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Methodology of Research-Oriented Training in the System of Pedagogical Education

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Abstract

The article is devoted to the topic, the relevance of which is due to the contradiction in the system of pedagogical education: between the objective demand for research-oriented training as a mean of forming research competence among graduates of pedagogical magistracy, on the one hand, and their lack of readiness for the design and implementation of research-oriented training due to the lack of development in didactics goals, principles, forms, methods and means of designing such training. The purpose of the study: to develop and justify the methodology of research-oriented training in the system of pedagogical education. Research hypothesis: the effectiveness of research-based learning will increase if the process of its design and implementation is based on a system of knowledge about the methodology of training and the essential features of research-based learning. Objectives of the study: 1) to identify the essence and content of the concept of "methodology of training"; 2) to reveal the main characteristics of research-oriented training in the system of pedagogical education; 3) experimental testing of the methodology of research-oriented training of undergraduates in the direction of pedagogical education. Research methods: theoretical (analysis of scientific and pedagogical literature on the problem, generalization, transfer, abstraction, modeling), empirical (testing, pedagogical experiment); methods of mathematical processing of empirical data. The paper shows that research-oriented learning in the modern system of pedagogical education is formed as an independent didactic system, which has grown on the basis of the theory of problem learning and aimed at the formation of research competence of students. The methodology of research-oriented training in the system of pedagogical education is the doctrine of the organization of research activities of students, including a system of knowledge about its logical (features, forms, methods, tools) and time (phases, stages, stages) structure. Implementation of research-oriented training in accordance with the methodology proposed in the study contributes to the effective development of research competence of undergraduates in the direction of "Pedagogical education". The influence of group, pair and individual forms of organization of research-oriented training on the effectiveness of the formation of research competence of students. The results of the study can be used by researchers in the field of pedagogy, teachers of higher education, to improve the development of research competence of students, as well as teachers of secondary schools.

Keywords: methodology, research-oriented training, system of pedagogical education.

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Introduction

Trends in social development indicate that work becomes creative, and trends in the development of higher education are characterized by increased activity orientation of the educational process, the formation of students' competencies to see, identify and solve problems in professional and social activities. In this regard, the system of pedagogical education should be focused on the development of future teachers' research competence, which in modern conditions becomes an integral characteristic of the professional culture of the teacher. This is evidenced by the requirements of the FSES HE 3++ (FSES, n.d.) to graduates of the program of pedagogical magistracy. According to them, graduates should have such competencies as "the ability to design pedagogical activities on the basis of special scientific knowledge and research results" (General Professional Competence-8), "the ability to carry out critical analysis of problem situations on the basis of a systematic approach, to develop a strategy of action" (Universal Competence-1).

Let us note that the General professional competence of the GPC-8 requires a modern teacher with a master's degree in the ability to design pedagogical activities not only on the basis of special scientific knowledge, but also, very importantly, on the basis of research results. It is not so much about the results of the research of specialists as about the results of their own research carried out by the teacher in the process of teaching. This means that the system of pedagogical education should prepare the future master in the field of education to carry out pedagogical and research activities in unity. The modern practice of pedagogical education requires new standards of organization of cognitive activity of undergraduates, the construction of which is impossible without the development of appropriate methodology. In the work of a modern teacher (and not only a graduate of the master's educational program, but also at the bachelor's level), the training function is closely intertwined with the research function aimed at developing students' research skills. Therefore, the concept of research-oriented training is increasingly used in scientific sphere, and in educational practice has already accumulated some experience of such training.

However, the analysis shows that in pedagogy the concept of "research-oriented learning" is often interpreted as identical to the concepts of "problem-based learning", "problem-oriented learning", "developmental learning", "project-based learning", etc. In our opinion, research-oriented learning, although it intersects with the selected concepts, but it has its own specifics and its own characteristics that allow us to talk about its independent status. As for the educational practice, the application of research-based learning faces certain difficulties, including: insufficient development of young teachers' skills to isolate contradictions and formulate the problem of research, its object, subject and other elements of the scientific apparatus; choose the necessary research methods, process the results, analyze and comprehend them taking into account the available scientific data; interpret the results of pedagogical research. The low level of methodological culture, due to the lack of development in the didactics of design and implementation of research-oriented training, leads to the fact that the results of research cannot serve as a reliable basis for improving the efficiency of teaching (Ibragimov & Nafikova, 2018). Thus, there is a contradiction between the objective demand for research-oriented training as a means of forming research competence among graduates of the pedagogical master's degree, on the one hand, and their lack of readiness for the design and implementation of research-oriented training due to the lack of development in didactics goals, principles, forms, methods and means of designing such training. There is a lack of clarity on how to organize research-based learning in teacher education.

