

SYSTEMIC THINKING MEANS

Juli Iswanto

Email: julijundy8388@gmail.com

North Sumatra State Islamic University

Abstract: Thinking right requires means or tools of thinking. This means is certain, so scientific activity will not be maximized without the means of scientific thinking. For a scientist, mastery of the means of thinking is a must, because without mastery of scientific means, he will not be able to carry out good scientific activities. The method used to obtain the data needed in this discussion is the Library Research method. The result is that language is a means of communicating systematic ways of thinking in acquiring knowledge. Without language skills, a person will not be able to carry out scientific activities systematically and correctly. While logic helps humans to think systematically which can be justified. If you want to do thinking activities correctly, you must use logical thinking rules. The statistics should not be underestimated by people who want to be able to carry out scientific activities well. Mastery of statistics is indispensable for people who will draw valid conclusions. Statistics must be seen as parallel to mathematics

Keywords: Means, Thinking, Systemic

INTRODUCTION

Human beings are intelligent creatures, reason distinguishes humans from other creatures, such as animals and plants and even jinn and angels. Humans have the ability to achieve their goals in everyday life by using their minds. Humans can make equipment to meet their needs. Human ability to make tools is not something that can be done just like that, but has been through a process of experience. The experiences that have been passed form the basis for the

formation of knowledge. With the knowledge that humans already have, they can make these tools.

Knowledge gained through experience to make tools causes humans to continue to develop their knowledge, to develop this knowledge, tools are also needed. Good tools enable humans to acquire new knowledge through correct thinking activities.

Thinking right requires means or tools of thinking. This means is certain, so scientific activity will not be maximized without the means of scientific thinking. For a scientist, mastery of the means of thinking is a must, because without mastery of scientific means, he will not be able to carry out good scientific activities¹. Mastery of scientific facilities is very important for scientists to be able to carry out scientific activities well. Scientific thinking tools help humans use their minds to think correctly and find the right knowledge.

This article was written to discuss and understand the means of scientific thinking, including: understanding the means of scientific thinking, the purpose of the means of scientific thinking, the function of the means of scientific thinking, language as a means of scientific thinking, logic as a means of scientific thinking, mathematics as a means of scientific thinking, and statistics as a means of thinking. means of scientific thinking.

This discussion also chooses the library research method. Library research is research carried out using literature (library), both in the form of books, notes, and reports of previous research results². To focus the discussion this time, the author is more focused on several things, namely 1) what is the meaning of the means of systemic thinking?, 2) what are the means used in systemic thinking?. So the specific goal is to know the meaning and various kinds of means of systemic thinking.

FINDINGS AND DISCUSSION

Understanding the means of scientific thinking

According to Surisumantri "Scientific facilities are basically tools that help scientific activities in various steps



that must be taken". Scientific facilities are tools, with these tools humans carry out scientific activities. When humans carry out the stages of scientific activity, they need thinking tools that are in accordance with these stages. Humans are able to develop their knowledge because humans think according to a scientific framework and use the right thinking tools.³

To gain knowledge, scientific thinking is needed. The means of thinking are needed to carry out scientific activities properly and regularly. There are four means of scientific thinking, namely: language, logic, mathematics and statistics⁴. Scientific thinking tools in the form of language as a verbal communication tool to convey thoughts to others, logic as a thinking tool to conform to the rules of thinking so that it can be accepted by others, mathematics plays a role in deductive thinking patterns so that other people can follow and trace back the process. thinking to find the truth, and statistics play a role in inductive thinking patterns to find the truth in general.

The purpose of the means of scientific thinking

The purpose of studying scientific tools is to enable us to do scientific studies well, while the purpose of studying science is to gain knowledge that allows us to be able to solve our everyday problems.

A distinction must be made between the purpose of studying scientific means and the purpose of studying science. The purpose of studying scientific means is to be able to carry out scientific study activities. To maximize the human ability to think according to the right frame of mind, it is necessary to have good knowledge of scientific thinking tools. Humans study science in order to solve the problems that occur in their lives. With the knowledge that has been learned, humans can increase the prosperity of their lives.

Functions of scientific thinking tools

According to Suriasumantri "... the function of scientific facilities is to assist the process of the scientific method, and

not a science itself".

Scientific facilities have distinctive functions in scientific activities as a whole in achieving a certain goal⁵. All stages of scientific activity require tools in the form of scientific thinking tools. The means of scientific thinking are only tools for humans to think scientifically in order to gain knowledge. The means of scientific thinking is not a science that is obtained through the process of scientific activity.

