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ORIGINAL

Building Inclusive Competence Among Higher Education Teachers

Fomentar la Competencia Inclusiva Entre los Profesores de Enseñanza Superior

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ABSTRACT

Introduction: providing assistance to students with special educational needs in higher education institutions and supporting their professional growth are effectively implemented under conditions of high-quality teacher training tailored to working with this category of students. The article addressed the problem of inclusive education in higher education, emphasizing the involvement of pedagogical hierarchical relationships that included students with disabilities in Ukraine.
Method: the study employed interviews, comparative analysis of teachers' knowledge levels before and after specialized professional development, and analysis of the data obtained.
Results: the article presented a concept for training teachers for inclusive activities, which consisted of five elements: informational and educational, analytical and practical, engineering and technological, psychological and social, and monitoring and analytical. Implementing this model contributed to the development of teachers' professional competencies in creating and applying inclusive education systems. It also ensured their readiness for professional work with students with special educational needs. Three levels were identified to measure such readiness: basic, intermediate, and advanced. Statistical analysis based on Pearson's criterion was applied to assess the dynamics of changes in four parameters: content-theoretical, technological-practical, social-psychological, and generalizing-analytical.
Conclusions: comparative results before and after using the model demonstrated an increase in the level of teacher preparedness across all problem areas. This preparedness was formulated through a comprehensive approach that integrated theoretical knowledge of inclusion, practical teaching methods (didactic, technical, technological, and psychological), and the adaptation and development of analytical skills essential for creating individualized educational pathways for students with disabilities.

Keywords: Inclusive Education; Higher Education Students; Special Educational Needs.

RESUMEN

Introducción: la asistencia a los estudiantes con necesidades educativas especiales en los centros de enseñanza superior y el apoyo a su crecimiento profesional se llevan a cabo eficazmente en condiciones de formación del profesorado de alta calidad adaptada al trabajo con esta categoría de estudiantes. El artículo aborda el problema de la educación inclusiva en la enseñanza superior, haciendo hincapié en la implicación

de las relaciones jerárquicas pedagógicas que incluyen a los estudiantes con discapacidad en Ucrania.
Método: el estudio empleó entrevistas, análisis comparativos de los niveles de conocimiento de los profesores antes y después del desarrollo profesional especializado, y análisis de los datos obtenidos.
Resultados: el artículo presentaba un concepto de formación de profesores para actividades inclusivas, que constaba de cinco elementos: informativo y educativo, analítico y práctico, de ingeniería y tecnológico, psicológico y social, y de seguimiento y analítico. La aplicación de este modelo contribuyó al desarrollo de las competencias profesionales de los profesores en la creación y aplicación de sistemas de educación inclusiva. También garantizó su preparación para el trabajo profesional con alumnos con necesidades educativas especiales. Se identificaron tres niveles para medir dicha preparación: básico, intermedio y avanzado. Se aplicó un análisis estadístico basado en el criterio de Pearson para evaluar la dinámica de los cambios en cuatro parámetros: contenido-teórico, tecnológico-práctico, social-psicológico y generalización-analítica.
Conclusiones: los resultados comparativos antes y después de utilizar el modelo demostraron un aumento del nivel de preparación de los profesores en todas las áreas problemáticas. Esta preparación se formuló mediante un enfoque global que integraba conocimientos teóricos sobre la inclusión, métodos prácticos de enseñanza (didácticos, técnicos, tecnológicos y psicológicos) y la adaptación y el desarrollo de habilidades analíticas esenciales para crear itinerarios educativos individualizados para estudiantes con discapacidades.

Palabras clave: Educación Inclusiva; Estudiantes de Enseñanza Superior; Necesidades Educativas Especiales.

INTRODUCTION

Inclusive education adapts higher education to students with diverse physical and/or psychological development needs. The main criterion for creating and implementing an inclusive learning environment is the availability of sufficiently qualified specialists who can organize learning with elements of differentiation, taking into account the individual characteristics of all participants.[1]

This group of specialists should provide for the use of methods and means that best suit the characteristics of the student population.

