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Measuring the Professional Competencies of Future Teachers

Abstract

Introduction. The article is aimed at studying the problem of measuring and evaluating teachers' professional competencies, which is related to updating the content of education and the need to ensure high-quality training for future teachers. *Methodology and methods.* As part of the study, a detailed analysis of regulatory documents and relevant scientific publications on this topic was carried out. Based on the professional standard of teachers, a diagnostic methodology has been developed aimed at assessing professional competencies. *Results.* The analysis showed that the majority of teachers demonstrate an average level of competence formation in such areas as pedagogical values, professional knowledge, pedagogical practice and professional development. At the same time, a high level of competence is distinguished by the following criteria: pedagogical orientation and responsibility; knowledge of the subject and teaching methods; awareness of the age characteristics of children and their motivation; skills in planning the educational process; as well as the ability to project personal professional growth and leadership development. Some problem areas requiring attention were also identified, including low proactivity and innovation in learning, difficulties in risk management, lack of knowledge in creating an inclusive educational environment, as well as weak teaching skills in multilingual classrooms and ensuring security in the digital space. *Scientific novelty.* This study helps to understand the specifics of the formation and measurement of professional competencies in the process of training future teachers. As a result of the work, the author's diagnostic method was developed and tested, which allows an objective assessment of the level of competence among students of pedagogical fields. *Practical significance.* The presented approach can be implemented in practical activities for monitoring and evaluating the quality of vocational education. The obtained results and conclusions of the study can become the basis for the development of educational programs and advanced training courses for teachers aimed at the effective development and strengthening of their professional competencies.

Keywords: professional competencies, professional standard, pedagogical measurement, competence assessment, competence approach.

Introduction. In modern conditions, there is an acute need for teaching staff possessing professional competencies that correspond to the requirements of the time and the provisions of professional standards. These standards define qualification requirements, competencies, and professional functions of teachers, serving as the basis for the design of educational programs (Order, 2022). The formation, development, and assessment of professional competencies have become the most important elements of educational policy, directly influencing the quality of teacher training (Akhmetov, 2023; Yersultanova, 2023; Abdiev, 2024; Sabharwal & Miah, 2024).

In Akhmetov's study, key problems related to the functioning of the national system of quality assessment in education were identified.

These include shortcomings in testing materials, difficulties in monitoring educational outcomes, a mismatch between graduates' competencies and employers' expectations, a shortage of qualified experts in educational measurement, and challenges in developing criteria for assessing knowledge, skills, and abilities. As a solution, the author proposed a quality management model in education that includes the following stages: goal-setting, planning, design, implementation, support, monitoring, analysis, and adjustment of educational activities (Akhmetov, 2023). Yersultanova, Kunakova, and co-authors emphasize the importance of the professional standard as the basis for assessing the readiness of social pedagogues for professional activity. Their approach suggests the inclusion of standard requirements in the content of university programs (Yersultanova, 2023). Abdiev and colleagues analyze the difficulties of implementing professional standards in IT education. The main problems concern the vagueness of requirement formulations, the lack of measurability, and the formal approach of universities to the development of educational programs (Abdiev, 2024). Sabharwal and Miah propose a machine learning model for assessing teacher effectiveness. This model makes it possible to take into account the contribution of various resources to the learning process and to monitor its results, demonstrating advantages compared to other similar approaches. The relevance of assessing teachers' professional activity is also reflected in the works of Shadrikov and Kuznetsova (2012), who emphasize the need to improve teacher training. The competence-based approach, which has become dominant in the modern higher education system, makes it possible to reconcile employers' requirements and future specialists' expectations (Zaitseva et al., 2024). It influences teaching, learning methods, program content, and assessment systems. Modern researchers propose new approaches to diagnosing competencies, based on labor market requirements and professional standards. This contributes to systemic changes in the university educational process. The importance of educational measurement is also highlighted in the context of the competency-based graduate model (Aigunova et al., 2017; Isupova, 2024). According to the authors, the teacher's model as a bearer of professional competencies is closely connected with competitiveness, mobility, and readiness for professional growth. International projects such as Tuning, iPAL, and AHELO have made a significant contribution to the development of tools for assessing students' professional and universal competencies. They are aimed at substantiating unified approaches to the evaluation of learning outcomes in higher education (Avdeeva et al., 2021). Nevertheless, despite the accumulated theoretical and methodological experience, the problem remains of the absence of a comprehensive and valid system for diagnosing, monitoring, and assessing students' professional competencies (Akhmetnov, 2023; Ushakova, 2024).

