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POSITIVISM AND POST-POSITIVISM AS THE BASIS OF QUANTITATIVE RESEARCH IN PEDAGOGY

Abstract: The paradigm on which a methodological approach is developed determines the situations in which its application will be most appropriate. The quantitative approach implies a positivist paradigm, the basis of which is cause-and-effect relationships, as well as the questioning and verifying of existing theories. Positivism aims to prove that phenomena from the field of social sciences and humanities are equally subject to measurement as natural phenomena. That assumption is also the epicenter of criticism directed at positivism, from which, in addition to its strengths, post-positivism developed, characterized by more flexible views on absolute objectivity. The aim of this paper is focused on the analysis of the basis of the quantitative approach, the possibilities and limitations of the positivist paradigm and the post-positivist paradigm that overcomes the limitations of positivism. The tasks are as follows: 1. Define the concept of paradigm and its role in pedagogical research, 2. Determine the connection between the positivist and post-positivist paradigms and the quantitative approach, 3. Analyze the strengths and limitations of positivism and post-positivism and the possibilities of overcoming its weaknesses. The authors applied the theoretical method with content analysis and accepted the facts and ideas of positivism as the primary paradigm for researching educational reality. They state that post-positivism is intuitive and holistic, flexible in research, while positivism is based on solid facts that are objective and do not depend on subjective interpretation.

Key words: quantitative research, paradigm, positivism, post-positivism, methodology.

Introduction

The basis of any research is determined by the paradigm. It is the first step in choosing main directions for research. Even today, the relationship between research paradigms has not been fully clarified among researchers, but it is clear that a paradigm determines a point of view on a particular problem, that is, a research model. A certain approach in pedagogical research is characterized by a certain paradigm, which it is based on. An in-depth understanding of the research paradigms and approaches, as well as research designs that can best address their research problems through the research process, is essential for researchers who must understand the paradigms that guide their methodological decisions in collecting information and data, analyzing and interpreting them, and reporting findings (Dawadi, Shrestha, & Giri, 2021).

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There are several research paradigms, some of them are complementary and some are opposed. One of the most common research paradigms is positivism, which is guided by the claim that only sense-confirmed knowledge is affirmed as knowledge and that positivists are the only ones who make a distinction between scientific and normative statements and believe that normative statements cannot be confirmed by the senses; therefore, only scientific statements are the true domain of scientists (Bryman, 2012).

The quantitative approach is articulated by assumptions that are in line with positivist philosophy, that is, the approach is based on the foundations of the positivist paradigm. Positivism is a philosophical movement that later developed into post-positivism in order to overcome its weaknesses. According to positivism, phenomena in both the natural and social sciences are objective and subject to measurement. It emphasizes the objectivity and impartiality of researchers, and refers to checking and testing existing theories. Positivists begin their research process by formulating hypotheses, which are tentative assumptions derived from previous theories. The researcher is the controller of the research process. Even though the positivist paradigm is mainly related to the quantitative approach, it is also present in the mixed approach. The continuation of positivism – post-positivism - develops on the criticisms of positivism, striving to overcome its weaknesses. It rejects the rigidity of positivism, the existence of absolute objectivity and accepts the possibility of multiple factors. Post-positivism is a milder form of positivism that follows the same principles but allows more interaction between the researcher and his/her research participants (Taylor & Medina, 2013). While positivism focuses on the objectivity of the research process, post-positivism has room for subjectivity as well. Therefore, it uses both quantitative (such as a survey) and qualitative methods (such as interviews and participant observation) (Dawadi, Shrestha, & Giri, 2021).

The term positivism denotes the *accepted view* that has dominated the formal discourse of the natural and social sciences for some 400 years, while post-positivism represents the efforts made in the last few decades to present in a limited way (that is, while remaining within essentially the same set of basic beliefs) the most problematic critique of positivism (Gojkov, 2007: 72).

The concept of paradigm and its functions in pedagogical research

The scientific revolution did not begin with Thomas Kuhn (1922-1996), but understandings of the development and products of science certainly changed with the book *The Structure of Scientific Revolutions* first published in 1962.

