

Enhancement of scientific research function of future teachers in modern education system

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Abstract

The global trend of accelerating scientific and technological progress, the introduction of information technologies, and the transformation of the vocational education system require the development of professional and general cultural competencies in future specialists. The purpose of the study was to scientifically substantiate, create and experimentally test a theoretical model of the formation of a research function in future teachers of vocational training. The methods employed in this research was complementary research methods: theoretical (analysis of scientific literature on the research problem; theoretical modeling, analysis, generalization, comparison, systematization, construction of the process of forming scientific and professional competencies of future teachers); empirical (questionnaire, interview, testing, cross-sectional method); statistical (processing of research materials, primary statistical processing, correlation analysis, analysis of the results of experimental activities). The result of this study showed that the problem of studying and designing a system of pedagogical conditions for the formation of research culture is relevant in the context of the introduction of innovative technologies.

Keywords: Future teachers; scientific research; modern education system.

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1. Introduction

In the context of the transition to a multi-level system of professional education, when the emphasis is on the development of research and creative skills, the main way to enhance the professional activity of future teachers in the field of pedagogical theory and practice is the formation of a research function among students. What is important is not so much the acquisition of knowledge by students as their efforts, initiative, and search activity in the acquisition of scientific knowledge. We are talking about the formation of a meaningful need to master the methods of scientific and pedagogical skills, to effectively solve research problems, to determine the significance of new scientific ideas for the development of modern society (Sirotova, MichvocíKová & Rubacha, 2021).

In this regard, it is fundamentally important to organize the learning process at the university in such a way that it purposefully includes specific research tasks and general methodological training, involving creative perception and reflexive assessment of pedagogical activity, with which the research work of future teachers of vocational training is closely related. Research work allows the future teacher to self-determine in the space of the social environment of professional and pedagogical activity. This problem is considered in studies of various theoretical approaches to the vocational education of following researchers as S. Uzakpayeva, S.Zholdasbekova, professionally significant qualities of a student by Zh. Bissenbayeva (Abdikerimova, Duisekova & Bissenbayeva, 2020).

In accordance with the specified criteria and indicators, the levels of the formation of scientific research function among teachers of vocational training are highlighted: adaptive, creative, creative, and the effectiveness of the theoretical model of the formation of research function among future teachers of vocational training in the scientific environment of the university is assessed.

Traditionally, the concept of student research work (SRWS) is identified with the forms of attracting students to the scientific work of departments, as well as department and university laboratories, the implementation of educational research work, the defense of term papers and theses, participation in conferences, seminars, competitions, exhibitions, which for building professional competence will not be enough (Orazakynkyzy et al., 2018).

Sociological studies show that a significant part of the student body does not take an active part in scientific work and scientific and technical creativity, although funds are allocated (in the form of grants) for the development of material and technical equipment and incentives for its participants. There is a problem of the formation of the skills of scientific search, system analysis of information, its use in research activities. This significantly weakens the influence of this factor on student professional and personal development.

The leading principle of organizing research work is to ensure the organic unity of scientific and educational processes that affect the improvement of the quality of training of specialists. It is necessary to strengthen the connection between science and production, the practical use of the obtained scientific, technical, professional knowledge based on a personal and creative approach (Tkacova, 2021a; Valiullina, 2021).

Research work should be identified with the scientific work of future teachers, in the process of which the formation of research qualities, skills, and research skills among students takes place in stages, taking into account the professional and pedagogical orientation of the future profession. In addition, it is necessary to develop the creative potential of students with direct participation in the development of research and production associations and focus on working with the advanced technologies of tomorrow.

For this, it is important to integrate the educational process with research design, which will allow future teachers of vocational training to accumulate a fundamental base of scientific knowledge and practical skills. It is necessary to actively motivate the attitude towards self-learning and self-organization, towards the continuous expansion and deepening of scientific knowledge and skills with possible development prospects, which is a key point in research activities. If a student, relying on his

own experience, independently "obtains" knowledge in the educational process, and does not receive it in a finished form, then he will strive to launch this mechanism in his future professional and pedagogical activity. The words of the philosopher G. Bockle that knowledge is not an inert, passive visitor who comes to us, whether we like it or not; it must be sought before it is ours; it is the result of a lot of work and therefore a great sacrifice, reflect the meaning of the educational process - to purposefully create oneself (Vasbiyeva, 2021).

