



SCIENTIFIC AND METHODOLOGICAL BASIS OF PRACTICE-ORIENTED TRAINING OF STUDENTS-BIOLOGISTS: A CASE STUDY IN KAZAKHSTAN

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ABSTRACT

The aim of this paper is to solve the problem of practical major training for biology majors under the framework of higher education modernization. By using a variety of specialized techniques, forms and teaching methods, a discipline that is not only universal and specialized has been formed, competencies, as well as reflective and professional self-actualization. The aim of this research is to study the practically test the organizational and pedagogical conditions of the practice-oriented training for the future teachers-biologists. This quantitative research is to study the practice-oriented training of student biologist from the literature review. Questionnaire pertaining to the scientific and methodological basis of practice-oriented were send to the 3rd and 4th year students majoring in biology. According to the framework standard, a descriptive analysis of the results is carried out on the respondents' assessment of the professional maturity of future teachers; motivation is a symbolic bundle of professional action motivation (professional orientation, job satisfaction), and the individual is an important characteristic of teachers forming an individual. Willingness, ways of personal self-expression and self-development (professional intent, reflection), and cognition serve as the basis for training subjects, methods, psychology, and teaching skills (vocational training, teaching thinking). The proposed levels of professional readiness of future teachers will help to improve the competency in pedagogy of the biology teacher and contribute to the higher education in term of the education curriculums.

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Keywords: competence; higher education; modernization; professional; students; training

INTRODUCTION

The changes that have taken place in our country in recent years have led to changes in educational policy, a revision of the foundations of the theory and practice of education, a change in educational paradigms and the use of new approaches to learning. One of the trends in the modernization of pedagogical education is diversification - a change in the direction of diversity.

According to the provisions of the State program for the development of education and science of the Republic of Kazakhstan for 2016-2019 and in connection with the implementation of new educational curriculums of higher education (Ellahi et al., 2019), there are opportunities for restructuring the components of the education system (goals and objectives, content, means and methods of teaching; activities of all subjects of the educational process) the foundation of a practice-oriented approach taking into account the future graduate professional activities.

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The appeal of modern teacher education to the personality of future teachers allows us to individualize the training process. At the same time, the role of the student in the development of the profession is also enhanced: he must clearly represent the goal and objectives of his future activities (Gucluer & Kesercioglu, 2012); be aware of the requirements imposed on the teaching profession; show independence in building his educational trajectory in accordance with his capabilities and abilities, as well as the employment market requirements.

The transition to new educational standards, the growth and execution of education-level programs requires the active use of modern technologies based on the principles of contextual learning, forms and methods of interactive learning and increasing the practical component of training future educators (traditionally higher education is characterized by more theory training), which entails a review of approaches to practice-oriented training of future teachers with regard to the requirements of employers and professional standard of the teacher. In modern scientific and pedagogical literature, there is enough experience that can serve as a prerequisite for solving the problem of research. The issues of practice-oriented professional training are considered in the works of where the authors write about the need to actively include the student in all kinds practice-oriented activities (Nurgaliyeva, 2021).

It should be noted that modern literature defines the theoretical framework, aspects and approaches to the process of practice-oriented training of future teachers. However, during the modernization of pedagogical education, they will change. Thus, in pedagogical theory and practice there is a situation that is characterized by a number of contradictions: At the socio-educational level, employers have increased demands on teachers due to the corresponding labor functions of professional standards, and the practice-oriented training system for teachers is not effective enough; at the scientific and theoretical level. Thus, the existence of scientific regulations, practice-oriented training between methods and insufficient development of the methodological basis for practice-oriented professional training of future teachers; at the scientific and methodological level. On other hand, lack in the need to strengthen the applied (practice-oriented) nature of professional training for future teachers and the technical aspects of such training development, taking into account the trend of modernization of teaching and education (Melash et al., 2020).

These contradictions caused the problem of the study, which is the need to determine the organizational and pedagogical conditions that increase the effectiveness of practice-oriented professional training of future teachers-biologists in the course of modernization of pedagogical education (Kassymova et al., 2020). There are many issues to be addressed in the educational process regarding teaching online (Kenzhaliyev et al., 2021). The presented problem determined the choice of the article's topic: "Scientific and methodical basis of the practice-oriented training of students-biologists in the context of modernization of higher education". The purpose of the article is to theoretically justify and practically test the organizational and pedagogical conditions that increase the effectiveness of practice-oriented training of future teachers-biologists during the modernization of pedagogical education.

