Методический конструктор «ПРО-инклюзия» на основе нейросетевых технологий как средство формирования инклюзивной компетентности педагогов

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АННОТАЦИЯ

Введение. Актуальность исследования обусловлена интеграцией технологий искусственного интеллекта в систему инклюзивного образования, приобретающей характер стратегического вектора развития в связи со способностью данных технологий персонализировать обучение и устранять физические, социальные и когнитивные барьеры для обучающихся с особыми образовательными потребностями, что отражает основные позиции, сформировавшиеся на площадках ЮНЕСКО, в документах Европейского Союза и в глобальном академическом дискурсе за последние 2–3 года.

Цель статьи – представить научно обоснованную разработку методического конструктора «ПРО-инклюзия» и стратегию его функционирования, объединяющего потенциал нейросетей и профессиональную компетентность педагога для оптимизации обучения детей с ограниченными возможностями здоровья (далее – ОВЗ).

Материалы и методы. Теоретическую базу составили исследования в области цифровизации образования (И.Ю. Алексашина, С.В. Гайсина), формирования инклюзивной компетентности (И.Л. Федотенко, Ю.В. Шумиловская) и применения искусственного интеллекта в педагогике (О.Д. Бочаров, Д.Л. Еськин). Применялись теоретический анализ, сравнительный анализ шести российских и зарубежных нейросетевых платформ (GigaChat, YandexGPT, Kandinsky 3.1, «Шедеврум», DeepSeek-V3, Qwen3-235B-A22B), критериальное оценивание и моделирование.

Результаты исследования. Разработана стратегическая модель конструктора, основанная на двухкомпонентном вводе данных: статичные сведения о психофизических особенностях ребенка и вариативные запросы педагога на адаптацию учебных материалов. Обоснована оптимальная технологическая конфигурация: базовую обработку текста и генерацию визуального контента обеспечивают российские модели GigaChat и Kandinsky 3.1; для задач, требующих сложного логического анализа, перспективно привлечение моделей DeepSeek-V3 и Qwen3-235B-A22B.

Установлено, что эффективность применения сгенерированных материалов определяется уровнем сформированности инклюзивной компетентности педагога, его способностью к критической интерпретации и творческой реализации полученных рекомендаций. Предложенная конфигурация обеспечивает адаптацию образовательного контента для разных нозологических групп.

Заключение. Методический конструктор «ПРО-инклюзия» выступает эффективным цифровым инструментом, оптимизирующим подготовку педагога к работе в инклюзивной среде при сохранении его ведущей роли в образовательном процессе. Разрабатываемая модель может быть масштабирована на различные нозологические группы и учебные предметы.

КЛЮЧЕВЫЕ СЛОВА

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"PRO-Inclusion" Methodological Toolkit, Based on Neural Network Technologies, as a Means of Developing Teachers' Inclusive Competence

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ABSTRACT

Introduction. The relevance of this study stems from the integration of artificial intelligence technologies into the inclusive education system, which is becoming a strategic vector for development due to these technologies' ability to personalise learning and remove physical, social and cognitive barriers for learners with special educational needs, reflecting the key positions outlined within UNESCO forums, in European Union documents and in global academic discourse over the past 2–3 years.

The aim of this article is to present the scientifically grounded "PRO-Inclusion" methodological toolkit and its operational strategy, which combines the potential of neural networks with the professional competence of a teacher towards optimising the education of children with disabilities.

Materials and methods. The theoretical framework is based on research into the digitalisation of education (I.Yu. Aleksashina, S.V. Gaysina), development of inclusive competence (I.L. Fedotenko, Yu.V. Shumilovskaya), and the application of artificial intelligence in pedagogy (O.D. Bocharov, D.L. Eskin). The author employed theoretical analysis, a comparative analysis of six Russian and foreign neural network platforms (GigaChat, YandexGPT, Kandinsky 3.1, Shedevrum, DeepSeek-V3, Qwen3-235B-A22B), as well as criterion-based evaluation and modelling.

