Developing professional competence in pre-service teachers

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Abstract

This study examines the development of professional competence in prospective teachers, specifically those preparing to teach technology and design. Professional competence is conceptualized as an integrative attribute encompassing both professional and personal qualities, including the knowledge, skills, and experience necessary for effective decision-making and pedagogical activity. The study addresses a critical gap in the literature concerning the structured formation and classification of competencies required in teacher preparation programs. The objective is to explore the scientific, theoretical, and pedagogical dimensions underpinning the development of professional competence in future educators. A mixed-methods approach was employed, incorporating structural and comparative analysis, diagnostic tools, questionnaires, essays, and expert evaluations of pedagogical outputs. Drawing on established theoretical frameworks, the study proposes a comprehensive classification system of key competencies. Findings highlight the multidimensional nature of professional competence and underscore the value of reflective and evidence-based strategies in teacher education. These results contribute to the refinement of teacher training models by emphasizing the alignment of pedagogical theory with practical application and the importance of cultivating both cognitive and affective domains in the professional formation of educators.

Keywords: Competence development; diagnostic tools; pedagogical training; professional skills; teacher education

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1. INTRODUCTION

In today's rapidly evolving global landscape, profound and multifaceted transformations are reshaping numerous sectors, with the field of education being particularly affected. These shifts are characterized by a series of dynamic developments that underscore the urgent need for redefined and updated models of professional competence (Āboltiņa et al., 2024). One of the most catalytic events in recent years has been the coronavirus pandemic, which significantly accelerated the integration of information and communication technologies (ICT) into educational systems. This global health crisis forced institutions to pivot swiftly from conventional face-to-face instruction toward more flexible, hybrid, and blended learning modalities. As a result, educators and institutions alike have had to rapidly adapt to new pedagogical frameworks that rely heavily on digital tools and virtual interaction (Jiang & Yu, 2024; Momdjian et al., 2024).

Moreover, the pandemic served as a stimulus for broader international collaboration in research and education. There has been a notable surge in cross-border academic initiatives, with research teams becoming increasingly involved in global projects and academic mobility programs. These engagements not only expand the scope of scholarly cooperation but also expose educators and learners to diverse educational methodologies and cultural perspectives. Concurrently, the pervasive influence of social media has become a defining force in shaping educational discourse, student engagement, and institutional reputation. Social platforms now play a critical role in the dissemination of knowledge, peer collaboration, and the informal learning environment, demanding new media literacy skills from both teachers and students.

Against this backdrop, there is a clear and pressing need for educational professionals who possess a high level of competence, not merely in a formal or nominal sense, but in terms of practical effectiveness and adaptability. Such individuals must be capable of designing and managing the learning process in a way that is both creative and responsive to the socio-economic conditions in which they operate. They must also demonstrate an ability to navigate the complexities of modern information ecosystems, critically assessing and synthesizing vast quantities of digital content. Furthermore, continuous self-directed learning and professional self-improvement are no longer optional but essential competencies in a landscape marked by constant change and innovation (Basilotta-Gómez-Pablos et al., 2022).

Importantly, the focus is shifting from static definitions of professional identity toward a more dynamic understanding of professional competence. This competence is increasingly viewed as the degree to which an individual's skills, knowledge, and attitudes align with the evolving demands of real-world professional practice. In this context, university education plays a foundational role, not as the endpoint of professional preparation, but as a launching platform for lifelong learning and adaptive expertise.

1.1. Purpose of study

Despite extensive investigations by Orlov (2012), Lerner (2004), Kolesnikova and Gorchakova-Sibirskaya (2005), Slastenin (2013), and others, this issue remains insufficiently addressed within the current global framework. The present study explores the formation processes of professional competence in future educators, using students pursuing careers as teachers of technology and design as a representative case. In accordance with Wenglinsky (2002) and Hattie (2008), identification of effectiveness conditions for competence formation requires consideration of relevant cultural dimensions..

2. METHODS AND MATERIALS

2.1. Data collection tool

This study holds particular significance for prospective educators in the fields of technology and design, as professional activities in these domains involve the transmission of cultural imagery through artistic production and creative expression. An experiment was conducted. A pedagogical investigation titled "Development of Professional Competence of Future Teachers (Using the Example of Technology and Design Educators)" was

conducted by the research group of the Department of Artistic Work and Design at Aktobe Regional University named after K. Zhubanov, Republic of Kazakhstan.