Thus, the research activity of the future teacher of vocational training must be considered as creative active work, in the process of which the formation of the research competence of the individual takes place with the aim of subjective development of scientific knowledge in the field of professional activity. This definition is aimed at solving professional research problems in the practical training of future teachers of vocational training. It is the organization of students' research activities that is an important form of seeking scientific knowledge, developing research skills, and forming personal qualities that contribute to the development of creative thinking, technical abilities, and professional confidence (Zholdasbekova, 2021).

1.1. Purpose of study

The problem of studying and designing a system of pedagogical conditions for the formation of a research culture, taking into account the implementation of new educational programs, modern teaching technologies in the educational environment of a university, and practical professional training, is especially relevant in the context of the introduction of innovative technologies. The purpose of the study is to scientifically substantiate, create and experimentally test a theoretical model of the formation of a research function in future teachers of vocational training.

2. Methodology

2.1. Data collection instruments

The solution to the tasks set led to the use of complementary research methods: theoretical (analysis of scientific literature on the research problem; theoretical modeling, analysis, generalization, comparison, systematization, construction of the process of forming scientific and professional competencies of future teachers). For empirical data collection, this study used questionnaires, interviews, testing, cross-sectional method.

2.2. Participants

The experimental research base is Kazakh National Women's Teacher Training University. The experimental work involved 150 students.

2.3. Data Analysis

Statistical data analysis included the processing of research materials, primary statistical processing, correlation analysis, analysis of the results of experimental activities.

2.4. Procedure

The first stage (2019) is exploratory, theoretical. Selection and theoretical understanding of the research topic. The scientific sources of domestic and foreign researchers on cultural and psychological-pedagogical concepts in vocational education studied. The features of educational, research activities of future teachers were identified, an analysis of state educational standards of higher professional education, basic educational programs, collection and processing of materials on the research problem was carried out; definition of goals, objectives, formulation of a working hypothesis.

At the same stage, the conceptual apparatus of the research was developed, and the ascertaining experiment was carried out.

The second stage (2020) is analytical, experimental. A theoretical model of the formation of the research function of future teachers of vocational training developed, the pedagogical conditions were experimentally tested and refined. Approbation of the academic discipline "Fundamentals of Scientific Knowledge", an additional special course "Fundamentals of Research Design" was carried out, and the necessary educational and program documentation was developed. A formative experiment was carried out with the processing of the obtained data.

The third stage (2021) is a generalizing, final one. Theoretical comprehension and analysis of the results of experimental work and the study as a whole. The research results were systematized, and the main conclusions are formulated on their basis; the text of the thesis, methodical recommendations were drawn up.

Based on these provisions, we will introduce a theoretical model of the formation of a research function among teachers of vocational training for the development of professional competencies.

The model under consideration is implemented through modeling problem-based learning technologies, using research and heuristic methods in the educational space of the university: the target block is presented by the goal of preparing future teachers of vocational training for research activities, the implementation of professional motivation and the formation of research function in the educational space of the university and its promising importance in professional activities; the content-procedural block consists of training modules, the application of new methods and forms of organization, for the successful mastery of knowledge, skills and abilities of research activities by the student, creates conditions for the analysis and solution of educational and professional problems, forms the activity of thought processes, preparation for developing their own creative projects and activates research functions; the performance-evaluating block includes criteria, levels of formation of research experience in professional activity and, as results, the formation of research and project competencies.

3. Results

The study identified the following criteria for the formation of the research function of future teachers of vocational training, which make it possible to track the dynamics and effectiveness of their readiness for research activities:

- the motivational-orientational criterion includes the following indicators: readiness for scientific self-knowledge, the presence of motivation to master and apply scientific knowledge in organizing research work in professional activity; the ability to scientifically analyze socially significant problems and processes in various types of professional and pedagogical activities; the ability to model professional and pedagogical actions;
- information criterion reveals the following indicators of readiness: knowledge of methodological foundations, concepts, theories, and fundamental principles of research activities; focused on the use of research methods and techniques for solving professional problems; possession of educational and program documentation for personnel training;
- the personality-cognitive criterion determines the integrity of ideas about the system of scientific knowledge, knowledge of research methodology, the presence of personal readiness to use research technologies; the ability for cognitive activity, conscious subjective reflection, and control in the process of research work; mastery of the creative process, search and creation of new ideas in the educational process.

