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Learning to Develop Students' Deductive Scientific Reasoning Patterns Through Sherlock Holmes Novels and Short Stories

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Abstrak

Penelitian ini bertujuan memberikan deskripsi terkait pembelajaran pengembangan pola penalaran ilmiah deduktif siswa melalui novel dan cerita singkat Sherlock Holmes. Penelitian ini merupakan penelitian kuantitatif sedangkan metode yang digunakan adalah semi eksperimen. Pendekatan kuantitatif yang digunakan meliputi uji Mann-Whitney. Kesimpulan dari penelitian ini adalah bahwa: 1) untuk uji Mann-Whitney terhadap nilai pretes kelompok control dan kelompok eksperimen disimpulkan bahwa sebelum adanya perlakuan atau treatmen kedua kelompok yaitu control dan eksperimen memiliki kemampuan yang sama dalam penguasaan penalaran ilmiah deduktif siswa; 2) untuk uji Mann-Whitney terhadap nilai postes kelompok control dan kelompok eksperimen disimpulkan bahwa sesudah adanya perlakuan atau treatmen kedua kelompok yaitu control dan eksperimen memiliki kemampuan yang berbeda dalam penguasaan penalaran ilmiah deduktif. Berdasarkan kedua pengujian bahwa memang terdapat perbedaan antara kondisi sebelum dan sesudah diberikan perlakuan atau treatmen terhadap penguasaan penalaran ilmiah deduktif siswa melalui pembelajaran novel dan cerita pendek Sherlock Holmes.

Keywords:
deductive;
logic;
scientific reasoning.

Abstract

This study aims to provide a description related to learning to develop students' deductive scientific reasoning patterns through novels and short stories of Sherlock Holmes. This research is a quantitative research while the method used is semi-experimental. The quantitative approach used includes the Mann-Whitney test. The conclusions of this study are that: 1) for the Mann-Whitney test on the pre-test scores of the control group and the experimental group it was concluded that before the treatment or treatment the two groups, namely the control and the experiment, had the same ability in mastering students' deductive scientific reasoning; 2) for the Mann-Whitney test on the post-test scores of the control group and the experimental group it was concluded that after the treatment or treatment the two groups, namely the control and the experiment, had different abilities in mastering deductive scientific reasoning. Based on the two tests that there is indeed a difference between the conditions before and after being given treatment or treatment of students' mastery of deductive scientific reasoning through learning Sherlock Holmes novels and short stories.

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INTRODUCTION

Learning is the main activities in the educational process. National education in Indonesia is defined as a conscious and planned effort to create a learning atmosphere and learning process, so that students actively develop their potential so that they have religious spiritual strength, self-control, personality, intelligence, noble character, and the skills needed both for themselves. students themselves as well as for the community, nation and country (Hanafy, 2014).

Learning is an activity carried out by the teacher under certain conditions, so that the cognitive, affective and psychomotor students change in a better direction. Learning aims to help students to gain various experiences. Based on this experience, the behavior of students which includes knowledge, skills, and values or norms that function as controllers of attitudes and behavior of students increases, both in quantity and quality (B. B. Yusuf, 2017).

Basically, every learning process that is carried out is directed to achieve the goals that have been determined. In the learning process there is interaction between various components, the learning components can be grouped into 3 categories, namely: teacher, teaching materials, and students. 1 The role of the teacher is very important because it functions as a guide who conveys and transfers teaching materials in the form of knowledge as well as students who act as knowledge gainers, while the teaching material delivered by the teacher is information or messages that must be learned by students to be understood, internalized, and practiced as provisions to complete their studies later (Abdullah, 2017).

Learning is a complex aspect of human activity, which is not fully explainable. Learning can be interpreted as a product of continuous interaction between development and life experiences. Learning in a complex sense is a conscious effort from a teacher to teach his students (directing student interaction with other learning resources) in order to achieve the expected goals (M. Yusuf & Syurgawi, 2020).

Learning always involves scientific means. Scientific facilities are basically tools that assist scientific activities in various steps that must be taken. To be able to carry out scientific thinking activities properly, facilities are needed in the form of language, mathematics, statistics and logic, so that scientific activities can run well, orderly and carefully (Rijal & Sere, 2017). All reasoning that uses the mind is of course based on logic. With it, the relationship between statements can be obtained. However, not all assumptions or statements are related to logic. Only what is true or false can be connected with logic (Imron Mustofa, 2016).