2.2. Participants

A total of 283 students enrolled in the academic programs 6B01405 "Fine Art, Artwork, Graphic and Design" and 6B02102 "Design" participated in the experimental study.

2.3. Procedure and analysis

The methodological basis of our research consists of the scientific works of foreign and domestic scientists: Klarin (2003), Markova (1996), Mitina (2004), Kaljuzhnyj (2008), Kozhakhmetova (1998), and Almurzayeva (2015). The diagnostic apparatus consisted of theoretical and empirical research methods. In our study, we relied on a set of diagnostic techniques: questionnaires, analysis, self-analysis of personal and professional qualities of teachers, expert evaluation of pedagogical "products", and essays (Table 1).

Table 1

Methods for determining the professional competence of a university teacher

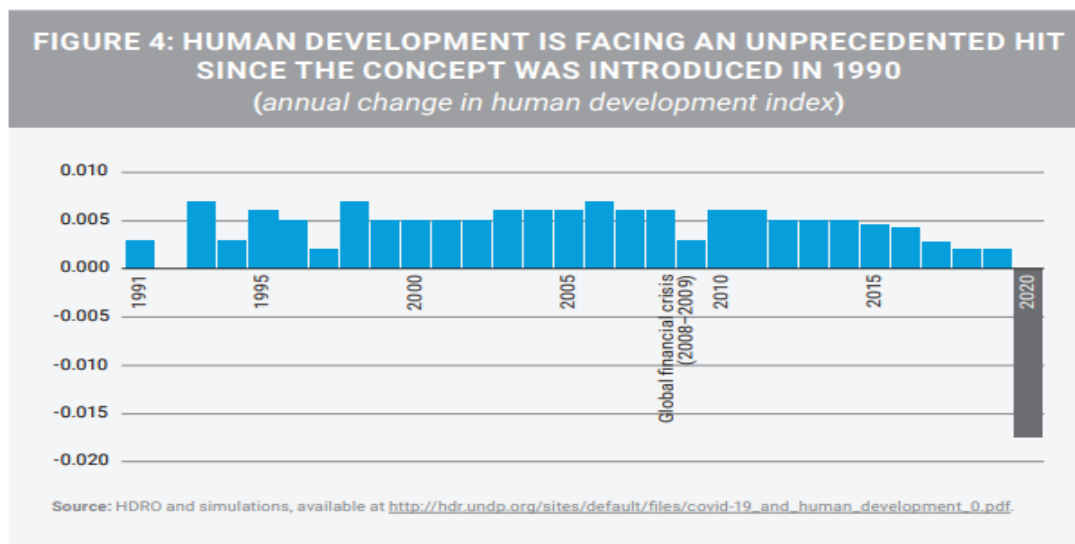| Diagnostic area	Methodology
Theoretical and methodological basis of research	Analysis of scientific literature, Internet sources, and training documentation
Questionnaire	Questionnaire "Examination of teachers' professional readiness to innovative work" by Rogov E.I.
Analysis, self-analysis of the personal and professional qualities of teachers	V.I. Andreev's method "Assessment of self-development and development needs"; social survey to identify the level of competence formation
Expert evaluation of pedagogical "products" (information literacy)	Analysis of the educational and informational field of the teacher (video conferences, social networks, YouTube channel)
Essay	The role of pedagogical competence in my profession

3. RESULTS

3.1. Evidence from previous studies

The changes taking place in modern education highlight the professional competence of the teacher as a set of universal abilities of the person, their professional orientation, moral and value behavior. The theme of professional competence is also reflected in the definition of "education" given in Ullah et al. (n.d.), given the pandemic changes: "Education is not just a basic human right. It is the fundamental right on which the realization of all other human rights directly depends. Education is a global common good, the most powerful force for progress on all 17 Sustainable Development Goals, and the foundation for a just, equitable, inclusive, and peaceful society. When education systems collapse, the task of building peaceful and prosperous, and productive societies becomes impossible. As we can see, in this definition, professional competence refers to a "productive society" that builds a prosperous world for the benefit of society. Professional competence and a productive society are characteristics of people's quality of life. The coronavirus pandemic, the shift from innovative educational technology to social technology, lockdowns and restrictions, changing economic and social conditions, and high human mortality have all contributed to the fact that the human development index in 2020 has fallen to a level that we did not see even during perestroika in 1991 (Figure 1).

