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Scientific Evidence and Their Role in Pedagogical Research

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Abstract
Pedagogical research relies, first of all, on facts that are precisely established and can be empirically verified, explained, and sometimes even predicted. Pedagogical research is also based on well-known pedagogical theories, concepts, and discoveries, with their help the obtained facts are explained. This article discusses about scientific evidence, the role in pedagogical research, which is the result of empirical knowledge.

Keywords: scientific evidence, evidence, empirical evidence, empirical hypotheses, interpretation, scientific explanation.

Introduction

When one hears the word 'evidence', science might not be the first thing that comes to mind. More likely one would think of a police investigation or a court trial where evidence is gathered and presented in an attempt to obtain a criminal conviction. There are similarities between what detectives and scientists do in terms of gathering evidence.

However, there are important differences. In police work, criminal evidence is gathered in order to prove someone guilty of a crime. What does evidence mean in science? First, it is important to be clear on a more basic question. What is evidence in the first place? Evidence is a collection of information. It includes data and facts. Then what is scientific evidence? Scientists use what is called empirical evidence. This is evidence directly collected by observations and measurements. Empirical evidence is classified into two main types: qualitative and quantitative. Qualitative evidence is gathered through observations and reported through written descriptions about the qualities of the observations. Quantitative evidence is collected through measurement and calculations. It involves determining quantities or amounts and sizes. This type of data is reported using numbers or quantities.

Now that a definition for evidence has been established, the next questions to ask are how and why do scientists collect data. The answers reveal the nature of science itself. For scientists, it is not enough just to explain a concept based on ideas. Scientists must be able to show that their explanations are valid. Empirical evidence provides unbiased facts to support scientific ideas as well as to ensure the validity of the experiments scientists conduct. This allows scientists to construct objective explanations for the natural world. These explanations are often presented as models that show relationships between the components of natural systems and describe the causes for the observed phenomenon. Scientific models or explanations of things observed must fit with data that has been collected and analyzed.

Methodology

Scientific evidence is the result of empirical knowledge. The identification of evidences (or evidence) is a prerequisite for scientific research. Evidence is a record of the phenomenon of the material or spiritual world, any phenomenon, property or relationship that has become a proven wealth of knowledge. According to Achinstein [1], science must begin with evidences and end with evidences, regardless of the structure of theoretical structures between the beginning and the end. The concept of evidence has different meanings. Among the numerous definitions of the term "evidence", the following can be noted.

First, evidence as an event of existence, a case, an event, a situation that can be relied upon. They are evidence of life that exists whether people know about them or not.

Secondly, the concept of "evidence" is used to define the perceived events and phenomena of existence. The diversity of human cognitive abilities is shown in such a way that the same evidence of existence can be realized at simple and scientific levels of knowledge, art, journalism or legal practice. Therefore, the level of reliability of different evidences determined by different methods will also be different. Often, scientific evidence and the event of existence seem to be synonymous, and this allows some philosophers and scientists to describe the truth of the evidence as absolute truth. Such a vision does not correspond to the real picture of knowledge, turns it into a dogma and simplifies it [2-8].

Evidence has a complex structure. They include information about existence, interpretation of evidence, method of obtaining and describing it. An important part of the evidence is the information about the existence that enables the formation of an idea about the existence or some of its properties. Evidence's consistency with existence allows it to be characterized as real. For this reason, evidence is the empirical basis of science, an important method of confirming or disproving a theory. With the help of evidence, existence is understood objectively, without being tied to a theory. The evidence makes it possible to discover phenomena that do not fit into the scope of the old theory, that contradict it [7-12].

Results and Discussion

Interpretation is an important element of evidence, and it takes many forms. Scientific evidence is implicitly related to theory. With the help of theory, the tasks of empirical research are determined and its results are interpreted. Interpretation is a theoretical-methodological condition of its formation, a theoretical conclusion from the evidence, its scientific explanation, or an assessment made from various ideological, scientific or philosophical points of view.

There is also a material-technical or methodical aspect of evidence, that is, a method of obtaining it. The reliability of the evidence is largely determined by the method and means by which it was obtained. For example, election campaigns often use the results of sociological studies to rate candidates and their chances of success. Often, their results are significantly different from each other, sometimes completely contradictory. Excluding the possibility of direct error, the reason for such differences can be explained by differences in methodologies [13-19].

The centuries-old history of science is not only the history of discoveries, but also the history of the development of the language of science, which is considered an important factor in theoretical abstraction, generalization or systematization of evidence. Therefore, any reasoning

has a sign-relational aspect, that is, the language of science in which it is described. Graphs, diagrams, scientific symbols and terms are important attributes of the scientific language. If a scientific discovery cannot be described in ordinary words, then the process of understanding it sometimes takes many years.