Society, in particular intellectually and professionally, develops people with disabilities, but in a more general context, it is with them that the full social applicability of equality and the overcoming of discriminatory barriers are guaranteed in order to create and implement such conditions.[2]

Within the chosen framework, it is important, in the opinion of teachers, taking into account the parameters of interaction with students, that the fundamental and justified goal of implementing the principle of inclusion in higher education institutions is achieved.[3] The training of teachers should be based on the development of adaptive teaching skills, the formation of a positive psychological climate, the personalization of the educational process, and the acquisition of knowledge about the specifics of teaching students with disabilities.[4]

Even with the state's efforts to develop inclusive education, issues such as insufficient pedagogical and psychological training of teaching staff, material and technical support, and the formal style of organizing inclusive education remain problematic. One possible solution to this situation is the introduction of teacher training courses that thoroughly examine inclusive education in its multifaceted nature, and automated learning systems. Equally important is the use of modern information and communication technologies that provide methodological and didactic support to teachers working with specialized software.[5]

Thus, within the framework of modern higher education, the problem of training higher education teachers – specialists for working with students with special educational needs – has become particularly acute. This requires innovative pedagogical development of paradigms with a unified concept at the level of policy management in higher education institutions, where the combination of self-training and self-education of teachers contributes to the improvement of their qualifications.

The presented study focuses on the formation of an inclusive educational environment in higher education institutions and a model of professional training for teachers working with people with special educational needs.

It is important to note that, according to Booth and Ainscow,[6] in order to systematically adapt teaching technologies and observation methods to the special needs of students, it is necessary to create an inclusive educational environment with adequate institutional support. According to Syriopoulou-Delli et al.,[7] the most effective educational courses at universities were those that implemented active learning for students with autism spectrum disorders. Peer mentoring for the development of social and organizational adaptation in students with autism spectrum disorders showed the highest effectiveness.[8] Armstrong and Tsokova[8] analyzed the potential of artificial intelligence to improve the accessibility of education for people with disabilities. They showed how modern technologies can contribute to the achievement of inclusiveness principles in higher education. The authors emphasized the need to adhere to strict ethical and regulatory rules for the safe

implementation of artificial intelligence in an educational context.[8]

Arishchenko[9] emphasizes a more individualized strategy for students with special educational needs at the higher education level. She points to the lack of adequate methodological and professional support for teachers working with this category of students. Prodius[10] emphasizes the insufficient understanding of the concept of inclusion by higher education teachers as an obstacle to the effective use of inclusive approaches in teaching. Babenko et al.[11] suggested that this problem could be overcome through long-term systematic analysis of positive experiences combined with continuous professional development of teaching staff. Shivani et al.[12] noted that institutional leaders hinder the further development of inclusivity in higher education, arguing that without administrative support in any institution, the implementation of inclusivity principles remains inactive.

For persons with disabilities, Davydenko[13] proposed a concept of educational process management guided by qualimetry, which focuses on the personalization of learning paths. Mitchell and Snyder[14] discuss the need to develop a methodological framework that takes into account the specific psychophysiological characteristics of students when designing their educational trajectories. Homaira et al.[15] proposed a learning model for students with disabilities that incorporates machine learning algorithms in interdisciplinary special education. These algorithms, which seek to analyze and learn from past teaching experiences, can provide recommendations on the most up-to-date strategies for fair assessment and the provision of educational opportunities for all students.

In their study, McInnes et al.[1] focused on gaps in career development and learning strategies for people with disabilities, emphasizing the need to focus on their employment. The authors note that participation in internships has a positive impact on the development of professional competencies of many members of socially vulnerable groups. However, the successful learning of these individuals requires qualified teachers who are prepared to provide appropriate educational support to students with disabilities.

Rajan et al.[2] describe an innovative teaching aid called Geomentoy, designed to help students from the Divyang community, which includes people with hearing and visual impairments. This tool combines the study of mathematical logic and geometry with elements of real-time gaming. In addition, self-learning resources for reading and writing were presented, as well as a tactile tablet that allows students with visual impairments to interact with visual materials using Braille. The publication also examines methodological aspects of teaching people with disabilities, approaches and directions for training caregivers for these students. Given the significant increase in the number of students with special educational needs, the authors emphasize the readiness of teachers in lower secondary and higher education institutions to implement advanced integration strategies at the post-secondary level, focusing on inclusive teaching practices and holistic educational frameworks.