Reasoning usually begins with thinking because thinking is an activity to find true knowledge. What is true for everyone is not the same, so therefore the thinking process activities to produce correct knowledge are also different (Budiyono Hari, Kusumana Ade, 2020). It can be said that every line of thought has what is called a criterion of truth, and this criterion of truth is the basis for the process of discovering that truth. reasoning is a process of finding the truth in which each type of reasoning has its own criteria.

Reasoning has several meanings, namely (1) the process of thinking logically, systematically, organized in an interconnected sequence up to a conclusion; (2) connecting facts or data to a conclusion; (3) the process of analyzing a topic so as to produce a new conclusion or understanding; (4) examine, discuss, or analyze by linking the variables studied to produce a degree of relationship or conclusion; and (5) discussion of the problem to produce a conclusion in the form of new knowledge or understanding (Widjono, 2012). Reasoning is "the process of drawing conclusions (conclusion, inference) from evidence or evidence, or what is considered evidence or guidance. In general, there are two ways to draw conclusions, namely inductive and deductive (Alek & Ahmad, 2011).

Deductive reasoning is a thinking process starting from general ideas followed by specific details. According to Alek and Ahmad (2011), deductive reasoning is called reasoning from the general to the specific. Widjono (2012) states that deductive reasoning is a process of logical thinking that begins with the presentation of general facts, accompanied by specific evidence and ends with specific conclusions in the form of principles, attitudes or facts that apply specifically.

Science can simply be defined as knowledge that has been tested for its truth. All scientific statements are factual in nature where the consequences can be tested either by using the five senses, or by using tools that help the five senses. Empirical testing is one the link in the scientific method that distinguishes science from other knowledge (Rijal & Sere, 2017). Deductive reasoning is a framework or way of thinking that departs from an assumption or general statement to reach a conclusion that has more specific meaning. It is also often interpreted

in terms of minor logic, because it deepens the basics of conformity in thinking with certain laws, formulas and standards. The pattern of drawing conclusions in the deductive method refers to a pattern of thinking called a syllogism. That is starting from two or more statements with a conclusion. Which two statements are often referred to as the minor premise and the major premise. And always followed by conclusions obtained through reasoning from the two premises. However, the conclusion here is only true if the two premises and methods used are also true, and the results also show the coherence of the data (Mustofa, 2016). Novels and short stories of Sherlock Holmes reveal a lot of ways of thinking using deductive logic. So it is very suitable for student development learning in applying deductive scientific reasoning.

Sherlock Holmes novels and short stories written by Sir Arthur Conan Doyle are a genre that elevates detective stories in which there is a lot of disclosure and contains deductive logical reasoning. This study aims to provide a description related to learning to develop students' deductive scientific reasoning patterns through novels and short stories of Sherlock Holmes.

METHOD

The method as a work tool is more emphasized on how the mind works in order to understand the object of research. In this study the method used is semi-experimental. While the approach used in this study is quantitative with the Mann-Whitney test method. In principle, hypothesis testing through this distribution is applied to ensure the same or different values of the two sample groups (which are assumed to represent two populations) or two groups of variables that are determined independently. Because testing this hypothesis involves a value marked with the letter U to formulate test criteria and final conclusions, it is also known as the U test (U test). The U value of the control group (U_1) and the experimental group (U_2) is known by applying the formula:

$$U_1 = (n_1 \, x \, n_2) + \frac{n_1 \, x \, (n_1 + 1)}{2} - R_1$$

$$U_2 = (n_1 \, x \, n_2) + \frac{n_2 \, x \, (n_2 + 1)}{2} - R_2$$

Where U_1 is the calculated U value in the first sample group and U_2 is the calculated U value in the second sample group, R_1 is the total number of levels in the first sample group, R_2 is the overall number of levels in the second sample group, n1 is the number of samples in the first group, n2 is the number of samples of the second group, and 1 and 2 are constants. Of the two calculated U values, the smaller value is chosen. The U value resulting from a larger calculation is denoted as U'. The U' value is used to check again whether the calculated U value is correct. Re-examination of the calculated U value is carried out through the formula.

$$U = (n_1 \, x \, n_2) - U'$$

Research design is the whole of planning to answer research questions and anticipate some difficulties that may arise during the research process. This is important because research design is a strategy for obtaining the data needed for the purposes of testing hypotheses or for answering research questions, and as a tool for controlling variables that influence research.

