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Ethics and Science in Philosophy: Understanding the Nature of Science in an Educational Context

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ABSTRACT

This study aims to explore the crucial relationship between ethics and science within a philosophical framework, with a specific emphasis on understanding the nature of science in the context of education. The research addresses fundamental questions about how ethics influences and shapes the role of scientific knowledge in the educational process. Examining the concepts of ethics and science from a philosophical perspective, this study presents an in-depth analysis of their interconnectedness and philosophical significance. The significance of ethics in science, particularly in education, is the primary objective identified as a moral foundation guiding the development and utilization of scientific knowledge. In this context, the researcher employed a literature review method. The study proposes efforts to comprehend the nature of science as an integral part of student's character development and understanding of the world. These efforts include critically reflecting on the ethical values embedded in scientific knowledge and emphasizing the integration of ethics into forming worldviews. Taking a philosophical approach, this research delineates the conceptual and practical implications of the relationship between ethics and science, providing a foundation for holistic thinking. The conclusion of this research suggests the development of educational methods and strategies that consider ethics as a central element in the knowledge transmission process. The study is expected to contribute positively to strengthening the balance between ethics and science in future generations' education, fostering intellectual intelligence and ethical and social integrity.

INTRODUCTION

In education, particularly in philosophy, the relationship between ethics and science is often a hot topic of discussion. Philosophy is a foundational thought tool that emerges as a means for deep reflection on all areas of life, including education (Williamson, 2021). Within the scope of philosophy, the exchange of ideas related to ethics and science is essential for broadening our understanding of the nature of science (Wu & Erduran, 2024). Issues arise when philosophy is considered unimportant and even labeled heretical despite its significant value in the educational world, including Islamic *Tarbiyah* (Watt, 2017).

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Knowledge in the educational context is not merely a collection of facts and theories taught in schools. Science encompasses a broader scope, including ethical considerations in its acceptance, development, and application (Moon et al., 2019). Therefore, understanding ethics and science, especially within the educational sphere, is crucial for forming a generation that is intellectually intelligent and has strong moral foundations (Prasetiyo et al., 2021).

Ethics and science are two interrelated fields in philosophy. Ethics, often seen as a branch of philosophy dealing with morality and values, is crucial in determining how science should be used (Dewey & Tufts, 2022). On the other hand, science provides us with the tools and knowledge to understand the world, but its application must be guided by ethical principles to ensure its benefits to society (Rosenberg & McIntyre, 2019). Barsky (2019), for instance, emphasized the importance of integrating knowledge and ethics. Knowledge without ethics becomes dangerous, while ethics without knowledge becomes ineffective (Barsky, 2019). This view underscores that both must work together to create a just and prosperous society.

The development of science cannot be separated from ethical considerations. Scientific research must be conducted about its impact on society and the environment. There are many instances where the lack of ethical considerations in research has led to significant negative impacts (Morales-Doyle, 2019; Taquette & Borges da Matta Souza, 2022). For example, medical experiments on humans without proper consent have caused great suffering and harm. Therefore, in the development of science, ethics serves as a guide to ensure that research is conducted responsibly. It includes informed consent, non-maleficence, justice, and respect for human rights (Kretser et al., 2019; Pappworth, 2023).

In the context of Islamic Tarbiyah, the integration of ethics and science is crucial. Islamic education emphasizes the formation of good character based on Islamic teachings (Yumnah, 2021). Science in Islam is seen as a tool to understand the universe and draw closer to Allah SWT (Mape et al., 2023). Islamic education emphasizes the importance of honesty, justice, and responsibility. These values must be integrated into every aspect of education, including science teaching (Ilham et al., 2023). Seeking knowledge in Islam is considered an act of worship. Therefore, science must be used for the benefit and welfare of the community. Ethics in research and the application of science have become very important to ensure that they are used following Islamic principles.