At the stage of the formative experiment for each of the organizational and pedagogical conditions for the formation of a research culture, we conducted a study of 2–4-year students of the specialty "Vocational Training" in the development and application of research training projects by them. The research was carried out in three stages, at each stage we tested the following program and organizational conditions:

1. Provision of positive motivation and actualization of the needs of future teachers of vocational training for research activities and the purposeful formation of research culture.

2. Introduction of the special course "Fundamentals of Research Design" into the educational process of vocational training of future teachers of vocational training.

3. Development and application of the educational program Web-quest "Researcher".

These conditions were tested in the 2020 academic years at the stage of the formative experiment. In accordance with the tasks of the experimental work, three experimental and three control groups we formed. In the first experimental group (EG-1), the effectiveness of the introduction of the first and second conditions was determined, in the second experimental group (EG-2) - the effectiveness of the first and third conditions, in the third experimental group (EG-3) - the complex of the pedagogical conditions identified by us.

In groups KG-1, KG-2, KG-3, the formation of the research function of students took place within the framework of traditional education. In 2021, the final statistical processing of the results was carried out.

To generalize the results of the experimental work at the formative stage of the experiment, we used the method of statistical processing of the experimental results according to the Student's t-criterion. We used the following adapted methods to assess the formation of the research function of future teachers of vocational training: motivational-orientational, informational, personality-cognitive criterion was studied according to the methodology "Research function of the future teacher of vocational training", we used control sections and questionnaires "Attitude to the special course" Scientific -research design ". The personality-cognitive criterion was assessed by the method of evaluating the results of research activities. The personality-cognitive criterion was assessed using the test "Self-assessment of the creative potential of the personality of a teacher-researcher".

The study to identify the level of formation of the research function (according to the information criterion) among 2-year students provided for the assessment of the future teachers' proficiency in vocational training in information and communication technologies. An analysis of the tools used and applied allows us to give a qualitative assessment of the studied skills of students, as well as to conclude their readiness for research activities and the involvement of innovative technologies in the process of vocational training. Revealing the level of formation of information retrieval skills was carried out in accordance with the levels of assimilation of their content identified by us for 2-4 courses with the participation of students from control and experimental groups.

In the process of studying the level of formation of information retrieval skills among students, we assessed not only the ability to own and use information and communication technologies in various pedagogical situations but also their ability to choose the most rational ways of using them, as well as to justify their choice.

Parameters for evaluating practical actions for the implementation of the course project: score 0 - the task is not mastered (during its implementation, a large number of errors are allowed or it has not been completed); point 1 - the task is satisfactory (1-2 inaccuracies are allowed during the operation); point 2 - the task was completed without errors, but the student finds it difficult to independently choose the way to complete the task and justify his actions; 3 - the student implements the required action without errors and can determine the most rational way of performing this or that technological means of teaching, depending on various kinds of conditions.

The general results of the fulfillment of educational tasks in the experimental groups: 56.4% or 123 students received a score of 3; score 2 - 25.7%, or 57 for future vocational education teachers; score 1 - 13.3%, or 29 people; score 0 - 2.6%, or 5 students. The overall results of the fulfillment of the same tasks in the control groups were, respectively: 29%, or 59 for future teachers of vocational training; 51%, or 105 students; 11.3%, or 23 students; 8.7%, or 17. Thus, the percentage of students

who received points 3 and 2 is in the experimental groups - 26.6%, (57 students), in the control groups - 11.3% (23 students).

It follows from this that the difference in the average indicators of the fulfillment of the control and experimental groups of test tasks by future teachers of vocational training is statistically significant.

At the first stage of the formative experiment, the first program-organizational condition was realized: the organization of a professionally directed learning process based on a systematic selection of integrated training content, intensification and optimization of the educational process, and the creation of an information environment.