Kuhn defines a paradigm as a concrete, definitive scientific achievement, law, theory. Normal science tends to deepen its knowledge. When we move from one generally accepted paradigm to another, that is a scientific revolution because we have introduced something that is new and different. Conflicts and disagreements are what lead to a crisis in science, with divergent and convergent thinking playing a major role in this. Both kinds of thinking create the tension that leads to the best scientific research (Kuhn, 1977). A scientific revolution is not a confrontation of two or more understandings, but a complete transition to something new (Maksimović & Jovanović, 2019).

Paradigm, in the context of scientific research (Morgan, 2007), implies an outlook, an epistemological attitude, a research model. The research paradigm includes all aspects of the entire research process: it affects the choice of problems to be researched and the way in which they will be researched. Even though metatheoretical conceptions are very important, they have a special significance for research in the field of education (Gojkov, 2006). The choice of a paradigm is based on its advantages, that is, on its compatibility with the type of research. The emphasis, when defining a paradigm, is that it also represents the common beliefs of the research community and

that the difference between paradigms comes from their view on the nature of knowledge and the one doing the research.

A paradigm consists of at least three elements; ontology, epistemology and methodology. However, the construction of each paradigm has different connotations depending on the supported theoretical frameworks (Assalahi, 2015). Another explanation of a paradigm is that it represents *a point of view*. The dominant paradigms in pedagogical research are positivism and post-positivism. At the same time, it is necessary to bear in mind that post-positivism leans critically on the experience of positivism and tries to assert itself independently of it as an equally useful paradigm.

Positivist and constructivist paradigms imply contradictory viewpoints. Combining different paradigms in research does not lead to a merging of viewpoints on a specific problem, but to an explicit framing of research in two or more viewpoints, but in such a way that each paradigm retains its authenticity (Sandelowski, 2000). The theoretical foundations and values of scientific research, that is, research methodology, belong to a certain paradigm. For the researcher, the paradigm represents the definition of what is meant by research, what falls within the scope of research. Each paradigm represents the highest level of information and sophistication of views that its proponents have devised (Gojkov, 2007). It determines the further course of research organization and design and directs the researcher to the choice of methods that will be used in the research. It gives the researcher different possibilities in approaching the problem that will be researched, but also limits it within its framework.

Positivist and post-positivist paradigm and quantitative approach

Each paradigm has its own ontology, epistemology and axiology. Based on these specificities, a classification of different types of paradigms is made. One of them includes the following paradigms (Teddlie & Tashakkori, 2009): positivism, post-positivism, constructivism, pragmatism and the transformative paradigm. As the aim of this paper is to explain positivism in the context of quantitative research, we will take a look at this paradigm in more detail.

The term *positivism* is derived from the *positive* philosophy that appears in the works of Francis Bacon in the 16th century. Positivism is based on a rationalist, empiricist philosophy that originated with Aristotle, Francis Bacon, John Locke, Auguste Comte, and Immanuel Kant. However, Auguste Comte (19th century) is considered the founder and popularizer of positivism. Positivism emerged as a reaction to metaphysics and theology. It is based on universal laws and emphasizes the existence of a *common reality*. Thus, positivism accepts experience and verified knowledge, but rejects everything that is subjective, abstract and metaphysical (Crotty, 1998). It is defined as a philosophical movement in science that developed in the early Middle Ages. Despite the criticism, the importance of positivism is reflected in the fact that a large number of scientists, who explicitly reject its postulates, on the other hand, accept them as implicit assumptions on which their work is based. One of the basic assumptions of positivism is the unity of science. There is no difference between natural and social sciences as both are governed by laws, and the essence of every science is their discovery. The unity of natural and social sciences is precisely one of the most frequently contested assumptions of positivism (Croatian encyclopedia, 2021). Positivism follows Hume's radical conception that knowledge does not exist outside of what we can observe, therefore, what we claim to know is based on the unity of our observations (Loughlin, 2012). The fact is that both natural and social sciences are governed by laws. Their discovery leads to new knowledge, and this research activity is the basis of all science. However, it should be borne in mind that the conditions in which social-humanistic processes take place are not equivalent to those in which natural phenomena occur. Very often it is not possible to observe them in the same way, nor to control the conditions in which they take place. Attitudes, opinions, emotional and similar reactions are often

the subject of social and humanistic research. As such, they are difficult to fully objectively perceive, predict or control. In addition, one of the basic assumptions of the social sciences and humanities is the principle of ethics, which limits intentional action to the conditions in order to achieve the most objective results, so this objection directed at positivism is, for the most part, justified. The culture of positivism and its characteristics influence the school curriculum with special reference to ethical and moral education and that this is the primary purpose of education (Singh, 2022).