This research provides an overview of the systematic relationship between ethics and science in the philosophy of science and its educational implications. A deep understanding of the nature of science and the role of ethics in education can help form an intellectually intelligent generation with strong moral foundations. Education that integrates ethics is not merely a transaction of knowledge but also a means of character-building and implementing profound moral policies. The importance of ethics in education is emphasized by many figures, including Imam Shafi'i, who said to prioritize manners before knowledge. Good character education will help prevent destructive behavior in students and shape a responsible and moral generation.

In the context of Islamic Tarbiyah, the integration of ethics and science is critical to creating holistic and balanced education. Islamic education based on ethical values will help in students' character formation and ensure that science is used for the benefit and welfare of the community. Thus, a deeper understanding and better integration of ethics and science in education will provide a new framework for a more holistic and balanced educational approach, focusing on academic achievement and character and moral values.

METHODS

The type of research used was library research, which had books or library sources related to the theme to be researched as its primary object. Library research is included in the qualitative research category because it does not carry out statistical analysis procedures (Moleong, 2011). This research used primary data from books discussing ethics and science to understand science and ethics. Meanwhile, secondary data comes from journals and articles to help dissect the nature of science in an educational context. The data that has been collected will be analyzed in a measurable manner sourced from relevant books, articles, and journals. The analysis will be carried out deductively to obtain the desired and adequate results and conclusions. Specific conditions are also discussed with experts so that it is not just a complete literature study.

This research used a philosophical approach that examines philosophical thinking related to science and ethics to be researched philosophically (Nathan, 2014). To make research more accessible and help the researcher understand the theme of this research, the researcher limited this research to the field of education. This research focuses on how ethics influences and shapes the role of science in the educational process when viewed from ethics and science in philosophy. This design is suitable for answering the questions posed.

RESULTS AND DISCUSSION

Philosophy

Philosophy originates from the Greek term "philosophia," composed of "philos," meaning love, and "sophia," meaning knowledge (Williamson, 2021). Linguistically, philosophy is defined as the love of wisdom (James S Spiegel, 2019). Often called the "mother of all sciences," philosophy shifted from mythological justifications to reason-based thinking during the fifth century. This era, known as the Logos era, emphasized the use of reason in the pursuit of truth, which fundamentally transformed thought processes and led to the development of various branches and sub-branches of science (Williamson, 2021). Over time, these branches evolved, and the nature of philosophy faced numerous fundamental challenges, leading to further distancing science from its essence.

Two main interpretations of philosophy. The first defines philosophy as a type of science, concept, theory, or school system that emerges from the process of philosophizing. In this sense, philosophy represents the systematic, critical, and rational human thinking about nature, humanity, and values in life's reality (Lampert, 2020). The second interpretation views philosophy as a process—a method of critical thinking used to solve life's fundamental problems. Here, philosophy is seen as a human effort to find solutions or answers to essential questions and issues using systematic and critical reasoning (Peters & Besley, 2019).

Thematically, the development of philosophy has gone through three phases. The first phase introduced the main branches of philosophy, such as ontology, epistemology, and axiology. The second phase brought forth branches related to human life, including social, cultural, political, economic, and human philosophy. The third phase saw the emergence of specialized branches like the philosophy of language and environmental philosophy (Hayati & Dalimunthe, 2022). These developments highlight philosophy's role as a tool for logical, critical, and fundamental thinking to create optimal solutions for arising problems, thereby establishing philosophy as the mother of all sciences.

Knowledge

According to the Oxford Dictionary, science is knowledge about the structure and behavior of the natural and physical world based on facts that can be proven through experiments. Science is explicit knowledge regarding something; thus, anything unclear cannot be considered science (Ravetz, 2020). Science systematically organizes knowledge of natural and physical phenomena based on verifiable facts.

From a terminological perspective, knowledge refers to the understanding that an individual has gained through personal awareness. Knowledge is obtained through observation and experience. It involves information or understanding and requires consciousness, a subject, and an object (Chen et al., 2020). Hence, knowledge results from an individual's efforts to understand and know a particular object (Yang et al., 2022).

