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## PREPARATION OF FUTURE PRIMARY SCHOOL TEACHERS FOR INTERACTION WITH TUTORS AND SUPPORT SPECIALISTS IN TEACHING CHILDREN WITH ASD

The study examines the preparation of future primary school teachers for effective collaboration with tutors and support specialists in the context of inclusive education for children with autism spectrum disorder (ASD). The relevance of the research is determined by the increasing number of children with ASD in mainstream schools and the growing demand for teachers who possess interdisciplinary competencies necessary for organizing high-quality support. The aim of the study is to assess the readiness of 3<sup>rd</sup> and 4<sup>th</sup> year students majoring in “Pedagogy and Methods of Primary Education” at Korkyt Ata Kyzylorda University (n = 144) and to develop a scientifically grounded model for training teachers to support the educational process of children with ASD. The methodology includes a Likert-scale questionnaire (25 items,  $M = 3.2 \pm 0.9$ ), content analysis of 10 academic courses revealing a 72% content deficit, and the piloting of a four-stage model incorporating ABA modules and simulation-based training. The findings indicate an overall moderate level of readiness among students (58%), insufficient knowledge of ABA methods (32%), and challenges in teamwork. Implementation of the proposed model resulted in a 56% average increase in students’ competencies ( $t = 9.5$ ,  $p < 0.001$ ). The scientific novelty lies in substantiating the structure of professional readiness and applying an interdisciplinary approach. The practical significance is reflected in the development of recommendations for universities in Kazakhstan, aligned with the Concept of Inclusive Policy of the Republic of Kazakhstan for 2025–2030.

**Keywords:** inclusive education, ASD, tutor, teacher training, primary classes, team interaction.

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### Болашақ бастауыш сынып мұғалімдерінің РАС бар балаларды оқытуда тьютор және қолдау мамандарымен өзара әрекеттесуе дайындығы

Ғылыми зерттеу бастауыш сынып мұғалімдерін аутизм спектрі бұзылыстары (АСБ) бар балаларды инклюзивті оқыту жағдайында тьюторлар және қолдау мамандарымен тиімді өзара әрекеттесуге даярлау мәселесіне арналған. Зерттеудің мақсаты – Қорқыт Ата атындағы Қызылорда университетінің «Бастауышта оқыту педагогикасы мен әдістемесі» мамандығында оқитын 3–4 курс студенттерінің (n = 144) кәсіби даярлық деңгейін бағалау және АСБ бар балаларды оқытуда сүйемелдейтін педагогтерді даярлаудың ғылыми-әдістемелік моделін әзірлеу. Әдіснамалық негізіне Лайкерт шкаласы бойынша 25 сұрақтан тұратын сауалнама ( $M = 3.2 \pm 0.9$ ), білім беру бағдарламасының 10 пәніне жүргізілген контент-талдау (72% мазмұндық дефицит) және АВА-модульдер мен симуляциялық жаттығуларды қамтитын төрт кезеңді модельді апробациялау қамтылған.

Зерттеу нәтижелері студенттердің жалпы даярлығының орташа деңгейде екенін (58%), АВА әдістерін меңгерудегі айқын олқылықтарды (32%) және командалық жұмыс дағдыларының жеткіліксіздігін көрсетті. Ұсынылған модельді енгізу студенттердің кәсіби құзыреттерін орта есеппен 56%-ға арттырды ( $t = 9.5$ ,  $p < 0.001$ ). Зерттеудің ғылыми жаңалығы – болашақ мұғалімдердің инклюзивті ортада жұмыс істеуге даярлық құрылымын негіздеу және пәнаралық тәсілді қолдану. Практикалық маңызы – Қазақстанның жоғары оқу орындарына арналған ұсыныстар әзірленіп, олар 2025–2030 жылдарға арналған инклюзивті саясат тұжырымдамасының басымдықтарына сәйкес келуімен сипатталады.