Results. A strategic model of the design kit has been developed, based on two-component data input: static information about the child's psychophysical characteristics and the pedagogue's variable requests for the adaptation of teaching materials. An optimal technological configuration has been established and verified: basic text processing and visual content generation are provided by Russian models GigaChat and Kandinsky 3.1; tasks requiring complex logical analysis utilise the promising models DeepSeek-V3 and Qwen3-235B-A22B.

It has been established that the effectiveness of using the generated materials is determined by the level of development of the teacher's inclusive competence, their ability to critically interpret and creatively implement the recommendations received. The proposed configuration ensures the adaptation of educational content for different nosological groups.

Conclusion. The "PRO-Inclusion" methodological toolkit serves as an effective digital tool that optimises the teacher's preparation for working in an inclusive environment whilst maintaining their leading role in the educational process. The model under development can be scaled to various nosological groups and academic subjects.

KEYWORDS

neural networks, artificial intelligence, digital assistant, inclusive education, teacher's inclusive competence, learners with disabilities, adaptation of teaching materials, digital transformation of education

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INTRODUCTION

The analysis of international initiatives in the sphere of inclusive education suggests that the integration of artificial intelligence (AI) technologies is shifting from the realm of experimental developments into the domain of topical educational policy [1]. As demonstrated by documents and programmes from UNESCO, the Council of Europe [2] and the International Association of Universities, the need for this integration is driven not so much by technological progress as by the desire to realise every person's fundamental right to quality education [3].

In the international context, AI is viewed as a tool for overcoming systemic barriers, capable of adapting teaching materials to the individual needs of learners, automating the creation of an accessible environment, and providing educators with tools for working with diverse learner streams [4]. However, the key conclusion is that leading international organisations insist on a human-centred approach [5]. This means that the effectiveness of AI in inclusive education depends directly not on the complexity of algorithms, but on adherence to ethical standards and teachers' preparedness to work in new conditions. Thus, the integration of AI is not a replacement for human involvement, but rather its enhancement, enabling the education system to become truly equitable and accessible to all.

The current stage of development in Russian education is also characterised by the active integration of digital technologies, a trend reflected in key government documents of the Russian Federation. In particular, the National Strategy for the Development of Artificial Intelligence up to 2030 prioritises the creation of AI-based software solutions for the personalisation of the educational process [6]. This task takes on particular significance in the context of inclusive education, which requires tailoring teaching methods to the unique characteristics of each disabled learner. The potential for adapting content, pace and methods of delivery offered by AI technologies makes it possible to take a fresh look at the issue of accessibility and quality of education for children with special educational needs [7; 8].

In the context of inclusive education, which must take into account the complex and multidimensional characteristics of learners with disabilities, the digital transformation of education opens up unprecedented opportunities for implementing a personalised approach to learning and adapting its content and pace to the cognitive characteristics of each learner [7].

In academic discourse, the issue of integrating AI into education is a subject of lively debate. As rightly noted by Kathanova et al., the AI's potential to replace certain human functions has divided the expert community into three groups: optimists, who view technologies as a means of optimising teaching practice; pessimists, who warn of the risks of dehumanising the educational process and formalising interpersonal interaction; and realists, who adopt a balanced position [8].

There is an active debate within the academic community regarding the role and place of AI in education. Some authors, such as Kathanova et al., point to a polarisation of views: ranging from the complete acceptance of technologies as a panacea to concerns about the dehumanisation of pedagogical interaction [8]. A more balanced position is taken by the researchers Holmes, Griffiths, and Lukin, who argue that a genuine breakthrough will occur when AI takes on routine, algorithmisable tasks, freeing up the teacher's time for creative, empathetic and non-stereotypical interaction with their pupils [9; 10]. This approach allows AI to be viewed not as a threat but as a powerful tool for enhancing pedagogical potential.

Minina, analysing the social outcomes of the digitalisation of higher education, points out that "the introduction of web-based tools creates new demands on teachers. They must learn to work with Web 2.0 tools and acquire digital competencies. However, as shown by the experience of applying digital tools and technologies, by no means are all students and teachers ready for such changes" [11, p. 89].