Figure 1
Annual fluctuations of the human development index

FIGURE 4: HUMAN DEVELOPMENT IS FACING AN UNPRECEDENTED HIT SINCE THE CONCEPT WAS INTRODUCED IN 1990
(annual change in human development index)

Source: HDRO and simulations, available at http://hdr.undp.org/sites/default/files/covid-19_and_human_development_0.pdf.

Although the upheavals of the pandemic have taken their toll on the world, we have seen the other side, the side of the rapid transformation of the learning system and all actors in the pedagogical process. At this point, we see that tasks that society did not take for granted are now becoming feasible. They are exactly the basis for the development of professional competence. For students of pedagogical and technological orientation, this situation contributes to the formation of their IT competence. This is because they perform design and development in special information programs and websites.

These tasks may be considered as primary trends within the educational field and should be regarded as fundamental components of professional competence in teaching:

Trend 1. As technological advances intensify, entirely new professions emerge, and hobbies embrace previously unexplored areas. Many professions simply cease to be. Society is forced to adjust to these conditions of rapid change. Its cultural image is also changing, and the characteristics of the concept of "creativity" are also changing.

Trend 2. Education acquires the status of lifelong learning in the world and confirms it. As we see the situation of today, it is necessary to engage in education and self-education for the full life of a person. If we do not nourish our knowledge in a rapidly changing environment, we will simply find ourselves on the edge of life's events.

 Trend 3. The coronavirus pandemic has influenced the emergence of new areas of human activity based on gaining new knowledge by incorporating completely different technologies into the learning process. We are now seeing a shift in forms of learning from classical lecture-based to research-based and project-based, which is the basis of blended learning. In the field of the development of functional literacy of students, the issue of information literacy has become relevant. In this regard, the teacher should establish a dialogical, open relationship with students, expanding their professional and research field of interaction, and the student collaborative environment is improved. Teamwork, consideration of cases, problem-thematic insights, creation of information projects in the direction of their specification, ability to work on the Internet have become in-demand teaching techniques. Information-communication competencies in several other types of competencies have become leading.

Trend 4. The introduction of social networks and Internet technologies into the educational environment is seriously changing the process of acquiring knowledge. It is easier for a modern student, as well as any learner, to accept educational information if he/she is allowed to use Internet resources. This will allow the student to increase the role of independence in finding the necessary educational material through social networks: YouTube, Telegram, Instagram, and others, but under the guidance of a teacher. Visual forms of transmission through social networks, video conferencing, replace the form of presentation in the usual mode. It should be noted that this aspect for future teachers of technology and design allows them to express themselves creatively, to perform Internet exhibitions, to conduct a Master class on creativity, design basics.

Trend 5. All spheres of social life, including education, are imbued with global changes. This gives reason to increase in the world of people's morality, ethical norms in the implementation of interpersonal dialogues, to accept and understand other cultures, customs, and traditions.

This list outlines principal trends emerging from transformations in global society, each exerting influence on the criteria shaping general and professional competence as foundational elements of human activity. Professional competence emerges and evolves within the context of society, possesses a social character, and is expressed through social and professional engagement in interaction with others. This competence is grounded in knowledge, skills, and abilities cultivated throughout the educational process (Qin, 2024).

The development of professional competence in prospective educators represents an integrative characteristic encompassing both occupational and personal qualities. This construct reflects not only the extent of knowledge, skills, and experience required to achieve objectives within professional practice but also embodies a socio-moral stance. In accordance with the conceptual framework proposed by Slastenin (2013), professional competence in future educators should be understood as an integrative personal attribute. In the context of technology and design education, this competence is shaped by engagement in project-based activities within disciplinary learning and by the degree of preparedness for forthcoming professional responsibilities.

3.2. Results of the experiment

The content of professional development is determined by the specific features of the profession and the nature of professional activity. Professional development constitutes a necessary condition for the formation of effective educators and serves as a determinant of pedagogical success. A lack of sufficient professional development complicates the adaptation process to teaching roles and may, in certain cases, result in an inability to carry out pedagogical functions. As the academic discipline is mastered, the capacity to apply its scientific content to the resolution of professional challenges must be formed.