Based on these definitions, science is a collection of systematically organized and empirically tested knowledge. Knowledge arises from doubt or curiosity, leading to the discovery of relative truths. Thus, scientific truths are not absolute but relative, evolving with new facts, methods, and approaches suitable for future progress. The structure of science includes problems, scientific attitudes (curiosity, speculation, objectivity, openness, suspended judgment, and temporariness), scientific methods, activities, conclusions, and influences (Ravetz, 2020).

Humans, endowed with minds and reason, differentiate themselves from other creatures. In Islam, the value of reason is highly esteemed, as evidenced by the term "Ulil Albab," which refers to individuals with profound knowledge. Knowledge closely relates to science, often being synonymous with it. Knowledge that has not been empirically tested cannot be declared as science. In essence, science

comprises tested knowledge, whereas knowledge forms the basis of understanding (Muller & Young, 2019).

Scientific Ethics

Ethics, a branch of philosophy, examines and studies human behaviour, values, and morals. Derived from the Greek word "ethikos" (custom or habit), ethics in Indonesian refers to principles of behaviour. While ethics and morals are often used interchangeably, ethics typically involves examining existing value systems, whereas morals pertain to assessed behaviour (Astrachan et al., 2020).

Philosophers classify ethics into normative ethics and metaethics. Normative ethics provides a system to guide decision-making regarding right and wrong. Metaethics analyzes the logic of behaviour concerning good and bad, right and wrong. Analyzing various ethical systems compiled by philosophers falls within the field of ethics, even though these systems exemplify normative ethics (Klenk, 2019).

Ethics and morals distinguish humans from other creatures. The id, ego, and superego (passion, harmonizer, and conscience) shape behaviour within humans. If humans prioritize the id over ethics, destructive outcomes are likely. Therefore, harmonizing science and ethics is essential. Using the ego to balance desires with reality and the superego as a moral guide allows science to be used beneficially. Thus, axiological discussions about values are vital, particularly concerning morals and ethics in scientific development for humanity's benefit. Given the potential destructiveness of science, ethical and moral values are necessary controls (Muraille, 2019).

Fostering a sense of ethical responsibility from the outset can reduce scientific and technological development fraud. Technology, as the fruit of science, addresses life's problems but also risks misuse in education. Examples include inappropriate learning methods and biased or fraudulent information dissemination through technology.

Teachers sometimes make ethical mistakes, such as labelling students as stupid or unthinking, which can disrupt students' psychological and personal development. Negative words create disruptions, leading to arrogance or hatred in susceptible students. As extensions of home education, schools must foster values essential for future societal challenges. Authoritarian teacher-student relationships should replace harmonious interactions, where teachers guide and communicate positively, promoting warmth and positive student development.

Schools should be environments fostering innovation, imagination, and excitement, providing moral, personality, and intellectual development services (Charrón Vías & Rivera-Cruz, 2020). Teachers should transition from authoritarian figures to facilitators and mentors. Ki Hajar Dewantara, founder of Taman Siswa, emphasized the roles of family, school, and society in education. This study contributes to educational development through ethics, highlighting the importance of integrating ethical considerations in curriculum development, teaching methods, and academic policies.

Practical Implications of the Relationship Between Ethics and Science in the Context of Education

Ethics is one of the branches of philosophy that observes and studies human behaviour, values, and morals. The term ethics itself comes from the Greek word "ethikos," which is derived from "ethos," meaning custom or habit (Dewey & Tufts, 2022). The scope of ethics encompasses ideas and tendencies, and he believed that the ultimate goal of life is happiness or prosperity (Mökander et al., 2021). In Indonesia, ethics is defined as science related to the principles of behaviour. There is a distinction between the use of the terms ethics and morals in everyday life: ethics is often used to examine or evaluate an existing system or value, while morals are applied to the behaviour being assessed (Ardhana & Puspitasari, 2023; Muraille, 2019).

