmonious philosophy of science is needed.

4. Philosophy of Education and MBKM: Freedom-Based Learning and Contextualization

In the context of the Merdeka Campus policy, educational philosophy again plays a significant role. According to Chrismastianto et al. (2023) , examine the MBKM Curriculum from the perspectives of humanism, existentialism, and critical pedagogy. They conclude that this curriculum emphasizes independent learning, real-world-based learning experiences, and academic flexibility. The philosophy of science provides an adaptive framework to global dynamics, encouraging students to not only master academic content, but also understand the social and cultural context of the science studied.

However, implementation challenges still arise, especially with regard to the readiness of human resources and infrastructure. Therefore, the integration of philosophy of science in MBKM requires a systemic approach, not only in terms of curriculum, but also in lecturer training and institutional strengthening.

5. Philosophical Literacy for Teachers as a Critical Element of Transformative Curriculum

Teachers as curriculum implementers play a central role in realizing philosophical values in learning practices. According to Apala et al. (2025) , that teachers' understanding of constructivism, humanism, and progressivism greatly determines the success of the Merdeka Curriculum. Teachers who have philosophical literacy are able to develop a contextual, dialogical, and learner-oriented learning process.

In this context, teacher training is not only technical, but also philosophical. Teachers need to understand the ontological, epistemological and axiological basis of the curriculum they implement, so that the learning process is not trapped in administrative routines, but becomes a vehicle for social and moral transformation.

6. Synergizing Local Values and Global Challenges in Curriculum Design

In the era of globalization, the curriculum must be able to integrate local values with global demands. Amalia et al. ( )2025 , provide an example of how SD 1 Panggarangan developed a curriculum based on the values of humanism, idealism, and pragmatism. The result is a curriculum that not only shapes academic knowledge, but also the character of learners who are resilient, adaptive, and rooted in local culture. This approach affirms the importance of glocality in education: a curriculum that is global in competence, but local in value. Philosophy of science becomes a synthesis tool to unite these two poles in a harmonious whole.

7. Philosophical and Practical Obstacles in the Implementation of the Philosophical Curriculum

Although the role of philosophy of science is very central, some challenges remain to be observed. Muttaqin, (2016) , identifies institutional resistance and bureaucratic rigidity as major obstacles to integrating philosophical values into education policy. This is compounded by a lack of teacher training and weak political commitment to values-based curriculum reform. Haryadi et al. (2024) , added that the transition to a philosophical curriculum requires a bolder policy approach, accompanied by infrastructure support and strengthening the role of lecturers as agents of curriculum change at the higher education level.

8. Synthesis: A Multidimensional Framework for the Role of Philosophy of Science

From the overall analysis, it can be concluded that philosophy of science plays a role in five main dimensions:

Table 2. Five main dimensions of philosophy of science

Dimensions	The Role of Philosophy of Science
Ontological	Determining the nature of man as the subject of education.
Epistemological	Provides a framework of knowledge and learning methods.
Axiological	Directing educational values as a moral base.
Pedagogical	Shaping curriculum strategies, approaches and methods.
Sociological-Global	Aligning education with global challenges and local values.

Thus, philosophy of science is not just a conceptual narrative, but also a practical and strategic framework that is able to answer the dynamics of the 21st century reflectively and integrally. Sustainable curriculum reform is impossible without a strong philosophical base and a deep understanding of the interaction between education, culture and global civilization.

5. CONCLUSION

Philosophy of science has an essential role in shaping, directing, and reforming the curriculum to be able to answer the challenges of an increasingly complex era. In facing global dynamics, it is not enough for education to focus only on mastering teaching materials, but it must include character development, critical thinking skills, and high social awareness. A curriculum built without a philosophical foundation will lose its way, especially in responding to technological developments, issues of diversity, and the crisis of values in society.

The results of the literature review of 22 articles show that philosophy of science contributes to five main dimensions of the curriculum: ontology, epistemology, axiology, pedagogy and global sociology. This

approach forms a curriculum framework that is not only rational and systematic, but also humanistic and contextual. The Merdeka curriculum, as an example of national policy, is a concrete manifestation of the application of the philosophy of pragmatism and constructivism, which emphasizes freedom of learning and the relevance of learning to the real world. On the other hand, Islamic education philosophy contributes an ethical and spiritual approach in harmonizing science and moral values.

This article also reveals that the philosophical approaches of progressivism and existentialism also direct the curriculum to be more inclusive and multicultural. The role of teachers as curriculum implementers is determined by their philosophical literacy. Understanding the philosophical schools allows teachers to create learning experiences that are not only cognitive, but also affective and reflective.

However, several obstacles remain significant challenges in implementing a philosophy of science-based curriculum. Among these are the lack of teacher training, weak policy support, and institutional resistance to changes in the educational paradigm. Therefore, systemic efforts involving various educational actors are needed to ensure the integration of philosophy of science into the planning and implementation of the curriculum as a whole.

With a deep and reflective philosophical approach, the curriculum is not only an administrative tool, but also a vehicle for the formation of a visionary, adaptive, and strong character generation. Therefore, philosophy of science deserves to be positioned as a strategic foundation in the development of a sustainable and meaningful curriculum in facing global challenges.

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