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DEVELOPMENT PRE-SERVICE SPECIAL EDUCATORS' DIGITAL COMPETENCE IN THE CONTEXT OF DIGITAL EDUCATION

Abstract. The article addresses the issue of training future special educators to use digital technologies in correctional work with children with special needs. Based on an analysis of international and national theoretical sources, the article argues that the training of special educators should meet the current requirements of society aimed at changing attitudes toward children with special needs. This training should also meet society's demand for the active introduction of digital resources into the educational environment and prepare specialists with well-developed digital competence to work in a digital educational environment.

Enhancing the digital competence of special educators (defectologists) creates new opportunities for organizing the educational environment, combining information and communication technologies with pedagogical technologies, and overcoming difficulties in the psychophysical development of students with special needs. Training in this area should ensure that future special educators develop a thorough understanding of the possibilities for using digital technologies in their professional activities, an awareness of the advantages and disadvantages of their use, and the knowledge and skills required for their application. Nevertheless, the authors note that insufficient attention is currently paid to the development of specialized information and communication competence among future special educators. The article presents the general characteristics of the concept of "digital competence". It also considers the main criteria for selecting interactive computer games for correctional and developmental classes with children with various developmental disorders. Training special educators to use digital technologies in their professional activities should combine scientific and practical preparation with the development of the personal qualities necessary for building digital competence. These qualities are becoming increasingly relevant in the context of the digitalization of education and are necessary for successfully addressing professional tasks through the use of digital technologies when working with children with special needs.

Keywords: digital competencies, special educator, children with special educational needs, education system, remedial classes, professional activity, digital technologies.

Introduction

The rapid digital transformation of the educational system has significantly altered professional requirements for educators. Strategic documents of the Republic of Kazakhstan emphasize that the training of highly qualified specialists must encompass not only subject-specific and pedagogical competencies but also the development of advanced digital skills [1].

While digital literacy is fundamental for all teachers, its significance in special and inclusive education requires particular attention. In this field, digital tools serve not only instructional functions but, more importantly, act as essential means of compensation, communication, adaptation, and support for learners with disabilities.

However, despite extensive research into the digitalization of general teacher education, the development of digital competence specifically for pre-service special educators remains under-

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researched. Most existing studies focus primarily on technical aspects, leaving the pedagogical, correctional, and inclusive dimensions of digital competence overlooked. This highlights a clear research gap: the lack of a comprehensive understanding of how special educators' digital competencies should be structured during university training and what pedagogical conditions are necessary for their effective development.

In the context of special education, digital competence implies proficiency in specialized assistive technologies. These include screen access systems for the visually impaired (e.g., NVDA or JAWS), augmentative and alternative communication (AAC) software for children with speech impairments (such as PECS-based apps, Proloquo2Go, or Elibox), as well as specialized speech therapy simulators and eye-tracking software for children with severe motor disabilities.

The professional activity of a special educator differs substantially from that of a general education teacher. A specialist must be able to:

- Select and adapt digital tools based on the individual needs of learners;
- Utilize assistive and alternative communication (AAC) tools;
- Develop adapted digital educational materials;
- Ensure the accessibility of the digital learning environment.

It is critical to recognize that a special educator's digital competence is a complex, multi-component phenomenon. It integrates technological, pedagogical, diagnostic, correctional, and ethical dimensions. To analyze this structure, this study utilizes the European Framework for the Digital Competence of Educators (DigCompEdu). This model views digital competence as a multidimensional, dynamic, and context-dependent professional characteristic. Interpreting DigCompEdu through the lens of inclusive pedagogy allows for its adaptation to the specific requirements of special education.

Consequently, the purpose of this study is to identify the key components of digital competence for pre-service special educators, assess its current level of development, and determine the methodological approaches and pedagogical conditions necessary for its effective enhancement.

The study addresses the following research questions:

1. What are the key components of digital competence for pre-service special educators?
2. What methodological approach can effectively ensure the development of digital competence in students preparing for special education careers?

By analyzing the personal-motivational, cognitive, and praxiological components of digital competence, this study contributes to the theoretical and methodological foundation for preparing future special educators to work within a digital correctional and developmental environment.