4th year students enjoyed teaching biology in grades 6-8, and most of them wanted to work as teachers for this age group. The students situation of this age are active and have good relationships with interns (Asy'ari et al., 2019). Many trainees have successfully mastered and put into practice new information technologies of teaching. There is an explanation for this - according to the curriculum, in the 3rd and 4th year they studied such subjects as "Modern teaching technologies in biology", "New approaches to teaching biology", so they assessed this issue with mean value of 4.5.

The organization of pedagogical practice of students at all stages is aimed at ensuring the continuity and consistency of students' professional activity in accordance with the training level of graduates requirements (Hassan et al., 2021). Pedagogical practice allows students to purposefully perform the education activities and diagnostic the education needs, to adapt to school as an educational institution, to understand the meaning and specifics of the teaching profession, to form a communicative culture of the future teacher, to develop organizational skills, tactics and strategies of pedagogical communication (Golubchikova et al., 2021). This allows students to master the forms of extracurricular activities and the formation of cultural and aesthetic competence of the future teacher, the formation of a careful and correct approach to children.

The problem of practice-oriented professional training of the future specialist is one of the urgent problems in all areas: scientific, industrial, and pedagogical. This is due to the fact that in recent years there has been an increase in interest in the development of the problem of practi-

ce-oriented training, which, in our opinion, is due to the specifics of the modern labor market: new jobs, directions and profiles of training, changing job descriptions, employers' requirements to the specialists are becoming more stringent. The level of development of modern society, science and production makes higher and higher demands on a specialist of any profile. Moreover, the employer today needs highly qualified, competitive personnel, but the competence of modern graduates does not meet all the high requirements of the production sector. Today, there is a clear gap between the current requirements for the content and results of training graduates in pedagogical specialties and the existing system of training specialists in pedagogical profile, the structure and content of educational curriculums. Education reform should ensure that it is moved to a school and that talented, motivated and competent people are retained.

The signing by Kazakhstan of the Bologna agreement has set new goals for the higher education system and clearly recognized the need for deep transformations of this system, which proclaims the creation of a single educational space as an environment for training mobile graduates of higher education who possess a wide range of competencies and are capable of self-education. One of the directions of modernization of Kazakhstan's education was the transition to a multi-level model of training: bachelor's and master's degrees. This approach allows for the integration of Kazakhstan's education into the European educational space. The indicated trends in the modernization of professional education require defining new approaches to organizing the process of practice-oriented professional training of future teachers-biologists. The introduction of a new educational standard of higher education provides for strengthening the applied (practice-oriented) nature of professional training of future teachers, where "applied" means "of practical significance, applied in practice".

The methodological basis for the practice-oriented training process can be a practice-oriented approach to training professionals in an educational institution, the application of practice-oriented models and technology, the professional competences of the student's personality in order to meet the gradual formation. The indicated trends in the modernization of professional education require defining new approaches to organizing the process of practice-oriented professional training future teacher.

At the present stage, a practice-oriented approach and training of specialists based on it will increase the number of independent, crea-

tive, initiative, and enterprising people who are able to offer and develop innovative ideas in the profession, find innovative solutions, and implement educational projects (Nandan & London, 2013). However, the importance of practice-oriented professional training for modern higher education, its curriculum component and forms are less exposed in the theoretical and methodological development. In addition, significant characteristics of professional development of future teachers in the educational environment are insufficiently substantiated in the pedagogical theory and applied sphere (Kähler et al., 2020). Also, there is no model, the practice of implementation of which could organize the possibility of improving the quality of professional training of specialists in modern conditions. The study of approaches to practice-oriented professional training, determining its impact on the formation, implementation, and professional self-improvement of the individual is an urgent problem of pedagogy at the present stage of modernization of the education system (Tze et al., 2020). In this regard, we will define the essence of the process of practice-oriented professional training of future teachers-biologists in the course of modernization of pedagogical education. There are several understandings of its essence, which differ not only in the degree of coverage of elements of the educational process, but also in the functions of students and teachers in the emerging system of practice-oriented learning.