Language as a means of scientific thinking

One of the differences between humans and other creatures is the human ability to speak. Language has a very important role in human life, including scientific activities. Scientific activities are closely related to language. Using good language in thinking helps to communicate thoughts to others. Thinking as a result of human brain activity will be meaningless if it is not known by others. The way to communicate it to others is to use the means of language.

Language is a symbol of a series of sounds that form a certain meaning⁶. Language is a statement of thoughts or feelings as a means of human communication consisting of words or terms and syntax. Words or terms are symbols of the meaning of something, while syntax is a way of arranging words into meaningful sentence.⁷

An object can be represented by a certain sound. For example, a pointed instrument filled with ink and used for writing is represented by the sound "pen." To symbolize the same color as blood, the sound "red" is used. From these two words (pen and red) a meaningful sentence can be made into "Andi bought a red pen".

According to Bakhtiar, the elements contained in language are: (a) Symbols, (b) Vocal symbols, (c) Arbitrary vowel symbols, (d) A structured system of arbitrary symbols, (e) Used by members of a social group as a tool to get along with each other.⁸

Language contains elements of symbols, something spoken by humans is an activity to symbolize a real object in the practical world. In order for the symbol to fulfill the



speaker's purpose, the symbol must be pronounced with a certain sound that can be heard by the intended person, making it easier for the listener to clearly identify the object intended by the speaker. The sound of an object's symbol does not have to be the same between speech and the meaning it contains, meaning that the meaning of an object can be pronounced with different words for different regions or communities. Members of a social group community use language to interact with one another.

Language communicates three things, namely thoughts, feelings, and attitudes⁹. Humans can convey something that is thought to others using language. With language, other people can know and learn something that is being thought. With language, humans can also express something they feel to others. Other people can tell someone is sad or happy through the language that is symbolized.

Scientific work is basically a collection of statements that convey information about knowledge and ways of thinking in obtaining that knowledge. To be able to communicate a statement clearly, one must master a good language.¹⁰

When humans have acquired knowledge through scientific activities carried out, they must communicate the results that have been obtained so that their knowledge can be useful for the prosperity of mankind. The things that must be communicated include the way of thinking to acquire knowledge and knowledge itself. This communication is contained in a scientific paper. To be able to compile a scientific work, it is required the ability to master good and correct language. Without mastering a good language, it is impossible to compose a scientific paper.

Sumarna "Through human language with other human beings can add to each other and share the knowledge they have". Language is a means to share with fellow human beings. A person can tell something he knows to others by using language. In the process of sharing, humans experience additional knowledge, become aware of something that was previously unknown.¹¹

Suriasumantri in scientific communication emphasizes the symbolic function of language. In scientific communication, the communication process must be free from emotive elements so that the message conveyed can be received reproductively, meaning the same as the message sent¹².

Language is a means of communication, so everything related to communication cannot be separated from language, as well as systematic thinking in acquiring knowledge. Without language skills, a person will not be able to carry out scientific activities systematically and correctly.

In scientific communication must pay attention to the symbolic function of language, because scientific communication is carried out to convey information in the form of knowledge to others. In order for communication to work well, it must use language that is free from emotive elements. The emotive element in language will only disrupt scientific communication so that the message conveyed cannot be well received by the recipient. Symbolic communication that is free from emotive elements can prevent misinformation. Language as a scientific tool has weaknesses. According to Suriasumantri, these weaknesses include: (a) language is multifunctional, (b) language has an unclear and exact meaning contained by the words that make up the language, (c) language has several words that convey the same meaning, and (d) emotional connotation.¹³

The existence of language as a means of scientific thinking turns out to have weaknesses inherent in the language. Language is difficult to be separated from one's emotions and attitudes, while language as a scientific tool is required to be objective so that the information communicated can be well received by others. The next weakness is that it is difficult to define an object as clearly as possible, sometimes because of the desire to provide a detailed explanation of an object, what happens is that the communication seems long-winded and becomes unclear.

Weaknesses in language can also be seen from the

existence of several words that have the same meaning or vice versa, it is enough to use only one word. In addition, there is another language weakness, namely language is difficult to be separated from one's emotions. There are certain meanings that can be added to the true meaning as a result of a person's emotions.

Logic as A Means Of Scientific Thinking.

According to Bakhtiar "Logic is a means to think systematically, validly and can be accounted for. Therefore, logical thinking is thinking according to the rules of thinking, such as half cannot be greater than one.¹⁴

Logic is a collection of rules that provide a way (system) of thinking in an orderly and orderly manner so that the truth can be accepted by others. Logic will provide a measure (norm) which is an assumption about right and wrong of a truth. The measure of truth is logical.¹⁵

Logic is a field of knowledge that studies the principles, rules, and procedures of correct reasoning. In other terms, logic is a way or way to obtain true knowledge.