In the experimental (EG-1) and control (CG-1) groups, the dynamics of the formation of the components of the research function were traced. For this purpose, the methods of observation, testing, polling were used. The effectiveness of the experimental work was checked by the method of expert evaluation (by% 2-person criterion).

Among the main values noted by the students from the EG and CG were the following: a sense of satisfaction in the process of searching, processing, coding, interpretation, visualization, and use of scientific information (39% - EG and 12% - CT); the ability to understand someone else's point of view, respect other tastes (34% and 19%); a feeling of fullness and emotional richness of life, the fullest possible use of one's capabilities, strengths and creative abilities (20% and \ 2%); a sense of the need to achieve success in finding the necessary information and using information and communication teaching aids (33% and 12%); the ability to act independently and decisively (38% and 11%). These data indicate a positive attitude of about a third of students from the EG - 1 to the use of innovative forms of education, to participate in research activities (in CG - 1 these indicators are two times lower).

One of the indicators of the responsible, interested attitude of students to the formation of professional function (which can be considered as an independent one) is the measure of the formation of motivation for participation in the development of research teaching aids, the degree of interest in the results of their activities. According to the survey data received, 11 - 15% of students from CG - 1 agreed to prepare educational WEB-quests "to get credit in the subject", another 15 - 20% - "if something unusual, interesting comes to mind." At the same time, two-thirds of students from EG - 1 intended to prepare an educational WEB-quest for college students to "raise the prestige of their specialty, faculty", "to realize their creative potential." Thus, it can be stated: about a third of the future teachers of the experimental group can be attributed to the number of persons who have a high positive motivation to participate in research activities.

4. Discussion

The reliability and validity of the research results are due to the clarity of the initial methodological principles for the indicated problem; the choice of a set of scientific research methods corresponding to the goal, subject, and objectives of the research; the variability of the experiment and the repeatability of its results, the processing of experimental data, based on mathematical and statistical methods, with the confirmation of the research hypothesis about the possibility of the gradual formation of a scientific research function in the process of vocational training.

The personal participation of the applicant consists in:

- analysis of scientific and pedagogical literature;
- development of theoretical provisions and obtaining experimental data, in clarifying the capabilities of the research environment of the university;
- direct participation in experimental work as a teacher and consultant;
- development and implementation of a theoretical model of the formation of a research function among future teachers of vocational training;

- identifying the pedagogical conditions for the formation of a scientific research function for future teachers of vocational training (Kanybekova, 2020).

The source of the accumulation of professional and pedagogical knowledge, allowing to provide a theoretical basis for scientific work, are general philosophical provisions and categories that make it possible to consider the problem through the prism of philosophical knowledge; general scientific methodology; special knowledge obtained as a result of methodological research in the field of professional pedagogy; special scientific theories that can become a means of methodological support for specific pedagogical research; the results of methodological reflection, reflections of the future teacher about the methods of scientific knowledge used by him.

Research activities can be represented by various forms of work. This is the holding of conferences of various levels, theoretical seminars (reports, messages), workshops, masterclasses, debates, discussions ("round table", dialogue-dispute, debates, forum), "business games", role-playing games; research projects discussing the latest modern techniques, technologies, achievements of psychological and pedagogical science. Considering research work as a personality-activity component of professional training of future teachers, we consider it necessary to use it at all stages of professional training, determining the practical orientation of the work performed, depending on the degree of preparedness (Tkacova, 2021b).

A distinctive feature of the humanistic approach in pedagogy and psychology is special attention to the individuality of a person, his personality, a clear orientation towards the conscious development of independent, research thinking. This approach is considered in the world pedagogical practice as a traditional, problematic and an alternative in innovative education, mainly on the assimilation of ready-made knowledge and their reproduction, an approach focused on the independent, active, cognitive activity of students and is the main one in distance education (Zařková & Ambrozy, 2021).