For both of these paradigms, the researcher is in the role of an expert, which is a situation that grants a special and undeserved privilege to the researcher. The basic assumptions of positivism include the belief that the social world can be studied in the same way as the natural world, that the use of the scientific method makes it possible to experiment and measure what can be observed, with the aim of discovering general laws to describe constant relationships between variables. Positivists based their theory on the claims that scientific knowledge is completely objective, valid, certain and accurate.

The positivist paradigm is also called the scientific paradigm. As a scientific paradigm, positivism aims to investigate, confirm or predict patterns of behavior and is most often used to test hypotheses or theories. In order to eliminate the researcher's bias, which could negatively affect objectivity, he is isolated from the respondents (Taylor & Medina, 2013). According to this paradigm, there is one reality that can be objectively measured and determined. "The world exists as an objective entity, outside of the mind of the observer, and in principle it is knowable in its entirety. The task of the researcher is to describe and analyze this reality. Positivist approaches share the assumption that, in natural as in social sciences, the researcher can be separated from the object of his/her research and therefore observe it in a neutral way and without affecting the observed object" (Della Porta & Keating, 2008). Therefore, differences in the object of research in natural and social sciences are not taken as one of the criteria that will determine the course of research. Positivists take the position that the approach is the same in both cases, which is impracticable in practice.

Other characteristics of positivist research emphasize the scientific method, statistical analysis, and generalization of findings. In addition, positivist research usually has a control group and an experimental group (Mack, 2010). Positivism is based on the principle of verification. According to verification principle, one can distinguish valid knowledge from mere personal opinion if and only if there is a means to verify the truth of any given statement (Buchanan, 1998). Only facts that have been proven, verified and scientifically based are recognized. Facts characterized in this way are desirable both the field of natural and social sciences, so the question arises, why is positivism also criticized for its objectivity? If we look at the essence of the facts that we deal with within the framework of the social sciences and humanities, it becomes clear that they are not always easy to measure, sometimes it is even impossible, and that they are not always *black or white*, as is generally the case in the natural sciences. For these reasons, the rigid objectivity that positivism emphasizes in research of a social-humanistic character is unacceptable.

From the empirical standpoint, quantitative research aims to test theory. This can be achieved by questioning previous research and established theories, then postulating a hypothesis and collecting and analyzing data to see if the findings confirm or disprove those theories (Maksimović & Osmanović, 2020). Positivists assume that they can produce scientific explanations about the occurrence of events, using quantitative approaches or methods of collecting and analyzing data through experiments and observations.

The advantages of the quantitative approach are reflected in its high efficiency and practicality, especially when dealing with a large sample. It is economical because of its possibility of collecting data in several ways, in a relatively short time. The weaknesses of this approach stem from its

positivist background. Focusing on objective facts or checking existing theories and assumptions, the researcher narrows his horizons and may miss the occurrence of some phenomena. Also, due to the limitation to exclusive objectivity and absolute truth, the knowledge obtained in this way may be unusable for practice.

The quantitative approach is most effective when it is necessary to identify factors that influence the final outcome, to examine the effects of an activity, but also when testing theories. Another advantage of this approach refers to carefully and precisely established research procedures and rules. This provides the researcher with greater comfort when conducting research (Creswell, 2003). For these reasons, the quantitative approach is also suitable for less experienced researchers as established rules and procedures give them the opportunity to conduct research with greater certainty and *without going off the track*.

According to the quantitative approach, social phenomena should be treated in the same way as scientists from the field of natural sciences treat natural phenomena (Burke & Onwuegbuzie, 2004). This understanding stems from positivism, as the dominant paradigm on which quantitative research is based. The same authors (2004) state the following advantages of quantitative research:

1. Testing and validating already constructed theories about how (and to a lesser degree, why) phenomena occur.
2. Testing hypotheses that are constructed before the data are collected. Can generalize research findings when the data are based on random samples of sufficient size.
3. Can generalize the research finding when it has been replicated on many different populations and subpopulations.
4. The researcher may construct a situation that eliminates the confounding influence of many variables, allowing one to more credibly assess cause-and-effect relationships.
5. Data collection using some quantitative methods is relatively quick (e.g., telephone interviews).
6. Provides precise, quantitative, numerical data.
7. Data analysis is relatively less time consuming (using statistical software).
8. The research results are relatively independent of the researcher.
9. It is useful for studying large numbers of people.

