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Epistemological Foundations In Philosophy Of Science

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ABSTRACT

The research objectives are to explore epistemological foundations in the philosophy of science and the steps of the scientific method in epistemology. The research method employed in this study is a literature review (library research). The results of the research indicate that: First, the epistemological foundations in the philosophy of science include empiricism-positivism, rationalism, constructivism, and criticism. Second, the steps of the scientific method in epistemology are referred to as *logico hypotetico verificative-deducto hypothetico verificative*. This involves a logical framework, formulation of hypotheses, and factual verification, which serve as the basis for scientific truth with openness to new truths.

Key Words: epistemological, philosophy of science

INTRODUCTION

Philosophy of science is a branch of philosophy that examines various questions related to the nature of knowledge. Philosophy and science have intersected in seeking truth. Science delineates and philosophy interprets universal phenomena, truth spans throughout thought, whereas scientific truth arises from experience (Bahrum, 2013). Philosophy of science cannot be separated from the history of scientific development, as it rests on three main foundations: ontology, epistemology, and axiology. Science addresses not only the nature (ontological) of knowledge but also how (epistemological) knowledge is obtained and processed to become valuable and useful (axiological) in human life.

In other words, the philosophical foundation in the development of science is underpinned by three fundamental questions: What is to be known (ontological), how knowledge is obtained (epistemological), and what is the value of that knowledge (axiological). These questions may seem ordinary, but they encompass issues of utmost importance in the validation and advancement of science. These three philosophical foundations aim to examine examine the truth of a paradigm thoroughly, deeply, and comprehensively, whether apparent or non-apparent. The similar ideas are also expressed by Amsal Bakhtiar in Sehat Sultoni Dalimunte's book, he stated that science has two objects: material and formal. The material object

of philosophy includes everything that exists, both visible and invisible, where the visible is called the empirical world, while the invisible is called the metaphysical world (Sehat Sultoni Dalimunthe, 2011).

The empirical world, also known as the physical world or the real world, refers to the reality that can be measured, observed, and perceived through human senses. This is the world that can be described and understood through scientific methods and human experience. Meanwhile, the metaphysical world, also known as the non-empirical world or the world of abstract existence, refers to reality that lies beyond the limits of observation, measurement, and scientific methods.

RESEARCH METHOD

The method used in this research is literature review (library research). literature review (library research) method used to gather data by utilizing materials such as books, articles, journals available on the internet, as well as previous research results to serve as sources or references. The research process is carried out systematically through steps of data collection, data analysis, and interpretation of the data that has been successfully gathered to address the issues in this study.

RESULT AND DISCUSSION

1. The Nature of Epistemology

The scientific framework, also known as epistemology, is a branch of philosophy that specifically examines the nature of science (scientific knowledge). Epistemology explores deeply the processes and methods that seem by human efforts to acquire knowledge that are related to the sources of knowledge themselves. The basic framework/pattern those humans follow in discovering knowledge are required instruments and objects of knowledge.

Knowledge that has been obtained ontologically is then faced with epistemological aspects to be tested in scientific activities. Ritchie Calder states that the process of scientific activity begins when humans begin to observe it (Sehat Sultoni Dalimunthe, 2011). Thus, it can be concluded that every human contact with the empirical world makes him think about reality and natural facts. Every knowledge has special characteristics related to what, how and for what? Which is packaged in the form of ontology, epistemology and axiology.

Epistemology cannot be separated from ontology and axiology because the problems that arise and which are faced by epistemology are ways of obtaining correct knowledge by considering the ontological and axiological foundations of philosophy of science. The study of epistemology discusses how the process of obtaining knowledge, what things must be considered in order to get the right knowledge, what is called truth and what are the criteria?

The object of epistemological study is to question how something comes, how we know it, how we distinguish it from others, so it deals with the situation and conditions of space and time regarding something (Inu Kencana Syafii, 2004).

2. Epistemological Foundations in The Philosophy of Science

Epistemological foundations in the philosophy of science are very important aspects in understanding how knowledge is obtained, structured, and assessed in science. Some relevant epistemological foundations in the philosophy of science include:

a. Empiricism -Positivism

Empiricism is a view that knowledge comes from empirical experience, such as observation and sensory experience. According to this view, knowledge is the result of repeated observation and testing. For example, John Locke and David Hume are well-known empiricist figures in the history of philosophy.