Research methods and materials

In our study, we used several regulatory documents and summarized their data and key conclusions. We conducted a thorough analytical review of the scientific literature, the national higher education standard of the Republic of Kazakhstan, the professional standard “Teacher”, and several scientific publications related to the research topic.

At the ascertaining stage of the study, diagnostics were conducted among 52 students of the Department of Special and Inclusive Education at E.A. Buketov Karaganda National Research University, majoring in *Special Pedagogy*. Despite the relatively small sample size, it was sufficient to identify trends and regularities in the development of digital competence within a homogeneous professional group. This research represents the first stage of a larger-scale experiment, which will later include formative and control stages. The purpose of this stage was to determine the initial level of digital competence formation among future special educators, based on a three-component structure comprising personal, cognitive, and praxiological components.

- Personal component – motivation, value orientations, and attitudes toward digital technologies and inclusive education;
- Cognitive component – the level of knowledge about digital resources, platforms, approaches, and tools used in inclusive pedagogy;

• Praxiological component – the presence of skills and experience in using digital tools during practice and coursework.

The methodological basis of the study relied on a combination of quantitative and qualitative research methods. The diagnostic tools included:

- A student questionnaire, developed on the basis of concepts of professional readiness and the European framework for educators' digital competence (DigCompEdu) [2];
 - Observation sheets, recording students' use of digital technologies during their academic and practical activities;
 - Reflective tasks, aimed at self-assessment of the level of digital competence.
- Each indicator was assessed using a four-point Likert scale (1 – low level, 4 – high level).

Results and discussion

A total of 52 students participated in the study, distributed as follows (Table 1).

Table 1 – Participant Distribution

Year of Study	Number of Students
1 st year	14
2nd year	12
3rd year	13
4th year	13

The study was conducted in accordance with the principles of voluntary participation, informed consent, and confidentiality. The collected data were analyzed using descriptive statistics and thematic analysis (Table 2).

Table 2 – Summary of Results

Component	High (%)	Medium (%)	Low (%)	Description
Personal	28	53	19	Motivation and value-based attitude toward ICT
Cognitive	25	56	19	Knowledge of digital tools and pedagogical digitalization
Praxiological	19	49	32	Practical application of digital technologies

During the author's practical activities as a special educator and observations of students during their pedagogical internship, a characteristic example was recorded, reflecting an insufficient development of the praxiological component of digital competence.

In one session, a student intern was tasked with conducting a correctional and developmental lesson for a child with Autism Spectrum Disorder (ASD) using an interactive tablet. The student demonstrated a sufficient level of technical proficiency, including app installation and interface navigation, indicating a developed cognitive component. However, when the child experienced sensory overload, the student was unable to promptly adapt the digital tool's parameters (screen brightness, volume level, or content complexity) to meet the learner's immediate needs.

This led to the conclusion that although pre-service special educators possess foundational digital literacy, they face significant challenges when applying digital tools in professionally oriented, real-time scenarios. Future specialists must possess the flexible skills needed to adapt digital tools to the individual educational needs of children with disabilities. This observation correlates with the survey results, in which the praxiological component was identified as the least developed.

Analysis of the empirical data indicates that the overall level of digital competence among pre-service special educators is moderate. Notably, the personal-motivational and cognitive components have higher scores than the praxiological component.

The prevalence of the personal-motivational component can be attributed to the students' positive attitudes toward digital technologies and their recognition of the importance of digitalization in education. Modern students are generally motivated to use digital tools and understand their potential value for professional activities in special and inclusive settings.

The cognitive component is characterized by a medium level of development, indicating that students possess theoretical knowledge regarding digital resources, platforms, and general principles of educational digitalization. This may be due to the inclusion of ICT-related disciplines in the curriculum, which primarily focus on developing a conceptual framework rather than practical application.

Conversely, the relatively low scores of the praxiological component point to a substantial gap between theoretical training and practical skills. This result suggests that students have limited opportunities to apply digital tools in authentic correctional and developmental environments. A lack of practice-oriented assignments, weak integration of assistive technologies into the learning process, and limited experience working with learners with special educational needs exacerbate this imbalance.