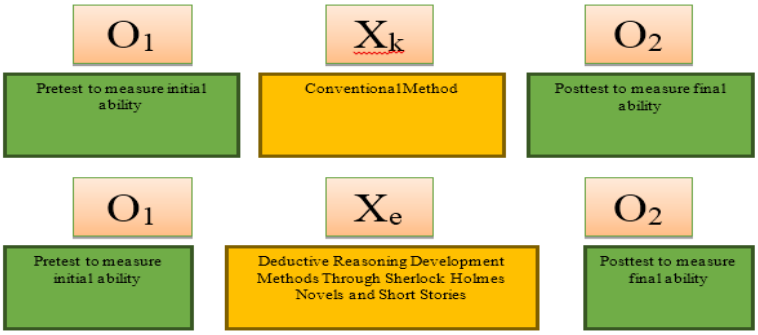

Figure 1. Research Design

Information:

X_k = treatment/treatment given to the control group

X_e = treatment/treatment given to the experimental group

O_1 = pretest

O_2 = post test

The sampling technique used for this design is purposive sampling. Purposive sampling is a sampling technique with certain considerations. The consideration in taking the sample was that the research was intended specifically to examine class XI high school students in Pemalang Regency.

RESULT AND DISCUSSIONS

To carry out scientific activities properly, a means of thinking is needed. The availability of these facilities allows scientific research to be carried out regularly and carefully. Mastering the means of scientific thinking is an imperative thing for a scientist. Without mastering this, good scientific activities cannot be carried out. Scientific facilities are basically tools that assist scientific activities in various steps that must be taken (Rijal & Sere, 2017).

The following is the treatment or treatment given to the experimental class related to learning the development of deductive scientific thinking patterns through Sherlock Holmes novels and short stories.

1. Deductive

Reasoning is the human ability to see and respond to what he sees. Because man is a creature who develops knowledge in a serious way, with this knowledge he is able to distinguish between what is good and what is bad. Reasoning is also the ability to think fast, precise and steady. In addition, reasoning is a process of thinking and drawing conclusions in the form of knowledge (Sudria, 2014).

Deduction is a way of thinking where from general statements specific conclusions are drawn, besides that the deductive method is a way of handling a particular object by drawing conclusions about general matters. Deductive logic is a variety of logic that studies the principles of deductive reasoning, namely a reasoning that derives a conclusion as a necessity from its base of thought so that it is correct according to form alone (Masykur, 2019).

Deductive drawing of conclusions usually uses a mindset called a syllogism. Statements that support this syllogism are called premises which can then be distinguished as a major premise and a minor premise (Sari, 2016). Conclusion is knowledge gained from deductive reasoning based on these two premises. Deductive logic talks about ways to reach conclusions when questions have first been asked about all or a number of these among a group of things. A valid conclusion to a deductive reasoning is always a necessary consequence of the questions that were previously asked. The discussion of deductive logic is very broad and includes one of the most interesting issues.

Example of Deduction
An example of making a syllogism is as follows:
All living things need air (Major premise)
Goddesses are living beings (Minor premise)
So the Goddess needs air (Conclusion)

The conclusion drawn that the Goddess needs air is valid according to deductive reasoning, because this conclusion is drawn logically from the two premises that support it. The question is whether the conclusion is correct, then it can be ascertained that the conclusions drawn are also correct. It is possible that the conclusion is wrong, even though both premises are true, if the method of drawing the conclusion is not valid. Thus, the accuracy of drawing conclusions depends on three things, namely the truth of the major premise, the truth of the minor premise and the validity of the conclusion.

2. Sherlock Holmes Novels and Short Stories

Sherlock Holmes is a fictional detective character created by Sir Arthur Conan Doyle, a Scottish author and physician. Holmes, who describes himself as a "consulting detective", is known for his acumen of logical reasoning, ability to disguise himself, and skill in using forensic science to solve various cases. Holmes, who first appeared in 1887, is a character in four novels and 56 short stories. The first novel featuring him, The Search for the Red Thread, was published in Beeton's Christmas Annual in 1887. Meanwhile, the second novel, The Four Treasure Hunters, was published in Lippincott's Monthly Magazine in 1890. The character gained popularity after his short stories were serialized in The The Strand Magazine, beginning with Scandal in Bohemia in 1891 which continued until 1927 with the addition of two novels. The novels and short stories are set in the 1880s to 1914.