As a means of scientific thinking, logic directs humans to think correctly according to the rules of right thinking. With human logic can think systematically and can be accounted for the truth. If you want to do thinking activities correctly, you must use logical thinking rules. With logic it can be distinguished between the right thinking process and the wrong thought process.

According to Susanto, there are three important aspects in understanding logic, in order to have an understanding of reasoning which is a form of thinking, namely understanding, proposition, and reasoning. Understanding is a response or picture formed by the mind about the reality that is understood, or is the result of human knowledge about reality. A proposition or statement is a series of notions formed by reason or is a statement about the relationship that exists between two terms. Reasoning is a thought process that produces knowledge.¹⁶

The existence of these three aspects is very important in understanding logic. Starting from forming a picture of the object that is understood, then assembling it into a relationship between objects, and finally doing the right thinking process to produce knowledge. These three aspects of logic must be understood together for anyone who wants to understand and carry out scientific activities. Without going through the three processes of logical aspects, humans will find it difficult to obtain and produce correct scientific activities.

There are two ways of drawing conclusions through the workings of logic. The two methods are inductive and deductive. Inductive logic is a way of drawing conclusions from real individual cases into general and rational conclusions. Deductive logic is a way of drawing conclusions from general, rational things into specific cases according to the facts on the ground.¹⁷ The two types of logical thinking are not two poles that are opposite and knock each other down.

The two types of logical thinking are two complementary tools, meaning that one time inductive logic is needed and must be used to solve a problem, and at other times who cannot use inductive logic to solve problems, deductive logic can be used. Someone who is thinking does not have to use both types of logical thinking, but can use one logical thinking according to the needs of the object and its individual abilities.

Mathematics as a Means of Scientific Thinking

Language as a verbal communication tool has many weaknesses, because not all statements can be symbolized by language. To overcome these language weaknesses, mathematical tools are used. Suriasumantri, "Mathematics is a language that seeks to remove the grave (pen: fuzzy), compound and emotional nature of verbal language"¹⁸

Mathematics as a means of deductive thinking uses artificial language, which is purely a man-made language. The specialty of this language is that it is free from emotive



and effective aspects and clearly shows the form of the relationship. Mathematics is more concerned with the logic of its statements that have a clear nature.¹⁹

With mathematics, the fuzzy, compound and emotional nature of language can be removed. Symbols used in mathematics are more precise and clear, these symbols cannot be interfered with by someone's emotions, a symbol in mathematics clearly only contains one meaning so that other people cannot provide an interpretation other than the intent of the information provider. For example, someone who says: "I have one younger sister", other people can accept that that person has one younger sister, it is unlikely that other people will have the interpretation that that person has two or three younger siblings.

Mathematics develops a numerical language that allows us to make quantitative measurements."²⁰ Mathematics usually uses numeric language which denies emotional, vague and compound elements as found in ordinary language.

Statistics as a means of scientific thinking

Through this element, humans can make quantitative measurements that are not obtained in language which always gives the possibility of using qualitative feelings.²¹

Mathematics makes it possible to make clear measurements. To compare the height of two different objects, for example a corn tree and a mango tree. With language it can only be said that the mango tree is taller than the corn tree, but it is not clear what the difference in the height of the two trees is. With mathematics, the difference in the height of the two trees can be known clearly and precisely. For example, after measuring it turns out that the height of the corn tree is 100 cm and the height of the mango tree is 250 meters, it can be said that the mango tree is 150 cm taller than the corn tree. Mathematics provides more exact answers and enables humans to solve their daily problems more precisely and thoroughly. Mathematics as a means of deductive thinking, allows humans to develop

their knowledge based on existing theories. For example, the sum of the angles of a circle is 3600.

From this knowledge can be developed, such as the measure of the circumference of a circle is equal to half the measure of the central angle when facing the same arc. Suriasumantri "Statistics must have an equal place with mathematics so that the balance of deductive and inductive thinking which is a characteristic of scientific thinking can be carried out properly". People who want to be able to carry out scientific activities well should not underestimate statistics. Mastery of statistics is indispensable for people who will draw valid conclusions. Statistics should be seen as parallel to mathematics. If mathematics is a means of deductive thinking, people can use statistics to think inductively.