These findings align with international research suggesting that pre-service educators typically possess basic technical skills but lack the pedagogical and applied digital competencies necessary for inclusive practice. In the context of special and inclusive education, this gap is of particular significance, as digital technologies must be used purposefully and adapted to the individual needs of learners with disabilities.

Thus, the research results confirm the need to transition to a practice-oriented model for training future special educators that provides for the systematic integration of digital tools into correctional and developmental preparation. Strengthening the praxiological component of digital competence should be considered a priority in preparing future specialists for professional activity in a digital educational environment.

The obtained data indicate that the overall level of digital competence among future special educators is moderate. Students demonstrate interest and theoretical awareness in the field of digitalization; however, they lack sufficient practical skills in using digital tools to work with children with special educational needs.

These findings are consistent with the conclusions of international researchers who note that students in teacher education programs often possess technical but not pedagogical digital skills. Global experience shows that future special educators should not only teach students about the consequences of digital actions and mitigation strategies [3] but also recognize the importance of their own digital well-being.

The low level of the praxiological component confirms the need to include digital competence modules in teacher education programs, as well as to develop practice-oriented training on the use of digital technologies in correctional and developmental education.

Thus, the results of the ascertaining stage of the experiment revealed the following:

- the need to integrate digital modules into the curriculum of special pedagogy programs;
- the necessity to enhance knowledge and skills in assistive and adaptive technologies;
- the expediency of developing methodological recommendations for university instructors on the use of digital tools in teaching children with special educational needs.

Overall, the findings of the ascertaining stage demonstrated a moderate level of digital competence formation among pre-service special educators, confirming the need to implement specific pedagogical conditions and digital modules within teacher training programs.

The methodological basis for the analysis of digital technologies is the research of Gerova, Elizarova, Lyadova, Selevko, Khenner, Khutorsky and others. The studies of Ossipova, Kukushkina

and others are devoted to the teachers' digital competence development. The structure and requirements for a teacher's digital competence are presented in the works of E.K. Henner, A.P. Shestakov and others. The features of the use of computer teaching aids are discussed in the works of Andreyev, Masshbits, Robert and etc. Researchers such as Kukushkina, Nikolaeva, Filatova, Zak, Lisitsyna, Shilova, Fixila and a number of other well-known researchers studied the use of digital resources in working with children with hearing, speech and cognitive impairments [4; 5; 6].

Foreign studies emphasize the inclusive potential of digital technologies and the right of learners with disabilities to digital accessibility. At the same time, it is noted that the effectiveness of using digital tools directly depends on the level of teachers' readiness to apply them in educational practice. The potential of digital technologies to support learning should be considered in professional teaching practice - both through practical experience and at the level of strategic planning [7].

Kazakhstani researchers – Khalikova, Kismetova, Turezhanova, Sarkulova, and others — emphasize that future specialists in special education must possess a sufficient level of digital literacy to successfully carry out correctional and developmental teaching [8; 9].

As mentioned above, the issue of developing digital competencies for special educators is presented in a sufficient number of studies, but in Kazakhstan this issue has merely been studied. Therefore, it is worth noting that the effective implementation of digital in working with children with impairments is impossible without solving the problems of increasing the digital competence of special teachers, which presupposes readiness to organize training in a modern electronic environment, knowledge of electronic interaction techniques, methods and types of electronic training [10].

In international practice, considerable attention is paid to continuous professional development, advanced training, and the use of assistive technologies, which can serve as a model for the national system of special teacher education. The development of digital competence is closely linked to personal motivation, cognitive growth, and professional readiness. Contemporary researchers emphasize the need to integrate digital competence into teacher education programs through theoretical preparation, practical modules, and reflective learning aimed at the conscious and effective use of ICT in the educational process. Digital competencies can be understood as a necessary set of personal and professional qualities that, in the course of a special teacher's professional work, will help him effectively apply digital resources and technologies in working with children with disabilities [11; 12]. We must understand that the modern model is a kind of multilevel system, which in turn should be based on close cooperation between all educational institutions. It is worth noting that this issue is still relevant in the preparation of the quality of special education and in the training of highly qualified personnel working in the system of special and inclusive education. The process of professional education of pre-service special teachers is aimed at "...special skills and abilities development, the use of teaching methods and tools, the theoretical foundations, awareness of the goals of personal education, i.e. worldview and competence building, etc. [13, 14].