Empiricism is linguistically derived from the English words empiricism and experience (Loren bagus, 2002). These words are rooted in the Greek word (*empeiria*) and from the word *experientia* (Paul Edwards, 1967). which means "experienced in" "acquainted with", "skilled for". Meanwhile, according to A.R. Lacey said that empiricism is a school in philosophy that believes that knowledge is wholly or partially based on experience using the senses (A.R. Lacey, 2000).

Furthermore, terminologically there are several definitions of empiricism, including: the doctrine that the source of all knowledge must be sought in experience, the view that all ideas are abstractions formed by combining what is experienced, sensory experience is the only source of knowledge and not reason (A.R. Lacey, 2000).

According to this school it is not possible to seek absolute and all-encompassing knowledge, especially since there are forces at our disposal to increase human knowledge, which although slower in nature, are more reliable. Empiricists are content to develop a system of knowledge that has a good chance of being correct. Although absolute certainty can never be guaranteed (Stanley M. Honer dan Thomas C. Hunt).

Empiricists hold that human knowledge can be gained through experience. If we are trying to convince an empiricist that something exists, he will say "show me". In matters of fact he must be convinced by his own experience. If we tell him that there is a tiger in his bathroom, he will first ask us to explain how we came to that conclusion. If we then say that we saw the tiger in the bathroom, the empiricist will listen to our account of our experience, but he will only accept it if he or someone else can check the truth of our claim by seeing the tiger with his own eyes (Stanley M. Honer dan Thomas C. Hunt, 2003).

Not much different from empiricism, positivism also has a similar view. Epistemologically, empiricism and positivism postulate that the five senses are the only ones that provide the human mind with conceptions and ideas. Concepts that

are not accessible to the senses cannot be accepted. This pattern of thought, historically, can be traced to Aristotle's thought, when he stated that at birth the human soul has nothing, like a white paper (remember the tabula rasa theory) that is ready to be painted by experience, or as Locke, the figure of empiricism, said, "There is nothing in the mind except what was first in the senses" there is nothing in the mind/soul unless it must first pass through the senses. Furthermore, Watson, one of the proponents of empiricism, arrogantly said (J.B Watson, 1934):

Give me a dozen healthy infants, wellformed, and my own specified world to bring them up in and I'll guarantee to take anyone at random and train him to become any type of specialist I might select; doctor, lawyer, artist, merchant, chief and yes, even beggarmen and thief. Regardless of his talent, penchants, tendencies, abilities, vocations, and race of his ancestors.

Only experience can determine one's thinking, and not internal factors such as talent, inclination, ability, or heredity. Positivism views experience as the basis for the scientific method. Therefore, internal things that cannot be reached by reason or are beyond reason, do not concern positivists.

Positivists oppose metaphysics, the unseen, what is beyond the limits of human experience. They regard metaphysics as meaningless to science, because it withdraws from any attempt at verification, the truth or untruth of unverifiable assertions (N.E Algra dan K. Van Duyvendijk, 1983). Therefore, positivists have bid farewell to the "world of gods" and the "world of nature", because they are considered irrational. At this stage, positivism has "discarded" philosophy. The realm of metaphysics and nature became the object of philosophical thought through contemplation-speculation, which could not be approached with the positivists' senses. Therefore, as a result, positivism only relies on the following principles (N.E Algra dan K. Van Duyvendijk, 1983):

- 1) Only what appears in experience can be called true. This principle is taken from the empiricist philosophy of Locke and Hume.
- 2) Only what can truly be ascertained as reality can be ascertained as reality can be called true. This means that not all experiences can be called true, but only those experiences that find reality.
- 3) Only through the sciences can it be determined whether something experienced is truly a reality.

b. Rationalism

Ratio is thinking according to sound reason. Ratio is a noun of degree or number relationship between two similar things; a comparison between various phenomena that can be expressed by numbers (Lukman Ali et al., 1993). Rationalist is a person who adheres to rationalism. Rationalism is a theory or understanding that considers that the mind and reason are the only basis for solving problems

(truths) that are beyond the reach of the senses; an understanding that prioritises (the ability) of reason over emotions, mind and so on (Ali, 2000).

Rationalism is a school of philosophy of science that holds that the authority of the ratio (reason) is the source of all knowledge. Thus, the criterion of truth is based on intellect. So the strategy of developing science according to rationalism is to explore ideas using human intellectual abilities.