Within this context, emphasis was placed on students enrolled in academic programs 6B01405 "Fine Art, Artwork, Graphics and Design" and 6B02102 "Design." At the organizational stage of the educational experiment, scientific seminars and production meetings were conducted. These forums addressed the overarching strategy and pedagogical methodologies for cultivating professional competence among future educators and facilitated the coordination of instructional activities across the department. The objective of each academic discipline was articulated as a specific manifestation of the broader goal of professional competence formation. The instructional tasks of each discipline were defined with a focus on the activation and development of relevant knowledge, enhancement of professional-pedagogical skills within the scope of the subject area, and the formation of a subjective academic stance among students. Systemic, personal, and competence-based approaches to professional training necessitated critical analysis of the scientific content of each discipline, integration of interdisciplinary problem-solving processes, and the construction of models for addressing pedagogical challenges.

According to Irzhasova et al. (2017), the theory of professional competence has passed through three main periods. Table 2 shows the generalized characteristics of periods of formation of the problem of formation of

socio-ethical competence of future teachers (students of pedagogical specialties) according to Irzhasova et al. (2017).

Table 2

Generalized characteristics of periods of formation of professional competence

First period (early 1970s – early 1990s)	Second period (early 1990s – early 2000s)	Third period (early 2000s – present day)
D. McClelland introduces the term "competency", beginning of the establishment of the competency-based approach	Spread of competency-based approach ideas, including in post-Soviet countries	Emergence of comprehensive studies on the problem of the formation of professional competence in prospective specialists
A single educational space on the territory of the entire Soviet Union, consistent training of teachers with higher education, aimed at increasing their professional competence	Independence of countries in Europe and Central Asia, reformation of vocational and higher education systems in said countries	Adoption of the Bologna agreements, reorganization of school teacher training according to the competency-based paradigm
Studies are mostly dedicated to improving the training of students in pedagogical higher educational institutions	An increasing number of studies are dedicated to improving the training of students in higher educational institutions	Emergence of first studies on the formation of professional competences (mostly related to the learning process) in prospective school teachers

A comprehensive examination of scientific, pedagogical, and specialized literature concerning the formation of professional competence in future technology educators has led to the identification of several distinct types of competence: basic competence, psychological competence, and pedagogical competence. Each of these categories contributes to the overall structure of professional competence. A more detailed consideration of these types is presented below:

- Initial competence is a competence that a student possesses when studying at university. It includes the following key competences: informational, communicative, independent, creative, and social.
- Information competence - the ability to search, analyze, transform, and apply information to solve problems.
- Communicative competence is the ability to cooperate effectively with others.
- Independent competence - the ability to approach learning independently, the ability to set goals and plan results.
- Creative competence is the ability to create.
- Social competence is an indicator of awareness of the social significance of the teaching profession. It characterizes moral culture, ideals, and spiritual values.

Basic professional competence is a competence that is formed by the student upon graduation (their professional knowledge, skills, and abilities, as well as the initial experience gained in their further teaching activity). It includes the following basic (special) competences: target, organizational, content, design, and control. Objective competence of a technology teacher implies the ability to set and implement educational goals of different levels and directions. Organizational competence of the teacher of technology is the ability to solve tasks to implement the intended. Content competence characterizes the teacher's knowledge of the subject, the ability to work creatively with the curriculum, to develop a work program that reflects the specifics of the region, the educational institution, as well as the possibilities of its methodological capacity, information, technical support

and, of course, the level of preparedness of students. Project competence includes the teacher's ability to anticipate the results of their activities and determine the sequence of their actions while achieving the aim. Monitoring competence of a technology teacher characterizes the teacher's ability to monitor the learning process and correlate the actual results with the planned ones, that is, to ensure the quality of education. Pedagogical diagnostics is an integral part of monitoring; it includes control, verification, evaluation, accumulation of statistical data, their analysis, identification of dynamics, data forecasting.

One of the conditions for the formation of professional competence of future teachers is the use of modern educational technologies in the educational process. Among a wide range of methods of professional training of future teachers, we have identified the most effective for the formation of components of professional competence - contextual, positional, and modular rating.

The transition of students from proper educational activity through quasi-professional and educational-professional activity to proper professional activity allows giving a holistic view of pedagogical activity. This also contributes to the formation of professional motivation, cognitive, orientational and operational components of competence.

Problem-search nature of cognitive activity of students in various forms and methods of "activating" learning (problematic lecture, project method, business game, lectures-discussions, and so on) contributed to the development of students' creativity, flexibility, ability to self-development. Extensive use of professional situations (conducting fragments of "lessons", discussion of problems at the "pedagogical council", viewing training videos, student presentations, and other types of work using Internet technologies) promoted the development of professional motivation, reflection, and the ability to work in a team.