The modern education system imposes increased demands on the quality of teacher training. However, practice shows that graduates do not always demonstrate a level of professional readiness that meets employers' expectations and the requirements of the educational system. A contradiction thus arises between the need for objective and comprehensive measurement of prospective teachers' professional competencies and the insufficient development of theoretical and methodological foundations for such measurement. Existing diagnostic approaches often do not provide systematic and valid assessment, which complicates the identification of students' professional deficits and the adjustment of educational programs. In these conditions, the task of objective, comprehensive, and systematic measurement of future teachers' professional competencies and the determination of directions for their further development becomes particularly relevant. This is of interest not only to students and educators themselves but also to employers and other stakeholders. We believe that only through systematic and comprehensive diagnostics of the quality of teacher education, along with continuous analysis of competency formation, is it possible to ensure the high effectiveness of teacher preparation.

Based on the reviewed literature and our practical experience in implementing the competency-based approach in teacher education, it can be argued that both methodological and practical tasks remain relevant. In particular, the development of diagnostic methods, measurement tools, and their integration into the educational process requires a serious scientific approach.

In this regard, the central research question is: What is the level of formation of key professional competencies among future teachers during their university education, taking into account the requirements of the professional standard?

The purpose of the study is to assess the level of formation of prospective teachers' professional competencies using a diagnostic methodology based on professional standards. This will make it possible to identify professional deficits and determine the vectors of further development of professional competence.

Materials and Methods. The following methods were used in the present study: theoretical analysis of the problem from primary sources; content analysis of scientific and methodological literature; analysis of normative documents regulating professional training; study and generalization of advanced pedagogical experience in the field of competence diagnostics; observation; questionnaire and survey on the research problem. The research materials were scientific works of domestic and foreign scientists on diagnostics and pedagogical measurements of professional competencies.

The difficulties of measuring and evaluating the quality of pedagogical activity are the subjects of research by many modern scientists, both domestic and foreign.

Aspects of the consideration of this problem are diverse:

- expert assessment of professional competencies with the involvement of highly qualified experts and artificial intelligence technology as an expert tool (Shadrikov & Kuznetsova, 2012; Nazarova & Panasenko, 2024);

- assessment of professional competencies using the competency model of the teacher (Aigunova et al., 2017; Isupova, 2024);

- development and implementation of a comprehensive model of assessment based on a professional standard of basic teacher competencies (Ajjawi et al., 2021; Sukhovienko et al., 2021, Gromova, 2024);

- application in the educational process of universities of different approaches to measuring the formation of professional competencies (Aglamova et al., 2018, Zaitseva et al., 2024);

- analyzing the final certification of teachers' professional competencies with the expected results of the professional standard (Ersultanova et al., 2023);

- research the structure of teachers' professional competencies in the context of modern requirements, to create a comprehensive system of professional competencies, which acts as both a tool for assessing competencies and a means of professional development (Seitenova et al., 2024);

- analyzing and developing reliable and objective methods and tools for measuring the quality of pedagogical activity (Yusof et al., 2019, Baskeeva, 2024, Abdiyev et al., 2024);

- evaluation of future teachers' professional competencies based on criterion-level assessment (Golovchin, 2023);

- application of modern digital tools in measuring professional competencies with: digital portfolio (Tikhonova, 2021), ML portfolio assessment (Sabharwal et al., 2024), case (Skorova et al., 2021), digital case studies (Renkiewicz et al., 2024).