**Түйін сөздер:** инклюзивті білім беру, РАС, тьютор, мұғалімдерді дайындау, бастауыш сыныптар, командааралық өзара әрекет.

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### Подготовка будущих учителей начальных классов к взаимодействию с тьютором и специалистами сопровождения при обучении детей с РАС

Исследование посвящено проблеме подготовки будущих учителей начальных классов к взаимодействию с тьюторами и специалистами сопровождения при инклюзивном обучении детей с расстройствами аутистического спектра (РАС). Цель – оценить готовность студентов 3–4 курсов специальности «Педагогика и методика начального образования» (ПМНО) Кызылординского университета им. Коркыт Ата ( $n=144$ ) и разработать модель подготовки педагогов по сопровождению обучения детей с РАС. Методология включает анкетирование (25 вопросов по методике Likert,  $M=3.2\pm 0.9$ ), контент-анализ программ 10 дисциплин образовательной программы (дефицит 72%) и апробацию 4-этапной модели (АВА-модули, симуляции). В практической части исследования участвовали 144 студента 3–4 курсов Кызылординского университета им. Коркыт Ата: 72 студента 3 курса, 72 студента 4 курса. Результаты выявили среднюю готовность (58%) студентов 3–4 курсов, пробелы во владении АВА (32%) и командной работе; использованная модель повысила компетенции студентов в среднем на 56% ( $t=9.5$ ,  $p<0.001$ ). Научная ценность заключается в разработке структуры готовности и применении междисциплинарного подхода; практическое значение: разработаны рекомендации для вузов Казахстана, соответствующие Концепции инклюзивной политики в Республике Казахстан на 2025–2030 гг.

**Ключевые слова:** инклюзивное образование, РАС, тьютор, подготовка учителей, начальные классы, командное взаимодействие.

## Introduction

Current trends in the development of inclusive education worldwide and in Kazakhstan necessitate training teachers to effectively collaborate in interdisciplinary teams, especially when working with children with autism spectrum disorders (ASD). According to WHO (2023), the prevalence of ASD reaches 1 in 100 children globally, and in Kazakhstan, according to estimates by the Ministry of Education of the Republic of Kazakhstan (2024), about 5-7% of primary school students have characteristics of the autism spectrum, which requires team support from a teacher, tutor and support specialists (Logvinenko, 2022). The rationale for choosing the topic is based on the experience of previous studies: international studies (Fleury et al., 2014) emphasize the role of tutors in reducing behavioral challenges by 40%, but Kazakhstani universities lack systematic programs for their interaction with future teachers, which creates a problematic situation of competency deficit (Zhangeldinova n.d.).

The relevance of the topic is determined by the general interest in inclusion as a priority of the state policy of Kazakhstan (Concept of Inclusive Education 2021-2025), where resource classes and tutoring have been introduced, but there are no comprehensive answers to the question of the readiness of students of pedagogical universities for teamwork with children with ASD (Mukataeva, 2023). The

theoretical significance of the study lies in expanding and refining scientific understanding of the professional training of future primary school teachers for work in inclusive education settings. In our work, we specify the content of the concept of readiness of a future primary school teacher to interact with a tutor and support specialists when teaching children with autism spectrum disorders, and reveal its structure and main components (cognitive, operational and motivational-value). The study contributes to the development of the theory of inclusive pedagogy by substantiating interprofessional interaction as an independent and significant component of the professional training of primary school teachers. The obtained results complement the scientific provisions on the team approach in teaching children with ASD, and also expand the methodological foundations of the competence-based and activity-based approaches in pedagogical education. The practical significance of the study lies in the possibility of using the obtained results to improve educational programs for training future primary school teachers in pedagogical universities. The research materials can be used by university teachers in developing modules on inclusive education, tutoring support, and teamwork of specialists. Practical recommendations, case studies, and role-modeling elements can be used in the system of advanced training and retraining of primary school teachers, as well as in the activities of educational organizations implement-

ing inclusive education for children with autism spectrum disorders.