Purpose and objectives of the study

Research question: what is the methodology of research-oriented learning in the system of pedagogical education? The purpose of the study was to develop and justify the methodology of research-oriented training in the system of pedagogical education. To achieve this goal, we proceeded from the hypothesis that the effectiveness of research-based learning will increase if the process of its design and implementation is based on a system of knowledge about the methodology of training and the essential features of research-based learning. With this in mind, the following tasks: 1) to identify the essence and content of the concept of "methodology of training"; 2) to reveal the main characteristics of research-oriented training in the system of pedagogical education; 3) to test the methodology of research-oriented training of undergraduates in the direction of pedagogical education by experimental means.

Methodology

The research methods included a group of theoretical (analysis of scientific and pedagogical literature on the problem, generalization, transfer, abstraction, modeling), empirical (testing, pedagogical experiment) methods; methods of mathematical processing of empirical data were also used.

Results and discussion

In the course of solving the first problem it was found that in the literature there are three approaches to the definition of "methodology" (Pidkasisty, 1998). Supporters of *the first approach* believe that the methodology is: a) a system of principles and methods of building activities (theoretical and practical); b) the doctrine of this system. The methodology answers the question of what principles underpin any activity, and what methods are used to do so? Moreover, it is emphasized that it is not a set, but a system of principles and methods of building activities.

The essence of *the second approach* to the definition of methodology is that it is the doctrine of: a) the method of scientific knowledge and b) the method of transformation of the world. The emphasis only on the method (scientific knowledge and transformation of the world) suggests that this approach to the definition of methodology is narrower than the first approach. In fact, the method (from Greek. "metodos" — the way of research) is interpreted as "a way of practical or theoretical mastering of reality". In science, as a method used primarily recognized theory, acting as a means of thinking. Methods are divided into philosophical (universal), General scientific (analysis, synthesis, induction, deduction, etc.) and private-scientific, specific to a particular field of knowledge.

In accordance with *the third approach*, the methodology acts as a teaching on the principles of construction, forms and methods of research activities. Note that we are talking only about research activities. Kraevsky rightly emphasized that the indistinctness of ideas about the methodology is generated by the direct transfer of one or the other of these definitions to the pedagogical reality without taking into account the peculiarities of pedagogical science. As for pedagogy as a field of scientific knowledge, the first definition of the concept of "methodology of pedagogy" was given by Kraevsky, who noted that it is "a system of knowledge about the foundations and structure of pedagogical theory, the principles of the approach and methods of obtaining knowledge reflecting the pedagogical reality, as well as the system of activities for obtaining such knowledge and the justification of programs, logic and methods for assessing the quality of research" (Pidkasisty, 1998, p. 34). It can be seen that the methodology of pedagogy is in two aspects: as a system of knowledge and as a system of research activities.

In accordance with the first part of the definition, the methodology of pedagogy should provide an answer to the question of on what basis the pedagogical theory is built and what its structure is; what principles should be based on in the study of pedagogical reality and what methods should be used for this purpose. The second part of the definition describes the methodology of pedagogy as a system of activity. There are two types of activities. The first type – activities to obtain knowledge (on the basis and structure of the pedagogical theory, principles and methods of obtaining this knowledge) – methodological research. Their task is to identify patterns and trends in the development of pedagogical science in its connection with practice, the principles of improving the efficiency and quality of pedagogical research, analysis of their conceptual composition and methods. The second type of activity is to justify the programs, logic and methods of assessing the quality of research – methodological justification. To provide research methodologically means to use methodological knowledge to justify the research program and assess its quality.

The teacher's knowledge of the methodology of pedagogy and his ability to apply methodological knowledge in the process of resolving pedagogical situations is the basis of his methodological culture, the components of which are the design and construction of the educational process, awareness, formulation and creative solution of pedagogical problems, methodical reflection.

The study showed that since the 50s of the last century in the domestic pedagogy there has been a process of continuous increase of attention of researchers to the methodology and methods of pedagogical research. The concept of "methodology of pedagogy" with the accumulation of scientific data and developed in breadth (there was an expansion of its scope through the inclusion of new objects covered mentally by this concept - a multi-level methodology, a palette of interrelated approaches at different levels of methodology: philosophical, General scientific, private scientific, technological; coverage of methodology and practical pedagogical activity) and deep into (deepening of its content due to the allocation of new essential features).