METHOD

In the process of studying aspects of inclusive education in higher education institutions, a survey was conducted among teachers who had completed a training course aimed at preparing them to work with students with special educational needs. During the 2023–2024 academic year, a didactic model for creating an inclusive environment in universities was tested as part of this course. In addition, teachers were trained in new subject matter specializing in the stylistics of educational and didactic systems. The model was studied at the Ukrainian State University named after M. Dragomanov as part of professional development programs for teachers.

The assessment took 120 academic hours, was systematically structured according to 4 ECTS, and was consistent with the methodological model. The training course established each of the pre-defined key criteria for teacher assessment, which were agreed upon. Volunteers specializing in inclusive education, practical psychologists, and specialists in the provision of adaptive teaching aids participated in the development of the course. Within the framework of the course, teachers acquired the necessary skills to create an infrastructure to support inclusive education processes at universities for those who were able to pass the final assessment at different levels in one compulsory module. The module aimed to create a single comprehensive infrastructure for assessment.

The first module of the international training program for higher education teachers for people with special needs included a theoretical framework for specialists in special educational needs. This module included lectures on topics related to the development and special needs of these students, inclusive pedagogy, and the provision of a minimum information base. To assess the knowledge gained, the participants developed a shared review in which they summarized how, in their opinion, international inclusive practices in higher education had been most successfully implemented, taking into account the module “Harmony of the Earth and the Sky”.

The second module was devoted to solving practical and technological tasks in teacher training. The practical classes discussed modern approaches to adapting learning objects to the requirements of their special educational needs, the introduction of auxiliary methods, and new technologies in the field of inclusive education. Considerable attention was paid to the use of artificial intelligence, augmented and virtual reality, and elements of gamification. After completing the course, participants were invited to try out one of the above methods as part of an integrative interdisciplinary course.

The third training module focused on the psychology and sociology of teacher training. It included lectures on developing empathy, emotionally supporting students with disabilities, and socializing such students. The final activity within the module was a round table discussion on strategies for behavioral interaction in groups with students with disabilities.

The fourth and final module focused on developing skills related to monitoring and evaluating teaching activities. Participants were offered specific methods and approaches for assessing learning outcomes and monitoring changes in the achievement levels of students with special educational needs. The culminating task was reflection and self-assessment of professional activities in the context of inclusion. Overall, the course culminated in the development of teachers' competencies in planning and implementing inclusive educational institutions and providing appropriate pedagogical support to students with special educational needs.

As part of the study, preliminary (initial) and final (final) assessments of teachers' professional readiness to work in the context of an inclusive approach were conducted. For this purpose, the average score was calculated on a scale based on self-assessment and assessment provided by supervisors, using a 12-point grading system. Seventy-six teachers participated in the pedagogical experiment.

In addition, a survey was conducted among course participants – teachers who have experience working with students with special educational needs. The survey was conducted using a specially designed questionnaire (see Appendix A), the structure of which corresponded to pre-defined levels and criteria of professional training. Mathematical statistics methods were used to process the results, in particular, a comparative analysis of teachers' readiness levels according to the specified criteria and a test of the significance of differences using Pearson's criterion x^2.

RESULTS

It is extremely important to conduct a detailed analysis of indicators and establish a hierarchy for them within the framework of the pedagogical concept of educators' readiness to work with certain categories of learners. Figure 1 presents a matrix for evaluating this model and the corresponding indicators.[13]

