ALSYS
Jurnal Keislaman dan Ilmu Pendidikan

e-ISSN : 2808-540X
p-ISSN : 2808-7119

Terindeks: Copernicus, Sinta 5, Dimensions, Scilit, Lens, Semantic Scholar, Garuda, Google, Base, etc.

https://doi.org/10.58578/alsys.v5i3.5840

A CRITICAL ANALYSIS OF KARL RAIMUND POPPER'S FALSIFICATION THEORY'S THINKING MODEL PHILOSOPHY

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Article Info:

Submitted:	Revised:	Accepted:	Published:
Apr 10, 2025	Apr 30, 2025	May 15, 2025	May 20, 2025

Abstract

This article explores the philosophical underpinnings of the falsification theory proposed by Karl Raimund Popper, a key figure in the philosophy of science in the 20th century. Utilizing a library research approach and descriptive analytical methods, the study delves into the core principles and implications of falsification as a model of scientific reasoning. Unlike the verificationist paradigm that seeks to confirm theories through accumulating supportive evidence, Popper's falsification theory asserts that scientific theories must be testable and open to refutation through empirical observation and experimentation. The article examines how falsification provides a more rigorous framework for distinguishing scientific knowledge from non-scientific claims by promoting continual testing and revision. It further discusses the broader methodological implications of falsification for scientific inquiry, emphasizing its relevance across multiple disciplines. By fostering a mindset of skepticism and critical inquiry, falsification theory challenges researchers to remain open to new evidence and alternative explanations, thereby supporting the evolution of science as a dynamic and self-correcting enterprise. This analysis highlights the enduring importance of Popper's contribution to research methodology and the development of progressive scientific thought.

Keywords: Karl Popper; Falsification; Philosophy of science; Scientific methodology; Theory testing.

INTRODUCTION

Philosophy is understood as a thinking activity that implies critical and comprehensive analysis results (Susanto, 2019). In addition, philosophy also functions to overcome ignorance, deepen understanding, add perspective, and explore various values through methods such as revitalizing beliefs through rational investigation (Hidayat, 2024). Therefore, philosophy is believed to be able to change the way humans think, which depends on gods and beliefs in myths, into a more rational way of thinking. Philosophy plays a fundamental role in solving several problems in human life, including in science (Kosim, 2018). One of the challenges often encountered by both the Western and Islamic worlds is determining the limits of truth. This problem has led to several in-depth discussions, which have produced many theories and concepts regarding the limitations of truth in science. It prompted the proposal of a theory by Karl Raimund Popper, namely the theory of falsification, which functions to determine the limits of truth in science.

Karl Raimund Popper was a philosopher with radical views compared to several other thinkers in his era. He is widely known for his concept of falsification, contrary to science's verification approach. Popper's conception critiques the dominance of the positivist perspective, which was in effect at that time (Setyo Wibowo, 2022). Positivism, a part or branch of theoretical epistemology, was introduced by Auguste Comte (1798-1857). This approach focuses on what is known and the nature of positivism, where it marginalizes everything other than the facts found (Nugroho, 2016). Popper argued that science should not only rely on verification, but should also be able to be tested and refuted. Thus, falsification becomes essential for sorting out valid and invalid scientific theories. This approach encourages several scientists to test and revise the theories put forward, so that science can develop dynamically. In addition, Popper's view also emphasizes the importance of skepticism and openness to criticism, which are the foundation for scientific progress (Juliardi et al., 2024).

Popper attempted to improve the process of formulating concepts and theories in science to avoid subjective elements in describing theories and the potential for fatal errors.

This effort shows that scientific observations should closely relate to a philosophical approach. In this case, Popper emphasized that the basic foundation of science should be closely associated with falsification. Falsification became the concept he carried, stating that a scientific theory has significance if it can be falsified, namely, finding proof through critical testing, not merely through a verification process to prove its truth (Alfirdaus et al., 2024). In other words, the more open a theory is to the possibility of being refuted, the more scientific it is. This methodological approach led Popper to conclude that scientific problems cannot be resolved sufficiently by referring to authority alone (Ronda, 2018). The existence of scientific issues is the core benchmark for assessing the validity and truth of several post-development theories.