Scientists studying the issues of training special teachers note that this process is specific in its content and technology. The practice of training special teachers abroad takes into account the specifics of the population of children. When forming the content of training, attention is paid to the professional development and personal qualities of teaching staff, systematic vocational training, as well as retraining of special (correctional) education teachers. The works of the scholars mentioned above and other authors serve a basis for theoretical and practical knowledge in domestic pedagogy in professional training and pre-service preparation of special teachers.

The special education system is so-called a main customer for training special teachers. It also requires the use of digital technologies for educational and other purposes. Special teachers' digital competence acquisition can ensure integration of technologies in correctional learning environment.

There is reliable data on the effectiveness of computer-based technologies in the correctional educational process, including their role in students' personal development and enhancement of social skills. Thus, improving the pre-service preparation of special teachers for the use of computer-based technologies in professional performance is in demand in the practice of special education [6].

Despite numerous studies on teachers' digital competence in general, there is still a lack of comprehensive research specifically focused on pre-service special educators. Most existing studies emphasize the technical aspects of digitalization, while the pedagogical, corrective, and inclusive dimensions remain underexplored. In Kazakhstan, there is a shortage of empirical data and an absence of an established model for developing the digital competence of special educators within higher education. This highlights the necessity of developing conceptual, structural, and methodological foundations for fostering digital competence among future special educators in the context of the digital transformation of education. We believe that by integrating different types of educational tools and a wide range of information sources, a person cannot be uncultured in the information world.

It is safe to say that the digitalization of education is taking rapid steps, which has a qualitative impact on the teaching process in higher education institutions. There may be a misconception that the acquisition of digital competencies by special educators is the management of learning activities in a digital educational environment, but it is also important to develop personal qualities, i.e. constant self-improvement of oneself and one's personality as a whole. After analyzing domestic and foreign literature, the following conclusions can be drawn: a special teacher working in the conditions of modern educational technologies can effectively perform their work by adopting and implementing certain digital competencies. Here are some key digital competencies that a pre-service special educator should have:

1. Basic computer skills:
 - Operating systems knowledge (Windows, MacOS, Linux).
 - Office applications effective-user (Microsoft Office, Google Workspace, etc.).
 - Analytical skills for information search.
2. Specialized programs and applications awareness and competence:
 - The ability to use software applications in work and adapt them in the educational process, alternative, communicative ways of communication.
3. Auxiliary communication technologies:
Proficiency in Advanced Communication Systems (ATC), IPECS (Image Exchange Communication System), text-to-speech synthesizers and other auxiliary devices.
4. Interactive whiteboards and tablets user:
 - Ability to work with interactive whiteboards (for example, SMART Board) and tablets to create interactive lessons and educational materials.
5. Online learning platforms expertise:
 - Experience in using distance learning platforms such as Google Classroom, Microsoft Teams, Moodle, etc.
 - Knowledge of methods for adapting educational materials for online format.
6. Autonomous training:
 - Ability to create individualized educational plans using technology to accommodate the needs of children with special educational needs.
7. Online resources and educational applications expertise:
 - Awareness in selecting and using educational resources and applications aimed at developing educational and social-communicative skills.
8. Assessing and monitoring progress:
 - Knowledge of tools and technologies for assessing learning progress, including electronic journals, online testing and learning analytics.

9. Virtual reality (VR) and extended reality (AR) expertise:

- Awareness how to use virtual and augmented reality technologies for educational purposes [15].

10. Collaboration and communication:

- Awareness how to use tools for virtual communication and collaboration, including video conferencing, email, cloud services, etc.

A special teacher should be prepared for modern challenges and use digital technologies as a means of support and further assistance in the process of socialization of children with disabilities. It is also imperative to improve your level of knowledge and mastery of digital competencies in accordance with the development of digital education.

Future special education teachers should keep up to date with the latest special education news. In the process of studying at the university, they must constantly motivate themselves to continuous growth and self-improvement. It is worth noting that we have the necessary digital competencies, which necessarily include a block of theoretical knowledge and practical knowledge, but the most important aspect is the application of their educational realities.