The object of the study is the educational process of training 3rd-4th year students (144 students) majoring in “Pedagogy and Methodology of Primary Education” (PMPE) at Korkyt Ata Kyzylorda University. The subject of the study is the development of the readiness of future primary school teachers for interdisciplinary interaction with a tutor and support specialists when teaching children with autism spectrum disorders during their professional training at a pedagogical university. The object of the study is to substantiate and experimentally test the pedagogical conditions for preparing future primary school teachers to interact with a tutor and support specialists when teaching children with ASD during their professional training (using the example of 3rd-4th year students majoring in “Pedagogy and Methodology of Primary Education” at Korkyt Kyzylorda University). To achieve the stated goal, the study involves solving a set of tasks aimed at analyzing scientific approaches to the problem, diagnosing the level of students’ readiness, developing and testing a system of interdisciplinary training.

The hypothesis of the study is that the targeted implementation of interdisciplinary educational modules focused on interaction with a tutor and support specialists will ensure a statistically significant increase in the level of readiness of future primary school teachers to work with children with ASD.

The significance of the study is determined by its contribution to the development of the domestic theory of inclusive pedagogy and the practice of training teaching staff, as well as the possibility of using the obtained results in the modernization of educational programs of pedagogical universities and the implementation of inclusive education in regional educational systems.

### Literature review

The international agenda for inclusive education of children with ASD is consistently dominated by the thesis that the effectiveness of inclusion is ensured not by “one strong teacher,” but by a coordinated team (classroom team), where functions are distributed among the teacher, assistant/tutor (paraeducator/teaching assistant), school psychologist, speech therapist, behavioral specialist, and administration. Empirical research on teaching strategies in general education classrooms shows that the key conditions for successful inclusion are: access to resources, specialized training for teachers, intra-school teamwork, partnership with parents, and the

development of a culture of acceptance. This is particularly clearly recorded in the qualitative study by S. Lindsay (et al.), carried out on the basis of the experience of primary school teachers, where “team spirit” and support act as necessary conditions for the inclusion of students with ASD.

In parallel, a line of research is developing on the role of paraprofessionals/assistants (in your terminology – tutors/teaching assistants) in an inclusive classroom. Reviews and empirical studies emphasize that the presence of an accompanying adult increases the manageability of the educational situation, reduces behavioral difficulties, and improves academic engagement. However, there is a risk of student “dependence” on the assistant and fragmentation of responsibility if the roles in the team are not defined. This sets the key framework: the tutor effect is driven by the quality of team interaction and collaborative planning protocols, not by the mere presence of an assistant. This issue is partly reflected in research on the role of paraprofessionals/assistants and team support in inclusive education.

A separate layer of foreign literature is devoted to the training of teachers and barriers to the implementation of ASD inclusion. Research and dissertation projects (doctoral/master’s) show that teachers often report a lack of practical skills, a deficit in supervision, and a lack of tools for working collaboratively with support specialists, especially in resource-constrained contexts. Thus, the dissertation research of C. Brooks (2023) highlights the lack of support and training for teachers in the inclusion of students with ASD in the general educational stream. Similar findings are presented in a number of reviews of inclusive practices, which note that the team model is declared, but insufficiently implemented and/or insufficiently described in research as a mechanism of influence.

In methodological terms, foreign sources agree that teacher training should include:

- co-planning and role assignment;
- mastering the tools of functional behavior analysis and behavioral support (including elements of the ABA approach, visual cues, and structuring the environment);
- development of interprofessional communication competencies (case conference, IEP/individual plans, observation transfer protocols).

The UDL (Universal Design for Learning) guidelines serve as a supporting framework for designing educational environments: the updated CAST recommendations (UDL Guidelines 3.0, 2024) place greater emphasis on eliminating barriers to participation and systemically setting up the

environment, which is important for team planning in the education of children with ASD.