Almost all of Holmes' adventure stories are narrated by his best friend, dr. John H. Watson, except for two which he tells himself (The Case of the Pale-Faced Soldier and The Mystery of the Lion's Mane) and two which are written in third person (The Case of the Mazarin Stone and The Last Salutation). In two stories, The Ritual of the Musgraves and The Gloria Scott Ship, Holmes initially tells Watson what he remembers about the case, which Watson later expands on. The first and fourth novels, The Search for the Red Thread and The Valley of Fear, each have an omniscient third-person retelling section that neither Holmes nor Watson know (KITTLE, 1960).

Sherlock Holmes Novels
A Study in Scarlet (1887)
The Sign of Four (1890)
The Hound of the Baskervilles (1902)
The Valley of Fear (1915)
Sherlock Holmes Short Story Collections
The Adventures of Sherlock Holmes (1892)

The Memoirs of Sherlock Holmes (1894)
The Return of Sherlock Holmes (1905)
His Last Bow (1917)
The Case-Book of Sherlock Holmes (1927)
The Complete Sherlock Holmes Short Stories (1928)

The following presents data regarding the pretest and posttest values of the two groups, namely control and experiment:

Table 1. Pretest and Posttest Values of the Control and Experiment Groups

Control Group		Experiment Group	
Pretest	**Postest**	**Pretest**	**Postest**
85	85	85	100
55	60	85	90
35	80	75	100
65	75	70	100
35	55	55	75
55	95	55	75
35	55	60	55
45	65	75	85
65	85	45	65
40	75	65	95

The following shows the results of the Man Whitney test for the pretest and posttest values of the control group and the experimental group:

With regard to this study, in essence, the null hypothesis and the alternative hypothesis formulated state that:

1. For the Mann-Whitney test pretest control group and experimental group

H_0 : There is no difference in the pretest scores of the control group and the experimental group

H_1 : There are differences in the pretest scores of the control group and the experimental group

2. For the Mann-Whitney posttest control group and experimental group

H_0 : There is no difference in the post-test scores of the control group and the experimental group

H_1 : There are differences in the post-test scores of the control group and the experimental group

In this study, the hypothesis testing carried out was a one-sided test, namely the right side. For one-tailed testing, the significance level applied is 2.50%. If we look at the table, the U value for the number of samples in the control group (n1) is 10 and the number of samples in the experimental group (n2) is 10 and a significance level of 2.50% is 23. The U value is the basis for the formulation of the test criteria and final conclusions.

So the testing criteria applied to this case is that the null hypothesis can be accepted if

$$U \leq 23$$

While the null hypothesis is declared rejected if

$$U > 23$$

At this stage, the number of levels must be calculated first so that the value of U can be known. The calculation of the number of levels is shown in the following table

Table 2. Mann Whitney Pretest Control Group and Experiment Group Test

Control Group		Experiment Group	
Pretest	**Rank**	**Pretest**	**Rank**
85	19	85	19
55	8.5	85	19
35	2	75	16.5
65	13	70	15
35	2	55	8.5
55	8.5	55	8.5
35	2	60	11

45	5.5	75	16.5
65	13	45	5.5
40	4	65	13
R1	77.5	R2	132.5

From the calculations made with the help of the table above, the overall number of levels for the control group (R1) is 77.5 and the experimental group (R2) is 132.5. These two values are used as the basis for calculating the U value. The U value of the control sample group is equal to

$$U_1 = (n_1 \, x \, n_2) + \frac{n_1 \, x \, (n_1 + 1)}{2} - R_1$$

$$U_1 = (10 \, x \, 10) + \frac{10 \, x \, (10 + 1)}{2} - 77{,}5 = (100 + 55) - 77{,}5 = 77{,}5$$

While the U value of the experimental sample group is equal to

$$U_2 = (n_1 \, x \, n_2) + \frac{n_2 \, x \, (n_2 + 1)}{2} - R_2$$

$$U_2 = (10 \, x \, 10) + \frac{10 \, x \, (10 + 1)}{2} - 132{,}5 = (100 + 55) - 132{,}5 = 22{,}5$$

Of the two calculated U values, we determine the smaller value. Therefore, the chosen U value is 22.5. Meanwhile, the larger U value, which is 77.5, is chosen as U'. In order to make the calculation of the value of U more convincing, we need to apply the calculation in another way to determine the value of is

$$U = (n_1 \, x \, n_2) - U'$$

$$U = (10 \, x \, 10) - 22{,}5 = 77{,}5$$

Apparently, the value is also the same as the value obtained through the first method. So that the calculated U value is indeed 22.5.