The ability to analyze, search, evaluate, and create are all necessary tools necessary for successful professional growth in the information society. That is, special educators should have the necessary skills related to a specific subject area, but also be aware of the latest changes in modern society [10, p. 66].

It is emphasized that special educators should have knowledge of the psychological and pedagogical characteristics of children with various disabilities, as well as possess technical skills in working with specialized software.

It is important to choose the right approach based on the types of disabilities and learning objectives when working with children with disabilities using digital technologies. With proper use of digital resources, this will help to individualize learning and optimize the learning process for children with disabilities. Let's look at how we can use digital technologies in various components of correctional and developmental education. For example:

- Standard Microsoft PowerPoint can help you create theoretical materials for classes through interactive presentations.
- Educational applications can help you consolidate certain skills during classes or as independent tasks.

You can use digital tools as an assistant for remedial classes as a separate additional module aimed at strengthening cognitive and behavioral skills.

Advantages of using digital technologies in working with children with disabilities:

- the use of this method increases the motivation of students and increases their involvement in the learning process;
- understanding, accessibility and feedback through digital resources;
- regulation of the complexity and volume of training tasks;
- reproduction of real-life situations that contribute to cognitive development and social adaptation.

Additional benefits:

- digital content looks dynamic and attractive, as well as increases the attention and motivation of children;
- visual ways of presenting information are more quickly absorbed by children with disabilities;
- Maintain concentration and memorization through features such as motion, animation and sound;
- ensuring your own pace of task completion;
- gaining self-confidence, achieving success;
- gradual mastery of the necessary skills, as well as the ability to repeat tasks in case of an

error without criticism.

In the course of theoretical training, special educators must go through each stage sequentially. Scientists usually distinguish a three-level model of digital technology implementation.:

1) Preparatory (pre-digital) stage – all children participate here. At this stage, the teacher introduces the content of teaching using traditional methods, thereby laying the foundation for further study of the practical application of digital tools.

2) The digital interaction stage – here children are already working with digital devices such as computers or tablets. The total duration of these sessions should be from 10 to 15 minutes.

3) Post-digital stage (consolidation) – after working with digital technologies, children return to working with traditional technologies.

The use and implementation of digital tools with children with disabilities should be gradual and phased. At the first stage, it is important to simply explain what digital resources are and show light interactive games in the classroom. After that, as children will feel more confident, it is possible to introduce a specific fragment into the remedial lesson using digital tools.

As we have already noted, it is important to combine traditional teaching methods in the learning process and only then implement digital technologies. As soon as a special teacher understands that children already have sufficient level and experience, digital educational content can be used and even recommended and included in homework assignments for parents to support further development.

Also an important area in training students-defectologists with special digital competence is training in creating personal correctional and developmental materials. Moreover, by creating new content, pre-service specialists are responsible for ensuring that these materials meet the requirements of correctional and developmental schemes. A personality-oriented approach in special education will help to adapt learning according to the individual needs of each child with disabilities.

Practical Recommendations and Implications

Based on the conducted research and the identified deficit in practical skills among future educators (with the praxiological component showing a 32% low level), we propose a comprehensive model for enhancing professional training.

1. Digital Competence Development Model A systemic approach is recommended, integrating three interconnected blocks: personal-motivational (attitudes), cognitive (theory), and praxiological (practice).

