

## The Role of Philosophy of Science in Scientific Research

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### Abstract

Philosophy of science is a continuation of the development of philosophy of knowledge, which is also a branch of philosophy that has three components as a pillar body of the knowledge. The component are ontology, epistemology and axiology. By understanding these three types of elements, it will help us to distinguish the different types of knowledge contained in the treasures of human life. It helps to recognize a wide range of existing knowledge such as science, art and religion, and puts each science in place so that it enriches human life. The ontology, epistemology and axiology have an important role in carrying out research methodology in solving the problem. Philosophy of science is the process of reflective thinking on the issues concerning all matters concerning both the foundation of science and the relationship of science with all aspects of human life.

**Keywords:** *Philosophy of science; Body of knowledge; Reflective thinking*

### A. Introduction

There are two graces that are gifted to human beings who make them a creature that is able to develop their knowledge, the first is the ability to reason by using their reasoning and the second is the ability to communicate by using language. Reasoning is a process of thinking in attracting something of thought in the form of knowledge. Human being is essentially a creature of thinking, feeling, and acting. Attitudes and actions derived from the knowledge gained through activities of feeling or thinking. Reasoning produces knowledge that is associated with thinking and not feeling. However, it should be realized that not all thinking activities rely on reasoning. So reasoning is an activity of thinking that has characteristics of certain traits in expressing the truth.

Characteristics of thinking that can be included in the category of reasoning are: the existence of a mindset that is widely called logic. Second, the analytic thinking process. The reasoning in this case is a scientific reasoning, the combination of deductive

and inductive reasoning, in other words, the reasoning associated with rationalism and impartiality.

The reasoning can be conveyed through the use of language as a means of communication. Thinking deeply to gain knowledge or truth is the deepest part of the purpose of philosophy. Science was originally part of philosophy, so the definition of science depends on the system of philosophy adopted. This paper begins by briefly describing the notion of philosophy and science based on etymology, terminology and opinions of the experts, as well as philosophical contributions to the scientific research.

## **B. Research Method**

This is a library study with content analysis. This study attempts to examine the contribution of the philosophy of knowledge to research methodology. The writer tries to explain the information found in the written sources both online and offline modes. The sources of the data in this study come through library research, including the internet, books, e-journals and others. At the same time data was collected through the library at the Aceh Provincial Library and Archives Services and also through online literatures.

## **C. Finding and Discussion**

### **1. What is Philosophy**

Plato (427-347 BC) calls philosophy a knowledge of everything that exists. As for Aristotle (384-322 BC) who was a disciple of Plato declared that philosophy serves to investigate the cause and principle of all things. According to Marcus Tullius Cicero (106-43 BCE), philosophy is the knowledge of something exalted and the effort to achieve it. Al Farabi (d. 950 AD) was the greatest *Muslim* philosopher before Ibn Sina declared that philosophy was the science of the natural world and aimed to investigate its true nature. Harun Nasution, a renewal of Indonesian Islamic thought, implies that philosophy is to think according to the order of logic freely (not bound by tradition, dogma or religion) and so deeply that it reaches the basics of the problem.

### **2. What is Knowledge**

Science comes from the Arabic root: '*alima, ya'lamu,*' *ilman* which means to know, understand and understand correctly. In English called Science, from Latin derived from *Scientia* (knowledge) or *Scire* (knowing). While in Greek is *Episteme* (knowledge).

In the Indonesian dictionary, science is the knowledge of a field arranged systematically according to certain methods that can be used to explain certain symptoms in the field.<sup>1</sup>

According Mulyadhi Kartanegara<sup>2</sup> science is any organized knowledge. He argues that sciences and knowledges are the same, especially before the nineteenth century, but after that science is more limited to physical fields or senses, whereas science transcends them in non-physical areas, such as metaphysics.

In line with the development of the times, the demands of human life, and the development of modern life, then special sciences were born. The momentum of separation between philosophy and special science dated back to the Middle Ages, at the time of the Renaissance Renaissance (eg Physics and Mathematical Sciences). In the field of philosophy of science is directed primarily to the components that become pillars for the existence of science, namely: ontology, epistemology and axiology. Philosophy of science seeks general knowledge of science or about the world as shown by science. The interaction between science and philosophy implies that today's philosophy can not develop well if it is separate from science and science can not grow well without criticism from philosophy. Michael whiteman in Koento Wibisono et al<sup>3</sup> (2007) suggests that the problem of science is considered to be scientific because it is involved in philosophical issues so that separating one from another is impossible. On the contrary many philosophical problems urgently require the foundation of scientific knowledge.