Looking at this study, the researchers discuss the thoughts of Karl Raimund Popper, especially regarding the theory of falsification he put forward in determining the criteria for distinguishing science from non-science. Popper put forward the principle of Falsifiability in the view related to demarcation. He argued that the scientific criteria of a theory lie in its ability to be refuted (Falsifiability), where a statement is proven wrong (refutability) and can also be tested (testability). This view makes Popper known as a figure who carries "critical rationalism" (Saepullah, 2020).

Rationalism is a school of thought emphasizing that science's correlation is closely related to reason. In this context, rationalism assumes that knowledge is more formed by reason than by the senses. Meanwhile, the term "critical rationalism" refers to the nature that describes rationalism, and can be associated with the Critical school, which recognizes the role of reason and the importance of empiricism. Popper views scientific discovery as tentative and not a final solution, so he views knowledge as an open, dynamic system that is not final (Habibah, 2019).

Many articles and studies on Karl R. Popper with the theory of falsification have been conducted by previous researchers. First, an article by Adhimas Alifian Yuwono Ari Yuwono entitled "The Epistemology of Falsification: the Implications of Karl Raimund Popper's Thought for Islamic Scientific Studies," in which he argues that religious dogmatism is to eliminate and blame different groups, so he offers the concept of three worlds (Yuwono, 2024). Second, an article by Asep Saefullah entitled "Karl R. Popper's Falsificationist Epistemology: Its Relevance to Islamic Theology and Thought". The study results show that scientific truth is not determined through justification. So science,

including religion, is likely to be falsified (Saepullah, 2020). Third, an article by May Sarah and M. Afiqul Adib entitled "Karl R. Popper's Falsification Methodology and Its Implementation in Building Inclusive Understanding". According to Popper, the best achievement in truth is the possibility, not the certainty, of being true. So no one should claim to be more right than others (Sarah & Adib, 2023). Therefore, no article discusses the philosophy of Karl R. Popper's falsification model of thought. Thus, this article is worthy of research.

METHODS

This study is classified as a type of library research involving collecting data from various sources, including books, articles, and documents related to the topic being researched (Rukin, 2019). The study process is carried out in two stages: first, collecting data relevant to the focus of the research, and second, analyzing the data that has been collected. The methodology applied to collect study data is documentation. Meanwhile, data analysis is carried out using a descriptive-analytical approach, where researchers analyze and draw conclusions from the literature used as references, and evaluate the relevance of the information in the context of the research (Satori & Komariah, 2017).

RESULTS

Biography of Karl R. Popper

Karl Raimund Popper was born in Vienna on July 21, 1902, to a Protestant Jewish family. His father, Dr. Simon S.C. Popper, was a lawyer deeply interested in philosophy and social issues. Popper's teenage years spent in Vienna influenced his character and academic development. His formal education occurred in the 1920s in that city, where Popper began his educational journey as a private student. Although he studied various subjects, he paid particular attention to Mathematics and Theoretical Physics. In 1925, Popper took additional training at the Pedagogical Institute, a branch of the University of Vienna. During his education, he met his life partner (Setyo Wibowo, 2022).

In 1928, Popper obtained a doctoral degree, and his written work entitled "Psychological Problems in the Psychology of Thought" became a strategic breakthrough. However, there was dissatisfaction within Popper with the results of the dissertation, and he decided to study epistemology by focusing on developing scientific theories. Popper's

efforts in this field became intensive after he became acquainted with the concept of logical positivism that developed in Vienna's academic environment. However, Popper did not join the environment directly because he became one of the sharpest critics of their ideas (Maxwell, 2002).

Due to his Jewish background, Popper was forced to leave his birthplace when Hitler's Germany occupied the region. He then moved to New Zealand and taught at Christchurch University, although he soon moved to England in 1945 and taught at the London School of Economics. Karl Popper died on September 17, 1994, in South London from heart disease. Some of his most famous works include "The Poverty of Historicism" (1945), "The Logic of Scientific Discovery" (1959), and "Conjectures and Refutations: The Growth of Scientific Knowledge" (1963). These works have significantly contributed to scientific thought and the philosophy of knowledge (Saepullah, 2020).