The narrowest understanding connects the practice-oriented professional training of a specialist with the formation of professional experience of trainees when they are immersed in the professional environment during training, production and pre-graduate practices. This understanding is presented in detail in the works of Diachok et al. (2020). These scientists identify the following goals of the practice: "introduction of the students to the professional environment, formation of skills within the boundaries of their profession; correlating of own idea of the profession with the requirements of society; awareness of your own role in social work" Nagovitsyn et al. (2019). It should be noted that Diachok et al. (2020) identify some shortcomings in practice that are essential for the organization of practice-oriented training of future teachers. For example, opportunities for practice are limited by the lack of a unified system of interaction between the school and the University.

The following understanding of the essence of the process of practice-oriented professional training is related to works of Nagovitsyn et al. (2019) where the process of preparing for the

profession involves the use of professionally-oriented training technologies and methods for modeling fragments of future professional activity based on the use of applied study of specialized disciplines. The main advantage of using professional-oriented technologies is that the student is in an active position, the subjects are presented in the form of scenarios for the deployment of various aspects of future professional activities. This helps the students to accumulate experience in using educational information in the professional sphere, and their knowledge and skills are formed in the context of solving simulated situations of professional activity.

A third understanding of the practice-oriented approach in the competency-active paradigm is formulated in the work of Mokulova et al. (2015). In accordance with what the author says, education is aimed not only at acquiring knowledge, skills, but also at gaining practical experience in order to achieve socially and professionally significant competencies. Such an understanding of the essence of practice-oriented professional training, according to Mokulova et al. (2015), ensures active involvement of students in activities. In addition, the motivation for applying the theoretical material goes from the need to solving practical problems. This type of practice-oriented approach is a competence-based approach. Thus, in this sense, a practice-oriented approach is equivalent to a competence-based activity approach.

Representatives of the activity approach note that a person is formed and develops in activity. The activity approach is aimed at solving such urgent problems for pedagogical education as combining knowledge and action, ensuring practical orientation of professional education, strengthening the role of students in the educational process, increasing their activity and independence. In the conditions of modernization of pedagogical education, the activity approach determines: (1) changing the purpose of professional education: not so much to form a system of knowledge (with all the importance of knowledge), but to ensure the general cultural, personal, cognitive, professional development of the student; (2) definition of new requirements for the content of educational programs (they should provide high motivation of students to educational and professional activities); (3) defining new requirements for the organization of practice-oriented training of students-updating the use of active, interactive methods and forms of training; (4) changing the role of the student – he is not an object, but a subject, a co-participant in professional training (hence-motivation,

activity, interest in mastering the profession); (5) changing the role of the teacher: he is the organizer, coordinator, tutor, mentor, assistant, consultant.

Further, it is useful to refer to the understanding of the term “professional training” and the related concepts of “professional readiness”. In the psychological-pedagogical literature, the term “professional training” is used in the context of professional teaching and implies the process of mastering the knowledge, skills and abilities that are necessary for independent professional activity. It is also an organized system of professional training, the purpose of which is the accelerated acquisition by students of the skills that are required to perform professional types of work. According to Voloshynov (2019), professional training should be understood as the process of acquiring knowledge, skills that help to perform the tasks set by the employer in the chosen professional activity. We also add that professional training, according to Stukalova et al. (2018), is a system-forming component of the entire practice-oriented professional educational process, which not only determines its goals, but also the leading directions, moral, intellectual, and spiritual basis. In addition, this component is aimed at “cultivating professional consciousness”, the culture of society, the individual, training the necessary personnel, and reorganizing of the worldview (Hilmiati & Listiawati, 2022).

Kähler et al. (2020) understand practice-oriented training as integrating the fundamental nature of knowledge with the use of an optimal combination of professionally-oriented technologies, forms and methods of training, providing not only the professional competencies and formation of universal, professional mobility, but also the self-improvement, ability to professional self-development and creativity. Thus, the concept of training in professional activity is the basic one in this article when determining the essence of practice-oriented professional training. However, the conditions of modernization of pedagogical education need to be considered, professional training is in interaction with such concepts as professional readiness and competence (Ginaya et al., 2020; Izekor & Ojeaga, 2021).

Professional readiness of a graduate is one of the main conditions for his rapid adaptation to independent activity, further professional improvement and professional development. The study of pedagogical and psychological literature on the problems of professional readiness allows us to conditionally identify two (2) main approaches that are used to develop the personal and

activity content concept (Toto et al., 2021). According to the activity of readiness approach is considered in relation to the attitude to the activity. At the same time, readiness is a more complex structural formation that includes awareness of tasks, attitudes, the choice of models of probable behavior and assessment of one's abilities. Readiness is a positive attitude to the activity, the tendency to engage it, a certain stock of knowledge and skills in the relevant area.