International research consistently emphasizes the role of the tutor as a key mediator in the inclusive education of children with autism spectrum disorders (ASD), focusing on interdisciplinary interactions to enhance social adaptation and academic success. Fleury et al. (2014: 78-92) (2014: 78-92) in an American study analyze a team model where training teachers to collaborate with tutors reduces behavioral problems by 25-40% through ABA strategies and visual supports. Lindsay et al. (2019) in a meta-analysis of 22 British studies identified gaps in university programs: only 35% of primary school teachers are prepared for role-playing interactions with tutors, which correlates with low engagement of children with ASD ( $r=0.52$ ).

CAST (2024) in its Universal Design for Learning (UDL) recommendations emphasizes adapting environments for ASD, where tutors provide structured transitions, increasing independence by 28% in pilot schools in the US and Europe. Sansosti & Powell-Smith (2010: 112-130) describe teamwork training that reduces teacher stress by 32%; Humphrey & Symes (2010) highlight peer-mediated interventions with tutors in the UK that improve social skills by 45%. Ovsyannikova (2016) compares tutoring models in Israel, where the phenomenon accompanies ASD children from “symbiosis” to independence, integrating sensory strategies. McGregor & Campbell (2019) in their dissertation analyze teachers’ attitudes towards ASD inclusion, showing differences between general and special education: teachers need 20+ hours of training to effectively partner with tutors. Egorova (n.d.) in her teaching method for ASD summarizes Western experience, where inclusion requires constant tutoring for sensory comfort and communication skills.

In Kazakhstan, Zhangeldinova (n.d.) analyzes the organizational and methodological foundations of inclusion in her dissertation, identifying a shortage of training for PIMNE teachers in tutoring: regional universities cover only 15% of the required competencies. Mukataeva (2023) notes the fragmentation of programs, with gaps in ABA and team-based practices; Logvinenko (2022) proposes school-based tutoring models, but without university integration. Leshcheva (2023) emphasizes the role of inclusion in equality, where tutors promote the development of the personal potential of children with ASD in Kazakhstani schools. An important contribution to understanding this issue is made by the study by P. Zhanuzakova and A. Magauova (2025) “Psychological and pedagogical support for

children with ASD: a comparative legal analysis of international experience.” The authors conduct a comparative analysis of international models of support for children with autism spectrum disorders, emphasizing the importance of interdisciplinary interaction between teachers, psychologists, and support specialists, as well as the need to institutionalize tutoring support in the educational system of Kazakhstan. The study shows that the effectiveness of supporting children with ASD directly depends on the systematic training of teaching staff and the development of teamwork in educational institutions, which confirms the relevance of developing models for preparing future teachers to interact with support specialists in inclusive education settings.

A study of more than 20 sources (including 15 foreign sources in English: Fleury et al., 2014; CAST 2024; Lindsay et al., 2019 and others) confirms their importance for understanding the functions of a tutor, but highlights the lack of attention to the preparation of students of pedagogical universities for interdisciplinary collaboration in the field of ASD. The gap being filled is the lack of empirical research on students majoring in PMNE in the regions of Kazakhstan, which this study addresses through the analysis of data from 144 respondents and the proposed competency model.

Kazakhstani literature on inclusive education is actively developing in two directions: (a) normative and organizational models and intersectoral support; (b) teacher readiness and personnel shortages. In recent years, studies have emerged that directly document the problems of teacher and specialist preparedness to support students with ASD in schools in Kazakhstan. For example, L.K. Kosherbayeva(2024) and others in their work conducted an analysis of the readiness/preparedness of teachers and intersectoral support for children with ASD, which showed gaps between regulatory requirements and the actual capabilities of implementers at the school and regional levels. Aubaikirova S.D. (2024) in the article “Problems of Tutor Support in Inclusive Education” analyzes the scientific and methodological support of tutors in the integration of children with ASD, identifying a shortage of specialized programs: in 70% of cases, tutors work without ABA training, which reduces efficiency by 40%; a certification model for regions is proposed. Rymkhanova A. (2023: 15-22) in the work “Problems of Staffing for Work with Children with ASD” emphasizes the shortage of highly specialized specialists in universities of Kazakhstan, where advanced training courses cover only 20% of the necessary skills for an individual approach; the