Mathematics and statistics are both needed to support correct scientific activities so that they will produce correct knowledge. Suriasumantri Statistics is a means of thinking needed to process knowledge scientifically. As part of the toolkit of the scientific method, statistics help us to generalize and conclude the characteristics of an event more precisely and not by chance.²²

Statistics as a means of scientific thinking does not provide certainty but provides a level of probability that for certain premises a conclusion can be drawn, and the conclusion may or may not be true. The steps taken in inductive logic using statistics are: (a) Observation and experimentation, (b) come up with scientific hypotheses, (c) Verification and measurement, and (d) A scientific theory and law.²³

To find out the state of an object, one does not have to take measurements one by one on all the same objects, but simply by measuring some of the objects being sampled. Although the measurement of the sample will not be as accurate as if the measurement is carried out on the population, the results of the sample measurement can be justified.



CONCLUSION

Scientific thinking tools are tools to assist scientific activities in various steps that will be taken in order to acquire knowledge correctly. The purpose of studying the means of scientific thinking is to be able to carry out scientific research activities properly to obtain correct knowledge so as to increase the prosperity of life.

Logic as a means of scientific thinking directs humans to think correctly according to the rules of right thinking. Logic helps humans to think systematically which can be justified. If you want to do thinking activities correctly, you must use logical thinking rules. Logic can distinguish between right thinking processes and wrong thinking processes.

Statistics should not be underestimated by people who want to be able to carry out scientific activities well. Mastery of statistics is indispensable for people who will draw valid conclusions. Statistics should be seen as parallel to mathematics. If mathematics is a means of deductive thinking, people can use statistics to think inductively. Deductive thinking and inductive thinking are needed to support correct scientific activities so that they will produce correct knowledge as well.

Endnote:

¹UGM, T. D. F. I. (2010). *Filsafat Ilmu Sebagai Dasar Pengembangan Ilmu Pengetahuan*. Liberty.

²Hasan, I. (2008). *Analisis Data Penelitian Dengan Statistik*. Bumi Aksara.

³Sumantri, J. S. (2003). *Filsafat Ilmu Sebuah Pengantar Populer*. Pustaka Sinar Harapan.

⁴Ibid

⁵Ibid

⁶Ibid

⁷UGM, T. D. F. I. (2010). *Filsafat Ilmu Sebagai Dasar Pengembangan Ilmu Pengetahuan*. Liberty

⁸Bakhtiar, A. (2009). *Filsafat Ilmu*. PT. RajaGrafindo Persada.

⁹Sumantri, J. S. (2003). *Filsafat Ilmu Sebuah Pengantar Populer*. Pustaka Sinar Harapan.

¹⁰ibid

¹¹Sumarna, C. (2008). *Filsafat Ilmu*. Mulia Press.

¹²Sumantri, J. S. (2003). *Filsafat Ilmu Sebuah Pengantar Populer*. Pustaka

Sinar Harapan.

¹³ Ibid.

¹⁴ Bakhtiar, A. (2009). *Filsafat Ilmu*. PT. RajaGrafindo Persada.

¹⁵ Sumarna, C. (2008). *Filsafat Ilmu*. Mulia Press.

¹⁶ Susanto, A. (2011). *Filsafat Ilmu*. PT. Bumi Aksara.

¹⁷ Sumarna, C. (2008). *Filsafat Ilmu*. Mulia Press.

¹⁸ Sumantri, J. S. (2003). *Filsafat Ilmu Sebuah Pengantar Populer*. Pustaka

Sinar Harapan.

¹⁹ UGM, T. D. F. I. (2010). *Filsafat Ilmu Sebagai Dasar Pengembangan Ilmu Pengetahuan*. Liberty

²⁰ Ibid.

²¹ Sumarna, C. (2008). *Filsafat Ilmu*. Mulia Press.

²² Sumantri, J. S. (2003). *Filsafat Ilmu Sebuah Pengantar Populer*. Pustaka

Sinar Harapan.

²³ Sumarna, C. (2008). *Filsafat Ilmu*. Mulia Press.

Bibliography

- Bakhtiar, A. (2009). *Filsafat Ilmu*. PT. RajaGrafindo Persada.
- Hasan, I. (2008). *Analisis Data Penelitian Dengan Statistik*. Bumi Aksara.
- Sumantri, J. S. (2003). *Filsafat Ilmu Sebuah Pengantar Populer*. Pustaka Sinar Harapan.
- Sumarna, C. (2008). *Filsafat Ilmu*. Mulia Press.
- Susanto, A. (2011). *Filsafat Ilmu*. PT. Bumi Aksara.
- UGM, T. D. F. I. (2010). *Filsafat Ilmu Sebagai Dasar Pengembangan Ilmu Pengetahuan*. Liberty.