Research in the field of pedagogical measurement and quality assessment of education covers the effectiveness of educational programs of teacher training, teaching methods, control, and the use of innovations in education. Modern research emphasizes the importance of individualization of education, adaptation of educational programs to the needs of students and the labor market, use of information and communication technologies, digitalization of education, and many other aspects affecting the quality of education and the success of students (Tzafilkou et al., 2023).

It follows from the above that modern research into the problems of measuring and evaluating professional competencies plays a

key role in improving education and increasing its effectiveness. They contribute to the development of a professional and pedagogical culture of a teacher, to the improvement of the process of professional training of pedagogical staff, and the enhancement of education in general

This study continues several works that studied the impact of standards on improving the quality of professional education and their use as tools for assessing teacher training (Ajjawi et al., 2021; Ersultanova et al., 2023; Sapieva et al., 2024). When carrying out the procedure for assessing the quality of teacher training and competence, we are guided by the professional standard "Teacher" (PS). This document sets general and uniform requirements for professional knowledge, skills, and abilities, as well as defines the boundaries of qualification characteristics for performing the main functions in professional and pedagogical activities (Order, 2022)

Implementation of the standard requires the creation of a system of diagnostics of compliance of professional training of pedagogical staff with its requirements (Sapieva et al., 2024). Standards for teachers, on the one hand, perform a normative function, i.e., set standards of professional practice, on the other hand, a developing function, i.e., promotes the individual growth of a teacher throughout life. Taking into account the opportunities for professional and personal development of a teacher, maximizing the potential of formal and informal learning, as well as the wide application of various forms and methods of improving professional skills, are common trends used in the practice of measuring and assessing the quality of pedagogical work.

Each country has its requirements for the professional competencies of teachers. For example, in Great Britain, the emphasis is on the development of teaching and personal professional competencies of a teacher without level division, while in Austria, a level approach is applied in the description of competencies, covering from the qualification of a university graduate to a manager. In CIS countries, and in particular in Russia, professional standards in the description of teacher competencies are based on knowledge and skills required to perform professional and labor functions in various spheres of professional activity, with the definition of qualification levels (Order, 2016). In Kazakhstan, professional standards also apply a level approach in describing professional competencies, starting from the entry into the profession and ending with professional mastery, with the definition of criteria and indicators structured according to the principle of build-up (Order, 2022).

The experience of studying the theory and practice of pedagogical measurement of professional competencies has shown that it is necessary to rely on normative documents regulating uniform requirements for professional competencies, international and domestic experience of quality assessment of pedagogical activity, and innovations in education. The material for measuring PC should be selected taking into account all types of teachers' activities through the prism of professional competencies (knowledge, ability, skill), as well as the performance of professional labor functions, actions, and operations. Given the complexity of the studied construct (professional competencies), it is important to measure and evaluate all its components separately and in their totality.

The system of quality assessment of teacher training modernization relies on the modern theory of pedagogical measurements and the introduction of reliable and objective measurement methods and tools. Our study attempted to develop and validate a tool for measuring the professional competencies of future teachers. Our study aims to diagnose and obtain reliable information about the competencies of future teachers, while the task is to assess the level of their competence to identify professional deficits and determine the prospects for the development of professional competence.

The pedagogical experiment was conducted at Kokshetau University, named after Sh. Ualikhanov. The study involved students of 3-4 courses of pedagogical direction of training, within the framework of educational programs:

informatics, mathematics and physics, chemistry and biology, Russian language and literature, as well as pedagogy and methodology of elementary education, pedagogy, and psychology.

Results. Based on the analysis of labor actions, the questionnaire "Diagnostics of professional competencies of a teacher" was developed and implemented. The questionnaire consists of questions divided into four blocks. The first block is aimed at identifying the competence "ability to perform professional activities on the basis of pedagogical values".