In modern conditions, there is a formation and development of design and technological type of culture, which imposes new requirements for activities in this culture. The main vector of these changes is in the increasing role of methodological knowledge, that is, knowledge of how to carry out activities, how to design, implement and evaluate them. It follows that the questions of methodology at the present stage of historical development of education become relevant for any activity in this field – research or practical (pedagogical, managerial, educational, labor, etc.). In this context, it is obvious that the limitation of the concept of methodology of pedagogy only by the sphere of scientific and cognitive activity in education is no longer correct; it does not meet modern requirements. Time requires the expansion of the concept through its inclusion in the sphere of influence and practice in education. Novikov (2002) managed to catch and clearly fix this trend, who interpreted the methodology as "a single doctrine of the organization of activity, defining the main characteristics (features, principles, conditions), the logical structure of the activity (subject, object, object, result, forms, means, methods) and the temporary structure of the process of its implementation" (Novikov, 2002, p. 302). He showed that the methodology of pedagogy is fundamentally no different from the methodology of any field of human activity.

The result of solving the second problem was the disclosure of the main characteristics of research-oriented training in the system of pedagogical education. In the literature, the concept of "research training" is more common, the study of which is devoted to the work of both Russian and foreign scientists.

Russian scientists found that the peculiarity of research training is that it is based on the natural

desire of the child to self-study of the world. The purpose of this training is to develop the ability to independently master the necessary knowledge and new ways of action in various fields of human activity and communication. Research here is the content and meaning of learning, not a simple set of appropriate methods and means of learning.

The essence of research training is the integration of research methods in the process of educational knowledge, convergence of classroom and extracurricular research activities, the implementation of the principles of cooperation in the relationship between the teacher and students. Research training in this format has a significant impact on the personal and professional development of the future master in the field of education, it becomes a factor of self-development and self-determination.

In the works of foreign researchers it is shown that research training requires teachers to create quite complex educational situations, participating in the resolution of which children learn to explain what they saw, ask questions, observe phenomena, put forward hypotheses, collect and analyze data confirming or disproving the hypothesis, plan and conduct experiments, build models, draw conclusions, etc. The created educational situations differ in that they do not have the only correct solution, they are open, that is, allow students to learn to analyze the observed phenomena, involve them in the process of posing questions, in research activities aimed at identifying cause-effect and other relationships. The main thing in the resolution of such educational situations is the involvement of students in the research process with all its attributes (observation, analysis, making assumptions, etc.) (Hattie, 2008).

It is revealed that the research training has a greater impact on the mastery of the processes than on the mastery of the content. Moreover, the highest rates were observed in primary school and decreased as students moved to the next stage of education. Bangert-Drauns & Bankert (1990) found that research training has a positive effect on the development of critical thinking skills of students, their ability to carry out the transfer of these skills in new situations, improves attitudes to the studied school discipline, improving academic success (Hattie, 2008).

We proceed from the fact that research-oriented training in the system of pedagogical education – this is an independent classroom and extracurricular educational and cognitive activity of students under the guidance of a teacher, aimed at performing a creative research (or practical) project involving the design and implementation of research procedures (substantiation of the relevance and formulation of the problem, hypotheses and problems, the study of the theory devoted to this problem, the selection of methods and techniques of research, collection of empirical material, its analysis, generalization and interpretation, formulation of conclusions). The main purpose of research-oriented training is the development of students' research experience as an interrelated set of knowledge, skills, abilities and habits to act in educational, professional and life situations, characterized by uncertainty, requiring non-standard solutions. The criterion for the formation of such experience is the research competence of students.

Students are future teachers in the framework of research-oriented learning should form an idea of research not only as a set of specific cognitive skills that allow to solve cognitive problems productively, but as a leading method of contact with the outside world. For this purpose, research-oriented training in the system of pedagogical education should not be reduced to the fragmentary inclusion in educational practice of methods of research training. It should become a paradigm of learning in the process of teaching each discipline in order to purposefully develop research competencies of students. This means the need for purposeful systematic use of techniques, methods and forms of training aimed at the development of research competencies, and in a broader context, the research culture of students in the unity of its value-motivational, cognitive and procedural components.

Based on the interpretation of the methodology as a teaching on the organization of activities, we understand the methodology of research-based learning as a system of principles, forms, methods and means of design, implementation and reflection of the results of research-based learning. It includes knowledge and skills: a) the logical structure of research-oriented educational activities of the student (especially research-oriented educational activities, its forms, methods, tools); b) the temporary structure of research-oriented educational activities (phases, stages, stages).

To perform its main function – the development of research experience, expressed in the mastery of students ' research competencies – research-oriented training should be cross-cutting. This does not mean a decrease in attention to the traditional function of the educational process – the formation of subject knowledge, skills. It is about to identify pedagogical tools (forms, methods, techniques) that allow to integrate the principles of research-oriented learning into the structure of the educational process. Our study of this issue has shown that a research project can serve as such a pedagogical tool. Its main feature is that it has a cross-cutting character that is performed by students during the entire period of study of the discipline. The result of the research project should be a significant product for students, which in our experimental work was a scientific article. The process of developing and implementing such a research project is monitored and discussed in accordance with a pre-defined project roadmap (usually weekly during semester classes and Advisory hours).