Philosophers classify ethics into two main categories: normative ethics and metaethics. Normative ethics refers to a system designed to guide decisions about what is good or bad, right or wrong (Gustafson, 2021). Metaethics, on the other hand, analyzes the logic of behaviour regarding its moral value (Chrisman, 2023). When people analyze various ethical systems compiled by philosophers, they engage in the metaethics field, even though these systems are examples of normative ethics (Ashby, 2020; Bench-Capon, 2020).

Ethics and morals distinguish humans from other creatures. Through morals, humans can discern values that define human behaviour throughout all levels of consciousness. Within individuals, there is

a psychological structure composed of the id, ego, and superego. The id represents primal desires, the ego acts as a harmonizer or mediator, and the superego functions as the conscience (Dewey & Tufts, 2022; Moon et al., 2019; Yumnah, 2021).

It is crucial to understand that if humans utilize science driven primarily by the id, it can lead to destruction. Therefore, humans must harmonize science with ethics or adab (proper conduct). The ego can serve as a balancing tool between desires and reality, while the superego can act as an internal moral compass. By doing so, humans can use science to find solutions that benefit everyone. In the realm of axiology, discussions about values are essential, particularly those concerning morals and ethics in the development of science for the greater good of humanity. Since science inherently has potential harm, ethical and moral values are necessary as regulatory controls (Nieuważny et al., 2021; Weber, 2019).

Fostering a sense of ethical responsibility from the outset is essential to minimize scientific and technological development fraud. Technology, as a product of science, aims to address problems that arise in life. The educational sector is not immune to the misuse of knowledge either. Common issues include implementing teaching methods that do not align with student development and disseminating biased or fraudulent information through technology (Coeckelbergh, 2023; Leclercq-Vandelannoitte, 2022).

One example of unethical behaviour by teachers is labelling students as stupid or incapable, which can have severe psychological repercussions. Such negative comments can disrupt a student's mental development, potentially leading to arrogance or feelings of resentment. It is particularly harmful to the development of a student's mindset, inner growth, and personality, especially for those who are sensitive (Eren & Rakıcıoğlu-Söylemez, 2021; J. Wang et al., 2021).

As formal education institutions follow the family, schools must instil values necessary for future life and societal challenges. The relationship between teachers and students should not be authoritarian, where teachers exert absolute power and are quick to punish. Instead, a harmonious and supportive relationship should be fostered, where teachers guide and engage in positive dialogue with students. This approach helps students feel valued and encourages positive development (Alt & Itzkovich, 2019; Hennessy et al., 2023; Ilham et al., 2024).

Schools should no longer be perceived as frightening prisons but as environments that liberate students to learn and grow. Schools should foster innovation, imagination, and excitement while providing moral, personality, and intellectual development (Charrón Vías & Rivera-Cruz, 2020; Muraille, 2019). Teachers should not be seen as authoritarian figures but as friendly and supportive facilitators of student growth. Today's educators are expected to be mentors, coaches, and trainers rather than mere sources of knowledge. As Ki Hajar Dewantara, the founder of Taman Siswa, stated, education occurs in three primary places: the family, the school, and society (Asnawan, 2020). This study emphasizes the importance of developing education by integrating ethical principles.

Practical Implications in Curriculum Development

Incorporating ethics into science education can significantly impact curriculum development. Curriculums should include courses that specifically address the ethical implications of scientific advancements (Garrecht et al., 2023; Sivasubramaniam, 2022). For example, bioethics courses can discuss the moral dilemmas in genetic engineering, cloning, and stem cell research. Environmental ethics can be integrated into science curriculums to address climate change, conservation, and sustainability (Dillon & Herman, 2023; Rashid, 2020). By embedding these ethical discussions into the curriculum, students can better understand science and its impact on society.