The use of positional learning technology allowed students to develop the ability not only to find normative solutions of pedagogical situations, but also to develop their mobility and adaptability, the ability to navigate in a rapidly changing environment. Adoption of a certain position by students in such classes created conditions for maximum understanding of alternative solutions and determination of personal-conceptual positions in the process of solving a professional problem. The use of different roles-positions during the discussion developed flexibility, proof of students' thinking, which became more and more independent and characterized by boldness in judgment, purposefulness, and other qualities inherent in a creative personality. At the same time, students developed skills of pedagogical communication, the ability to respect others' opinions, to perceive an alternative position, to show tolerance and empathy in the process of interpersonal interaction, among others.

Modular-rating learning technology in the present study acted as a technology of individualization of learning by content, teaching methods, the level of independence and the pace of learning activity of the student. Presenting to the student at the beginning of training the purpose of studying the discipline, as well as modules as its structural parts, allowed him to understand and realize the personal and significant result of studying the discipline for the formation of his professional competence. The choice of teaching methods or professional activities was based on the following algorithm: from informational teaching methods (lecture, conversation, counseling, among others) to operational (project method, practical exercises, among others) and exploratory methods (discussion, business game, among other thing). In the complex formed the professional orientation of the personality, developed generalized ways of activity, relevant competencies required by the future teacher for this type of activity.

The final rating parameter in this study served as a method of work as a demonstration exam, where students showed their readiness to work, and the experts were employers and representatives of professors. This form of control allows providing regular feedback between the subjects of the educational process and performing its correction, activating the learning activity of the student. This allows students to understand and realize their potential and gain experience in planning and reflective assessment of their personal and professional

development. The students of the chosen specialties 6B01405 - "Fine Art, Artwork, Graphics and Design", 6B02102 - "Design" demonstrated the skills and competencies that reflect their field of work.

The experimental component of the study was implemented with participation from students and faculty members of the Faculty of Education at Aktobe Regional University named after K. Zhubanov during the period 2019 to 2021. The pedagogical investigation incorporated a diagnostic phase involving selected subjects. A total of 283 students enrolled in the academic programs 6B01405 "Fine Art, Artwork, Graphics and Design" and 6B02102 "Design" were included in the research sample. Distribution by year of study comprised 73 first-year students, 114 second-year students, and 96 third-year students.

The results of the diagnostic assessment based on the "Motivation to Study in Higher Education" methodology (Ilyin, 2011) are presented and analyzed below (figure 2).

Figure 2

Results of the method "motivation to study in higher education" in %
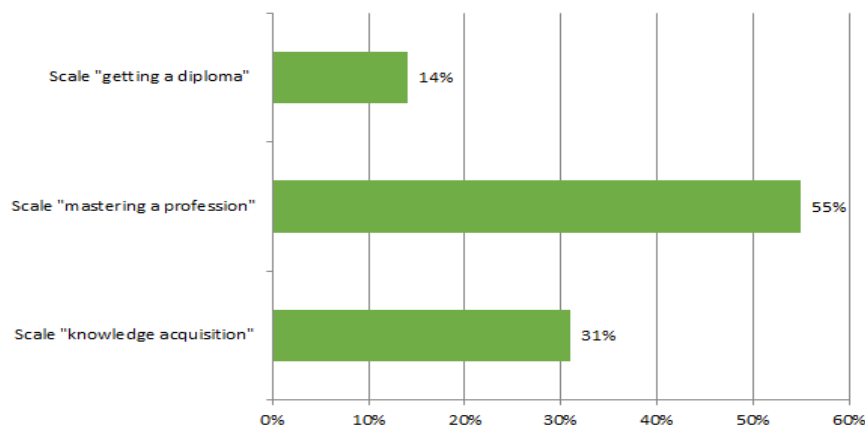
The data obtained indicated that the predominance of motives on the first two scales indicates adequate choice of the profession by the student and satisfaction with it.

Taking into account the specifics of the specialties, the results were mostly positive and amounted to 86% of adequate choice and 14% of expectation of a diploma.

The results of the questionnaire "Study of professional readiness for innovative work" showed that all participants of the experiment have a positive attitude to innovations in the pedagogical process and are ready to transform their activities, also none of the future teachers marked the field "do not own" (Figure 2).