The word Philosophy which come the greek word, by way of Latin (Philosophia) “the love of wisdom”, is a central element of an intelektual history of human civilization<sup>4</sup>. Philosophy is the science that tries to know everything in depth based on thought or ratio. According Philosophy is also interpreted as an attitude of a conscious and mature person in thin king things in depth and wants to see in terms of a broad and comprehensive with all relationships.

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<sup>1</sup> Kamus Besar Bahasa Indonesia. (Jakarta: Pustaka Amani,1998).

<sup>2</sup> Mulyadhi Kartanegara, *Menyibak Tirai Kejahilan; Pengantar Epistemologi Islam*, (Bandung; Mizan, 2002). hlm. 1.

<sup>3</sup> <https://matematikacooy.wordpress.com/hubungan-filsafat-dengan-matematika/> accessed 30 April 2024.

<sup>4</sup> <https://www.britannica.com/topic/philosophy>. Accessed 01 May 2024.

### 3. The Nature and Role of Philosophy of Science

The philosophy of science, according to The Liang Gie, is all reflective thinking on matters concerning all matters concerning both the foundation of science and the relationship of science with all aspects of human life.<sup>5</sup>

Philosophy of Science is a part of epistemology (knowledge philosophy) that specifically examines the nature of science. The philosophy of science seeks to answer the following question: First, which object is the study of science? What is the essence of the object? The relationship of the object to the catch of man (thinking, feeling and sensing (which leads to knowledge) Secondly, how is the process that allows knowledge to be drawn in the form of knowledge How is the procedure What things must be considered in order to get the right knowledge, and what is truth? What are the criteria? The means and techniques of the means that help us to acquire knowledge in the form of science? Third, what knowledge is the science used? Betw een procedural techniques that are operational scientific methods with norms of moral / professional.<sup>6</sup>

The role of philosophy of science according to Cony as quoted by M. Zainuddin<sup>7</sup> is as follows: First, the philosophy of science formula tests the consistence of world view with important scientific theories. According to this view, the task of the philosopher of science to elaborate the broader implications of science; Second, the philosophy of science exercises the exposition of the presupposition and pre-disposition of scientists; Third, the philosophy of science is a discipline in which there are concepts and theories about the sciences that are analyzed and classified; The four philosophies of science are a second-level benchmark, the philosophy of science demands answers to the following questions: (a) what characteristics distinguish scientific inquiry from other types of inquiry; (b) what conditions should be obeyed by scientists in natural investigations; (c) what conditions must be achieved for a scientific explanation to be true; (d) what cognitive status of principles and scientific laws.

Scientific method is a procedure in gaining knowledge called science. So science is the knowledge gained through the scientific method. According to Senn as quoted by

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<sup>5</sup> The Liang Gie *Pengantar Filsafat Ilmu* (Yogyakarta: Liberty, 2007), hlm. 27-29.

<sup>6</sup> Jujun S. Suriasumantri, *Filsafat Ilmu sebuah Pengantar Populer* (Jakarta: Pustaka Sinar Harapan, 2005), hlm. 33-34.

<sup>7</sup> Zainuddin, M., *Filsafat Ilmu: Perspektif Pemikiran Islam* (Jakarta: Lintas Pustaka, 2006), hlm. 21-22.

Jujun<sup>8</sup> "method is a procedure or a way of knowing something, which has a systematic step". Methodology is an assessment in studying the rules contained in the scientific method. This methodology is philosophically included in what is called epistemology. Epistemology is a discussion of how knowledge is gained.

The first step that must be done in the implementation of scientific research is to pose a problem. The proposed problem is not isolated and isolated from other factors. Problems in research arise because of the gap between what is expected with what is happening or the existence of a paradoxical situation. In such constellations can be identified object to be a problem.

Filing a problem is the first step in scientific research. there are six chronological stages in the step of filing a problem namely; background problems, problem identification, problem restrictions, problem formulation, research objectives and research uses.<sup>9</sup>

Once the problem has been successfully formulated, the second step is in the scientific method is to propose a hypothesis. This is a tentative answer to the problem posed. The hypothesis is a tentative proposition as a result of combining scientific concepts with scientific language, thus being a provisional revelation of verifiable researchers and containing temporary ideas/answers/questions. The hypothesis was formulated based on the relationship (causality/coherence/correspondence and consistency) between the research problem and the theories from the previous research (presented as a literature review/research theory framework). (third-theoretical information). The formulation of the hypothesis is strongly influenced by the particular knowledge capabilities of the researcher, as it relies on reason/rational thinking/reasoning of the researcher and rests on the researcher's observational focus influenced by the breadth of the empirical experience of the researcher (as per objective reality)<sup>10</sup>. Once the hypothesis is successfully deduced from scientific knowledge, the next rare is to test the hypothesis implicitly. It means to verify whether the proposed hypothesis is supported by existing data. In the process of submission of hypotheses, researchers are required to make deductive deductions, but in the process of verification researchers are

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<sup>8</sup> Jujun S. Suriasumantri *Filsafat Ilmu sebuah Pengantar Populer* (Jakarta: Pustaka Sinar Harapan, 2005), hlm. 119.