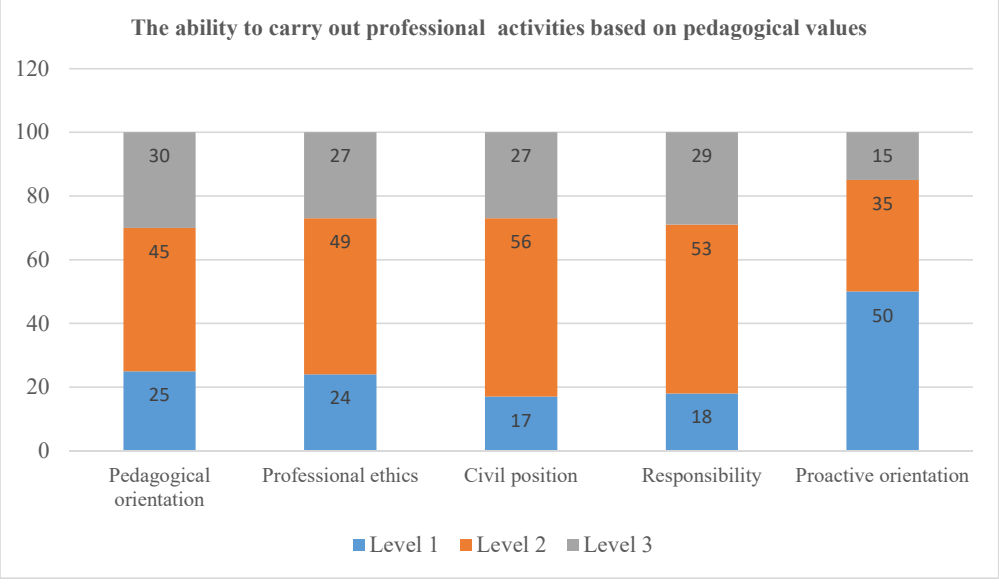

Figure 1: Results of measuring the competence "ability to perform professional activity based on pedagogical values"

The results of the study showed that the average level of formation prevails for all the above criteria, except for the low level of the criterion "proactive orientation

The second block of questions of our diagnostic methodology concerned the identification of the competence "able to use professional knowledge to solve pedagogical problems". The criteria for this competence were knowledge of students' peculiarities, subject, methodological, and evaluation knowledge.

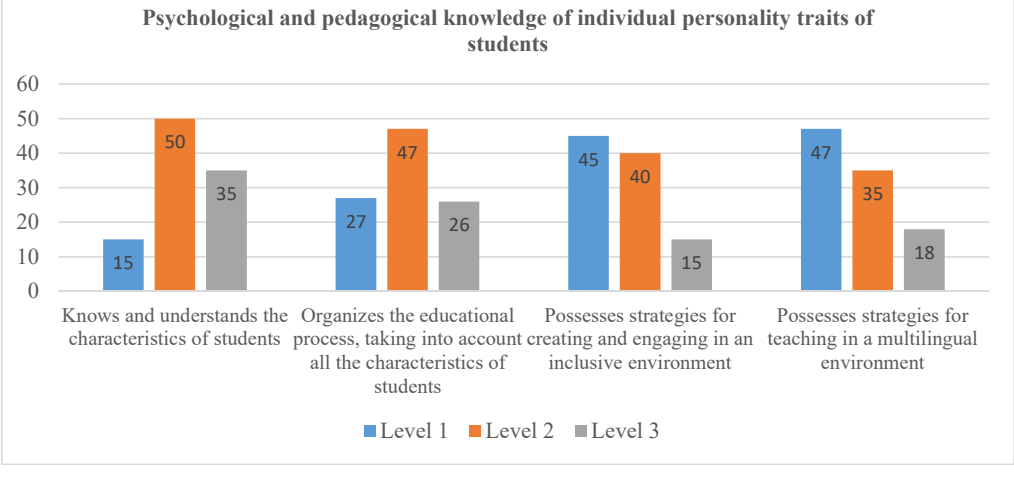

Figure 2: Results of measuring the competence "able to use professional knowledge to solve pedagogical tasks" by the criterion "psychological and pedagogical knowledge of students' personality traits"