C1: theoretical and substantive criterion	C2: practical and technological	C3: psychological and social criteria	C4: Performance and Analytics
Explain the basics of accessibility and inclusion in higher education. Be familiar with the guidelines and documents that regulate the educational process in higher education for individual special educational needs. Emotional and psychological aspects of students with developmental disabilities: autism spectrum, motor disorders, visual impairments, hearing impairments, psycho-emotional characteristics. Understanding modern teaching methods and technologies for pedagogical support of students with special educational needs.	Development of original educational modules taking into account individual differentiated optional areas using interactive digital adaptive technologies. Creation of teaching materials for "devices" - for closed classes, for people with hearing and visual impairments. Skills in creating a recommended individual learning path (ILP) and educational program for any student, designed for independent work.	Highly empathetic responses for deep connections with students with special needs. Emotional support: Maintaining a healthy microclimate in groups that include students with special educational needs. Managing an inclusive learning environment requires the ability to prevent conflicts and establish respectful relationships between students.	All students with special educational needs are assessed according to their specific needs related to disability in terms of their academic achievements. Willingness to adapt teaching styles to the needs of students in a timely manner when interacting with such students. Systematic monitoring of the effectiveness of educational methods and timely adjustments based on information and analytics from collected and analyzed educational outcomes are extremely important.

Figure 1. Criteria for a pedagogical model for training teachers to work with students with special needs

To analyze pedagogical readiness to work with individual educational needs, an independent assessment of educators was conducted based on the algorithm presented in (appendix A). For each criterion, the assessment ranged from 0 to 12.

The levels were defined as basic (0-4), intermediate (5-8), and advanced (9-12).

The basic level includes the ability to rewrite instructions for teaching materials in a way that high school students can understand, the presence of and tangible empathy for issues of inclusion, and a deep knowledge of inclusive pedagogy.

The intermediate level of readiness involves familiarity with the principles of inclusive education and inclusion, as well as their basic implementation. Educators who have reached this level can effectively use specialized support technologies, develop individual learning trajectories, and adapt assessment methods.

The advanced level of competence covers knowledge of the fundamentals of inclusive education, the development and implementation of new pedagogical approaches and technologies for inclusive education, the ability to analyze the implementation of unique educational pathways and adaptive monitoring based on the results obtained, as well as the presence of competencies in psychosocial support for students with special educational needs.

As part of a pedagogical experiment in teacher training aimed at assessing teachers' readiness to interact with students with special needs, based on the author's pedagogical model, it was found that their level of preparedness was mostly below the fundamental benchmark. In a survey on the level of teachers' preparedness for inclusive education, compliance with all assessment benchmarks was decisive. Full mastery of a single criterion, while results for others were below the control levels, does not indicate overall effectiveness; therefore, each established criterion.[14]

