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SCIENCE TEACHING RESEARCH METHODS

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Abstract
The article presents the methods of researching the teaching of natural sciences, the creative approach of future elementary school teachers to the selection of investigative scientific research methods in accordance with the topic, purpose, tasks, subject and object of pedagogical research, and the principles of implementing research methods.

Keywords: Natural sciences, research, researcher, methodological research, practical, form, method, tool, mathematical methods, pedagogical experiment, empirical, analysis, synthesis, sociological methods.

Introduction

Local methods of natural sciences have a history of more than 200 years of development. During this period, science defined its scientific research methods. Research methods are methods of solving research problems. Scientific justification of research methods is provided by methodology, i.e. a set of principles and methods of organizing theoretical and practical activities.

Methodological principles include:

- to consider separate components of the pedagogical process (the purpose and content of education, teaching methods, forms and tools, activities of teachers and students) not separately, but in interdependence and interaction 'a systematic approach that allows for review;
- a personal approach that requires orientation of the educational process to the individual, recognition of his uniqueness, intellectual and moral freedom;
- an activity-based approach that puts the child in the position of the subject of the educational process, including independent goal setting; planning and organization of educational activities; self-monitoring and self-evaluation of performance results;
- a cultural approach that connects a person as a carrier of a certain culture with a system of social and spiritual values.

In pedagogy, there are other methodological principles that allow to distinguish the actual problems of science, to determine their importance and to define the strategies and methods of solving them - polysubjective approach, ethnopedagogical approach, and anthropological approaches. One of the main tasks of the methodology of natural sciences is to understand and improve the process of teaching natural sciences to elementary school students. To solve it, general scientific methods (dialectics, theory of knowledge, logic), special scientific methods used in pedagogy, subject-thematic

methods specific to didactics and its narrow field - methods of teaching natural sciences are used.

We consider only the most commonly used methods in methodological research. The main requirements for any method are objectivity, that is, the ability to present reliable, reliable material without distortion, subjective interpretation and hasty conclusions. The second requirement is reliability, that is, the uncertainty of the results when conducting repeated studies and the uniformity of the results between different researchers. The third requirement is validity (validity) - the ability of the selected method to accurately study the characteristics of the educational process that interests the researcher. The last requirement - accuracy of information - is determined by clear differentiation and individual approach.

All methods of pedagogical research can be divided into several groups. Theoretical methods are based on the use of mental operations: comparison, analysis and synthesis, generalization and specification. Theoretical methods include comparative historical analysis of literary sources, school documents, study of public experience of teachers, etc. These methods help to determine the research problem, to set goals and objectives, to put forward a hypothesis. Empirical methods are based on emotional perception of objects and serve to collect factual materials. This is pedagogical observation of the educational process, personal teaching and experimentation.

Sociological methods are used to study the personal characteristics of children and teachers participating in the research. These are surveys and interviews between teachers and students, surveys, tests, analysis of students' formed knowledge and skills. Mathematical methods (descriptive statistics methods and the theory of statistical inference) are based on the processing of results obtained by mathematical analysis methods.

These include:

- registration, that is, recording for the purpose of taking into account and systematizing quantitative information about the presence or absence of the studied parameter (for example, correct and incorrect assignment the number of students who completed ri);
- ranking - placing the obtained data in descending or ascending order of any indicator and determining the position of each studied parameter in this series (for example, making a list of difficult concepts);
- scaling - introduction of numerical indicators in the evaluation of educational activities by conducting a survey on subjects (for example, about the difficulty of learning certain topics of the course);
- determination of average values - arithmetic mean, median (indicator of the middle of the series), dispersion (degree of spread around the average), coefficient of variation, etc.;
- comparison of the obtained results with the norm, deviations from the specified indicators are determined.

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These methods make it possible to determine the reliability of the data obtained during the research. There are mathematical formulas for performing statistical calculations. Currently, there are computer programs that allow statistical processing, after which the collected material can become the property of science.

We will consider the main methods of pedagogical research without grouping.

1. Comparative historical analysis of literary sources, archival materials, documents, programs and textbooks in terms of the problem under consideration allows to get acquainted with the methodological heritage of the past years and the current state of the research problem. At the same time, the achievements are analyzed, o Valuable and pedagogical ideas that do not justify themselves are swept aside.

2. Studying the mass experience of teachers helps to identify innovative ideas justified by practice and to identify typical mistakes in teaching.

3. Pedagogical observation is one of the main methods of empirical research. It is defined as the researcher's direct perception of the pedagogical process under study. There are direct and indirect observations in which the researcher himself or his assistants act. A distinction is made between continuous and discrete observations. The first covers the entire process. The latter records the results selectively. When a researcher engages in real natural activities (such as teaching classes), they talk about participant observation. Observation materials are recorded in reports, diaries, videotapes, etc. The observation method is limited in its capabilities, because it records only the external manifestations of pedagogical facts.

4. Survey methods - information gathering methods based on the direct or indirect interaction of the researcher and subjects. The source of information is oral or written findings obtained during questionnaires, tests, control sections, etc. The results of the survey undergo statistical processing, after which the researcher can work with the obtained factual materials[22].

5. Pedagogical experiment is one of the main methods of pedagogical research. It is carried out in order to experimentally test the hypothesis. In the methodology of natural sciences, the effectiveness of using certain methodological innovations is usually determined.

The experiment, using the methods of natural sciences, is carried out in three stages.

The first stage - the identification stage - helps to identify the typical shortcomings and difficulties in teaching the fundamentals of natural sciences to schoolchildren and defines the essence of the work of searching for the most effective ways to correct them.

the second stage , during the training (formation) stage, experimental materials are tested (checked) and proposed innovations are introduced. Often, the training stage of the experiment is carried out in the natural conditions of the training process according to the variable type, which is characterized by targeted changes in different groups (control and experimental) with equal initial parameters of the experimental test conditions. . and comparing learning outcomes.

the third control stage, the effectiveness of using the new methodology in the educational process is checked. Pedagogical efficiency evaluates the level of implementation of educational goals in comparison with the given ones, i.e. ensures consistency between designed and obtained results.

The researcher should have a creative approach to the choice of scientific research methods in accordance with the subject, purpose, tasks, subject and object of pedagogical research. In this case, it is necessary to take into account the scientific working conditions[23].

The selection of scientific research methods is carried out in accordance with the following principles:

- the principle of a set of research methods, that is, to solve any scientific problem, several methods are used that correspond to the nature of the phenomenon being studied;
- the principle of conformity of the method to the essence of the studied subject and the result to be obtained.

An important requirement for the implementation of any innovation should be to take into account the principle of feasibility and reasonableness of the innovation. The science of local pedagogy has undergone many reforms, most of which later turned out to be useless for the education system. Nevertheless, even negative experimental results enrich science [24].

Science methodology should provide science theory supported by practice that allows children to be effectively taught the basics of science and develop practical skills specific to science.

KDUshinsky warned: "Pedagogical practice without theory is the same as witchcraft in medicine." It is a mistake to think that teaching skill is an art that depends on a person's innate ability and mastery of science. The teacher, of course, he must know the scientific content of the subject well, but without mastering the teaching methodology, he cannot ensure that children acquire this knowledge.

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