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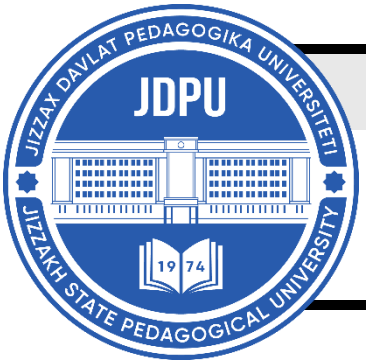

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BASIC ASPECTS OF PROBLEM DEFINITION IN SCIENTIFIC RESEARCH

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ABOUT ARTICLE

Key words: problem, problem situation, problem justification, problem characteristics, problem forms, scientific problem, requirements of a scientific problem, stages of problem analysis, problem solving mechanisms, anomaly, hypothesis, discovery.

Abstract: This article examines the important aspects of problem definition in scientific research, the principles of effective problem definition, the requirements of a scientific problem, and the stages of problem analysis.

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INTRODUCTION

Our world is constantly changing. As our knowledge deepens and social priorities change, new scientific problems arise. Understanding how to identify and address these evolving challenges is critical to adapting to the ever-changing environment of science and society. Because the issues often intersect with the most pressing global issues we face. Issues such as climate change, pandemics, energy sustainability, and resource depletion require serious scientific research to find effective solutions. To address these existential threats, it is important to understand how scientific problems are defined and solved. Technology is developing at an unprecedented speed. Understanding and addressing scientific challenges is critical to the responsible use of these technological advances. It allows for the study of the ethical, social and environmental impact of innovations such as artificial intelligence, biotechnology and renewable energy.

In the field of scientific research, problem solving is at the heart of everything. Researchers grapple with complex problems and strive to uncover solutions that contribute to human knowledge

and progress. However, the main condition for effective problem solving is often overlooked: a correct understanding of the nature of the problem.

MATERIALS AND METHODS

The essence of the problem can be divided into several main aspects:

1. The first step in solving any problem is to recognize its existence. It requires keen observation, critical thinking, and the ability to discern patterns or anomalies in a given context.

2. Deeper study of the problem involves understanding its root causes, complexities and possible consequences. This phase often involves research, data collection, and the application of relevant theories or frameworks.

3. Once the problem is thoroughly understood, the next step is to develop potential solutions. It requires creativity, innovation and a systematic approach to problem solving.

4. Implementing a solution can be a complex process and often requires collaboration, resource allocation, and adaptation. After implementation, it is important to evaluate the effectiveness of the solution and make adjustments if necessary.

5. Problems are dynamic and the essence of solving them lies in the pursuit of continuous learning and improvement. As solutions evolve, new challenges may emerge, creating a cycle of growth and adaptation.

“While it is important to study the cause and effect of a problem, it is equally important to identify the nature of the problem - its defect or mismatch - along with its appearance - its manifestation or symptoms. Both the effect and the nature of the problem are usually co-localized in the defective product and are found by working backwards after the problem manifests itself as symptoms. However, the cause cannot be found in any product and must be identified in the process that creates the defective product. The concept of "problem" refers to a gap in knowledge, an unresolved question, a practical problem, or an area of uncertainty in a particular field of study. It encourages and directs scientific research by ensuring that research efforts are clearly focused. Problems arise from observations, contradictions, gaps in existing theories, social needs, or the desire to advance understanding in a particular area. Problems are the driving forces behind the relentless pursuit of knowledge in every field of science. From the great questions of cosmology to the complex puzzles of molecular biology, scientific problems form the basis of our understanding of the world.

The concept of "problem" adapted to the evolving nature of scientific research and over time was formed as part of philosophy, science and scientific method. Ancient philosophers such as Socrates, Plato, and Aristotle laid the foundation for thinking about problems and explorations. For example, Socrates is famous for his "Socratic Method," which involves probing questions to encourage critical thinking and problem solving. The scientific revolution of the 16th and 17th centuries was a decisive period in the development of scientific problems. Thinkers such as Galileo

Galilei, Johannes Kepler, and Isaac Newton contributed greatly to scientific research by formulating problems related to the behavior of celestial bodies and the laws of motion. They used empirical observation and mathematics to solve these problems. Francis Bacon, an English philosopher and statesman of the 16th century, put forward the idea of the scientific method. He emphasized the importance of systematic observation, experimentation and problem solving in the pursuit of scientific knowledge. In the 20th century, the philosopher Karl Popper introduced the concept of falsity, which is closely related to the idea of scientific problems. He argued that scientific theories should be formulated in such a way that they are open to potential falsification through empirical testing. This insight has changed how scientists approach problems in the context of hypothesis testing. Thomas Kuhn's work on the structure of scientific revolutions showed how scientific problems develop over time. He introduced the concept of "paradigm shifts", in which established theories and problems are replaced by new ones with the development of scientific understanding. The concept of scientific problems continues to evolve in contemporary debates between scientists and philosophers of science. Today's understanding of scientific problems is influenced by scientists from a wide range of disciplines as they grapple with the complexities of modern research and inquiry.