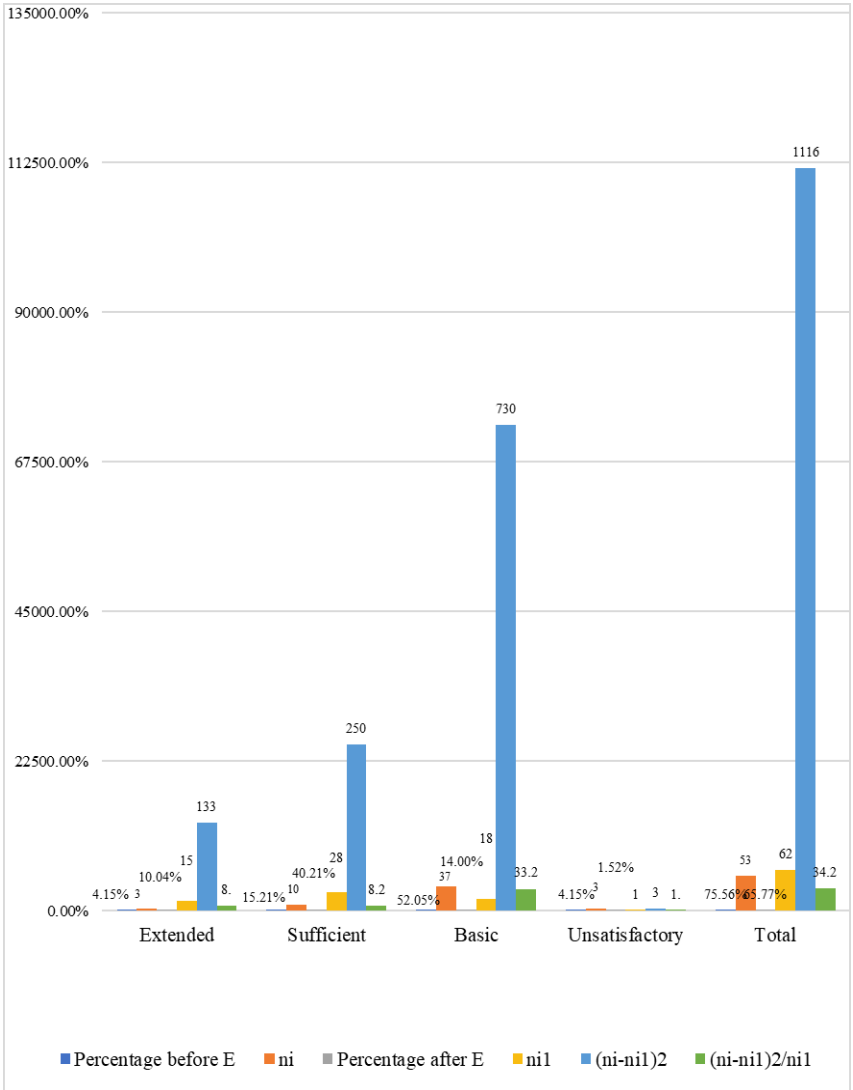

Figure 2. Results of statistical verification of the effectiveness of the pedagogical model for training teachers to work with students with special needs based on theoretical and content criteria

Note: ni – empirical frequency before the experiment, ni1 – empirical frequency after the experiment, E – experiment on implementing a model for training teachers to work with students with special needs.

The critical values of x^2 in this study were set as $\rho(0,05) \geq 9,49$ and $\rho(0,01) \geq 13,28$. Figure 2 contains the

results of a statistical analysis of the effectiveness of the implementation of a pedagogical model for training teachers for inclusive education with an analysis of specific educational and theoretical criteria.

The analysis (figure 2) shows that the obtained value of $x^2 = 34,15$ significantly exceeds the threshold value, which justifies the effectiveness of the proposed pedagogical model of teacher readiness to work with students with special educational needs. This demonstrates the effectiveness of the model in the context of theoretical training of teacher-researchers and the inclusive education teaching system.[15] Figure 3 presents statistical data on the effectiveness of the implemented model of teacher training for interaction with students with SEN, based on practical and technological parameters.

The results of the analysis (figure 3) indicate that the value of $x^2 = 43,79$ significantly exceeds the critical threshold, which allows us to conclude that the empirical pedagogical model for training teachers in their interaction with students with special educational needs is effective. In particular, the model demonstrates its effectiveness in the formation of practical, technical, and technological competencies of future scientific and pedagogical workers in higher education, as well as in the processes of designing and implementing an inclusive educational environment.

Figure 4 presents the results of a statistical test of the effectiveness of the same model using the criterion of teachers' psychosocial readiness to work with students with special educational needs.