The early pioneer of rationalism was Heraclitus, who believed that reason exceeded the five senses as a source of knowledge. According to him, human reason can relate to the divine reason that radiates the light of God in human beings. Thales applied rationalism in his philosophy. This was clearly continued by the sophists and their opponents (Socrates, Plato and Aristotle).

In the medieval period, Greek rationalism flourished in the hands of Socrates, Plato and Aristotle. Rationalism reached its peak in the time of Aristotle who tried to fend off the attack of the Sufastho'iyun school of thought which propagated that "a thing is considered good when man thinks it is good", in other words "man is the measuring stick of all things". As a result of this influence, Aristotle introduced rationalism by systematising the rules of logic in his famous work *Organon* (Muhammad Bahar Akkase Teng, 2016). Then continued by one of the modern philosophers, Rene Descartes (1596-1650), known as the father of modern philosophy.

The background to the appearance of rationalism is the desire to break free from all traditional thinking (scholastic; scholastic is an adjective derived from the word school which means school. Thus, scholastic means school-related, and the word scholastic is typical of the history of medieval philosophy), which was once accepted, but found itself unable to deal with the results of the science at hand. What Aristotle had planted in thought at that time was also still influenced by delusions. Descartes wanted a new way of thinking, hence the need for a definite point of departure that could be found in doubt, *cogito ergo sum* (I think and I exist). Clearly, it is from doubt to certainty.

Rationalism believes that the reason is the fundamental factor in knowledge. And according to rationalism, experience cannot be used to test the truth of the law of cause and effect, because of the infinite events in natural events and the impossibility of observation. Rationalism does not deny the usefulness of the senses in gaining knowledge. In addition, the use of the senses is to stimulate reason and provide materials that cause reason to work. Reason can also produce knowledge without any material from the senses at all. So, reason can also produce knowledge about abstract things (Ali Maksum, 2008).

Rationalism etymologically comes from the English word "rationalism". This word is rooted in the Latin word *ratio* which means reason. A.R. Lacey added that

based on its root word Rationalism is a view that holds that reason is the source of knowledge and justification.

c. Constructivism

The constructivism paradigm is the first component of the self-learning concept. The foundation of the concept of learning activities based on this paradigm is the use of existing knowledge to process incoming information, so that new knowledge is formed towards the formation of a competency desired by the learner (Haris Mudjiman, 2009). In this case, learning is an activity or process to gain knowledge, improve skills, improve behaviour, attitudes, and strengthen personality. The context of acquiring knowledge, according to conventional scientific understanding, human contact with nature is termed experience. Experiences that occur repeatedly give birth to knowledge. However, after the birth of the theory of cognitivism, this understanding of knowledge has changed. A number of phenomena always exist in human experience, so knowledge is built from a set of facts (Suyono dan Hariyanto, 2012).

The thought of philosopher Giambattista Vico is the earliest thought about the constructivism paradigm when he said that "man will only understand the things he builds himself (Haris Mudjiman, 2009)." That is, new knowledge can only be understood through the lens of prior knowledge. Using glasses to see new knowledge then build new knowledge as a result of their own processing. A person will process knowledge when he acquires new knowledge he gets. Thus, he is no longer considered a party who just receives knowledge, but there is a process of processing before understanding. Therefore, thinking about the new paradigm places students as an important component in the learning process in education.

In addition, Vico also explained that "knowing" means "knowing how to make something". This statement shows that a person only knows something if he can explain what elements make up that something. Unfortunately, according to many observers, Vico did not prove his theory. For a long time, Vico's ideas were unknown to people and seemed to be lost. Then Piaget wrote his ideas about constructivism in his theory of cognitive development and also in his genetic epistemology. Piaget's ideas spread faster than Vico's ideas, it is not clear whether Piaget's ideas were influenced by Vico or not (Paul Suparno, 2001). According to constructivists, the tools used for a person to know something are the senses. A person interacts with objects and the environment by seeing, hearing, touching, smelling and feeling them. In touch with these senses, a person will build a picture of the world (A.M. Slamet Soewandi et al., 2005). For example, if a person observes the soil and then plays with the soil, one will build knowledge about the soil and form knowledge.