From the results of the calculations carried out in the previous stages, the value of U is 22.5. This value is clearly smaller than the U value in the table of 23. In accordance with the applicable testing criteria, the null hypothesis which states that there is no difference in the pretest scores of the control group and the experimental group is declared accepted. While the alternative hypothesis which states that there are differences in the pretest scores of the control group and the experimental group is rejected.

The following presents the results of the Man Whitney test for the post-test scores of the control group and the experimental group:

Table 3. Mann Whitney Posttest Control Group and Experiment Group Test

Control Group		Experiment Group	
Postest	**Rank**	**Postest**	**Rank**
85	13	100	19
60	4	90	15
80	11	100	19
75	8.5	100	19
55	2	75	8.5
95	16.5	75	8.5
55	2	55	2
65	5.5	85	13
85	13	65	5.5
75	8.5	95	16.5
R1	84	R2	126

From the calculations made with the help of the table above, the overall number of levels for the control group (R1) is 84 and the experimental group (R2) is 126. These two values are used as the basis for calculating the U value. The U value of the control sample group is equal to

$$U_1 = (n_1 \, x \, n_2) + \frac{n_1 \, x \, (n_1 + 1)}{2} - R_1$$

$$U_1 = (10 \, x \, 10) + \frac{10 \, x \, (10 + 1)}{2} - 84 = (100 + 55) - 84 = 71$$

While the U value of the experimental sample group is equal to

$$U_2 = (n_1 \, x \, n_2) + \frac{n_2 \, x \, (n_2 + 1)}{2} - R_2$$

$$U_2 = (10\ x\ 10) + \frac{10\ x\ (10+1)}{2} - 126 = (100 + 55) - 126 = 29$$

Of the two calculated U values, we determine the smaller value. Therefore, the selected U value is 29. While the larger U value, namely 71, is selected as U'. In order to make the calculation of the value of U more convincing, we need to apply the calculation in another way to determine the value of is

$U = (n_1\ x\ n_2) - U'$

$U = (10\ x\ 10) - 29 = 71$

Apparently, the value is also the same as the value obtained through the first method. So that the calculated U

value is indeed 29.

From the results of the calculations carried out in the previous stage, the U value is 29. This value is clearly greater than the U value in the table of 23. In accordance with the applicable testing criteria, the null hypothesis states that there is no difference in the post-test scores of the control group and the experimental group. rejected. While the alternative hypothesis which states that there are differences in the post-test scores of the control group and the experimental group is declared accepted.

Deductive logic is a reasoning system that examines valid inference principles based on their form and the resulting conclusions as a necessity are derived from the base of the mind. In this logic what is mainly studied is the form of the work of the mind if it has been coherent and in accordance with reasoning which can be proven without any other conclusions because the inference process is correct and valid. Deductive logic because it talks about the relationship of the main forms of statements regardless of what content is described because deductive logic is also called formal logic (Rakhmat, 2013). Novels and short stories of Sherlock Holmes reveal a lot of ways of thinking using deductive logic. So it is very suitable for student development learning in applying deductive scientific reasoning.

So that in a scientific discourse, the study of logic has a significant contribution to the development of it. What's more, the condition of society that generally tends to be practical seems to have led students to forget this most important aspect of scientific discourse. In fact, a concept is considered scientific if it is able to prove the validity of its argument, of course, which is structured in a logical systematic, using either the five senses or others. So here between explanations and evidence there is an irreplaceable thread (Arifin & Nurdyansyah, 2018). So it appears that a good presentation will be the keyword of the most basic scientific criteria. So that the expression that the scientific method of thinking has an important role in supporting humans to gain new scientific horizons in ensuring human existence is not mere boasting. By using scientific thinking methods, humans continue to develop their knowledge.

So it has become a necessity for the scientific world to make a discourse on a method of thinking that is compatible with logic as an in-depth discussion. So whether or not the determination of the choice of methods or ways that might be taken will determine the final outcome of the discourse. Therefore, finally the question arises about how and when a method in the logic of scientific thinking can be accepted and used in line with this discourse (Sandra et al., 2016).

One thing in the logic of reasoning, which is taken into consideration are the statements that existed before. Each can only be true or false but not both. This is what was previously referred to as a proposition. The propositions that have been collected can later be evaluated in several ways, such as: deduction and induction (Winarso, 2014). The deduction method is the opposite of the induction method, because it draws conclusions to a more specific, and detailed.