4.1. Developing a theoretical model for the formation of scientific research in future teachers

In this study, we draw attention to the fact that by the formation of the research function of future teachers of vocational training we will mean "not molding", not putting in a finished form, but "taking shape" with certain content, providing this aspiration with certain forms, means, and conditions, focusing on a personal approach in vocational training. When developing a theoretical model for the formation of scientific research in future teachers of vocational training, we have identified the following key blocks: target, content-procedural, productive-evaluative.

1. The target block is aimed at preparing future teachers of vocational training for research activities, at the implementation of professional motivation, and the formation of a research function in the educational space of the university and its promising significance in professional activities. In the aspect of the implementation of this component of the model, the formation of holistic pedagogical knowledge of future teachers takes place, performing a guiding, motivating function, and includes:

- target attitudes are due to the fact that the conscious goal in the activities of the teacher-researcher determines the choice of methods, actions, and acts as a means of control, verification of the results of actions with the predicted outcome. On the other hand, it is aimed at fostering motivating and intellectual motives based on the understanding by future teachers of the importance of holistic scientific knowledge in future professional activities;
- emotional attitudes associated with the formation of directly motivating motives based on the emotional manifestations of future teachers in relation to the knowledge of the psychological and pedagogical cycle and holistic pedagogical knowledge in particular;
- creative attitudes, implying the formation of creatively creative motives based on obtaining satisfaction from the process of creative "appropriation" of integral pedagogical knowledge.

The implementation of the target block of the model for the formation of research function is possible provided that the following provisions are fulfilled: development of achievement motivation in the process of creating integral pedagogical knowledge as a product of professional and cognitive activity; creating situations of success and openness and supporting the aspirations of future teachers of vocational training to assimilate holistic pedagogical knowledge and creative activity; reliance on life experience as a way of demanding knowledge, which has grounds for an emotionally comfortable process of mastering integral pedagogical knowledge.

2. The content-procedural block consists of training modules, the application of new methods and forms of organization for the successful mastering by the student of knowledge, skills, and abilities of research activities, creates conditions for the analysis and solution of educational and professional problems, forms the activity of thought processes, preparation for development own creative projects and activates research functions.

The substantive-procedural block of the model determines the stable, consistent, purposeful nature of the process of forming integral pedagogical knowledge in future teachers of vocational training. The main function of the content-procedural block is to create creative pedagogical conditions for high-quality training of future teachers of vocational training.

The content-procedural block includes an effective didactic toolkit: the sequence and appropriateness of the selection of methods, techniques for the formation of holistic professional knowledge of future teachers of vocational training. Methodological methods of emotional and intellectual stimulation of cognitive activity, methods of enhancing understanding of holistic pedagogical knowledge, the method of creative interpretation of scientific knowledge, and life experience were chosen as the means of ensuring the functioning of this block. Their implementation is spelled out in the technological support of the process of forming integral professional scientific knowledge at the formative stage of experimental work.

Forms as a way of implementing the content-procedural block include lectures based on the integrative content of the psychological and pedagogical cycle of disciplines, seminars based on intellectually creative activity, practical exercises. It should be noted that research activities should be aimed at the self-development of future teachers of vocational training: to activate cognitive processes (stay in the educational environment as a researcher-analyst capable of analyzing and generalizing scientific factors); to form an information function (the ability to manage information, navigate databases, use various sources of information, including the ability to work with an electronic library); development of computer literacy (practical and information technology skills).

Forms as a way of implementing the content-procedural block include lectures based on the integrative content of the psychological and pedagogical cycle of disciplines, seminars based on intellectually creative activity, practical exercises based on theoretical scientific knowledge in their single whole. For the scientific support of the developed theoretical model, we consider it necessary to include in the process of professional training: the discipline "Fundamentals of Scientific Knowledge", the special course "Fundamentals of Research Design" and the educational program of the Web-quest "Researcher", which broaden the horizons and deepen knowledge about research work with the use of modern computer technologies. Their detailed implementation is described in the technological support of the experimental work of this study and represents a personal-activity approach to the formation of integral professional and pedagogical knowledge in future teachers.

3. The productive-evaluative block includes the criteria, the levels of the formed research function in vocational training, and, as a result, the readiness for research and professional-pedagogical activity.