Implementation in Teaching Methods

Teaching methods should evolve to include discussions on ethics as part of the scientific inquiry process. Case studies and real-world examples of ethical dilemmas in science can stimulate critical thinking and debate among students (Rahmawati et al., 2022). For instance, teachers can present historical case studies like the Tuskegee Syphilis Study or the ethical concerns surrounding the use of artificial intelligence. Role-playing and debates can help students explore different perspectives and develop ethical reasoning skills (Shilton et al., 2020; Wright et al., 2020).

Influence on Educational Policies

Educational policies should mandate the inclusion of ethics in science education. It can be achieved by setting standards and benchmarks that require teaching ethical principles alongside scientific concepts. Policies could also promote interdisciplinary courses that combine science and humanities to provide a well-rounded education. Furthermore, professional development programs for teachers should include training on effectively integrating ethics into their science teaching practices (Darling-Hammond et al., 2020; Mitcham & Englehardt, 2019; Schiff, 2022).

Promoting a Culture of Ethical Responsibility

Fostering a culture of ethical responsibility within educational institutions is crucial. Schools can implement honour codes and ethical guidelines that students must follow. Encouraging students to participate in ethics committees or clubs can also promote a sense of responsibility and integrity. Additionally, involving students in community service projects that address ethical issues can provide practical experience and reinforce the importance of ethical behaviour (Bajrami et al., 2024; Weber, 2019).

Addressing Technological and Scientific Misuse

Education systems should actively address the potential misuse of technology and scientific knowledge. It includes educating students about the ethical use of digital tools and the responsible dissemination of information. Lessons on digital citizenship can teach students the ethical considerations of using social media, the internet, and other digital platforms. By doing so, schools can help prevent the spread of misinformation and promote responsible use of technology (Hertlein, 2023; Paris, 2023).

Developing Critical Thinking and Ethical Decision-Making

Critical thinking and ethical decision-making skills are essential for students to navigate the complex ethical landscapes they will encounter professionally and personally. Educational programs should emphasize these skills by incorporating problem-solving activities that require ethical considerations. For example, students can be tasked with developing solutions to hypothetical scenarios involving scientific research and its ethical implications. This practice can help students develop the ability to analyze situations critically and make informed ethical decisions (Elm, 2019; Mladenovic et al., 2019).

Enhancing Teacher-Student Relationships

Building positive and respectful teacher-student relationships is fundamental to fostering an ethical learning environment. Teachers should model ethical behaviour and create a classroom atmosphere that encourages open dialogue and mutual respect. Positive reinforcement and constructive feedback can help students develop a strong moral foundation. Teachers should also be trained to recognize and address ethical issues in the classroom, ensuring students learn to navigate these challenges effectively (Poling et al., 2022; Robinson, 2022; Wanders et al., 2020).

Long-Term Impact on Society

Integrating ethics into science education can potentially create a long-term positive impact on society. Students educated about ethical principles will likely become responsible and conscientious citizens. They will be better equipped to address societal challenges, make ethical decisions professionally, and contribute to the greater good. By fostering a generation of ethically aware individuals, education systems can help build a more just and equitable society (Q. Wang & Yan, 2019; Zidny et al., 2020).

CONCLUSION

There is a close relationship between philosophy, science, and ethics in the scope of education so that it can run properly. The philosophical foundation makes science stand firm in its essence as a science. Science cannot have autonomous value because science must be paired with ethics in its application. Ethics is a branch of philosophy whose task is to direct science in its application so that it

produces benefits for humans. Education is a forum for forming knowledgeable and ethical humans. Education must have a strong basis in its implementation because it will produce future humans as the next generation. So, there is a need for direction and assistance from the students.

Science has a neutral nature both in its ontology and axiology. The facts are deepened, and the methods may be neutral. However, the purpose of the study makes a difference. Someone who is called a scientist can be used for a variety of knowledge that is new and appropriate to the times. Therefore, someone who knows has a responsibility towards their scientific field. Ethics is the central element of the educational transmission process. The recommendation from this research is delivered to all the stakeholders in education. They should strengthen ethics so that the educational level can grow.

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