An important aspect of AI implementation is the readiness of the teachers themselves to work with new tools. The research conducted by Yakovleva et al. shows that a significant number of teachers, particularly those belonging to the older generation, experience difficulties in acquiring digital competencies, which can create barriers to the effective use of modern technologies [12]. In this regard, the development of intuitively comprehensible digital assistants that do not require in-depth technical knowledge is becoming not merely desirable but a necessary measure to support teachers in inclusive schools [13; 14].

Arnautov emphasises in his comparative analysis of approaches of Russian and foreign scholars, as concerns the understanding of information literacy, that modern digital literacy significantly surpasses the traditional understanding of ICT competence in terms of its structural complexity and functional scope [14]. Aleksashina and Gaysina identify a group of promising competencies related to advanced digital technologies, including readiness to apply and improve virtual and augmented reality technologies, as well as readiness to master cross-cutting digital technologies, such as AI and distributed ledger systems [13].

In his research, Fedotenko emphasises the need to develop the psychological and pedagogical readiness of future teachers for professional practice in an inclusive environment [15]. The author emphasises that effective inclusive practice requires teachers not only to be professionally competent in nosologies and teaching technologies, but also to have a developed reflective stance, as well as the ability to interact empathetically and respond flexibly to changing conditions in the educational environment.

Shumilovskaya, in her study of future teachers' fitness for work in an inclusive education setting, highlights cognitive and activity-based components as the most significant factors within the structure of inclusive competence [16]. Domur-Ool, expanding this area of research, emphasises that inclusive competence represents the ability to engage in professional activities effectively in an inclusive learning environment, which implies a change in the focus of the activity and an expansion of the student body [17].

International researchers are actively exploring the potential of AI in inclusive education. In particular, Zhang and Chen demonstrate in their study of the application of in-depth learning for the personalisation of educational content that neural network algorithms are capable of significantly improving the effectiveness of adaptive learning by taking into account a multitude of factors, including the learner's cognitive characteristics, their pace of learning, and emotional state [18]. Holmqvist et al. conclude in their paper analysing the use of AI in special education that intelligent systems open up new opportunities for creating an accessible educational environment for children with various developmental disabilities [19].

The author's thorough analysis of scholarly literature reveals a contradiction between neural network technologies' potential to optimise inclusive education and the lack of sufficiently developed, scientifically grounded strategies for their integration into pedagogical practice. This contradiction has conditioned the formulation of the research objective: to develop and provide a scientific rationale for the operational strategy of the "PRO-Inclusion" methodological toolkit, which integrates AI technologies and the teacher's professional inclusive competence to optimise the educational process for learners with disabilities.

Achieving this objective involves addressing the following tasks:

1) based on theoretical analysis, to develop a strategic model for the operation of a neural network within the structure of the methodological design kit;

2) to carry out a comparative analysis of the functional capabilities of Russian neural network developments and to justify the appropriateness of their use in the "PRO-Inclusion" design kit.

MATERIALS AND METHODS

The theoretical and methodological basis of the study was formed by fundamental works in the field of the digital transformation of education and the development of digital competence among teachers. In particular, the study is based on: an analysis of the conceptual framework of digitalisation and changes in teachers' professional functions in a digital environment, as proposed by Aleksashina and Gaisina [13]; a comparative analysis of international approaches to understanding information competence, as presented in the work by Arnautov [14]; and the practical aspects of developing teachers' digital skills within the system of continuing education, as developed in the research by Gromov [20].

The author analysed the issues of applying AI in education, as explored in the research by Bocharov [21], which substantiates the organisational and methodological conditions for implementing AI in higher education, and the works by Dudukin and Samokhin [8], which describe

the didactic potential of neural networks, as well as Eskin's developments, where the latter identified the methodological risks of using AI in teaching [7].

In analysing the characteristics of the development of educators' inclusive competence, the model of future teachers' readiness to work in an inclusive environment, as outlined in the works by Fedotenko [15], was examined. The author also explored the organisational and pedagogical conditions for such training, as presented in the research by Shumilovskaya [16] and Domur-Ool [17], who addressed the regional specifics of the inclusive competence development among future computer science teachers.