Without experience, a person cannot form knowledge properly. In this case, experience is not only physical experience, but also cognitive and mental

experience. The surrounding environment is the scope of the formation of experiences that cannot be separated from the observer. This can form knowledge if the structure can be used as a problem solver or face experience. If a person's abstract concept of something is able to explain various related issues, then the concept can form knowledge of it, resulting in a concrete concept.

d. Criticism

The beginning of criticism stems from the contrasting stances of rationalism and empiricism. Rationalism holds that the ratio is the source of recognition or knowledge, while empiricism holds the opposite view that experience is the source. Immanuel Kant (1724-1804) attempted to resolve the dispute with his philosophy called criticism (Atang Abdul Hakim, 2008).

Criticism is derived from two words: critical means reasoned and reflective. While ism is a school of thought. Meanwhile, according to the term Criticism is a school of thought that is reasoned and reflective based on the limits of the ability of the ratio as a source of human knowledge (Hakim dan Saebandi, 2008).

Konisbergen, East Prussia, Germany. From childhood he did not leave his village, except for a few short periods to teach in a neighbouring village. His thoughts and written were of great importance and brought about a far-reaching revolution in modern philosophy (Hakim dan Saebandi, 2008). Kant viewed rationalism and empiricism as always one-sided in valuing reason and experience as sources of knowledge. He said that human knowledge is a synthesis between a priori and a priori elements.

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Truths are sensations that enter through the sensory organs then enter the brain, then the object is noticed, then realised. The sensations enter the brain through certain channels, namely laws. Because of these laws, not all stimuli that hit the sensory organs can enter the brain. The capture has been organised by perception according to purpose. This purpose is the laws (Hakim dan Saebandi, 2008). A priori truth is obtained through the structure of the soul which then enters the idea. Therefore, recognition centres on the subject, not on the object (Hakim dan Saebandi, 2008).

The main ideas of criticism are about the theory of knowledge, ethics, and aesthetics. These ideas arise because of fundamental questions, such as: 1) what can

I know?; 2) what should I do?; 3) what can I hope for? (Hakim dan Saebandi, 2008). The characteristics of criticalism can be summarised in three ways: 1) Considering that the object of knowledge is centred on the subject and not on the object; 2) Affirmation of the limited ability of human ratios to know the reality or nature of something; ratios are only able to reach the symptoms; 3) Explaining that human recognition of something is obtained on a combination of the role of a priori elements derived from ratios and in the form of space and time and the role of a priori elements derived from experience in the form of material (Hakim dan Saebandi, 2008).

Each epistemological foundation has different implications for understanding how scientific knowledge is acquired, developed and assessed. These approaches may vary depending on the branch of science and the approaches used by scientists and philosophers of science.

3. The Steps of the Scientific Method in Epistemology

The epistemology of Western science begins with the development of empirical thinking as the antithesis of intuitive philosophy developed in early human history and its contradiction with the philosophy of rationalism in the 17th century as the antithesis of empiricism, as well as the emergence of a new epistemology in the early twentieth century. This twentieth century epistemology is characterised by the glimpse of phenomenology (synthesis) which combines aspects of rationalism, empiricism and intuition in its scientific epistemology (Cecep Sumarna, 2005).

The concept of epistemology can be explicitly studied from the application of the scientific method. The meaning of scientific method in methodological application is a procedure that includes various acts of mind, work patterns, technical methods, and procedures to obtain new knowledge or develop existing knowledge. Steps are increasingly varied in science depending on the area of specialisation.

Basically, the scientific method is the way science acquires and compiles its body of knowledge based on: (a) A logical framework with arguments that are consistent with previous knowledge that has been successfully compiled; (b) Elaborate hypotheses which are deductions from the framework, and; (c) Verify the hypothesis to test the truth of the statement factually.

The three things above are acronymically called *logico hypotetico verificative-deducto hypothetico verificative*. A logical framework is a rational argument in developing explanations for natural phenomena. Empirical verification means objective evaluation of a hypothesis statement against factual reality. This verification means that science is open to other truths, other than those contained in the hypothesis (perhaps the facts reject the hypothesis). Likewise, factual verification opens itself up to criticism of the framework of thought underlying the

submission of hypotheses. Scientific truth with openness to new truths has a pragmatic nature whose process is repeated based on critical thinking.