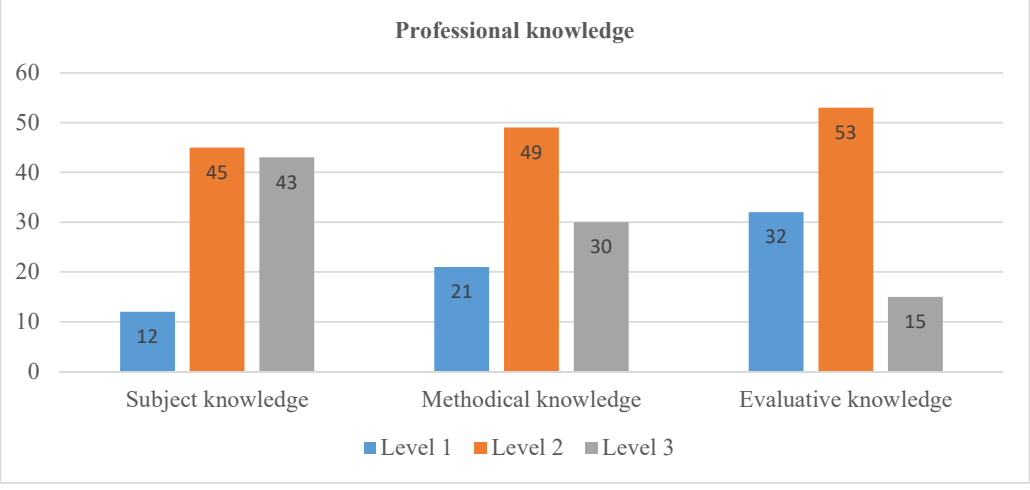

Figure 3: Results of measuring the criterion "subject, methodical, and evaluation knowledge"

As can be seen in Figures 2 and 3, the results of diagnostics for all criteria of the competence "able to use professional knowledge to solve pedagogical problems" demonstrate the prevalence of the average level of formation.

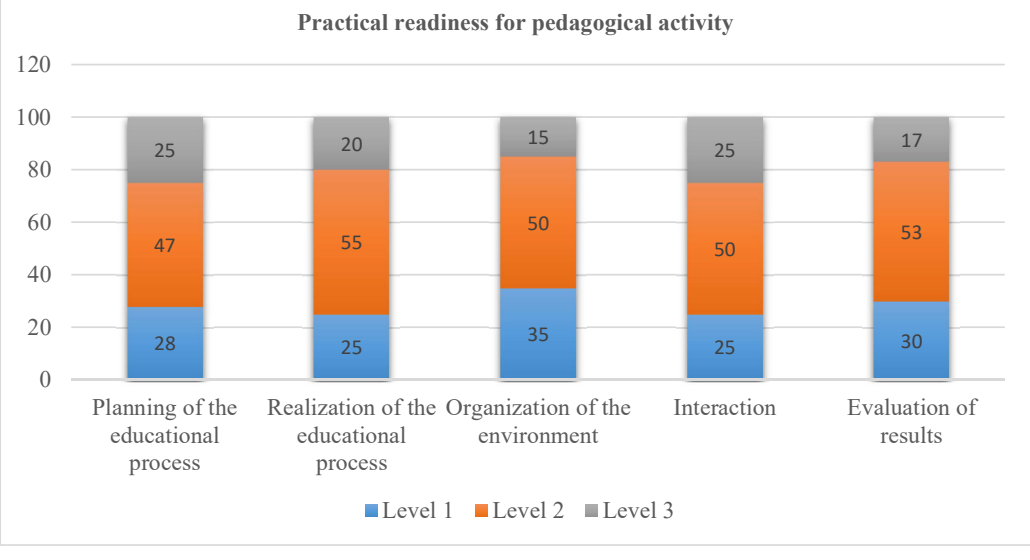

Figure 4: Results of measuring the competence "practical readiness for pedagogical activity"