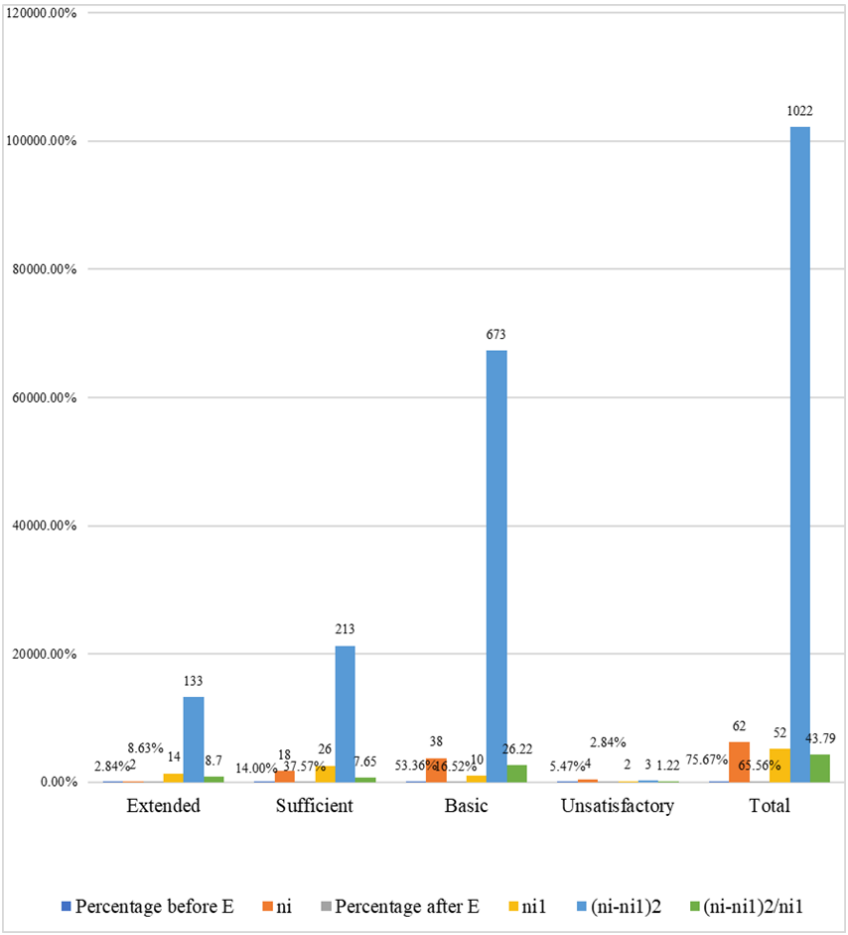

Figure 3. Results of statistical verification of the effectiveness of the pedagogical model for training teachers to work with students with special needs based on practical and technological criteria

Note: ni – empirical frequency before the experiment, ni1 – empirical frequency after the experiment, E – experiment on implementing a model for training teachers to work with students with special needs

Analysis of the collected data (figure 4) shows that the value of $x^2 = 37,2$ significantly exceeds the permissible critical level. This allows us to understand that the proposed pedagogical model for training teachers for professional interaction with students with special educational needs effectively positively influences the psychological climate in the student community, the integration of children with special needs into the social environment, and reduces the level of psychosomatic/emotional stress among participants in the educational process.

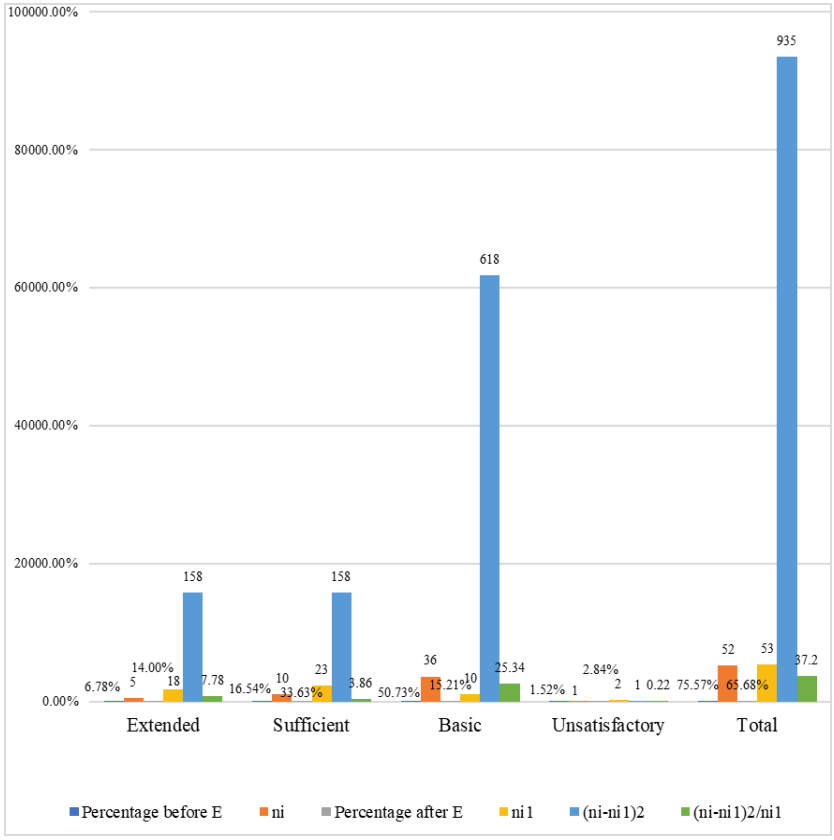

Figure 4. Results of statistical verification of the effectiveness of the pedagogical model for training teachers to work with students with special needs according to psychological and social criteria