The results of the questionnaire facilitated the assessment of participants' readiness for engagement in innovative processes. This readiness appears to be a consequence of the coronavirus pandemic, during which all educational institutions transitioned to distance learning formats between March 2020 and September 2021. This shift involved the active use of internet technologies and social media platforms, including Instagram, WhatsApp, and Telegram. According to the data, 82.7 percent of respondents demonstrated partial readiness for innovative processes, while 17.3 percent exhibited full readiness. These groups demonstrated awareness of the significance and impact of innovation in contemporary life and actively engaged in self-education. Notably, the same proportion of students exhibited higher involvement in research activities and more frequent participation in creative projects.

To assess the level of self-development needs, the methodology "Self-development Needs Assessment" proposed by Andreev (2014) was utilized, incorporating a five-point evaluation scale (Wenglinsky, 2002). Among

the 283 students surveyed, 34 percent displayed a high level of self-development needs, 57 percent exhibited a sufficient level, and 9 percent demonstrated a low level.

In response to recent global developments, a sociological survey was also conducted to determine the technological proficiency of participants. Respondents were required to answer three questions designed to assess the degree of information technology competence:

-using new technology randomly (about 13%);

-using IT technologies involuntarily (about 75%)

- groups of innovators (about 12%).

Figure 3
The results of a sociological survey of students to identify the level of competency formation
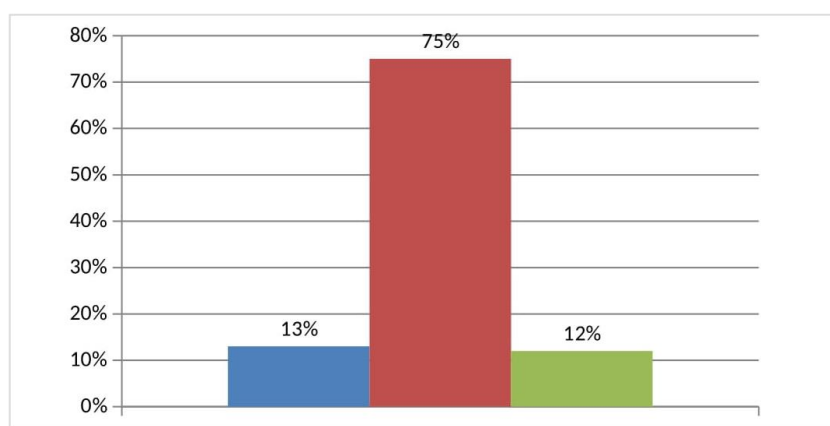
The findings of the sociological survey indicate heightened anxiety among the group of students who are either compelled to utilize information technologies in pedagogical practice or who apply innovative technologies inconsistently (Figure 3). This phenomenon reflects insufficient levels of information literacy, despite active engagement in educational and professional contexts.

An analysis of student essays on the topic "The Role of Pedagogical Competence in the Teaching Profession" revealed that a majority (81 percent) identified competence as a critical component of effective teaching. Another segment of participants emphasized the significance of foundational knowledge and inherent predispositions or abilities, which contribute to the development of a professional orientation alongside the formation of competence. Overall, recognition of the relevance of competencies in contemporary human experience was evident among all participants. The capacity of competence to support adaptation to rapid global transformations was consistently acknowledged. Furthermore, the acquisition of new social competencies was frequently described as engaging, informative, and beneficial in the context of current global uncertainty.

The obtained diagnostic results were announced at the extended Scientific and Methodological Council of the Faculty, which aroused pedagogical interest. Because of the diagnostic results was the question of the choice of the methodological problem of the faculty, which was associated with the definition of a group of competencies for students of specialties 6B01405 - "Fine Art, Artwork, Graphics and Design", 6B02102 - "Design". Thus, for the consideration of the teaching staff, competencies were proposed to be discussed in the departments, taking into account their specificity, and to develop methodological recommendations as an instruction manual for education and self-education.

The following group of competencies is presented as a structured framework. The identified system of competencies constitutes the foundation for the development of professional competence (see Table 2).

Table 3

Comparative indicators of the main components of professional competence

Title	Start of the experiment	Completion of the experiment
information-technology	121 people	245 people
acmeological	74 people	137 people
design and construction	70 people	229 people
research	157 people	241 people

The indicators in Table 3 indicate the impact of global integration processes on the improvement of professional competence of a university student.