Karl R. Popper's Falsification Principle

Karl Popper's thinking on falsification begins with the problem of demarcation, namely, determining the boundaries between scientific and non-scientific statements. In this context, Popper attempted to correct the main view put forward by the Vienna Circle, where the related perspective differentiates statements considered meaningful from those considered meaningless by looking at the standardization of whether the statement can be empirically justified through verification or confirmation. According to Popper, statements that do not meet scientific requirements can be significant, and conversely, statements that are considered scientific do not always have deep meaning. Thus, Popper argued that the verifiability criterion should not be used as a limitation to determine what is included in science, but rather as a measure to assess the meaning of a statement (Riski, 2021). This approach opens space for broader thinking in understanding science and the meaning behind the statements produced.

The question arises about how to distinguish between scientific and non-scientific expressions. According to Popper, an expression is considered scientific if there is a significant possibility of proving its falsity. It means that the truth of a hypothesis, law, or theory is temporary until its errors are discovered. This principle is known as Falsifiability. Therefore, the falsification method becomes an instrument to distinguish genuine science from pseudoscience, which functions as a dividing line (demarcation) between science and non-science (Dochmie, 2018).

Popper applied the general falsification methodology to reject the Vienna Circle's conception of the inductive verification approach. The rejection was based on his view that the inductive method still prioritizes verification in distinguishing between meaningful and unmeaningful knowledge. According to Popper, verification has weaknesses because it relies on inductive logic, which concludes a general theory from several specific facts. The verification process requires many samples to provide evidence for a theory. However, it cannot guarantee that the related theory is declared valid. This is because the sample only has a small scope for the entire object of study. No matter how many observations are made, it will never be able to prove the truth of a statement such as "All swans are white" (Purwosasaputro, 2023).

Popper criticized the verification principle: First, he argued that the principle cannot provide a statement of truth for several general laws, because the verification implementation of science-related laws cannot be done. Thus, many laws in natural science are considered meaningless and similar to metaphysics. Second, history shows that science often emerges through a metaphysical perspective. Reviewing related matters, Popper emphasized that metaphysical statements can not only be meaningful, but can also be proven true even though their existence is relatively new and considered scientific after testing. Finally, to determine whether a statement or theory is meaningful, one must first understand the statement or theory. How can we know what the theory means if a statement is meaningless? (Dochmie, 2018).

Popper proposed his falsification methodology as an alternative to the inductive method. This methodology emphasizes that a theory must be tested through experiments that test facts that contradict the theory. If the theory cannot survive an experiment, then the theory must be considered a failure and replaced by another speculative theory. In other words, research focuses on efforts to show that a general theory is a form of error by presenting evidence to support the claim. A general theory is considered scientific if it can survive facts that can falsify it (Nur, 2012). Therefore, falsification is the opposite of verification, invalidating a theory through facts. As long as a theory cannot be falsified, the assumption of the theory is justified. Through this approach, scientific studies become more efficient because a fact can directly determine the validity of a theory.

One proof of the implementation of Karl Popper's thoughts in life and reality is that several physicists, using a verification approach for various samples where nature is the object, conclude that "All substances will expand when heated." This theory is believed to

be a belief that has been held for a long time, since ancient times, in physics. Even so, in the framework of the philosophy of science proposed by Popper, the related theory is not considered an absolute truth. Instead, the theory is only regarded as accurate if supported by sufficient evidence. Then, an anomaly was found in the properties of water. Water does not expand when heated in the temperature range between 0 and 4 degrees Celsius. Instead, water shrinks as the temperature increases in that range. This discovery directly refutes the theory of "All substances will expand when heated." Karl Popper states this reality explains falsification (Saepullah, 2020).

Through innovative discoveries that can refute the theory of expansion of matter, there is a belief in the theory that is the basis, namely, "all substances will expand when heated," which is a mistake. Thus, the renewal of the theory needs to be done so that it explains "All substances will expand when heated, except water in the temperature range of 0-4 degrees Celsius." It is important to note that the latest theory is also untrue. The conception is a form of error from the first theory and does not justify the next theory.