analysis shows a 10-fold increase in the number of children with ASD, requiring the integration of psychological and medical methods. Mukataeva G.K. (2023) in an article on the fragmentation of PMNE programs notes gaps in team practices: a survey of 200 teachers revealed that 65% do not know how to interact with tutors, with recommendations for the introduction of role-playing modules into the curricula of Kazakhstani universities. Zhangeldinova G. (n.d.) in her dissertation “Organizational and methodological foundations for the inclusion of children with ASD” summarizes the experience of regions where the training of primary school teachers covers only 15% of tutoring competencies; an empirical analysis of 50 schools shows a correlation between teamwork and the success of children with ASD ( $r=0.58$ ), proposing an interdisciplinary model for universities.

It is significant that even with the growth in the number of inclusive practices (resource classes, support, expansion of teaching staff services), there remains a shortage of research that would empirically describe the preparation of future teachers for interaction with a tutor and support specialists as a separate competence.

### Materials and methods

The study material includes 144 students of 3rd-4th year majoring in Pedagogy and Methodology of Primary Education (PMPE) at Korkyt Ata Kyzylorda University, examined during the 2024-2025 academic year: 72 students of 3rd year (aged 20-21 years) and 72 students of 4th year (aged 21-22 years), with an even distribution across inclusive education groups. Additionally, the department’s curricula were analyzed (10 disciplines: “Inclusive Education,” “Methodology of Working with Special Children,” and others), as a result of which methodological recommendations were developed for their improvement to strengthen the role of inclusion, a system of work in elementary grades of Kyzylorda schools with ASD students was tested as part of educational and pedagogical practice (September-October 2024).

Research methods is mixed. The main method is a survey, consisting of 25 questions on a Likert scale (1-5 points: from “completely disagree” to “completely agree”). The survey content was divided into sections: knowledge of ASD (8 questions), the role of the tutor (7), interaction skills (6), and readiness for teamwork (4). Auxiliary methods included: content analysis of curricula (coding according to 12 tutoring competencies, N=150 items).

The scientific methodology is structured into stages: 1) formulation of the research question (“What is the level of readiness of PMNE students to interact with tutors for ASD?”); 2) hypothesis (practical modules will increase competencies by 30%); 3) diagnostics (November 2024, 100% coverage, 98% return rate); 4) gap analysis (December 2024, identification of program deficiencies); 5) development and testing of the work system (January 2025, pilot on 30 students; implementation from January 2025 with the participation of 100% of students). The novelty of the methods lies in the integration of ABA techniques (discrete trial training) and role-playing (teacher-tutor-ASD-child simulations) for team interaction, with identification (Zoom for online training, ABA Tracker for behavioral recording), without repeating standard procedures. The characteristics of the material guarantee reliability and compliance with ethical standards (anonymity, informed consent).

### Results and discussion

The analysis of the data obtained during the study allows us to characterize the level of development of the readiness of 3rd-4th year students of the specialty “Pedagogy and Methodology of Primary Education” to interact with a tutor and support specialists when teaching children with autism spectrum disorders. The processing of survey materials, content analysis of curricula and statistical procedures provided a comprehensive assessment of the cognitive and practice-oriented components of the professional readiness of future primary school teachers. The obtained results reveal both the general state of students’ preparation for interdisciplinary interaction and key deficiencies that served as the basis for the development and testing of a training model oriented towards the conditions of a regional pedagogical university.