The third block of questions concerned the identification of the competence "practical readiness for pedagogical activity". This competence was identified by criteria such as planning and implementation of the educational process, organization of effective interaction and developmental environment, and evaluation of learning and education results. Figure 4 shows the prevalence of the average level of expression for all indicators of this competence (47-55%).

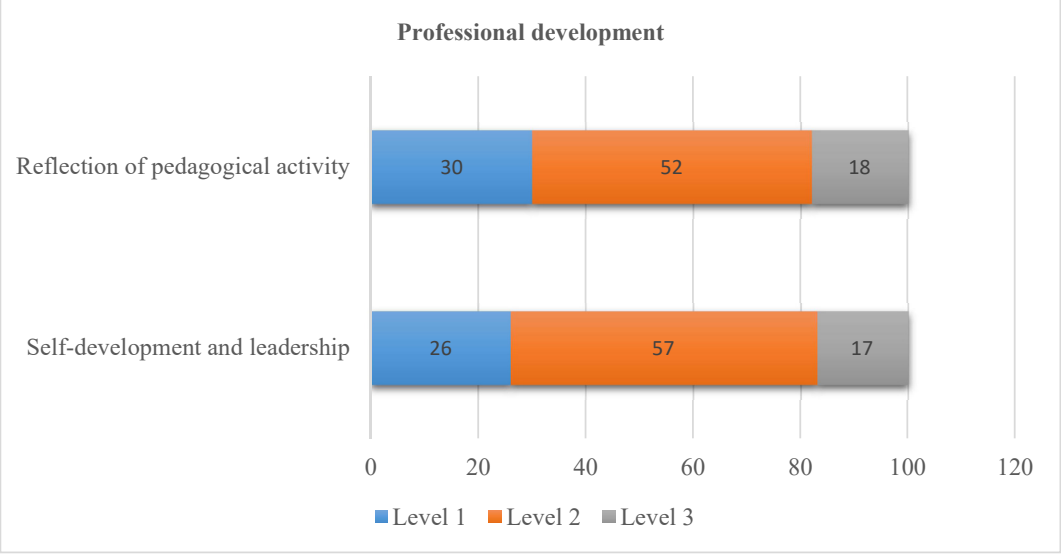

Figure 5: Results of measuring the competence "readiness for professional growth and development"

The fourth block of the study was devoted to identifying the competence "readiness for professional growth and development". The key criteria for this competence were identified: the reflection of the pedagogical activity, leadership, and professional self-improvement. Figure 5 shows the predominance of the average level of expression for all indicators of this competence (52-57%).

Discussion. Generalized diagnostic results for all criteria of the competence "ability to perform professional activity based on pedagogical values" demonstrate the prevalence of the average level of formation (47.6%). The exception was the criterion "proactive orientation", which was recorded at a low level (50%). Let us consider each of the criteria in more detail.

Pedagogical orientation and dedication to pedagogical activity we analyzed through the manifestation of pedagogical optimism, belief in the potential, opportunities, and abilities of students, as well as through the performance of professional functions based on pedagogical principles and regulatory requirements. As can be seen from Figure 1, 30% of respondents demonstrated a low level of this criterion, 45% an average level, and 25% a high level. The respondents showed good knowledge of normative and legal acts, pedagogical principles, and functions of professional activity, but revealed a weak manifestation of pedagogical optimism about students and their motivation in achieving educational goals.