Some of the more important weaknesses of quantitative research are as follows (Burke & Onwuegbuzie 2004):

1. Knowledge produced may be too abstract and general for direct application to specific local situations, contexts, and individuals.
2. The researcher may miss out on phenomena occurring because of the focus on theory or hypothesis testing.

The connection between paradigm and methodology is very significant, because the methodological implications of the choice of paradigm are related to the subject of research, the choice of research participants, the choice of instruments, the method of data collection, as well as the analysis and interpretation of data (Kivunja & Kuyini, 2017). More specifically, in terms of data analysis, the choice of a positivist paradigm means that the data collected will be quantitative in nature and, most likely, will be analyzed using quantitative procedures.

The *measurement* process is another important aspect of quantitative research. Researchers encounter measurement every day, through various types of research work, by measuring a number of aspects of social life - self-esteem, prejudices, abilities. It is also present in qualitative research, but it is of particular importance in quantitative research. It has a special terminology and a series of techniques. The goal is to accurately collect data and details and express them in numbers. The three

basic characteristics by which measurement in quantitative research differs from measurement in qualitative research are as follows (Neuman, 2014):

1. The first difference is time. In quantitative research, we define variables and turn them into specific actions during the planning phase; in qualitative research, measurement takes place in the data collection phase.
2. The second difference is data. In quantitative research, we use techniques that will produce data in the form of numbers. This process takes place by moving deductively from abstract ideas to specific techniques of data collection and refinement of numerical information. Numerical data represent a unique, standardized and compact way of presenting the obtained results. Unlike quantitative research, qualitative research does not convert all observations into a single, common medium such as numbers, but presents results in different, non-standard, sizes and shapes.
3. The third difference is the connection between concepts and data. In quantitative research, we think about concepts before we collect data. Measurement techniques are chosen to bridge the abstract concept with empirical data.

Measurement is not only a technical matter in research; if this step is of poor quality, the whole research loses its quality and significance.

The aforementioned weaknesses of positivism served as the basis for constructing a paradigm that, in addition to overcoming existing weaknesses, will also use its good sides. Post-positivism developed on those foundations.

Post-positivism arose as a reaction to the shortcomings of positivism, after the Second World War, and the most significant representative of this paradigm is Karl Popper (1972), who believes that knowing is a creative process that sometimes cannot be explained by reason or reduced to some method, because often something that we have concluded with some form of our own logic puts us in a position where we cannot explain the exact method of knowing.

Because there is much about the human experience that is not observable but is still important, post-positivist psychologists came to reject the positivists' narrow view that what could be studied was limited to what could be observed, as well as to question the ability of researchers to establish generalizable laws as they applied to human behavior (Shadish, Cook, & Campbell, 2002). Post-positivists still hold beliefs about the importance of objectivity and generalizability, but they suggest that researchers modify their claims to understandings of truth based on probability, rather than certainty. In the philosophy of positivism, researchers deal with questions objectively without affecting the actual problem being studied.

O'Leary (2004), provides a definition of post-positivism that post-positivists see the world as ambiguous, variable and multiple in its realities (...) what might be the truth for one person or cultural group may not be the "truth" for another. Post-positivists accept that we cannot view the world entirely objectively and that our subjectivity shapes that reality. Before finding the truth, post-positivists will try to present reality in the best possible way (Mat Roni, Merga, & Morris, 2020). Post-positivists accept that we cannot observe the world in complete objective reality. Instead of finding the truth, post-positivists will try and present reality as best possible. Unlike positivists, post-positivists believe that research can never be objective.