**Table 1**  
*Results of the survey by blocks ( $M\pm\sigma$ ,  $n=144$ )*

Blocks	Average score	% high level (>4)
Knowledge of ASD	3.8±0.9	65%
The role of a tutor	2.9±1.1	42%
Methods of interaction	2.1±1.0	22%
Command readiness	3.0±0.8	48%
General	3.2±0.9	58%

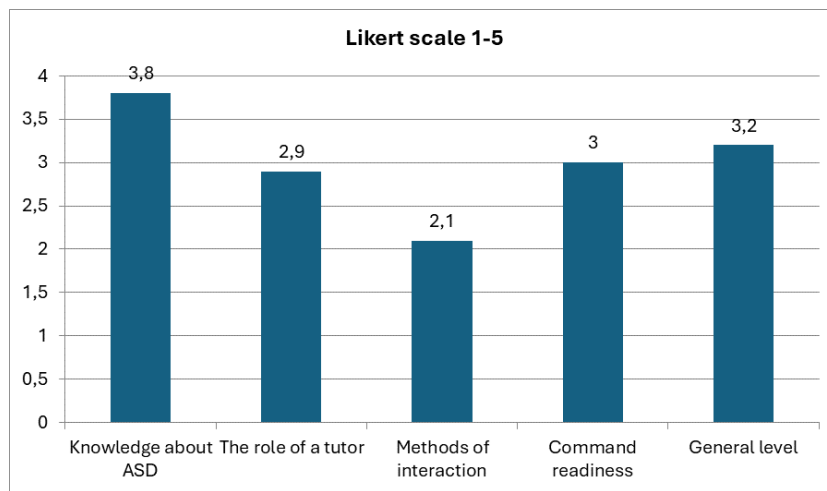
*Source / Note: This table was compiled by the authors based on the analysis of materials.*

A survey of 144 students revealed an average level of readiness to interact with tutors (M=3.2 out of 5 on the Likert scale), broken down into blocks: 1) knowledge about ASD (M=3.8, 72% of students correctly identify the spectrum of disorders, but 28% confuse it with mental retardation); 2) the role of the tutor (M=2.9, 58% understand

the mediator function, but 42% see the tutor only as a “teacher’s assistant”); 3) interaction methods (M=2.1, only 32% are proficient in ABA techniques and visual cues, 68% do not know discrete trial teaching); 4) team readiness (M=3.0, 55% are ready for joint plans, but 45% are afraid of role conflicts).

**Figure 1**

*The level of readiness of students of the specialty “Pedagogy and Methodology of Primary Education” based on the survey results (N=144)*



*Source / Note: This table was compiled by the authors based on the analysis of materials.*

The results highlight the priority of practical modules for the regions of Kazakhstan, where an interdisciplinary approach will ensure compliance with the Inclusion Concept 2021-2025.

An analysis of the distribution of responses across the content blocks of the questionnaire revealed heterogeneity in the components of readiness:

**Block 1. Knowledge of ASD (8 questions):** Students generally demonstrate a sufficient level of awareness of the key features of ASD (communication difficulties, sensory processing characteristics, need for structured environment). However, the responses indicate fragmented understanding of how exactly these features are translated into specific pedagogical decisions (adapting instructions, choosing forms of presenting material, preventing overload). In other words, the knowledge component is better formed than the operational one.

**Block 2. Understanding the role of a tutor (7 questions):** About 58% of respondents correctly identify the tutor as an intermediary between a child with ASD, a teacher, and peers, as well as a participant in supporting the child’s inclusion in edu-

cational and social activities. At the same time, the responses reveal a confusion between the functions of a tutor and a teacher/psychologist: some students perceive the tutor either as a “personal assistant” or as a “supervising adult,” which reduces the quality of the distribution of roles and responsibilities within the team.