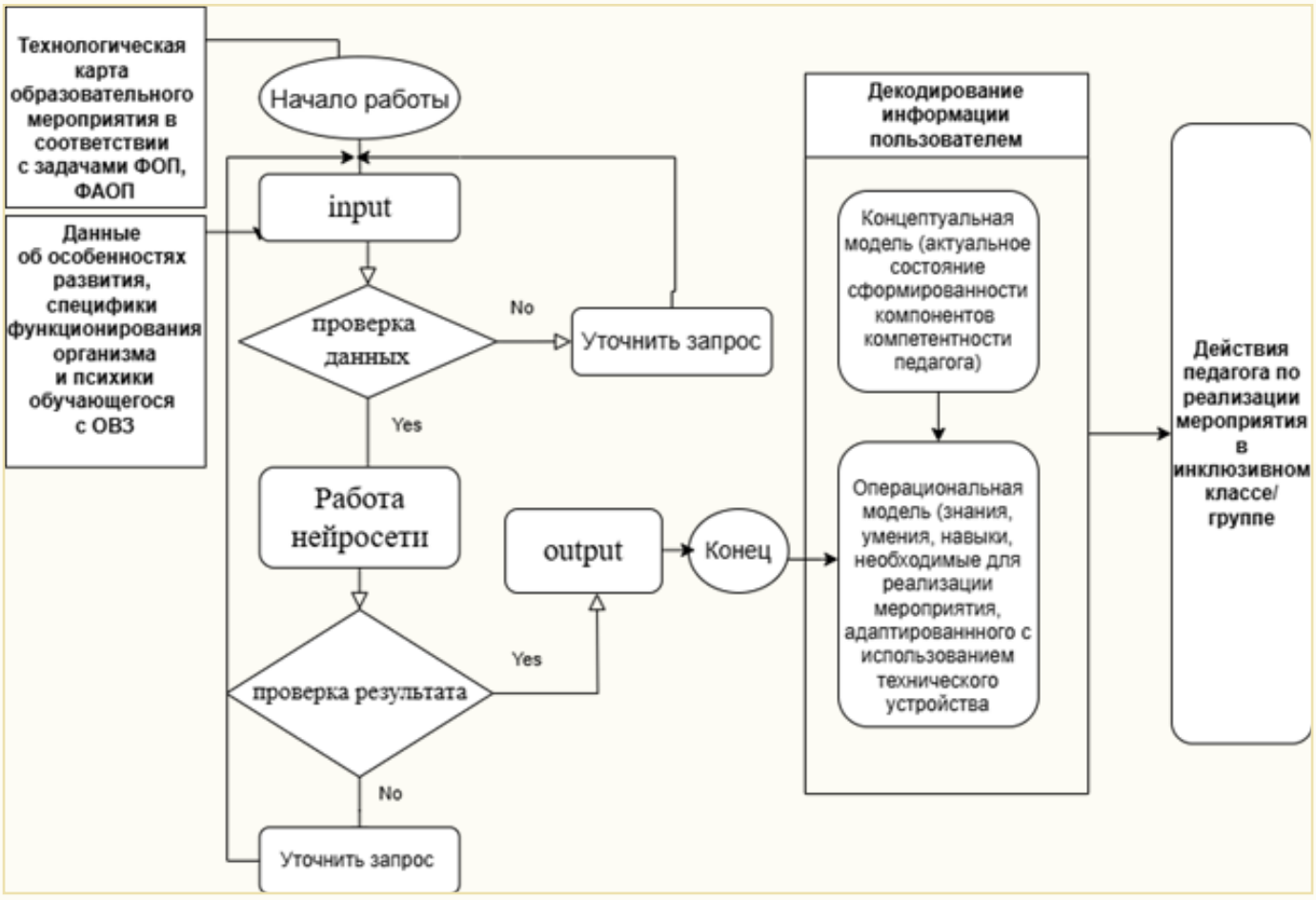
The study employed a range of methods:

- theoretical analysis of the scientific literature on the research problem;
- comparative analysis of the functional characteristics of Russian neural networks (GigaChat, YandexGPT, Kandinsky 3.1, and Shedevrum);
- criterion-based assessment of the potential of neural networks for addressing the challenges of inclusive education;
- modelling the algorithms underlying the methodological design kit.