Note: ni – empirical frequency before the experiment, ni1 – empirical frequency after the experiment, E – experiment on implementing a model for training teachers to work with students with special needs

In table 1, authors present generalized indicators of the effectiveness of this model in terms of pedagogical readiness using established evaluation criteria.

Table 1. Generalized results of comparing the assessment of the application of the pedagogical model of teacher training for working with students with special needs in percentage terms

Before the experiment, %							
C1	4,15	C2	2,84	C3	6,78	C4	6,78
	15,21		14		16,52		20,47
	52,15		53,36		50,73		46,78
	4,15		5,47		1,52		1,52
After the experiment, %							
C1	10,04	C2	18,63	C3	14	C4	12,57
	40,21		35,57		33,63		37,57
	14		16,52		15,21		15,21
	1,52		2,84		2,84		1,21

Notes: C1 – theoretical and substantive criterion, C2 – practical and technological criterion, C3 – psychological and social criterion, C4 – resultative and analytical criterion.

Based on the analysis of the data presented in table 1, it can be concluded that there is a positive trend: the number and proportion of teachers with high and medium levels of readiness to work with students with special educational needs is increasing, while the percentage of teachers with basic or low levels of readiness is decreasing. Therefore, the presented model seems to be achieving its goals, and a comprehensive, systematic approach to teacher training is necessary for the effective functioning of an inclusive educational environment.

DISCUSSION

Education helps to systematize and prepare people with disabilities for independent living by providing them with the necessary skills. To improve the quality of life of people with “limited abilities,” it is extremely

important to implement special measures in support services that promote their integration and provide opportunities for obtaining the necessary education.mIn their work, Grindei et al.[16] investigate the use of computer games by people with intellectual disabilities as a teaching aid at the International Institute of Applied Social Sciences. In particular, the development is based on the creation of game technologies for teaching mathematical thinking based on autism.

Elavarasi et al.[17] have identified a trend over the past decade toward an increase in the number of students with special educational needs. This has necessitated the introduction of a new intellectual education platform to synchronize the efforts of teachers and parents in order to improve learning management at school and at home. Researchers in the field of education also emphasize the traditional solution of responding to participants in an interdisciplinary approach. In the context of the above data, the issue of inclusive education in higher education remains relevant. There is a lack of innovative pedagogical, methodological, technological, and even engineering approaches for professionals involved in the education of students with disabilities.[17]

Shumak et al.[18] proposed solutions to remove barriers that prevent productive collaborative learning among students with disabilities. The researchers focused on the effectiveness of free digital tools such as TeamViewer with Skype, Krut Computer Recorder, and ZoomText. These technologies allow all learning materials to be transferred directly from the teacher's computer to the student's device in real time and in an accessible format.

Thanks to ZoomText, students with visual impairments can independently control the learning process without interfering with the work of the online instructor. Such digital solutions simplify access to educational equipment for students with disabilities and improve the performance of laboratory work. Remote access to the instructor's computer from a tandem classroom allows remote lectures to be given to students with visual impairments. Such technologies can improve interaction not only with people with special needs, but also with students with disabilities, which will greatly contribute to the inclusion of people with disabilities in a competitive environment. To successfully accomplish the tasks at hand, the tools require a certain level of training, mentoring, and awareness among educators in the field of inclusive education.[19]