In epistemology, there are moral principles that are implicitly and explicitly included in *logico hypotetico verificative-deducto hypotetico verificative*, namely that in the process of scientific activity, every scientific endeavour must be aimed at finding the truth, which is carried out with full honesty, without having certain direct interests and the right to life based on the strength of individual argumentation (Endang Komara, 2010).

In some studies of philosophy of science, this epistemological position has a solid standard of testing because it is based on the postulate of value free. This concept is different from ontology and axiology which are very prone to abuse because the element of subjectivity is very high in these two fields so that it is seen as not value free. This value-free interpretation indicates that the process of understanding in the realm of ontology and axiology gives researchers the freedom to determine various matters related to research (Gunnar Myrdal, 1985).

The effort to conduct epistemological studies in research methods is an exploration of the basic concepts that become blue prints for learning development patterns. This exploration is carried out with the aim that in the future there will be significant efforts to develop research methods that are in accordance with one of the concepts of science development strategy, namely science and its context are mutually permeating and mutually influencing to provide possibilities for the emergence of new ideas that are actual and relevant to fulfilling needs in accordance with time and circumstances (*science for the sake of human progress*).

The scientific method is a certain set of procedures followed to obtain certain answers to certain statements. The epistemology of the scientific method will be easier to discuss if we direct our attention to a formula that regulates the steps of the thinking process arranged in a certain order. The basic framework of scientific procedures can be described in six steps as follows:

- a. Awareness of the problem and formulation of the problem
- b. Observation and collection of relevant data
- c. Compilation or clarification of data
- d. Formulation of hypothesis
- e. Deduction from hypothesis
- f. truth testing (Verification) (AM. Saefuddin et.al, 1998)

Elsewhere, it is stated that method is a procedure or way of knowing something with systematic steps. An outline of the systematic scientific steps is as follows: (1) Finding, formulating, and identifying problems; (2) Developing a framework of thought (logical construct); (3) Formulating hypotheses (rational answers to problems); (4) Testing hypotheses empirically; (5) Conducting discussions; (6) Drawing conclusions.

By identifying situations or conditions that are possible or not possible, we have formulated a research problem. The simplest way to find a research question is through secondary data. There are several possibilities, for example: Seeing the process of the realisation of the theory; Seeing the linkage of the propositions of a theory which then intends to improve it; Concerned about the validity of a postulate or model in a certain place or at a certain time; Seeing the level of informative value of existing theories, then intending to improve it; Everything that cannot be explained by existing theories or cannot be explained perfectly. Developing a framework of thought is to flow the way of thought according to a logical framework or according to a logical construct. This is nothing other than occupying the problem under study (identified) in a theoretical framework that is relevant and able to capture, explain, and show a perspective on the problem. Efforts are aimed at answering or explaining the research questions identified (Soetriono dan Rita Hanafie, 2007).

The relation between epistemology and research methodology is summarised by Endang Koswara as follows: The processual structure includes nine systematic steps, namely: Pre-research stage (problem identification, setting research objectives/achievement of knowledge, introspection and scepticism). Research process stage (basic ontological stage/basic assumptions). Epistemological stage (methodology / means and ways to achieve knowledge, inference, practical application of science and achievement as proof and final science). Final stage (achievement of eternal happiness) (Endang Komara, 2010). Keenam langkah metode ilmiah tersebut masing-masing memiliki unsur -unsur empiris dan rasional.

Furthermore, AM. Saefuddin argues that to make knowledge a science (theory), it must be through the scientific method which consists of two approaches: Deductive approach and inductive approach. These two approaches cannot be separated by using just one of them, because deduction without reinforced induction can be likened to brain sport without the quality of truth, on the other hand induction without deduction produces barren thoughts (Saefuddin et.al, 1998).

CONCLUSION

Epistemology is one of the pillars in the philosophy of science. Some relevant epistemological foundations in the philosophy of science are Empiricism-Positivism, rationalism, constructivism and Criticalism. The concept of epistemology in the overall series of research is the application of the scientific method based on a framework of thought. which is logical with arguments that are consistent with previous knowledge that has been successfully compiled. Explaining the hypothesis which is a deduction from the framework of thought is

to verify the hypothesis and test the truth of the statement factually. These three things are called *logico hypotetico verificative-deducto hypothetico verificative*.