RESULTS

Strategic model of the operation of the "PRO-Inclusion" methodological design kit

The "PRO-Inclusion" methodological design kit proposed by the author represents an attempt to create a support tool for inclusive education teachers. Its architecture is based on the "teacher-operator" principle, where the neural network serves as the computational and generative core, and the teacher acts as an interpreter and end implementer. The operation of the design kit can be represented as a cyclical process consisting of several key stages (Figure 1).



Translate:

Flowchart of educational activity in accordance with the objectives of the federal educational programme and the federal adapted educational programme

Data on developmental characteristics and the specific functioning of the body and mind of a learner with disabilities

Start of work

input

Data verification - No - Specify the query

Neural network operation - output - end

Check the result - Yes - No

Specify the query

Decoding of information by the user

Conceptual model (current state of maturity of the teacher's competence components)

Operational model (knowledge, abilities and skills required to implement the activity adapted with the use of a technical device)

The teacher's actions in implementing the activity in an inclusive class/group

Figure 1 Strategic model of the operation of the "PRO-Inclusion" methodological design kit (developed by the authors)

At the first stage – the initiation stage – a query is formed. The teacher enters two types of data into the system. The first type represents conditionally static parameters characterising a learner with disabilities. This includes data provided by the psychological/pedagogical/medical commission, as well as psychological and pedagogical profiles, information on health status, and characteristics of the learner's cognitive and emotional/volitional spheres. The second type comprises dynamic parameters of a specific educational event, such as the lesson plan, its objectives, planned outcomes, and content.

During the processing stage, built-in neural network modules analyse the generated query. As shown in the comparative analysis (Table 1), the basic functionality of text processing and visual content generation is optimally implemented by the Russian models GigaChat and Kandinsky 3.1. To address tasks requiring in-depth logical analysis and the adaptation of complex educational material to individual cognitive characteristics, additional use of the DeepSeek-V3 and Qwen3-235B-A22B models is promising. At the final stage – presentation of results – the system provides the pedagogue with a complete set of adapted teaching materials, along with the accompanying methodological recommendations.

The key feature of the model is the stage of pedagogical interpretation and realisation. The generated materials are not a dogma. The teacher, drawing on their professional experience, knowledge of the context and the specific situation in the classroom, makes a final decision on how and to what extent to use the proposed resources. It is precisely their "conceptual model" – a combination of knowledge, skills, values, and inclusive competence – that acts as the filter which transforms the raw digital product into meaningful pedagogical action. Feedback from this action can serve as a basis for adjusting both the input data and the neural network's algorithms, making the system self-learning.

Thus, the "PRO-Inclusion" methodological toolkit functions as a digital assistant, helping to reduce the time and effort required to prepare for lessons. However, the key role in the educational process remains with the teacher: it is the teacher who, relying on critical thinking and the ability for pedagogical improvisation, makes the final decisions in non-standard situations and bears responsibility for the outcome [9].

To identify the optimal technological solution for the operation of the methodological design kit, a comparative analysis of some leading Russian neural networks was conducted. The criteria-based analysis included an assessment of functional capabilities, format support availability, and suitability for working with various categories of disabled learners. The results of the analysis are presented in Table 1.

Table 1 Comparative analysis of the functional capabilities of neural networks available in Russia for use in the "PRO-Inclusion" methodological design kit