Arishchenko[9] focuses on improving approaches to creating an educational environment for students with disabilities. The author analyzes the experiences of such students during a summer research program and attempts to identify both the advantages and difficulties they encounter. The researcher's study emphasized that involving students with physical disabilities in some form of research activity is valuable not only in terms of experience, but also in terms of increasing students' improvisational independence and self-confidence. When it comes to equalizing opportunities for training teachers to teach such students, the most important component is a positive attitude on the part of teachers, informing other students about disability issues, and promoting equal treatment in the education system.[4]

Adequate pedagogical training for students with special needs is one of the critical factors enabling such individuals to participate fully in the education system. The teacher development model presented in this article emphasizes the prior training of teachers in inclusive approaches, which promotes the individualization of the educational path, starting with accessibility and ending with the active participation of students. The improved model of pedagogical knowledge integration focuses not only on teachers with a specific specialization, but also supports the involvement of specialists with diverse interests and qualifications, and demonstrates a positive impact on teachers' professional readiness and on improving their skills in working with students with special needs.[20]

Therefore, training competent teachers in an inclusive environment requires a comprehensive approach that combines theoretical knowledge and practical experience, psychological readiness, and analytical thinking. This should involve specialists from various fields: inclusion specialists, practical psychologists, engineers, and specialists working with people with disabilities. Thus, in the context of inclusive education, the basis for the professional growth of educators is the practical orientation of training and the introduction of modern pedagogical technologies into the higher education system.[21]

CONCLUSION

Determining the scope of pedagogical training for interacting with people with special needs involves not only adapting teaching materials to students' abilities, but also promoting strategies such as empathy, communication skills, and flexible thinking. Modern higher education teachers should not only impart knowledge but also promote the integration of such students into the learning process by actively involving them in relevant interactions and paying attention to their individual characteristics. To ensure effective teacher training, a pedagogical model focused on developing competencies for inclusive organization has been developed. The implementation of this model has had a positive impact on the development of teachers' professional pedagogical competencies, such as the development and implementation of individual educational pathways for students with disabilities. To determine the effectiveness of the model, a number of criteria were identified, including: content-theoretical, technological-practical, socio-psychological, and analytical-

resultative. Based on these criteria, the pedagogical training of specialists was assessed at the following levels: low, medium (sufficient), and high. Statistical analysis using Pearson's x^2 test confirmed the obvious effectiveness of the model. To ensure a high-quality inclusive educational environment at the higher tactical level, systematic professional development of educators is necessary regarding the specifics of supporting the education of persons with disabilities or students with other limitations. Such training should be conducted at an exemplary level, familiarizing participants with modern adaptive teaching materials, technical solutions, and psychological interaction, involving specialists in inclusivity, technical profiles, and practical psychologists.

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ANNEXES

Appendix 1

Questionnaires for determining the initial and final level of training of teachers to work with students with special needs

Please rate your level of training to work with students with special needs from 0 to 4, answering the questions about your professional level according to the assessment criteria.

Notes: 0 – the lowest score, 4 – the highest score.

C1. Theoretical and substantive training of a teacher to work with students with special needs

Assess your level of understanding of the concept of accessibility and inclusion in higher education and knowledge of the regulatory acts used to regulate the education of students with special needs in higher education institutions.

0	1	2	3	4

Assess your level of awareness of the psychological and emotional characteristics of students with special needs (autism spectrum disorders, motor disorders, vision, hearing, psycho-emotional characteristics).

0	1	2	3	4

Assess your awareness of pedagogical methods and technologies used to work with students with special needs.

0	1	2	3	4

C2. Practical and technological preparation of teachers for working with students with special needs

Assess your ability to adapt educational content to the inclusive needs of higher education students, including through the use of adaptive technologies.

0	1	2	3	4

Evaluate your use of assistive technology, such as text-to-speech software, when creating an educational environment for students with visual or hearing impairments.

0	1	2	3	4

Assess your ability to develop personalized learning pathways and individualized curricula for students with special needs.

0	1	2	3	4

C3. Psychological and social preparation of teachers for working with students with special needs

Assess your ability to communicate effectively with students with special needs, including your level of empathy.

0	1	2	3	4

Assess your ability to provide psychological support and ensure a comfortable and optimistic atmosphere when working in a team that includes students with special needs.

0	1	2	3	4