Depending on the development of scientific knowledge, it became apparent that the natural language is not semantically consistent with the content of the things expressed in it. The fluency of natural language expressions, the ambiguity of the logical structure of sentences, the variability of the meanings of language signs under the influence of the context, psychological associations - all this hindered the achievement of the accuracy and clarity of the meaning necessary for scientific knowledge. As a result, there was a need to replace natural language with artificially formalized language. Its discovery greatly enriched the knowledge tools of science, allowing it to solve new and new complex tasks. It should be noted that both scientific evidence, hypotheses, theories, and scientific problems rely on artificial languages created in science [20-24].

Scientific evidence is included in the theoretical system and has two important properties: reliability and univariability. The reliability of scientific evidence is shown in such a way that it can be obtained and expressed by researchers with the help of new experiments conducted at different times. One of the virtues of scientific evidence is that it retains its reliability regardless of the variety of interpretations.

As a result of the generalization of scientific evidence, they serve as a basis for theory. Simple forms of summarizing evidence are systematization and classification based on their analysis, synthesis, classification, use of primary explanatory schemes, etc. It is known that many scientific discoveries were made as a result of the selfless work of scientists to systematize and classify evidence (for example, the theory of the emergence of species by natural selection created by Ch. Darwin, D.I.Mendeleev's periodic system of chemical elements) [2].

Empirical hypotheses and empirical laws that explain the relationship between the quantitative indicators of the objects under study with the help of scientific evidence and the properties of consistent reproducibility are the most complex forms of evidence generalization.

Scientific data, empirical hypotheses and empirical laws only provide knowledge about how events and processes occur, but do not answer the question why events and processes occur in this way, do not explain their causes. The task of science - to determine the causes of phenomena, to explain the essence of the processes underlying scientific evidence - is solved within the framework of the highest form of scientific knowledge - theory.

Scientific evidence is a product of reliable observation, experiment: it is valid in the form of direct observation of objects, instrument indicators, photographs, reports of conducted tests, schemes, notes, archival documents confirmed by eyewitness testimony, etc. However, evidence does not constitute science in its own right, just as building materials are not yet buildings. Evidence only takes place in science after it has been sorted, classified, summarized and explained. The task of scientific knowledge is to determine the reason for the occurrence of this evidence, its important properties, and the legal connection between the evidence. The discovery of new evidence is very important for the development of scientific knowledge [3,4].

Evidence sometimes includes incidentals. Science is primarily interested in general, legal things. The basis of scientific analysis is not a single piece of evidence, but a set of pieces of

evidence that reflect a general trend. The evidence is innumerable. Among the many evidences, some of the ones necessary to understand the essence of the problem should be selected wisely.

Conclusion

However, it should not be forgotten that the criterion of practice is not able to fully confirm or deny any imagination of a person in practice. This criterion is also so vague that it does not allow a person to turn his knowledge into a complete and complete truth that does not need to be supplemented and developed.

Evidence acquires scientific significance only if there is a theory that interprets it, a method of classifying it, and if it is understood in relation to other evidence. Only in an interconnected and integrated way can evidence serve as a basis for theoretical generalization. Anecdotal evidence from life is incapable of substantiating any thing or event. Any theory can be constructed from poorly selected evidence, but it will have no scientific value.

According to the coherent theory, "evidence" is what the knowing subject recognizes as true. In this case, the existing belief system of the subject is considered as a (joint) internally agreed system. F.Bacon praises the importance of empirical evidence in his theory of knowledge. According to him, "The pure empiric scientist, like an ant, collects only evidence and is content with it, while the pure rationalist, theoretician, on the contrary, ignores evidence and weaves a theoretical web for himself like a spider, but a real scientist, like bees, collects material from various flowers and disposes at his own discretion". It is necessary to clarify the theory with the help of these arguments or, on the contrary, to find it outdated and lose its importance. In this sense, scientific proof is the result of empirical knowledge. But the evidence does not determine the theory, but the theory chooses one or another evidence that can enter its conscious experience. That's why Achinstein, comes to the conclusion that "Science must begin with evidence and end with evidence, regardless of what theoretical structures exist between the beginning and the end." This opinion is correct to a certain extent. Because the scientific evidence retains its essence regardless of the variety of interpretations of its reliability.

Summarization of evidence is carried out on the basis of analysis, synthesis, classification, use of primary explanatory schemes, etc. Evidence becomes scientific only after it has been sorted, classified, summarized and explained.

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