Comparison criterion	GigaChat (Sber PJSC)	YandexGPT (Yandex LLC)	Kandinsky 3.1 (Sber PJSC)	DeepSeek-V3 (DeepSeek-AI)	Qwen3-235B-A22B (Alibaba)	ERNIE-4.5 (Baidu)
Key features	Text and table generation, data analysis, text-to-speech (TTS), context support up to 32K tokens	Text generation and analysis, integration with the "Alisa" voice assistant, RAG technologies	Image creation and editing based on text, short video generation (up to 6 seconds), 3D models	Cutting-edge MoE architecture (671B parameters), excellent reasoning capabilities in mathematics and coding	Dual-mode architecture (reasoning/dialogue), support for 100+ languages, creative writing, integration with external tools	Efficient MoE architecture (300B/47B), multimodal training, and outstanding performance in reasoning and coding
Types of processed content	Text, tables, images, audio	Text, tables	Images, video, 3D models	Text, code	Text, code, multilingual content	Text, images
Availability in Russia	Fully developed in Russia	Fully developed in Russia	Fully developed in Russia	Fully available, with no restrictions	Fully available, with no restrictions	Available via API
Suitable for teaching people with disabilities						
Hearing impairments	Subtitle generation, speech synthesis	Creation of structured abstracts, voice output via "Alisa"	—	Text description generation, summarisation	Multilingual support, translation	Textual content generation
Visual impairments	Image description, text-to-speech conversion	Preparation of structured texts for screen readers	Creation of high-contrast images, diagrams and tactile graphics	Generation of detailed text descriptions	Generation of adapted texts	—
Cognitive and mental impairments (mental retardation, autism spectrum disorders, intellectual disability)	Simplification of complex textual materials	Logical structuring of information	Visualisation of complex concepts, creation of infographics	Step-by-step explanations, adaptation of complex material to the learner's comprehension level	Dual-mode architecture allows switching between complex and simplified explanations	Efficient information processing
Advantages	Multitasking, support for various formats, handling long contexts, data security (storage in the Russian Federation)	High accuracy in text processing, integration with the Yandex ecosystem	Leadership in image generation among Russian counterparts, support for animation and 3D	Free access, open source, superiority to GPT-4.5 in mathematics and coding	Unique dual-mode architecture, exceptional multilingual capabilities, free access	Efficient MoE architecture, good balance of performance and cost-effectiveness
Disadvantages	Image generation requires a separate service, no video editor	Text generation only	Limited video duration (6 seconds), potentially incorrect processing of complex queries	Fewer features in the applications and the web version compared to market leaders	Models are not as advanced as those of foreign counterparts	May be inferior in Russian-language scenarios

The conducted analysis leads to a conclusion that the optimal technological strategy for implementing the tasks of the "PRO-Inclusion" methodological design kit is based on the flexible combined use of several neural network solutions. The core of the system, providing basic functionality and data security, is represented by applications developed by the Sber PJSC ecosystem: GigaChat for text processing, table generation and speech synthesis, as well as Kandinsky 3.1 for creating adapted visual materials, including high-contrast images and simplified contour versions suitable for subsequent presentation in the Braille raised-dot format.

At the same time, the emergence of freely available high-performance models in Russia, such as DeepSeek-V3 and Qwen3-235B-A22B, opens up further prospects for enhancing the functionality of the design kit. These neural networks demonstrate exceptional capabilities in tasks requiring complex logical reasoning, step-by-step explanation of material, and multilingual support, which may be particularly valuable when working with children with cognitive and mental disorders.

The proposed combined strategy provides an extensive functional coverage of tasks faced by an inclusive education teacher:

- adaptation of text materials with regard to the cognitive characteristics of learners (simplification of complex texts, structuring of information, creation of step-by-step instructions);
- creation of alternative formats for presenting information (audio, tactile images, high-contrast graphics);
- generation of personalised learning plans taking into account the pace of learning, fatigue levels and sensory characteristics;
- designing of adapted teaching materials for various categories of learners with disabilities, including sensory and cognitive impairments.

DISCUSSION

The research results are consistent with the conclusions of contemporary researchers regarding the prospects for the application of AI in education. According to Bocharov, intelligent systems are capable of providing a high degree of individualisation in the educational process, as well as instant feedback [21]. Eskin emphasises the importance of using AI to improve access to education for people with physical and mental constraints [7].

Thus, the proposed approach not only automates preparation for lessons but also contributes to the teacher's professional development. Working with the design kit requires the teacher to reflect on their own methods and approaches, since they are not supposed simply to accept ready-made material, but are to evaluate it critically and adapt it to real conditions. This echoes Fedotenko's conclusions regarding the need to develop a reflective stance among future teachers [15]. The introduction of a tool such as "PRO-Inclusion" can serve as a catalyst for the development of more profound inclusive competence, where technological literacy is not an end in itself, but a means for the achievement of the main goal – the creation of a genuinely personalised and accessible educational environment for every child with disabilities. The foreign colleagues rightly point out that the success of integrating AI into special education depends directly on teacher training in an effective symbiosis with new technologies [22].