4. DISCUSSION

The predominance of information-technological and research competencies has been observed, while acmeological and design-constructivist competencies exhibit comparatively lower levels of development. Although a broad range of activities supports acmeological training, a key limiting factor remains the shortage of available time. This limitation is particularly evident in students' daily academic preparation and sustained engagement with information and communication technologies. A notable positive development is the emergence of mutual integration among the identified competencies within the context of blended learning and recent global transformations, wherein information-technological competence assumes a leading role.

Within the scope of the present study, information-technological competence warrants distinct attention, given its heightened relevance in light of recent global events. This competence encompasses a synthesis of the essential components constituting professional competence in university-level teaching. The impact of the coronavirus pandemic, the adoption of blended learning models, the establishment of international university branches in Kazakhstan, increased relocation of IT enterprises, the ongoing internationalization of higher education, and the expanding opportunities for academic mobility among university educators have collectively acted as significant catalysts for the development of this domain of competence.

5. CONCLUSION

The process of professional development for future teachers of technology and design necessitates a concentrated emphasis on the cultivation of professional competence. This concept encompasses a comprehensive set of professional knowledge, skills, and abilities essential for effective pedagogical engagement. Within this framework, information technology (IT) competence holds particular significance in the contemporary educational landscape. The specificity of the teaching profession in the field of technology and design requires familiarity with specialized internet programs and digital tools, reinforcing the necessity for a technologically integrated skill set.

The technological dimension constitutes a systematic structure of professional competencies that collectively inform pedagogical effectiveness. A pedagogical experiment conducted within this research produced several key outcomes: a scientific-theoretical conceptualization of "professional competence"; identification of prominent scholars in this field; adjustments to the educational process, including the revision of academic content and expansion of creative assignments; integration of a demonstration-based examination as a form of student assessment; development of a personalized and creative internet environment offering diverse digital opportunities for students; and the subsequent refinement of instructional practices among departmental staff.

Professional competence among teachers of technology directly influences readiness for professional engagement, which involves the development of both psychological and pedagogical competence. Based on the findings of the present analysis, a conceptual model is proposed for the formation of professional competence in

future teachers of technology and design. This model consists of four interconnected components: primary competence, psychological competence, pedagogical competence, and basic-professional competence. Each component is influenced by pedagogical conditions and incorporates distinct sub-competencies necessary for future educators in the domain of technology and entrepreneurship.

Teacher standards and competencies are articulated across several domains. First, in relation to student development, professional educators: (1) demonstrate appreciation for student diversity; (2) build constructive relationships; (3) relate prior learning, life experience, and student interests to instructional goals; (4) apply diverse strategies and resources to address individual student needs; (5) promote autonomy, interaction, and choice in the learning process; and (6) engage students in problem-solving, critical thinking, and other meaningful academic activities.

Second, in creating an effective learning environment, professional educators: (1) foster equity and inclusivity; (2) establish collaborative classroom cultures; (3) design physical spaces that encourage full student participation; (4) implement structured procedures that support learning; and (5) utilize instructional time efficiently.

Third, concerning subject matter expertise, educators: (1) demonstrate comprehensive content knowledge; (2) integrate concepts across disciplines; (3) use appropriate instructional methodologies; and (4) incorporate meaningful materials, resources, and technologies.

Fourth, in instructional planning, educators: (1) establish clear learning objectives; (2) design and sequence lessons that support student progress; (3) adapt curricula to address diverse needs; and (4) utilize relevant resources to enhance educational outcomes.

Fifth, in the area of assessment, educators: (1) communicate clear learning goals; (2) use multiple data sources to evaluate student progress; (3) guide students in self-assessment; (4) maintain detailed academic records; and (5) engage with families regarding student achievement.

Sixth, in professional development, educators: (1) engage in reflective practice; (2) pursue ongoing professional learning goals; (3) uphold ethical standards; (4) collaborate with families to support student success; (5) sustain collegial relationships; and (6) participate in professional communities to enhance pedagogical practice.

In conclusion, the development of professional competence in future teachers, particularly in the field of technology and design, extends beyond the acquisition of knowledge, skills, and experience. True professional competence is realized through the formation of internal readiness for instructional activity. Even in the presence of well-established academic and experiential foundations, an absence of self-confidence, professional disposition, or internalized commitment to teaching responsibilities precludes the recognition of an individual as a professionally competent educator.

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