<sup>9</sup> Jujun S. Suriasumantri, *Filsafat Ilmu sebuah ...*, hlm. 313-315.

<sup>10</sup> Tjen Dravinne Winata, "Manfaat Kajian Filsafat, Nilai Etika dan Pragmatisme Ilmu Pengetahuan untuk Melakukan Penelitian Ilmiah," *Jurnal Ilmiah WIDYA*: Vol. 2, No. 2, ISSN: 2337-6686, ISSN-L 2338-3321.

required to draw conclusions inductively.<sup>11</sup> The next step is the determination of research methodology, in this stage there are several things to do, briefly described as follows: First, set the objectives of the research is complete and operational in the form of statements that identify the variables and characteristics of the relationship to be studied. Second, determine the place and time of research where will be made generalization of variable variables to be studied. Third, the determination of research methods based on research objectives and expected level of generations. Fourth, determine the sampling technique in accordance with the purpose of the study. Fifth, establish data collection techniques consisting of identification of variables, data sources, measurement techniques, instruments and techniques to obtain data. The final step taken in the research methodology is to establish data analysis techniques that include step steps and analytical techniques used and defined by hypothesis.<sup>12</sup> After the formulation of the problem, the submission of hypotheses, and the determination of research methodology, then the next step is to report the results of the study. In analyzing the results of research, should always note the conclusions drawn from the data collected with the hypothesis proposed.

#### **4. Contribution of Philosophy of Science in Scientific Research**

Philosophy of science according to Koento Wibisono<sup>13</sup>, as a continuation of the development of philosophy of knowledge, is also a branch of philosophy that has three components as a pillar body of the knowledge it is composed. The component are ontology, epistemology and axiology. By knowing the answers to these three types of questions, it is easy to distinguish the different types of knowledge contained in the treasures of human life. It helps to recognize a wide range of existing knowledge such as science, art and religion, and puts each science in place so that it enriches human life.

The ontology, epistemology and axiology described at the beginning of this paper have an important role in carrying out research methodology in solving the problem. The philosophers have also given birth to several approaches used as an umbrella in research. For example, the philosophers helped clarify and improve the theory that scientists use in their work.<sup>14</sup>

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<sup>11</sup> Jujun S. Suriasumantri, *Filsafat Ilmu sebuah ...*, hlm. 238.

<sup>12</sup> Jujun S. Suriasumantri, *Filsafat Ilmu sebuah ...*, hlm. 332.

<sup>13</sup> Wibisono, Koento S. dkk., *Fillsafat Ilmu Sebagai Dasar Pengembangan Ilmu Pengetahuan* (Klaten: Intan Pariwara. 1997).

<sup>14</sup> R.S Peters & J.P. White, "The Philosopher's Contribution to Educational Research," *Educational Philosophy and Theory*, Vol. 1. Issue 2, Great Britain: Pergamon Press. 1969. hlm. 1-15.

### **C. Concluding Remarks**

1. Philosophy of science is the process of reflective thinking on the issues concerning all matters concerning both the foundation of science and the relationship of science with all aspects of human life.
2. Scientific methods as steps, laws or rules in seeking the truth of science is to formulate problems, propose hypotheses, do roses deduction hypothesis through literature review, prove hypothesis through induction process, and accept the results of research into science or new scientific theory is constructive.
3. The theory of truth that exists in the philosophy of science is used as a basis for generating truth for right and logical thinking. With the logical way of thinking, the human knowledge of truth and the way in which knowledge is acquired also develops. There are two graces that are gifted to human beings who make them a creature that is able to develop their knowledge, the first is the ability to reason and the second is the ability to communicate by using language. Reasoning is a process of thinking in attracting something of thought in the form of knowledge. Human being is essentially a creature of thinking, feeling, acting and acting. Attitudes and actions derived from the knowledge gained through activities feel or think. Reasoning produces knowledge that is associated with thinking and not feeling. However, it should be realized that not all thinking activities rely on reasoning. So reasoning is an activity of thinking that has characteristics of certain traits in expressing the truth. Characteristics of thinking that can be included in the category of reasoning are: the existence of a mindset that is widely called logic. Second, the analytic thinking process. The reasoning in this case is scientific reasoning, the combination of deductive and inductive reasoning, in other words the reasoning associated with rationalism and impartiality. The reasoning can be conveyed through the use of language as a means of communication. Thinking deeply to gain knowledge or truth is the deepest part of the purpose of philosophy. Science was originally part of philosophy, so the definition of science depends on the system of philosophy adopted.

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