An important theoretical aspect requiring discussion is the balance of roles between AI and the teacher in the developed model [22; 23]. Unlike approaches that tend to replace the teacher with intelligent systems, the presented model of a methodological toolkit involving AI is based on the principle of "enhancing" the pedagogical activity. As rightly noted by Lukin et al., the most promising direction involves not replacing the teacher, but creating tools that expand their capabilities and free up time for direct interaction with learners [9].

The analysis of international experience in applying neural networks in special education confirms the expedience of the developed approach.

For instance, Heggler et al. explore the nature of AI use in education, focusing on its potential for personalised learning [24]. Pagliara et al. systematise data on how AI (including adaptive technologies) can support learners with disabilities and special educational needs [25]. Melo-López et al. review AI-based applications in inclusive education, analysing the impact of various technologies on the accessibility of learning and the personalisation of educational pathways [26]. Ngô et al., in a systematic review on the impact of generative AI on equity in foreign language learning, emphasise that AI helps to overcome educational barriers [27]. García-López and Trujillo-Liñán, in a systematic review, examine regulatory issues of applying generative AI in education, including the need to develop new pedagogical approaches [28]. Lachheb et al. point to the lack of attention to issues of inclusivity in library services for learners with disabilities and the potential to remedy this situation through the use of digital tools [29]. Mochizuki and Vickers analyse the geopolitical dimension of AI in the educational agendas of major powers, noting that high technology is of key importance for the future of education [30]. Zhang and Chen state that deep learning enables the creation of adaptive educational environments that take into account students' individual cognitive profiles [18]. Holmqvist et al. emphasise that teacher training to use high technologies effectively is a key factor for the successful implementation of AI in inclusive education [19].

The "PRO-Inclusion" methodological toolkit serves as an effective digital instrument that optimises teachers' preparation for working in an inclusive environment whilst maintaining their leading role in the educational process. The being-developed model for using the toolkit can be scaled to various diagnostic groups and academic disciplines. To clearly demonstrate the practical implementation of the developed strategy, let us consider a scenario for preparing and conducting a biology lesson in a 7th-year stream on the topic "The structure of a vegetable cell". There is a totally blind learner in the stream, whose perception of information is basically tactile and auditory, conducive to the formation of adequate spatial concepts of micro-objects.

The process of the teacher's work with the "PRO-Inclusion" design kit, schematically represented in Figure 1, includes the following stages in this specific case (see Table 2).

Table 2 Example of using the "PRO-Inclusion" methodological toolkit to adapt the biology lesson for a learner with severe visual impairment

Stage	Action by the teacher and the design kit	Result (what has been achieved)	Comment (role of neural networks)
1. Data entry (query formulation)	The teacher enters the following into the system: **1. Static data:** the conclusion of the psychological/pedagogical/medical commission (total blindness), recommendations of the visual impairment specialist, sensory characteristics (reduced tactile sensitivity). **2. Dynamic data:** the implementation chart of the lesson "The structure of a vegetable cell" (7th-year stream, objectives, list of visual materials.	A comprehensive query has been formulated, containing the student's individual profile and the parameters of the lesson.	Human factor: the teacher identifies the relevant data and formulates the query.
2. Processing (neural network operation)	The design kit analyses the query, distributing tasks among the neural networks: **Kandinsky 3.1:** generates a simplified contoured image of a cell with a differentiated relief. **GigaChat:** creates a text description and an audio story. **DeepSeek-V3:** adapts tasks to cognitive characteristics (logic, sequence).	A set of adapted materials has been generated (see stage 3).	Technological factor: neural networks perform routine and complex computational tasks.
3. Presentation of results (materials at the output)	**For the student:** An embossed model of a cell has been created (the nucleus has the highest salience, the vacuole is represented by a smooth depression, chloroplasts are represented by rough inclusions). An audio file "A journey inside the cell" with tactile analogies. An adapted homework assignment (on matching of the functions). **For the teacher:** Methodological guidelines ("Hand-in-hand" techniques, "Guess the organoid" game). An adapted lesson plan (with extra time for tactile palpation).	A set of resulting teaching and methodological materials.	The result of the combination: the materials are ready for use but require pedagogical interpretation.