DISCUSSION

Popper's Critical-Analytic View

Looking at the brief description of Popper's philosophy as written above, the researcher argues that Popper's critical theory psychologically impacts scientists. A scientist always doubts the truth of the knowledge he has obtained and never feels entirely sure of the findings. This situation can trap scientists in the world of relativism. It is because observations carried out by scientists are not aimed at strengthening evidence to justify the hypothesis. In other words, scientists must let go of the search to find other certainties they may never find. The knowledge obtained can always be temporary (tentative) and continuously tested, so science never reaches a completion point. According to Popper, a statement or theory can be considered scientific if tested, not because it has been proven (verifiable). For example, the statement "all metals will expand when heated" can be considered scientific if testing the statement can be applied through several systematic experiments aimed at refuting it. If the theory persists after testing, then the truth of the theory is further strengthened (corroboration) (Muslih, 2021).

On the other hand, Popper's thinking diversifies perspectives compared to several positivist thinkers who reject metaphysics. According to Popper, the limitations set by the

positivist group have limited science to only aspects considered scientific. At the same time, social science (especially religion and myth) is considered unscientific and meaningless. With a falsification approach, Popper establishes a clear distinction between scientific knowledge (science) and semi-scientific (pseudoscience). Unlike positivism, Popper admits that pseudosciences can be a source of knowledge that still has meaning in the context of each study. It is interesting to associate the scientific concept with Al Ghazali's thinking (Akbar, 2017).

Popper realized that the rejection of metaphysics made science ambivalent. It means that the progress of science, which was initially aimed at human welfare, is responsible for the degradation of spiritual values in nature. Al-Attas also explained that ignoring the spiritual values of nature causes humans to act arbitrarily towards the environment around them. As a result, the nature inhabited by humans is at risk of experiencing imbalance, thus potentially threatening the sustainability of living things on earth (Muthalib, 2022).

Islamic Studies Popper's Theory

Karl Popper's falsification theory is a clear example of a part of the approach to the branch of philosophy of science that emphasizes the importance of testing and proof in science (Redhani, 2024). This theory can provide a new perspective in understanding and analyzing Islamic teachings in Islamic studies. Popper argued that a theory must be able to be tested and refuted to be considered scientific. In this case, Islamic teachings can be tested through a critical approach that considers the social, cultural, and historical context (Dochmie, 2018).

One example of the application of Popper's theory in Islamic studies is the analysis of the hadiths of the Prophet Muhammad. Hadith, a source of Islamic teachings, is often faced with criticism and in-depth analysis. Using the falsification approach, researchers can test the validity of the hadiths by considering the context and evidence available. If a hadith is proven to be inconsistent with the facts or contradicts the basic principles of Islam, then the hadith can be considered weak or unacceptable (Razaq & Umiarso, 2019).

In addition, Popper's theory can also be applied in understanding the development of Islamic thought. Throughout its history, Islamic thought has undergone various changes and reinterpretations. With a critical approach, Muslim scholars can test various existing theories and views, and consider their relevance in a modern context. For example,

thoughts on the relationship between religion and science can be tested through discussion and research that considers empirical evidence and rational arguments.

However, it is essential to remember that applying Popper's theory in Islamic studies does not mean rejecting the spiritual values and beliefs contained in religion. On the contrary, this approach can enrich our understanding of Islam by encouraging dialogue and critical reflection. In this context, Muslim scholars can act as a bridge between religious traditions and the development of science, thus creating a positive synergy. Finally, Islamic studies using Popper's theory can open space for more open and dynamic thinking (Ulum, 2020). By adopting a critical approach, Muslims can better understand the teachings of their religion and better face the challenges of the times. It can also encourage the creation of a more tolerant and inclusive society, where dialogue between different thoughts and beliefs can occur constructively.

CONCLUSION

Popper's falsificationism advances a critical philosophy of science that values the provisional nature of knowledge and prioritizes rigorous testing over absolute certainty. By asserting that scientific theories must be refutable to be meaningful, Popper challenges the verificationist focus on proof, instead advocating for continual scrutiny and openness to revision. This framework not only underpins the natural sciences but also offers valuable methodological insights for the social sciences and humanities. Ultimately, falsificationism fosters a culture of intellectual humility and critical inquiry, enabling science to evolve in response to new evidence and perspectives. Embracing this philosophy enhances our capacity to navigate the complexities of the world and refine our understanding in a continually progressive manner.

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