Advantages and limitations of positivism and post-positivism

In the second half of the 20th century, there were more challenges to positivism from other, competing paradigms. However, probably the most influential were the criticisms of positivism from the 1960s and 1970s by numerous philosophers. Critics came from different perspectives, and

positivism was destabilized, its notion of absolute truth, provability of hypotheses and impartial participation of researchers were called into question. Criticism of positivist paradigms also referred to the application of the scientific method in research in the field of human activity. Critics argued that the unique, causal relationships that could be established in the study of the natural sciences could not be applied in the classroom. Mack (2010) believes that it is practically impossible for any theory in the social sciences to be simple and precise, because the world we live in and people's multiple perspectives and interpretations of events make theories complex and chaotic. So many variables affect various events and human actions that it is impossible to determine the absolute truth. These criticisms meant that positivism began to lose the importance it once had. New methodological platforms and research strategies emerged, as an alternative to a simple positivist approach. However, we must emphasize, they did not aim to completely reject the positivist approach, but to upgrade it so that its many advantages are appreciated. This is how post-positivism developed.

As the positivist paradigm is exposed to criticism because it follows an objective path in research and advocates that knowledge is acquired by collecting objectively verifiable facts using quantitative methods, a way to overcome its weaknesses was found in the construction of a new paradigm - post-positivism. Despite the weaknesses and criticisms directed at positivism and the quantitative approach, this paradigm, as well as this approach, remained irreplaceable in specific, concrete, research situations.

Post-positivist theory was created on the basis of the limitations and shortcomings of positivism. Its essence is an attempt to overcome the weaknesses and upgrade positivism, and not to reject all positivist ideas and postulates of the scientific method. Post-positivism does not reject quantitative methodology, but is more cautious about one-sided interpretations and limitations regarding the overemphasized (or obsessive) use of quantitative methods (Adam, 2014). Unlike positivists, who assume linear cause-and-effect relationships, post-positivists perceive the result of research as the result of the complex influence of a large number of causal factors, which interact. Post-positivists believe that reality is socially and culturally constructed and that absolute objectivity is impossible. Accordingly, they speak of results that *support* rather than confirm hypotheses. They also advocate the position that the researcher cannot be completely objective, but accept the position of positivists that he should be as neutral as possible in relation to the object of research (Giddings & Grant, 2007). The role of the pedagogical researcher, according to the post-positivist paradigm, is the disciplined monitoring and realization of the intended research procedures. Therefore, the objectivity of the researcher is highly valued, although the fact that human subjectivity cannot be completely avoided is not rejected. They reflect a deterministic philosophy in which cause determines outcomes or effects. Thus, the problems addressed by post-positivism reflect the need to examine causes. One of the important tasks, characteristic of pedagogical research, which is based on the post-positivist paradigm, is the statistical generalization of the obtained research results to the entire population from which the sample of respondents was taken. Objective data collected through a large sample is superior to data collected through smaller samples. Larger samples improve consistency in data and representation of the population characteristics, facilitating better generalizations. That is why research based on the positivist paradigm has a *nomothetic character* (Greek: *nomos-law*) (Park, Konge, & Artino, 2020). Post-positivism is based on the recognition that we cannot be *positive* about the knowledge claims we make by studying human behavior. The positivists' obsession with generalization is unsustainable because different phenomena have different meanings in different contexts. It is impossible to generalize social behavior because people have different perceptions. Reducing the essence of human beings to a series of controlled, predictable and managed behaviors is not acceptable and comprehensible in the social sciences. Therefore, reality is an ambiguous and contradictory tenet of positivism, especially in the realm of social sciences (Creswell, 2003). Post-positivists rule out the possibility of viewing social processes in the same way as natural phenomena. The reality dealt with by

pedagogical research is conditioned by social and cultural changes, and therefore cannot be viewed as completely objective and unchanging. Taking into account the circumstances in which the same phenomenon can be observed differently, post-positivism contributes to objectivity in concrete situations and conditions, in contrast to the rigid objectivity present in the positivist paradigm.

Positivism has been criticized, among other things, for excluding various sources of understanding of the world, including those arising from human experience, thinking and interpretation, as unsuitable for scientific research. In the social sciences, these sources of understanding are of great importance as bases for the growth of knowledge, and many areas of social scientific enquiry would be impoverished without recourse to such sources. For post-positivists, while the pursuit of knowledge remains an aim of social scientific enquiry, the concept of an absolute truth may be seen as an aspiration rather than something that can be discovered once-and-for-all. Consequently, it is important for the social researcher to understand not only rational thoughts and reflections, but also the affective components that contribute to the constructions of an actor's or groups of actor's social reality (Fox, 2008). This fact, among other things, challenges the position of positivists that we can put the equality sign between social and natural sciences. Social sciences, and the phenomena that are the subject of their research, cannot be observed exclusively through laws, as is the case with the natural sciences. The affective note, which permeates all research that deals with people and social processes, must be taken into account, both during the research and when summarizing the results. This approach to the scientific endeavor represents the main characteristics of post-positivism. Objectivity is maintained to the extent that it preserves the scientific value of the obtained results, but, unlike positivism, enough space is left to take into account the conditions in which research in the field of social sciences takes place.