This is the control and assessment of the results of the formation of research culture, which are carried out when performing tests, passing exams, as well as by questioning students. The formation of a research function among future teachers of vocational training is influenced both by the characteristics of the teaching profession itself and by objective ones: global trends in education,

the state of the education system and the quality of educational services, the function of an educational institution, the prestige of the profession in society, as well as subjective which can be attributed to the general culture, the motivation of the individual to obtain a professional education, a predisposition to teaching.

Thus, we can conclude that pedagogical conditions are specially created external circumstances that predetermine the choice of forms and methods of teaching, which determine the professional development of future teachers of vocational training. In the course of the study, we identified and substantiated pedagogical conditions that ensure the formation of a research function of future teachers of vocational training (Orazakykyzy et al., 2018, Wang et al., 2017).

In modern society, the needs of pedagogical theory and practice are expressed, first of all, in the need to improve vocational and pedagogical training, the purpose of which is to form future teachers of general pedagogical knowledge and skills, typical professional and personal qualities, skills and abilities corresponding to specialization. In addition, the priority task is to ensure the training and self-realization of the future teacher, and the specificity of the activities of the subjects of the educational process is due to the action of a combination of internal and external factors associated with social innovation processes. This is due to the determination of the specifics of the vocational education process aimed at shaping the personality of a teacher who has a holistic scientific worldview. In this regard, the implementation of professional and pedagogical activity in a university presupposes the correspondence and consistency of the needs of pedagogical theory and practice in such a process, which means a certain measure of conformity of professional function and all its components in the process of forming a holistic pedagogical knowledge of future teachers of vocational training (Pupikova & Birova, 2020; Ramakrishnan et al., 2020).

This task can be implemented in two ways. Through the external environment, by building the process of training future teachers based on spiritual continuity, taking into account internal factors; interaction of various entities in the process of preparing a future teacher; expanding the sphere of cultural influence on education and the process of preparing a future teacher. And, accordingly, using the internal environment of the educational process at the university, which implies: the organization of the activities of the subjects of education at the university as cultural in form, content, focus; implementation of the process of preparing a future teacher, taking into account cultural norms and moral aspects, as well as didactic samples; mediation of education by universal human values and its orientation towards the value attitude towards future pedagogical activity.

5. Conclusion

Based on the analysis of theoretical concepts, it should be noted that the formation of a research function is closely related to activities aimed at the implementation of mental, research, spiritual, creative work of a person - in the development and improvement of the inner world, consciousness, thinking, knowledge, emotions, experiences, the result which are new ideas, concepts, scientific hypotheses, theories, practical skills, etc. It has been established that the research activity of a teacher is a mechanism for the teacher's self-development as a researcher, which allows him to effectively solve emerging professional problems based on general provisions borrowed or created by him. Consequently, in the professional training of future teachers, it is necessary to pay attention to the very process of organizing the acquisition of scientific theoretical knowledge. After all, the content of the methodological component is a complex creative process in which the research function is a component of the development of the professional competencies of the future teacher. In this regard, it is required to determine the pedagogical conditions for the formation of the research function of future teachers and their readiness to carry out research activities in the educational space of the university.

In our opinion, it is special disciplines that form students' skills in research activities related to their future profession, namely: the formation of a teacher's internal motivation for research activities; organizational, pedagogical, and psychological components of the teacher's research activities; raising

the level of the teacher's research function through various forms of pedagogical interaction; self-analysis of professional activity from the standpoint of scientific character, significance and development prospects of the results obtained; development of an innovative project on the topic of self-education; the influence of the teacher's research activity on the development of his professional skills.

The theoretical significance of the research lies in the fact that the results of the dissertation research supplement the theory and methodology of vocational education with knowledge in the field of training future teachers of vocational training, expanding the understanding of the concepts of "research culture", "research competence"; the pedagogical conditions for the formation of a research culture, taking into account the scientific environment of the university, are theoretically indicated.

The practical significance of the study is as follows:

- developed: educational and methodological complex of the discipline "Fundamentals of Scientific Knowledge", a special course "Fundamentals of Research Design", an educational program WEB-quest "Researcher", aimed at improving the process of forming a research function among future teachers of vocational training, taking into account the scientific environment university.

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