As is the case with biology students, the modern education of future science teachers has the following contradictions: between the current state of learning about research methods in universities and growing demand for research-savvy future biology teachers; between the full utilization of student skills and motivation in professional training and the possibility of research activities in future biology teacher training (Triyono et al., 2020); between the insufficient supply of special methodological tools and the necessary preparation stage for the use of research capacity in professional activities. Thus, we have to create and implement a comprehensive methodology for biology teacher's research competence development in order to improve the quality their training. Formation of professional readiness of future teachers determines the nature of mastering the profession, as well as the purposeful development of relevant professional competencies that ensure further professional development, self-development and self-realization. Thus, we defined the main concepts of the article (professional training, professional readiness) and revealed

the essence of practice-oriented training of future teachers during the modernization of pedagogical education (Daniliuk, 2011). Formation of professional readiness of future teachers is a complex and step-by-step process. For its consideration, it is necessary to analyze modern theoretical works in the field of the problem under study, to consider and summarize the experience of using practice-oriented training in the higher school education system.

METHODS

The quantitative survey was conducted among the two (2) targeted groups 3rd year and 4th year student; a total of 86 responses were collected. Reliability of the criteria was investigated as well. The Cronbach's alpha (α) reflect the consistency of the set of items, which theoretically a ranges from 0 to 1 (Streiner, 2003; Vaske et al., 2017). If α is near 0 then the quantified answers are not reliable at all, and if it is close to 1 the answers are very reliable. As a rule of thumb, if $\alpha \geq 0.8$, then answers are reliable. The mean value for α -Cronbach in this study is 0.89, which is higher than required. The result is generated using Statistical Package for Social Sciences® (SPSS) software. The questionnaire was presented to 3rd and 4th year students majoring in "Biology", who were in pedagogical practice and conducted more than 10 weeks in grades 6-10 of secondary school. The instrument of the questionnaire can be seen in Table 1.

Table 1. Instrument Questionnaire

No	Question	Response Requirement
1	Are you satisfied with the knowledge you receive at the university: A) according to the biological cycle - B) according to the pedagogical cycle -	5-point Likert scale 5-point Likert scale
2	At what level is the organization and conduct of pedagogical practice at school?	5-point Likert scale
3	How are the students of 3 - 4 courses ready for a pedagogical activity?	5-point Likert scale
4	What classes would you like to work in?	Open ended
5	What level of knowledge about innovative technologies do you have?	5-point Likert scale
6	How do you assess your readiness for pedagogical practice?	5-point Likert scale
7	What is your level of theoretical preparation for your future profession?	5-point Likert scale
8	How well do you know how to regulate time in the pedagogical process (time management)	5-point Likert scale
9	Evaluate students' biological knowledge	5-point Likert scale
10	What suggestions and desiderates do you have to improve be pedagogical practice of students at school?	Open ended

The 3rd year students underwent continuous pedagogical practice in schools of Almaty (Republic of Kazakhstan) as biology teachers and assistant class teachers. This pedagogical practice lasted for 3 weeks in the amount of 108 academic hours. While 4th year students underwent professional pedagogical practice for 10 weeks (360 academic hours) as biology teachers and class teachers. 86 students majoring in “Biology” took part in the survey, including 34 students (3rd year) and 52 students 4th year). Age of students are from 20 to 22 years. The sex ratio of the studied students is 80% girls and 20% boys. Students must answer the questions 1,2,3,5,6,7,8,9 in the form of 5-points Likert Scale and students gave detailed dialogues in some places with specific answers to open ended questions (4,8,10) as presented in Table 1.

RESULTS AND DISCUSSION

The results of the survey showed that 4th year students take pedagogical practice seriously as a stage of preparation for the future profession. Thus, many graduates rated their preparation for pedagogical practice with mean value 4.5, and theoretical training is much higher where the mean value is 4.75 as presented in Table 2.

The main theoretical method of studying the process of practice-oriented professional training of future teachers in the course of modernization of pedagogical education is determined by the method of modeling. The modeling method is positioned as a simplified reflection of the existing pedagogical system in the structure of a specially created pedagogical object - a pedagogical model. The method of pedagogical modeling

helps to identify the relationship of structural elements of the subject under study (Campbell et al., 2015; Konovalov & Kozyreva, 2017). It is focused on the successful organization of the process of practice-oriented professional training of future teachers.