The positivist approach to research is recognizable by the strong application of quantification. In most cases, only statistical methods are used, and as far as data is concerned, very limited data sets are taken into account. While positivism assumes that data are of good quality and adequate only if they can be quantified, on the other hand, post-positivism focuses on three basic issues (Adam, 2014):

1. the data quality
2. the application of an integrated approach
3. the context of the studied phenomenon

Post-positivists accept the fact that social reality is made up of measurable objective facts that the researcher can measure precisely and he can use statistics to test causal relationships. However, while positivists will favor a hypothetical-deductive approach, which advocates quantitative measurement, post-positivists will follow an inductive approach, which advocates qualitative assessment (Khaldi, 2017). In this way, post-positivism overcomes the limitation of the exclusive quantification of data as the only measure of their quality. Quantified data, obtained during the study of one phenomenon, in different contexts, may differ. By striving to stay strictly objective, positivism has gone to the other extreme here. The already emphasized characteristic of post-positivism - the context in which the phenomenon takes place - comes to the fore here.

And in the end, we will agree with the words of the author Gojkov (2021) that no theory, no matter how absurd it is, has ever changed the real, concrete world in which we live. Only the experience of the other, different from everything known, could shake someone out of a dogmatic slumber, but we have seen that this happens rarely, sometimes once in two millennia.

Quantitative approach is the one in which the researcher primarily uses post-positivist foundations for gaining knowledge (cause-and-effect relationships, reduction of variables and hypotheses, use of measurements and observations, testing of theories). It also uses research strategies such as experiments and collects data with the help of certain instruments that provide the possibility of

statistical processing (Creswell, 2003). In this way, quantitative research improves its quality and becomes more flexible, and the results thus obtained are suitable for application in practice.

Conclusion

Every research is aimed at confirming or refuting given hypotheses. It cannot be said that some theories can always be fully justified, but the most important thing is that they can be verified. The process of repeating the same results that empirics gives leads to their scientific justification. A paradigm is a set of logically related assumptions, concepts, or propositions that guide research. Without determining the paradigm, as a first step, there is no basis for further choices in terms of methodology, methods, literature and research design itself (Mackenzie & Knipe, 2006). The quantitative paradigm is based on positivism. It is characterized by empirical research; all phenomena can be reduced to empirical indicators that represent the truth. The ontological position of the quantitative paradigm is that there is only one truth, an objective reality that exists independently of human perception (Sale, Lohfeld, & Brazil, 2002). Certainly, there are problems in pedagogy that correspond to the methodology based on the positivist paradigm, as well as those that are more suitable for the so-called humanistic methodology. But what we can predict with greater certainty is that pedagogy, or any other field within the social sciences and humanities, will not develop within the framework of only one methodological approach. The reason for this is that those approaches to qualitative or quantitative research, even if we accept them as complementary, show many weaknesses and limitations. The existence of a large number of scientific methods is, apart from being an advantage, also a great challenge for the researcher. Empiricism cannot survive without theory, and the so-called Popper's (Popper, 1959) advocacy of experience as a method is advocacy of an experience-based theory of knowledge (Maksimović & Jovanović, 2019). A wrong choice of method implies a wrong organization of the entire research and therefore results that are not relevant.

Many problems in the social sciences and humanities depend on the choice of an appropriate paradigm, which is not an easy task for researchers. A paradigm determines the methodological direction, research questions, research objectives and objectives of the respondents, while researchers, on the other hand, should carefully consider the purpose of their research and the data they need before prioritizing research approaches.

Artificially merging paradigms through triangulation can sometimes be useless. Different paradigms are guided by different epistemological and philosophical frameworks and this is not a solution in itself, but a methodological problem.

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