According to the criterion "professional ethics," the levels of competence formation are distributed as follows: high - 24%, average - 49%, low - 27%. We study the ethical component of this professional competence through the teachers' observance of moral and ethical principles, pedagogical tact, and respectful attitude to all subjects of the pedagogical process, as well as through the culture of teacher behavior. Pedagogical ethics is a determining component of professional competence, a regulator of the interaction of all subjects of the pedagogical process, and a determinant of the effective professional activity of a modern teacher. Future teachers possess a set of knowledge for adequate ethical assessment of the situation and making pedagogical decisions, i.e., the cognitive component of professional ethics, but there are problems with the realization of practical skills and abilities, i.e., the development of the activity component of professional ethics.

According to the criteria "civic position of a teacher" (level 1 - 17%; level 2 - 56%; level 3 - 27%) and "responsibility for pedagogical activity" (level 1 - 18%; level 2 - 53%; level 3 - 29%) there are similar results in the levels of formation of the studied competence. The civic position of a teacher was considered by us as a

moral quality that determines the conscious and active fulfillment of his/her civic duties. It is based on intercultural respect, national values, and consideration of the educational needs of representatives of all peoples of Kazakhstan, as well as observance of academic honesty in pedagogical activity and reasonable use of civil rights. The surveyed students experience certain difficulties in the realization of integrative skills related to the introduction of intercultural diversity in the educational process.

The analysis of respondents' answers to the criterion "responsibility for pedagogical activity" has shown that more than half of the respondents demonstrate an average level of responsibility. The teacher's responsibility was assessed through the competence-based performance of his/her activity, self-regulation of professional behavior, value attitude to all subjects of the integral pedagogical process (IPP), and creation of optimal conditions for their development. The respondents demonstrate high responsibility in the sphere of professional growth and development of themselves as specialists. However, there are difficulties related to the division of responsibility with their colleagues for the organization of the educational process, for the safety of students, and their training and education.

Proactive orientation is considered as a teacher's awareness of his/her priorities, his/her ability to adhere to principles, subordinate circumstances to his/her values, as well as freedom of will and choice. It is manifested in the desire to improve professional practice, active search for and implementation of pedagogical innovations, forecasting the results of this activity, and regulating behavior under conditions of uncertainty and stress. In modern conditions, proactivity becomes one of the key skills of a successful teacher. More than half of the respondents demonstrated conservatism about the implementation of innovations in education, which indicates weak skills of stress resistance and risk management in pedagogical activity, as well as a low level of proactivity (50%). These data emphasize the need to strengthen and develop this competence among teachers.

According to the results of measuring the competence "able to use professional knowledge to solve pedagogical problems", Figure 2, it can be seen that according to the criterion "psychological and pedagogical knowledge of student's personality traits," there is a predominance of the average level in the teacher's understanding of students' personality traits (50%) and their consideration in the educational process (47%). The respondents showed insufficient competence related to the consideration of the educational and educational needs of students in the implementation of inclusion (45%) and polylingualism (47%) in the educational process. Students demonstrated a high level of subject knowledge, knowledge of curricula, and use of ICT. The respondents had difficulties in the implementation of methodological and evaluative knowledge: in the methodology of building an individual educational trajectory, the methodology of practice-oriented teaching and learning, and the methodology of evaluating the results of teaching and learning.

Figure 4 shows the results of measuring the competence "practical readiness for pedagogical activity" and reveals a good level of ability to plan the teaching and learning process, taking into account the set goals, but the ability to involve all its subjects in this process is poorly expressed. The criterion "implementation of the educational process" revealed high indicators of skills in motivating students and achieving goals in specific classes, teachers have difficulties in applying pedagogical technologies and adapting them to the individual needs of students. The criterion "organization of the environment" demonstrated quite high indicators in creating safe conditions for individuals in the educational environment and in providing pedagogical support. However, educators face difficulties in ensuring the safety of students in the digital environment. Since the digital environment is a rapidly developing area in education and is still insufficiently studied, there is a need to develop the competencies of educators in the field of ensuring the safety of students in this environment. Also within the framework of this criterion, the problem of creating conditions