REFERENCES

- A.M. Slamet Soewandi dkk, *Perspektif Pembelajaran Berbagai Bidang Studi*, Yogyakarta: Universitas Sanata Dharma, 2005.
- A.R. Lacey, *A Dictionary of Philosophy*, New York: Routledge, 2000.
- Ali Maksum, *Pengantar Filsafat dari Masa Klasik Hingga Postmodernisme*, Yogyakarta: Ar-Ruzz Media, 2008.
- Amiruddin, A., Walidin, W. ., Gade, S. ., & Silahuddin. (2023). Istiqamah Seumubeuet Teungku Dayah Salafiyah Aceh: (Analysis of the Alamtologi Approach). *Jurnal Al-Fikrah*, 12 (1), 82-95.
- AM. Saefuddin et.al, *Desekularisasi Pemikiran: landasan Islamisasi*, Cet. IV; Bandung: Mizan, 1998.
- Atang Abdul Hakim, Beni Ahmad Saebandi, *Filsafat Umum DariMetologi Sampai Teofilosofi*, Bandung: Pustaka Setia, 2008.
- Bahrum, "Ontologi, Epistemologi dan Aksiologi", dalam *Jurnal Sulesana*, Vol. 8 No. 2 Tahun 2013.
- Cecep Sumarna, *Rekonstruksi Ilmu dari Empirik Rasional Ateistik ke Empirik-Rasional Teistik*, Bandung: Benang Merah Press, 2005.
- Endang Komara, *Filsafat Ilmu dan Metodologi Penelitian*, Bandung : Refika Aditama, 2010.
- Endang Komara, *Filsafat Ilmu dan Metodologi Penelitian*, Bandung: Refika Aditama, 2010.
- Inu Kencana Syafii, *Pengantar Filsafat*, Cet. I; Bandung: Refika Aditama, 2004.
- J.B Watson, *Psychological Care of Infant and Child*. New York: Norton, 1934.
- Kajian tentang suatu penelitian yang bagaimana yang objektif, dapat ditelaah dari tulisan Gunnar Myrdal, *Objektivitas Penelitian Sosial*, Jakarta : LP3ES, 1985.
- Loren bagus, *Kamus Filsafat*, Jakarta: PT Gramedia Pustaka Utama, 2002.
- Lukman Ali dkk, *Kamus Besar Bahasa Indonesia*, Edisi Kedua, Jakarta: Departemen Pendidikan dan Kebudayaan Balai Pustaka, 1993.
- M. Muslih, *Filsafat Ilmu. Kajian atas Asumsi Dasar Paradigma dan Kerangka Teori Ilmu Pengetahuan*, Yogyakarta: Belukar, 2004.
- Muhammad Bahar Akkase Teng, *Logika dalam Perspektif Sejarah*, Cet 1, Makassar: De La Macca, 2016.
- N.E Algra dan K. Van Duyvendijk, *Mula Hukum Beberapa Bab Mengenai Hukum dan Ilmu untuk Pendidikan Hukum dalam Pengantar Ilmu Hukum*. Jakarta: Bina Cipta, 1983.
- Paul Edwards, *The Encyclopedia of Phylosophy*, Vol. II, New York, The Macmillan Company & The Free Press, 1967.
- Paul Suparno, *Filsafat Konstruktivisme dalam Pendidikan*, Yogyakarta: Kanisius, 2001.

- Romadi, Ugik. 2023. *Inovasi Pendidikan*, Sumatera Barat: CV. Afasa Pustaka.
- Sehat Sultoni Dalimunthe, *Filsafat Ilmu*, Depok: Indie Publishing, 2011.
- Soetriono dan Rita Hanafie, *Filsafat ilmu dan Metodologi Penelitian*, Yogyakarta, Andi Offset, 2007.
- Stanley M. Honer dan Thomas C. Hunt, *Metode dalam Mencari Pengetahuan: Rasionalisme, Empirisme dan Metode Keilmuan* dalam Jujun S. Suriasumantri (Penyunting), *Ilmu Dalam Perspektif: Sebuah Kumpulan Karangan Tentang Hakekat Ilmu*, Jakarta: yayasan obor Indonesia, 2003.
- Suyono dan Hariyanto, *Belajar dan Pembelajaran: Teori dan Konsep Dasar*, Bandung: PT Remaja Rosdakarya, 2012.
- Syamsudin dan Damaianti, *Vismaia*, Metodologi Penelitian Pendidikan Bahasa, Bandung: Rosda, 2006.