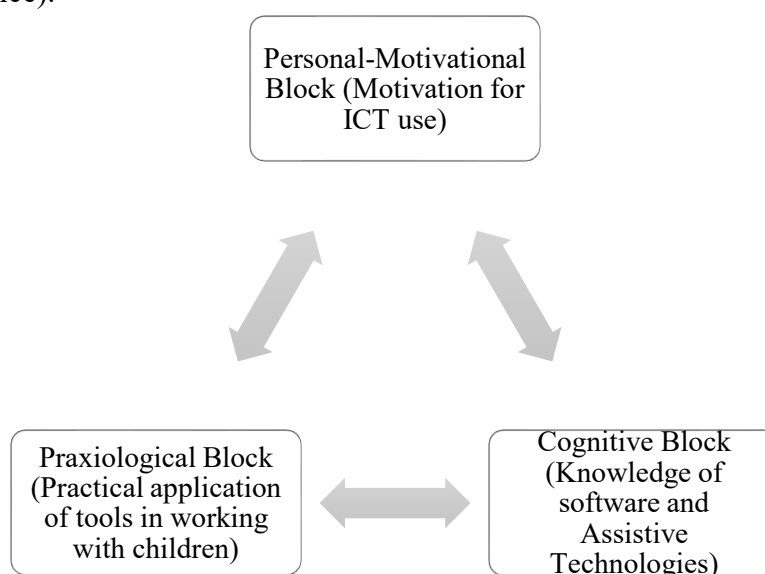


Figure 1 - Model of pre-service special educators' digital competence development

Figure 1 presents a structural model of pre-service special educators' digital competence development, illustrating the interrelation between cognitive, praxeological, and personal-motivational components.

2. Proposed Curriculum Structure: «Assistive Technologies in Inclusion» Module To bridge the “gap” between theory and practice identified in our clinical observation, we propose the implementation of a specialized training module consisting of the following units:

- Unit 1: Assistive Technology Toolkit. Hands-on mastery of screen access software (NVDA, JAWS), augmentative and alternative communication (AAC) systems (apps based on PECS, Proloquo2Go), and Eye-tracking technologies.

- Unit 2: Designing Accessible Content. Developing educational materials compliant with Web Content Accessibility Guidelines (WCAG) standards, including the adaptation of lessons for specific nosologies (e.g., visual, hearing, or cognitive impairments).

- Unit 3: Platforms for Individualization. Leveraging Learning Management Systems (LMS), such as Moodle and Google Classroom, to design personalized educational trajectories for learners with special needs.

- Unit 4: Gamification in Correction. Utilizing interactive games and immersive environments to foster fundamental academic and social skills.

3. Institutional and Organizational Recommendations

- Establishment of Digital Laboratories: Creating dedicated university-based hubs where students can test specialized hardware (touchscreens, educational robotics, sensory equipment) before commencing their clinical pedagogical practice.

- Digital Mentorship: Engaging experienced special educators to conduct masterclasses and share authentic expertise in real-time technology adaptation.

- Development of Methodological Guidelines: Producing specialized manuals on the application of ICT in correctional work, specifically tailored to the unique profiles of children with diverse developmental disorders.

4. Ethical Considerations and Accessibility It is critically important to recognize that digital accessibility is an ethical mandate, not merely a technical option. Educators bear the professional responsibility to select tools that remove rather than create barriers. As demonstrated by our clinical case study, it is insufficient to simply “activate a tablet”; a specialist must possess the skills to adapt parameters (e.g., sound, brightness, contrast) to the child's sensory requirements in real-time to ensure equitable access to quality education.

Study Limitations

The present study was conducted on a limited sample of 52 pre-service special educators, which may constrain the generalizability of the findings. Nonetheless, this sample size allowed for an in-depth, qualitative analysis of the structure and components of digital competence specifically within the context of special education. Future research should aim to expand the sample size and include representatives from diverse educational institutions to validate and refine the identified trends across broader populations.

Ethical Considerations

The research was conducted in strict accordance with the ethical principles governing pedagogical studies. Participation was entirely voluntary, and all respondents were fully informed of the study's objectives. Anonymity and data confidentiality were strictly maintained, with the collected information utilized exclusively for academic purposes. The use of digital tools throughout the study complied with all requirements for personal data protection and privacy.

Beyond data confidentiality, a fundamental ethical aspect of this research is the principle of digital accessibility. Within the framework of developing pre-service educators' competencies, we emphasize the specialist's ethical responsibility to select digital tools that do not create additional barriers for children with disabilities. The primary goal is to ensure equitable access to information and the educational process, fulfilling the educator's professional duty towards inclusive equity.

Conclusion

Special teachers' digital competence acquisition and the teachers' use of technologies in the classroom with impaired children will help optimize educational process. It also ensures diversity and accessibility of learning material.

We set out to answer the following research question: What are the key components of digital competence for future special educators?