Procedure for investigating the problem. The problem is the result of a theoretical understanding of the problematic situation and is expressed in a concrete form. The statement of the research problem means that it is necessary to justify the relevance and importance of studying the chosen topic and to reveal the nature of the problematic situation, why it is necessary to study it and to answer the questions of what its research will provide. Then it is necessary to formulate the problem itself, that is, to distinguish the sides of the real conflict in the node of social tension. In this case, "assumptions, dynamic thinking, and functionality are the three elements necessary to describe a problem-solving approach."

The following questions should be clarified in the problem:

1. "What kind of research has been done before me"?
2. "What contradictions exist"?
3. "Which aspects of the problem (issue) have not yet been studied"?
4. "What innovations, what scientific results are needed"?

Characteristics of problems:

Specificity: The problem should be well defined, focusing on a specific aspect or scope of the inquiry. A clear statement of the problem helps to formulate research questions, hypotheses and objectives.

Relevance: The problem must be relevant and important to the field of study or to the wider community. It should have the potential to contribute to knowledge, meet practical needs, or have social impact.

Innovation: Challenges often involve exploring uncharted territory or bridging gaps in existing knowledge. They should offer a new perspective or provide new insights to advance understanding.

Measurability: Problems should be formulated in a way that allows them to be measured and empirically tested. They should include operationally and quantifiable variables or concepts that enable researchers to efficiently collect and analyze data.

Scientific research begins with posing a problem. Identifying a problem or gap in knowledge is the starting point for conducting scientific research. Scientists and researchers aim to investigate and solve specific problems, unanswered questions, or areas of uncertainty in their fields. These problems may arise from observations, practical difficulties, inconsistencies in existing knowledge, or the need to develop understanding in a particular area.

The process typically involves reviewing existing literature, understanding the current state of knowledge, and identifying gaps or limitations in understanding the topic. This process helps researchers identify a problem or research question that is relevant, relevant, and has the potential to contribute to the existing body of knowledge.

Once the problem is identified, scientists can begin to design research methodology, collect data, analyze results, and draw conclusions. The problem serves as the foundation for the entire research process, guiding the researcher's focus, methodology, and interpretation of findings.

Problem types:

Theoretical problems involve gaps or inconsistencies in existing theories, models, or frameworks. Researchers aim to improve, expand or develop new theoretical perspectives to overcome these shortcomings.

Empirical problems arise when there is a lack of empirical evidence or contradictory findings related to a particular phenomenon. Researchers aim to collect data and conduct empirical research to explore these issues and generate new knowledge.

Practical problems involve real problems or problems that require solutions. Researchers aim to apply scientific knowledge to solve practical problems, develop interventions, or improve practice in fields such as medicine, engineering, or the environmental sciences.

RESULTS AND DISCUSSIONS

A scientific problem is a question or issue that requires research and a solution through the scientific method. Scientific problems are often characterized by their inherent complexity. They represent phenomena or questions that cannot be easily explained by existing knowledge. They challenge our current understanding and require extensive investigation to reveal their subtleties. Scientific problems are based on empirical observation. They are not abstract or philosophical puzzles, but grounded in the material world. When observations or data do not match current theories, these problems arise and lead to the need for explanation. The main feature of scientific problems is

their testability. They should be designed to allow for experimentation, data collection, and the application of the scientific method. This empirical approach allows for the creation of evidence to support or reject proposed solutions.

How are scientific problems defined? Scientific problems often begin with the observation of an anomaly or discrepancy between theory and observation. Scientists notice something unexpected or inexplicable, which arouses interest and helps formulate a problem statement. Once an anomaly is identified, scientists formulate a hypothesis or hypothesis to explain it. These assumptions become the initial basis for solving the problem. Scientists design experiments or collect data to test their hypotheses. This process involves careful planning, data collection, and analysis to confirm or reject proposed explanations. Scientific problems evolve as new data are collected and analyzed. Researchers may need to refine their hypotheses or develop entirely new ones based on emerging evidence. This iterative process is the basis for the scientific method.

Why are scientific problems important to human understanding? Scientific problems help to develop knowledge. They encourage explorers to explore uncharted territories, leading to discoveries that expand our understanding of the natural world. Solving scientific problems often leads to technological innovations. Solutions to a single problem can have broader applications that benefit society in a variety of ways, from healthcare to engineering. Scientific problems can have real-world consequences. For example, addressing issues related to climate change, the spread of disease, or energy sustainability are critical to human well-being and the future of the planet. Science problems develop critical thinking and problem-solving skills. They encourage people to question, analyze, and critically evaluate information that is valuable not only in science, but in all aspects of life.

Requirements of a scientific problem:

- careful development and correct definition of the problem.
- consistency, fundamentality, specialization and their harmony of knowledge.
- use of methods of related sciences.
- scientific generalization and systematization of knowledge.
- finding problems relevant to the topic.