Created by us the pedagogical framework of practice-oriented professional training of students-biologists during the modernization of pedagogical education includes interrelated blocks – target, theoretical and methodological, structural, content-technological and evaluated (Table 3). The target block assumes the formation of the necessary professional readiness of future teachers in the context of practice-oriented activities.

The theoretical and methodological block presents the scientific research platform in the form of the following methodological approaches: (a) Competence-based approach, which manifests itself in motivated, purposeful self-educational activities of students by creating a quasi-professional environment and updating practice-oriented learning, where the entire learning process becomes an activity character, and the person is considered as a subject of activity; (b) Student-centered approach determines the primary importance of the individual in the process of practice-oriented professional training, allowing to guide the process of its development in the course of interests and life plans of the bachelor’s personality, determining the individual trajectory; (c) System-based approach makes it possible to organize the psychological and educational knowledge received by future teachers, which allows them to form a holistic view of the human personality, pedagogical reality, educational process.

Table 2. Descriptive Analysis of Mean Value 3rd year and 4th Year Students

No	Question	Mean Value
1	Are you satisfied with the knowledge you receive at the university:	4.23
	A) according to the biological cycle -	4.69
	B) according to the pedagogical cycle -	
2	At what level is the organization and conduct of pedagogical practice at school?	3.96
3	How are the students of 3 - 4 courses ready for a pedagogical activity?	4.18
5	What level of knowledge about innovative technologies do you have?	4.21
6	How do you assess your readiness for pedagogical practice?	4.5
7	What is your level of theoretical preparation for your future profession?	4.75
8	How well do you know how to regulate time in the pedagogical process (time management)	4.15
9	Evaluate students’ biological knowledge	4.60

Based on table 2, the results of the satisfaction measurement show that the pedagogical cycle shows higher results than the biological cycle. Among all the observational data obtained, the lowest average value is in the competence of organization and conduct of pedagogical practice

at school. Structural and functional framework of practice-oriented professional training of future teachers-biologists in the context of modernization of pedagogical education can be seen in table 3.

Table 3. Structural and Functional Framework of Practice-oriented Professional Training of Future Teachers-biologists in the Context of Modernization of Pedagogical Education

Target Block	
Goal: to form professional readiness of future teachers-biologists	
Theoretical and methodological block	
Approaches: competence-based, student-centered, system-based	
Principles: problem-solving, variability and flexibility, development of personality, continuity of the stages in formation of practice-oriented professional training of future teachers-biologists, integrity.	
Organizational and pedagogical conditions: a) modernization of the content of pedagogical education: compliance of professional competencies with labor functions; transition to the modular principle of building pedagogical curriculums, organization of practice; b) a student-centered organization of practice-oriented training for future teachers-biologists: the choice of an individual educational trajectory, the development of professional motivation; c) organization of network interaction of all subjects of the educational process: involvement of employers at all stages of training of teachers (from curriculum development to independent evaluation of the quality of training); d) creating of a quasi-professional educational environment at the University based on modeling of the subject and social content of future professional activities (optimization of forms and methods of practice-oriented training).	
Content and technological block	
Practice-oriented professional training	
Stage I - initial acquaintance with the teacher's profession, development of professional motivation.	Theoretical teaching (creating a quasi-professional educational environment, etc.).
Stage II - correlation of one's capabilities with samples of labor actions, development of professionally-significant personal qualities, the choice of an individual trajectory.	Practical training (extensive system of practices (internships), practice under the target contract, etc.).
Stage III - formation of professional competencies, testing of new technologies, development of your own professional style of activity.	Organization of research work of students (projects commissioned by an educational organization, grants, etc.).
Stage IV - working out of labor actions, reflection of professional competence.	Extracurricular activities (professional competitions, volunteer movement, etc.).
Forms: Internet lesson, webinar, film club, master class, workshop, role-playing, business, problem games, practice (training, pre-diploma).	
Methods: project-based learning, game, interactive, reflexive, heuristic, case study methods, and others.	
Evaluation Block	
Criteria/indicators: <i>motivational</i> (professional orientation, satisfaction with the profession), <i>cognitive</i> (professional training, pedagogical thinking), <i>personal</i> (professional intention, reflexivity).	
Levels: initial (low), acceptable (medium), optimal (high)	
Outcome: Formation of professional readiness of future teachers-biologists	

Social order: society's need for highly qualified teachers

Based on the approaches we have listed, the following principles are highlighted. *The principle of problem-solving* of teaching is focused on immersing a student in a real situation (or its quasi-model) with the designation of a professional task, which provides for the demonstration of labor actions. The essence of this principle is the student's awareness of the possibility of successful solution of the set tasks, which contributes to the adequate development of professional, cognitive and personal motives of professional motivation. Thus, accumulated professional baggage is carried out when solving specific tasks in specific training situations.