The results of the survey and literature analysis made it possible to identify three interrelated components of digital competence for pre-service special educators:

Cognitive component – Includes knowledge of digital tools, understanding of their functioning, and awareness of their pedagogical potential.

Praxeological component – reflects the ability to apply digital technologies in the correctional and pedagogical process, adapting them to the individual needs of learners with special educational needs.

Personal-motivational component – associated with readiness for innovation, openness to digital solutions, and awareness of one's role in the digital transformation of education.

Based on the results, it can be concluded that teachers tend to possess stronger technical skills, but their pedagogical and reflective aspects of digital competence are often underdeveloped.

Thus, the key components of digital competence for future special educators comprise a complex of knowledge, skills, and personal qualities that enable the effective use of digital tools in special education.

What methodological approach should underpin the development of digital competence among future special educators?

The analysis of the ascertaining experiment revealed that the development of digital competence requires a systemic approach, including:

- Integration of digital technologies across all professional training disciplines, not limited to isolated ICT courses;
- A practice-oriented focus, based on real pedagogical tasks using digital tools;
- A modular and phased structure - progressing from basic technical skills to the use of digital technologies in correctional practice;
- A reflective-evaluative component that helps students understand their digital growth and the pedagogical value of technology.

In the context of the global digital transformation of education, competent and creative teachers with the necessary digital competence are needed to promote students' success and engagement. By providing clear classroom instructions, creating a positive atmosphere, and using modern ICT, educators can improve the learning outcomes of children with disabilities.

Children with disabilities need favorable conditions for socialization because they may experience difficulties in learning, behavior, or social integration within families or institutions. Such children require specialized support. Children with developmental disabilities may experience emotional instability accompanied by increased physical excitability or hyperactivity. Addressing these challenges successfully requires the introduction of new approaches and strategies.

Modern special educators should develop engaging teaching methods to make lessons more interesting for children with disabilities. It is important to enhance the digital competence of future special educators so that they can confidently apply digital technologies in their professional work.

In summary, special educators' use of various ICT tools in their professional work can help overcome difficulties and unlock the potential of children with disabilities, thereby supporting the further development of their skills. Special educators and parents of children with disabilities should work as a team; only under this condition is it possible to determine which digital technologies are essential for a child's learning process and to achieve further progress. Above all, it is important to prepare future special educators to work with digital tools and develop the necessary digital competence.

In conclusion, this study demonstrates that the development of digital competence in pre-service special educators is a multidimensional process encompassing cognitive, praxiological, and personal-motivational components. The findings highlight the critical need to integrate practice-oriented digital modules into teacher training programs to bridge the gap between theoretical knowledge and practical application.

The article contributes to the field by providing a structured analysis of digital competence specifically tailored for special educators - an area that remains under-researched in Kazakhstan. These results can serve as a foundation for curriculum development, faculty mentorship programs, and policy support in special and inclusive education.

Future research should aim to expand the sample size across multiple educational institutions and explore the long-term effects of digital competence development. Such studies will ensure a sustainable and effective integration of digital tools into special education practice, ultimately enhancing the quality of support for learners with disabilities.

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Ақпараттық-білім беру ортасы жағдайында болашақ арнайы педагогтардың цифрлық құзыреттілігін дамыту

Андатпа. Мақала болашақ арнайы педагогтерді ерекше қажеттілігі бар балалармен жүргізілетін түзету жұмыстарында цифрлық технологияларды қолдануға оқыту мәселесін қарастырады. Шетелдік және отандық теориялық дереккөздерді талдау негізінде мақала арнайы педагогтерді даярлау қоғамның қазіргі талаптарына сәйкес болуы және ерекше қажеттілігі бар балаларға деген көзқарасты өзгертуге бағытталуы қажеттігін негіздейді. Сонымен қатар, бұл даярлық цифрлық ресурстарды білім беру ортасына белсенді енгізуге деген қоғам сұранысына сәйкес келуі және цифрлық білім беру ортасында жұмыс істеу үшін дамыған цифрлық құзыреттері бар мамандарды даярлауы тиіс.