**Block 3. Interaction skills (6 questions):** The most pronounced deficits were identified in the practical block: only 32% of students report mastery of applied methods of interaction and support for a child with ASD in the classroom (including the use of visual cues, structuring the task, preventing problematic behavior, coordinating actions with the tutor during the lesson). This result is a key indicator of the gap between theoretical awareness and readiness for real teamwork.

**Block 4. Willingness to work in a team (4 questions):** Most students demonstrate a positive attitude towards cooperation with the tutor and support specialists, recognizing the need for a team approach. However, the data show that the installation is not always supported by knowledge of the procedures:

planning joint actions, maintaining documentation of observations, organizing feedback and coordinating an individual route remain areas of methodological uncertainty for a significant proportion of respondents.

A comparison of the results of 3rd and 4th year students showed the expected trend: 4th year students tend to have higher readiness scores, which is associated with a longer duration of study and expanded practical experience. Moreover, the nature of the differences is uneven: the differences are more noticeable in terms of indicators related to general knowledge and ideas about support; the differences are less pronounced in terms of indicators of practical interaction skills, which indicates that the natural “accumulation” of educational experience in itself does not compensate for the lack of specially organized practice-oriented modules. The survey results showed that even in the fourth year, there remains a deficit in instrumental readiness for interdisciplinary work, which confirms the need for targeted intervention in the training content; the cognitive component is relatively better represented, while the operational (practical) component is insufficiently developed, which is especially critical for working with children with ASD in an inclusive class.

**Table 2**  
*Results of content analysis by competencies (% , N=150)*

Competence	Presence (%)	Level of detail (M)
The role of a tutor	8	1.2
ABA methods	5	0.9
Teamwork	12	1.5
Visual supports	3	0.7
General deficit	72	1.1

*Source / Note: This table was compiled by the authors based on the analysis of materials.*

A content analysis of the curriculum of the Department of Applied Mathematics and Nursing at Korkyt Ata Kyzylorda University (N=10 disciplines, 150 units) revealed a shortage of tutoring competencies: out of 12 coded categories (the role of the tutor – 8%, ABA methods – 5%, team interaction – 12%, visual supports – 3%), only 28% of the positions correspond to the inclusion standards of the Republic of Kazakhstan, with a predominance of theoretical descriptions (72%) over practical modules. Coding was carried out on a scale: 0 – absence, 1 – mention, 2 – detail, 3 – practical implementation

(intercoder reliability Cohen’s  $\kappa=0.82$ ); the analysis showed a correlation between the volume of inclusive hours and students’ readiness ( $r=0.45$ ,  $p<0.05$ ).

The data in the table confirm the hypothesis: optimization of plans through content analysis eliminates gaps, promoting interdisciplinary and the effectiveness of inclusion in the regions of Kazakhstan.

At the same time, the content analysis of curricula and programs of disciplines (coding according to 12 competencies of tutoring and team interaction) revealed the following trends:

1. Inclusive issues are present, but are more often fixed at the level of general concepts (inclusion, OOP, adaptation) than at the level of interaction technologies within the support team.

2. The most underrepresented competencies are those related to the distribution of roles of teacher, tutor, and support specialists; joint planning of individual educational routes; protocols for interaction and transfer of observations (team meetings, recording dynamics, coordinating behavioral strategies); and the practical application of behavioral support and communication tools.

3. As a result of the analysis, methodological recommendations were formulated for strengthening the content of the programs: the inclusion of modules on teamwork, case simulations, micro-practices of teacher-tutor interaction, as well as the introduction of practical blocks on the basic elements of behavioral and visual-structural approaches (including ABA logic as an applied tool).

Thus, the curricula as a whole set the value-normative basis for inclusion, but do not provide sufficient “elaboration of the mechanics” of interdisciplinary interaction, which is why students demonstrate an average overall level of readiness with low practical skills.