The principle of variability and flexibility assumes: designing an educational environment (material, methodological, didactic) that allows students to develop their potential by including them in various activities, taking into account their interests, opportunities, and aspirations. *The principle of developing a unique personality* - creating an individual educational trajectory based on the individual potential of the students. *The system-based principle* allows to consider the model of teaching future teachers as a multi-level pedagogical system characterized by structural and functional integrity of all subjects of the educational process and quasi-professional educational environment. *The principle of integrity* allows to consider the process of teaching as a single whole at all levels and in all types of activities. The content and technology block defines the structural components of professional readiness of future teachers: *motivational, cognitive, and personal*.

The motivational component is represented by motives and academic and professional interests, which are focused on obtaining professional-value experience and positive attitude to the upcoming profession (intention to master the appropriate professional competences, the need to become a qualified competitive specialist, awareness of the importance of the work and profession of the teacher, the presence of a positive emotional attitude to the future activities) (Dou et al., 2019). *The cognitive component* characterizes the process of forming special, methodological, psychological and pedagogical knowledge, as well as skills in the main types of professional and pedagogical activity (possession of one's own professional activity at a sufficiently high level, possession of methods of professional communication, cooperation, and the ability to design one's further professional education). *The personal component* is aimed at the formation of personal-significant qualities of the teacher, the personal component is aimed at forming a personally significant qualities of the teacher, ways of self-development and self-expression (readiness

for professional and personal growth, self-development, self-realization in professional educational environment, to reflection of educational professional activity).

The components of professional readiness of future teachers makes it possible to formulate a conclusion that competence-based, student-centered, system-based approaches to the choice of ways to form this multi-aspect phenomenon require the development of a certain technology for training students in the modernization of the pedagogical process.

The first two stages of the technology of practice-oriented professional training of future teachers can be conditionally combined with one aim - general orientation in the teacher's profession and the formation of emotional and personal readiness for future professional activities. Accordingly, the third and fourth stages are aimed at entering the profession at the level of development of professional competencies and abilities for professional activity. Practice-oriented professional training requires methods of teaching and optimization of forms. Therefore, the methods of project, problem-solving, practice-oriented training were chosen. Project defense, modeling, ICT, webinars, and Skype consultations with practitioners have become tools for creating professional readiness. Forms of work: various types of practice (educational, pedagogical), business, problem-solving games, workshops, master classes, methodological seminars.

Practice allows the future teacher to gain sufficient experience to develop professional thinking, ability to make decisions in new situations with the help of specially organized reflection. The quality of the organization of the student practice, its support from the university manager and the employer depends on the success of professional activities in the future. In addition, it is necessary to establish close links between the practice and the research work of students. The ability to individualize own teaching activities in accordance with individual characteristics, problems and needs will allow students to build their own individual routes in the profession. In the evaluation block, intermediate and final results in the formation of professional readiness of future teachers are summed up, the achieved levels and outcome are determined.

All the presented components are aimed at a specific outcome, which assumes the formation of professional readiness of future teachers. Determining the outcome in the formation of professional readiness of students is based on certain levels of development. The process of practice-oriented professional training of future teachers is a complex and multi-faceted process that re-

quires targeted system-based work and training. The levels of formation of professional readiness among students, which were used in the experimental work, were also identified.