Арнайы педагогтердің (дефектологтердің) цифрлық құзыреттерін арттыру білім беру ортасын ұйымдастырудың, ақпараттық-коммуникациялық және педагогикалық технологияларды біріктірудің, ерекше қажеттілігі бар оқушылардың психофизикалық дамуындағы қиындықтарды жеңудің жаңа мүмкіндіктерін ашады. Осы бағыттағы даярлық болашақ арнайы педагогтердің цифрлық технологияларды кәсіби қызметінде қолдану мүмкіндіктерін терең түсінуін, сондай-ақ оларды пайдаланудың артықшылықтары мен кемшіліктерін, оларды қолдануға қажетті білімдері мен дағдыларын түсінуін қамтамасыз етуі тиіс. Дегенмен, мақала авторлары қазіргі уақытта болашақ арнайы педагогтердің арнайы ақпараттық-коммуникациялық құзыреттілігін қалыптастыру мәселесіне жеткіліксіз көңіл бөлінетінін атап көрсетеді. Мақалада «цифрлық құзыреттер» ұғымының жалпы сипаттамалары берілген. Сондай-ақ әртүрлі даму бұзылыстары бар балалармен түзету-дамыту сабақтарын өткізуге арналған интерактивті компьютерлік ойындарды таңдаудың негізгі критерийлері қарастырылады. Арнайы педагогтерді кәсіби қызметінде цифрлық технологияларды пайдалануға даярлау цифрлық құзыреттерді қалыптастыру үшін қажетті ғылыми-практикалық даярлық пен тұлғалық қасиеттерді дамытуды біріктіруі тиіс. Бұл қасиеттер білім беруді цифрландыру жағдайында барған сайын өзекті болып келеді және ерекше қажеттілігі бар балалармен жұмыс істеу кезінде цифрлық технологияларды қолдана отырып, кәсіби міндеттерді табысты шешу үшін қажет.

Кілт сөздер: цифрлық құзыреттер, арнайы педагог, ерекше қажеттілігі бар балалар, білім беру жүйесі, түзету сабағы, кәсіби қызмет, цифрлық технологиялар.

Развитие цифровой компетентности будущих специальных педагогов в условиях информационно-образовательной среды

Аннотация. В статье рассматривается проблема подготовки будущих специальных педагогов к применению цифровых технологий в коррекционной работе с детьми с ограниченными возможностями (ОВ). На основе анализа зарубежных и отечественных теоретических источников, авторы представляют аргументацию в пользу того, что подготовка специальных педагогов должна соответствовать современным требованиям, предполагающим гуманизацию отношения к детям с ОВ. Такая подготовка должна отвечать общественному запросу на активное внедрение цифровых

ресурсов в образовательную среду и обеспечивать формирование у будущих специалистов развитых цифровых компетенций для профессиональной деятельности в современной образовательной среде.

Развитие цифровой компетентности специальных педагогов (дефектологов) открывает новые возможности для организации образовательной среды, интеграции информационно-коммуникационных и педагогических технологий для коррекции психофизического развития обучающихся с ОВ. Профессиональная подготовка к применению цифровых технологий должна обеспечивать формирование у будущих специальных педагогов глубокого понимания возможностей применения цифровых технологий в своей профессиональной деятельности, понимание преимуществ и ограничений цифровых технологий, а также знаний и умений, необходимых для их применения. Тем не менее авторы статьи отмечают, что в настоящее время недостаточно внимания уделяется формированию профессиональной цифровой компетентности у будущих специальных педагогов. В статье представлена общая характеристика понятия «цифровая компетентность». Кроме того, рассмотрены основные критерии выбора интерактивных компьютерных игр, используемых при проведении коррекционно-развивающих занятий с детьми с различными нарушениями развития. Подготовка специальных педагогов к использованию цифровых технологий в профессиональной деятельности должна обеспечивать единство научно-практической подготовки и развития личностных качеств, необходимых для эффективного применения цифровых технологий. Развитие цифровой компетентности приобретает особую актуальность в условиях цифровизации образования для успешного решения профессиональных задач и эффективного применения цифровых технологий в работе с детьми с ограниченными возможностями.

Ключевые слова: цифровые компетенции, специальный педагог, дети с ограниченными возможностями, система образования, коррекционное занятие, профессиональная деятельность, цифровые технологии.

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