4. Implementation (pedagogical interpretation)	The teacher at the lesson: Uses the “Hand-in-hand” technique to familiarise pupils with the model. Plays an audio file to reinforce the auditory sensation. If a pupil has difficulties, the teacher improvises, comparing chloroplasts to “rough little leaves”.	An accessible and informative lesson; the pupil has mastered the topic; an adequate understanding of the cell structure has been formed.	Human factor: the teacher interprets the materials, makes decisions in non-standard situations, and creates a due emotional tone.
5. Feedback	The teacher records in the system: “The student has easily identified the nucleus but confused the vacuole and the cytoplasm. The presentation of a vacuole needs a more distinct contour”.	Data for further training of the neural network and the improved quality of subsequent generation.	The cycle is complete: the system has become “smarter”.

The described scenario of using the “PRO-Inclusion” design kit to adapt a biology lesson confirms the viability and effectiveness of the proposed model. It illustrates the full cycle of the tool’s operation: from entering the child’s individual data and lesson parameters to receiving complete didactic and methodological materials and their creative realisation by the teacher. It is important that the presented algorithm is universal in nature and can be reproduced for any academic subjects and various categories of learners with disabilities, which confirms the broad potential for implementing the developed design kit into inclusive educational practice.

The question of whether the individual characteristics of disabled learners are fully taken into account during the automated generation of educational materials remains open to debate. As the study has shown, even the most sophisticated neural network algorithms are unable to fully account for a child’s dynamically changing psycho-emotional states and the specific nature of their social developmental context. This circumstance confirms the fundamental importance of pedagogical interpretation of the generated materials and the need for the teacher to retain a leading role in the educational process.

CONCLUSION

The conducted study makes it possible to draw the following conclusions:

1. The research resulted in the development of a scientifically grounded strategy for the operation of the “PRO-Inclusion” methodological design kit, based on a combination of AI technologies and the teacher’s inclusive competence. Owing to the two-component data input system that takes into account both the child’s static characteristics and the teacher’s situational requests, the design kit ensures a high degree of personalisation of teaching materials. The technological framework of the solution is represented by a combination of the proven Russian neural networks from Sber’s ecosystem: GigaChat (text processing, speech synthesis) and Kandinsky 3.1 (generation of visual content, including adapted images and tactile graphics). Further expansion of the design kit’s functional capabilities involves the integration of new, freely available models, such as DeepSeek-V3 and Qwen3-235B-A22B, which demonstrate high efficiency in tasks requiring complex logical reasoning, step-by-step adaptation of learning materials, and multilingual support. The proposed combined configuration, validated through comparative analysis, enables the effective adaptation of educational content for a wide range of clinical groups: from children with sensory impairment (vision, hearing) to learners with cognitive and mental disorders (developmental delay, intellectual disabilities, autism spectrum disorder).

2. The obtained data confirm that the generation of adapted materials by a neural network is merely the first stage. The ultimate effectiveness of their use depends entirely on the teacher, specifically on the level of their pedagogical model. The teacher can transform technological recommendations into effective pedagogical practice only if they possess sufficient professional experience, well-developed inclusive competence and the ability for creative interpretation. The design kit acts as a digital tutor, optimising resource outlay, but responsibility for the realisation of the educational process remains with the teacher, who possesses critical thinking and the ability for pedagogical improvisation.

3. Promising areas for further research include the development of a highly specialised neural network focused exclusively on the tasks of inclusive education, or the adaptation of existing technological solutions to the specific needs of various categories of learners with disabilities. The impact of using the methodological toolkit on the quality of educational outcomes for learners with disabilities requires further study, as well as the specific requirements for training teachers to interact effectively with intelligent systems within an inclusive education setting.

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