for the development and motivation of students with special educational needs is identified. Analysis of the criterion "assessment of learning and education results" revealed several problems related to the use of measurement tools, checking their reliability, validity, and objectivity, development of assessment criteria, as well as analysis of assessment results to adjust and improve teaching methods. An equal number of teachers demonstrate both high and low levels of competence in the criterion "cooperation in the teaching and learning process". The study revealed high indicators of interaction with other teachers in professional communities aimed at improving the teaching and learning process. However, difficulties in interaction with the parent community to develop an individualized track of students' development were revealed. The overall analysis of the results for the competence "practical readiness for pedagogical activity" showed that 21% of respondents demonstrated a high level, 51% - an average level, and 28% - a low level of formation of this competence.

Analysis of the results for the competence "readiness for professional growth and development", Figure 5, showed the prevalence of the average level of this competence. According to the criterion "reflection of pedagogical activity," 18% of surveyed teachers have a high level, 30% - a low level, and 52% - an average level of expression of this indicator. Teachers have projective skills to improve their professional level, analytical and reflexive skills related to the improvement of their activity, and continuous professional development. At the same time, they experience difficulties in the objective assessment of their activities in interaction with other CPS subjects.

Leadership is an important competence for modern educators, as it plays a central role in the organization and effective management of the educational process (Valyaeva, 2022). This competence allows for the establishment of productive interaction in a professional team, the successful use of collaborative strategies to achieve goals, and contributes to professional development (Rerke et.al, 2020). The analysis of respondents' answers on the criterion "self-development and leadership" showed that 26% of respondents demonstrated a critically low level of this competency, 17% - high level, and 57% - medium level. The study revealed that teachers have good indicators in searching for methods and forms of professional development, as well as in monitoring their professional achievements and growth trajectory. However, certain difficulties were noted in analyzing the practice of colleagues, their involvement in self-assessment of their competencies, dissemination of positive experiences, and providing professional support to trainees. This emphasizes the need for both the development of students' personal qualities and special training in leadership and professional development skills.

Conclusion. In the framework of our research, we have studied the professional competencies of future teachers. As a result, the author's methodology for diagnostics of the level of formation of professional competencies of teachers was proposed. The results of the study revealed the prevalence of the average level of formation of such competencies as the "ability to perform professional activity based on pedagogical values", "able to use professional knowledge to solve pedagogical problems", "practical readiness for pedagogical activity" and "readiness for professional growth and development". For each criterion of the considered competencies, the strengths and weaknesses of the process of professional training of pedagogical staff were identified. The positive points are a high level of pedagogical orientation and responsibility, subject and methodological knowledge, knowledge of children's characteristics and their motivation, skills in planning the pedagogical process and organization of the educational environment, ability to design their professional level, and development of leadership qualities.

Certain problem areas that require attention have been identified, including low levels of proactivity and innovation in pedagogy, inability to manage risks, lack of knowledge and skills in creating inclusive environments, as well as weak skills in teaching in multilingual environments and ensuring safety in digital environments. Universities, colleges, and further education

institutes that provide professional training for educators need to develop a comprehensive approach to each area of identified professional deficits. The results of our study provide insights into the current state of teachers' competencies and their compliance with the requirements of the standard. The applied diagnostic methodology helps teachers to see their weaknesses and professional deficits and develop strategies for their improvement. In our study, we adhere to the position that even though the considered professional competencies are interrelated and represent their holistic model, each of them has its specific development, which should be taken into account when designing professional training programs. The important conclusion of the study was, firstly, that future teachers realize the target benchmarks and the need to develop their professional competencies, secondly, the need for systemic changes in the process of professional training of teachers, thirdly, the development of a structural model of teacher's professional competencies, fourthly, the development and implementation of modern methods and tools for measuring professional competencies. The results of our study became the basis for taking some measures to monitor professional competencies aimed at improving the educational process and updating educational programs.

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