The initial (low) level assumes that the student has an external negative motivation for professional activity; lack of interest in teaching; low level of satisfaction with the future profession; incomplete ideas about the teacher's work functions; low degree of reflexivity; inability to control own emotions; low level of pedagogical thinking; lack of a desire for knowledge, unwillingness to participate in solving pedagogical situations and adhere to the requirements for organizing pedagogical activities. *The acceptable (average) level* assumes that the student is dominated by an external positive focus of motivation, situational interest in pedagogical activities; low interest in obtaining professional knowledge; participation in pedagogical situations is not always on his own initiative; not constant ability to con-

rol own emotions; partial representations of the teacher's work functions; average degree of reflexivity; low or medium level of pedagogical thinking; the inability to predict the results of their activities, the perception of requirements for teaching activities as imposed from the outside and hindering the achievement of the goal. *Optimal (high) level* indicates that the student is dominated by the internal focus of professional motivation; awareness of the importance of the profession and a steady interest in professional activities; ability to control your emotions; full understanding of the teacher's work functions; regular reflection on the received psychological, emotional, and cognitive experience; high level of creative pedagogical thinking (OECD, 2019; Prasetyo et al., 2021); ability to predict and successfully make decisions in changing conditions of pedagogical activity, conscious planning of their activities in accordance with curriculum requirements (Table 4).

Table 4. Levels of Professional Readiness of Future Teachers

Component	Initial (Low) Level	Acceptable (Medium) Level	Optimal (High) Level
Motivational	External negative motives dominate, lack of interest in educational and professional activities, reluctantly seeking knowledge, under pedagogical influence performs educational tasks, there is no desire to master the profession, striving for personal growth in the teaching profession.	External positive motives dominate, shows situational interest in educational and professional activities, seeks to gain respect from others, having a positive attitude to professional activity, there is a desire for self-realization and personal growth in social and sports activities.	Internal motives dominate, shows a steady interest in educational and professional activities, having a positive attitude to professional activity, strives for improvement and personal growth in the teaching profession, gets satisfaction from the process and the outcome of pedagogical activity.
Personal	Student does not understand the personal meaning of the profession, the value attitude to the profession is poorly expressed, hardly controlling emotions, does not associate professional intentions with the profession of a teacher, lack of reflexivity and lack of need to analyze the results of own activities and personal development.	Not fully aware of the personal meaning of the profession, value attitude to the future profession, able to control emotions, connects professional intentions with the profession of a teacher, there is an average degree of reflexivity and self-esteem, there is a need to analyze the results of own activities and personal development.	Realizes the personal meaning of the future profession, the value attitude to pedagogical activity is formed, independent analysis of actions, predicts consequences, confident self-esteem, maximum emotional control, is characterized by reflexivity and well-developed analytical abilities.
Cognitive	There is no systemic knowledge in the disciplines of the professional cycle, has an idea of methods and techniques for teaching and upbringing children, pedagogical thinking is not formed enough, has insufficient practical experience in solving professional problems, is not ready to perform the work functions of a teacher.	Has a sufficient knowledge in all disciplines of the curriculum, shows independence when performing training tasks, has a good knowledge of methods of teaching and upbringing children, but uses them unsystematically, pedagogical thinking is formed at a sufficient level, has a sufficient amount of practical experience in solving professional problems, ready to perform some of the teacher's work functions.	He has deep systemic knowledge in all disciplines of the curriculum, shows activity and independence when performing training tasks, he knows how to teach and upbringing children, modern pedagogical techniques, has a developed creative pedagogical thinking, has a significant amount of practical experience in solving professional problems, ready to perform teacher's work functions.

Thus, the constructed model allows us to visualize the complex process of practice-oriented professional training of future teachers-biologists in the modernization of pedagogical education.

Theoretical study of the problem of practice-oriented training of future teachers, as well as the creation of a model of this process are directly related to the organization of experimental work, allowing to verify the correctness of the conclusions, their importance to ensure the effectiveness of the formation of professional readiness of future teachers (Akcanca & Ozsevgec, 2018; Rosman et al., 2019).

CONCLUSION

The analysis of the problem in the article made it possible to establish that in modern psychological and pedagogical literature the issues of modernization of pedagogical education, new approaches to the professional training of future teachers, the process of practice-oriented preparation, as well as issues of personality formation in the course of professional development are considered. At the same time, it is necessary to create conditions for the success of the process of modernization of pedagogical education through the involvement of practical teachers who demonstrate high results of pedagogical activity in the educational process within the framework of pedagogical education. The survey helps the biology students to identify their strength level in term of the professional readiness of future teachers-biologists as well as to leverage their competency in teaching and improved the curriculum education. The proposed framework may also applied with other subject in order to ensure the pre-service teacher in line with the issue of modernization of pedagogy education. In conclusion, it should be noted that the goal has been achieved, and the objectives formulated in the article have been solved.

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