Deductive reasoning is a way of logical and analytical thinking, which grows and develops with increasingly intense, systematic and critical observations. Also supported by the increase in knowledge acquired by humans, which will eventually lead to an attempt to answer problems rationally so that their contents can be accounted for, of course by setting aside irrational things. Meanwhile, rational problem-solving means that there is a focus on human ratios in an effort to obtain correct knowledge. And the understanding that bases itself on this process is known as the understanding of rationalism (Imron Mustofa, 2016).

The deductive method and this understanding have mutual attachments, because in compiling the logic of knowledge, rationalist scientists tend to use deductive reasoning. Furthermore, deduction is often born from a presumption of the majority of people. So that it can almost be said that every decision is a deduction, and every deduction is taken from a generalization in the form of an inductive generalization based on the particular things observed. This generalization occurs due to an error in the interpretation of the existing evidence (Izhar, 2016).

There are several theories that are often associated with deductive reasoning. Among them "coherence theory", as well as "pragmatic theory of truth." The latter is a process of empirical evidence in the form of collecting real facts that support all previous statements. The originator of this theory is Charles S. Pierce in a paper entitled "how to make our ideas clear?" published in 1878. For a pragmatist, the truth of a statement is measured by whether it is functional in practical life. In other words, a statement is true if it has consequences for practical use in human life. So that deductive reasoning is also often interpreted as an experimental method (Asrobuanam & Sumaji, 2020).

The advantage of this model is that it lies in the need for intense focus in analyzing an understanding in terms of the material, so that time can be used more efficiently. Even from another point of view the skills used could be arranged more neatly, this can happen because the points to be achieved are clear. Moreover, this approach is suitable for use in the learning process, just as the teacher provides information before starting learning (Haeniah, 2019). In addition to deduction, the conclusion is a logical consequence of the premises. So that in a good reasoning, the conclusion can be true when the premises are true.

The weakness lies in the activity of drawing conclusions which are limited to a certain scope. And if one of the two premises, or even both, is wrong, then the conclusions obtained based on these premises will also be wrong (Qodri, 2019). Another weakness is that conclusions drawn based on deductive logic cannot be broader than the initial premise, so it is difficult to obtain scientific progress if only relying on deductive logic. In addition, if the argument is tested for the truth, then what may be tested is only the form or pattern of reasoning but not the material premise, so the true or false premise cannot be tested.

According to Sternberg, deductive reasoning is a reasoning process that aims to achieve certain goals related to one or more general statements about what is known. Comparable with Sumaryono's statement which suggests that deductive reasoning requires drawing conclusions from things that are general to things that are specific. The PPPG team also stated that in line with that deductive reasoning is drawing conclusions whose process involves theories or other mathematical formulas that have previously been proven true (Nike, 2015). Thus, deductive reasoning is reasoning that shows a logical step of evidence for general conclusions. Conclusions are based on specific empirical evidence which is then generalized (Wijayanti, 2017).

The implications of this study reveal that deductive reasoning which is trained on students in the form of scientific reasoning learning treatments through Sherlock Holmes novels and short stories will have a good impact on students' logical development. Proving steps that are coherent and in accordance with theorems or axioms teach students to be able to obey the rules and turn their minds to prove the truth. The pattern of drawing conclusions in the deductive method refers to a pattern of thinking called a syllogism. That is starting from two or more statements with a conclusion. Which two statements are often referred to as the minor premise and the major premise. And always followed by conclusions obtained through reasoning from the two premises. However, the conclusion here is only true if the two premises and methods used are also true, and the results also show the coherence of the data.

CONCLUSIONS

Based on the 2 tests above, it can be concluded that there is a difference between the conditions before and after being given treatment or treatment of students' mastery of deductive scientific reasoning through learning Sherlock Holmes novels and short stories. This conclusion is based on the test results for the Mann-Whitney test on the pretest scores of the control group and the experimental group that there was no difference between the two groups, in the sense that before the treatment or treatment the two groups, namely the control and the experiment, had the same ability in mastering students' deductive scientific reasoning; for the Mann-Whitney test, the post-test scores of the control group and the experimental group showed that there was a difference between the two groups, in the sense that after the treatment the two groups, namely the control and the experiment, had different abilities in mastering students' deductive scientific reasoning. While the recommendations given to other researchers are to conduct similar research using different research designs because this research is still in the semi-experimental stage so that there are many other variables that are possible to influence students besides the treatment given.

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