In the course of solving the third task of the study, experimental testing of the methodology of research-oriented training of undergraduates in the direction of pedagogical education was carried out. Experimental work was carried out in the first semester of the 2018-19 academic year on the basis of the Department of pedagogy of the higher school of the Institute of psychology and education of the Kazan (Volga regional) Federal University in the process of studying the disciplines “Methodology and methods of pedagogical research”, “Modern didactics” (the first course of master's degree in “Pedagogical education”).

The purpose of experimental work is to determine the effectiveness of the methodology of research-oriented learning, depending on the forms of involvement of students in design and research activities (group, pair, individual). We proceeded from the hypothesis that the success of students’ design and research activity depends on the forms of organization of this activity (group, pair, individual) and, in particular, assumed that the greatest effect in the development of students’ research competence will be in the group form of training. With this in mind, experimental work was organized. The total sample consisted of 130 students (64 experimental groups, 66 control groups). In all groups, the training was conducted according to the methodology of research-oriented training. The only difference was in the forms of organization of educational and research activities of students: in the experimental group (EG) research projects were carried out by a team of 4 people, and in the control – in pairs (CG-1) and individually (CG-2). In all groups, the work was conducted by the same teacher, which eliminated the influence of the factor “personality of the teacher”.

As a criterion of efficiency (dependent variable) was the level of development of research competence of students. Diagnosis of levels of development of research competence of students at the beginning and end of the study was carried out on the basis of a comprehensive test developed and tested by Mishin (2011). To compare and evaluate the reliability of the results of the study, a sign test (sign criterion) was used, which allowed to justify the reliability of differences in the experimental and control groups (Kyveryalg, 1980). The results of the study at the initial and final stage of the experimental work are presented in the table.

Table

Distribution of students of experimental and control groups by levels of development of research competence at the beginning and end of the experiment (EG – project research work in groups of 4 people; CG-1 – work in pairs; CG-2 – individual work on the project)

Groups	Distribution of students by levels of research competence (abs./ %)							
	I		II		III		IV	
	tart	inal	S tart	F inal	S tart	F inal	tart	F inal
EG (64 students)	/0,0	/0,0	16/25,0	2 /3,1	40/62,5	36/56,3	/12,5	26/40,6
CG–1 (32 stud.)	/0,0	/0,0	14/43,8	10/31,3	16/50,0	18/56,3	/6,2	4 /12,4
CG–2 (34 stud.)	/5,9	/0,0	22/64,7	2/5,9	10/29,4	24/70,6	/0,0	8 /23,6

As can be seen from the table, at the initial stage of the experiment, the number of undergraduates at the third and fourth levels of formation of research competence in the experimental groups was 75.0%, and at the end - 96.9 % (increase – 21.9%); in the first control group (CG-1): at the beginning 56.2 %, at the end - 68.7% (increase – 12.5%); in the second control group (CG-2): at the beginning -29.4%, at the end - 94.2% (increase – 64.8%). Since the initial situation in the experimental and control groups was different, the assessment of effectiveness should be carried out according to the data on the pedagogical effect expressed in the increase in research competence that took place in all groups. With this in mind, it can be stated that the greatest pedagogical effect was observed in the control group CG-2 (64.8% increase), and the smallest – in the control group CG-1 (12.5% increase).

Thus, according to the test results, it can be concluded that the methodology of research-based learning is most effective when undergraduates work on the implementation of research projects individually. As for the group form of work, it is preferable to work in pairs.

Conclusion

Research-oriented training in the modern system of pedagogical education is formed as an independent didactic system, which has grown on the basis of the theory of problem education and aimed at the formation of research competence of students.

The methodology of research-oriented training in the system of pedagogical education is the doctrine of the organization of research activities of students, including a system of knowledge about its logical (features, forms, methods, tools) and time (phases, stages, stages) structure.

Implementation of research-oriented training in accordance with the methodology proposed in the study contributes to the effective development of research competence of undergraduates in the direction of "Pedagogical education". At the same time, the greatest efficiency takes place in the case when students work on the implementation of research projects individually. Group and pair forms of work are less effective than individual work.

In conditions of high uncertainty in all spheres of human life, the need for orientation of the system of pedagogical education to the training of teachers who are able to develop students' research experience as a certain guarantee of readiness to act in non-standard situations, to isolate problems and be able to find solutions based on the mastered research culture is actualized. In this regard, it is necessary to organize systematic work, covering organizational and managerial, psychological, pedagogical and methodological problems of design and implementation of research-oriented training at different levels – institutional, departmental, teacher and student activities.

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