Steps of problem analysis:

1. Determining the components (factors) of the problem situation, i.e. decomposition. Decomposition is a scientific method that helps you find the solution to one big problem by solving several smaller problems. This method (Breakdown) is to divide into parts or categories, to divide into simple components. For example, in the question "Problems related to the demographic situation in Uzbekistan", the first option is related to population (growth), births, deaths, marriages, divorces, immigrants and emigrants. problems are identified. In the second option, legal, institutional, socio-economic and other similar problems are studied.

2. Determining the scope of decomposition (delimitation). In the question "Problems related to the demographic situation in Uzbekistan": Problems related to death (due to disease; unexpected diseases (coronavirus); Inexperience; Lack of medicine; Vaccination problem; Chronic diseases (blood pressure, diabetes, hepatitis, etc.); Due to an unfortunate event (car accident; driving culture; irresponsibility of driving schools; irresponsibility of parents, etc.); Birth problems (birth with disabilities, birth with genetic disease , etc.).

3. Classification of tags into important and secondary, known and unknown categories, confirmation of their systematic or characteristic nature. In the question "Problems related to the demographic situation in Uzbekistan": (problems related to population (growth), births, deaths, marriages, divorces, immigrants and emigrants).

4. Identifying the main factors and consequences of problems. Causal analysis is performed.

5. Determination of the methodology of problem research. (Analysis of scientific approaches to studying the problem (what approaches are there?); Determination of adequate methods for studying the problem (based on tasks); Determination of relevant criteria (development); Based on relevant criteria (indicators) to assess the situation; draw conclusions regarding the uniqueness of the problem.

At the heart of every successful scientific work lies the careful art of formulating and articulating research problems. The scientific research process is often compared to the construction of a complex structure, each stage and component contributing to its stability and integrity. At the foundation of this structure lies the formulation of a well-defined research problem. This initial step serves as the intellectual foundation upon which the entire edifice of scientific inquiry is built. Without a clear, concise, and properly scoped research problem, the subsequent steps of hypothesis generation, data collection, and analysis lack direction and purpose. A clearly defined problem not only simplifies the research process, but also ensures that the collected data and subsequent analysis are consistent with the research objectives. This coordination, in turn, increases the reliability and validity of research results, creates a solid foundation for building scientific knowledge.

According to the stages of problem analysis, the following tasks are solved in the chapters and paragraphs of the dissertation:

Chapter I. Theoretical and methodological bases of studying the problem:

- Justification of the problem, determination of its impact on national interests;
- To study theoretical and methodological approaches aimed at solving the problem;
- Selection (development) of problem analysis methodology (authorship).

Chapter II. Scientific problem analysis:

- Studying the state of the research object using decomposition;

- Analyzing and processing statistical data, conducting empirical research in order to identify negative trends, determining the causes and consequences of the problem;

Chapter III. Development of ways and mechanisms to solve the problem:

- Summarizing the results of the analysis, taking into account the most optimal options for solving the problem;
- Project development;
- Development of ways to improve mechanisms of problem solving.

Criteria for sorting scientific sources found on the problem:

First level criteria:

- according to the similarity of the research topic;
- on similarity of research goals;
- on the similarity of research tasks;
- on the similarity of the research problem

Secondary criteria:

- by the proximity of the object;
- depending on the similarity of the field of research (same field or network, direction);
- according to the similarity of the research direction or structure;
- depending on the possibility of using the research as a model, that is, in solving the problem
- depending on the applicability of this methodology (homogeneity of the methodological basis, scientific schools
- left theories, closeness of views, used approaches and methods in this work
- applicability.

Tertiary criteria:

- the country where the scientific work was done and the studied problem is similar to Uzbekistan
- availability of features (as foreign experience);
- the author of the scientific work has great experience and is a prominent scientist.

CONCLUSION

In conclusion, we confirm that the problem definition process is not just an academic exercise. It is the epitome of human curiosity, the engine of innovation and the gateway to understanding the world around us. We explored key principles of problem definition, emphasizing clarity, empirical validity, relevance, feasibility, and testability. These principles are like the building blocks of a robust structure, providing the structural integrity necessary for rigorous research.

The following recommendations are presented in the analysis of the "problem" in scientific research:

- a comprehensive literature review to gain an understanding of existing research and to ensure that the problem is not repeated;
- exploring unconventional angles and questions that challenge existing paradigms and assumptions;
- clearly define what you want to achieve by solving the problem;
- explore how the definition of a problem varies across different scientific disciplines and identify commonalities and best practices;
- assessment of feasibility of the research problem;
- use concept mapping to visualize the relationships between different aspects of a problem. it helps identify key concepts;
- consider the cultural and social context of the research problem, as this has a significant impact on its definition and consequences;
- constantly thinking about the potential impact of the research problem on the scientific community, society and the field in which you work.

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