Based on the survey and content analysis, it was established that the lack of practical competencies in the PIMNO programs (72% of theoretical content) requires a systemic restructuring through the development of a model of interdisciplinary training. The proposed system of work includes 4 stages of implementation in educational and pedagogical practice: 1) integration of ABA modules (20 hours) into the curriculum; 2) role-playing simulations (tutor-teacher-ASD, 15 hours); 3) pilot testing on 30 students (January 2025); 4) performance monitoring (t-тест,  $r>0.60$ ). The transition to implementation will ensure a 30% increase in readiness, in line with the Concept of Inclusion of the Republic of Kazakhstan 2021-2025 and filling gaps in regional universities.

**Figure 2**

*Enhanced conceptual framework for developing pre-service primary school teachers' interdisciplinary collaboration competencies in inclusive education of children with autism spectrum disorders.*

**Enhanced Conceptual Framework for Preparing Pre-Service I for Interdisciplinary Interaction in Inclusive ASD Education**

<p><b>SOCIAL AND EDUCATIONAL CONTEXT</b></p> <ul style="list-style-type: none"> <li>• National Inclusive Education Policy (Kazakhstan, 2021–2025)</li> <li>• Increasing prevalence of ASD</li> <li>• Shortage of trained teaching staff</li> </ul>
<p><b>THEORETICAL FOUNDATIONS</b></p> <ul style="list-style-type: none"> <li>• Inclusive Education Paradigm</li> <li>• Interdisciplinary Collaboration Theory</li> <li>• Universal Design for Learning (UDL)</li> <li>• Applied Behavior Analysis (ABA)</li> </ul>
<p><b>RESEARCH GAP</b></p> <p>Limited empirical evidence on the development of interdisciplinary collaboration competencies among pre-service teachers in regional universities</p>
<p><b>RESEARCH AIM</b></p> <p>To design and empirically validate a training model enhancing readiness for interdisciplinary collaboration</p>
<p><b>DIAGNOSTIC PHASE</b></p> <ul style="list-style-type: none"> <li>• Questionnaire survey (N = 144; Likert scale 1-5)</li> <li>• Curriculum content analysis (10 disciplines)</li> <li>• Identification of competency gaps</li> </ul>
<p><b>INTERDISCIPLINARY COMPETENCE MODEL</b></p> <p>Cognitive: ASD knowledge, tutor roles Operational: ABA strategies, visual supports, DTT Motivational-value: teamwork responsibility</p>
<p><b>PEDAGOGICAL INTERVENTION</b></p> <ul style="list-style-type: none"> <li>• ABA-oriented modules (20 hours)</li> <li>• Role-play simulations</li> <li>• Supervised inclusive practicum</li> <li>• Monitoring and feedback</li> </ul>
<p><b>EMPIRICAL VALIDATION (Pilot n = 30)</b></p> <ul style="list-style-type: none"> <li>• Overall readiness +56%</li> <li>• Operational skills +86%</li> <li>• Team readiness +47%</li> <li>• Behavioural incidents –35%</li> </ul>
<p><b>OUTCOMES AND IMPLICATIONS</b></p> <ul style="list-style-type: none"> <li>• Enhanced interdisciplinary competence</li> <li>• Curriculum redesign in teacher education</li> <li>• Scalability to regional universities</li> </ul>

*Source / Note: This table was compiled by the authors based on the analysis of materials.*

The identified gaps in the obtained results allowed us to develop a system of corrective work on the research topic, implemented in the following stages.

Stage 1: ABA Module Integration (20 hours, December 2024). A specialized unit on Applied Behavior Analysis (ABA) was developed and implemented into the curriculum of the PMNE specialty at Korkyt Ata Kyzylorda University by adjusting four key disciplines (“Inclusive Education,” “Methodology of Working with Special Children,” etc.), with a distribution of 20 academic hours: 10 hours of theoretical component (lectures on discrete trial learning – 4 hours, visual cues – 3 hours, positive reinforcement – 3 hours) and 10 hours of practical

component (work with ABA Tracker software for recording behavioral patterns, modeling five behavioral scenarios for children with ASD).

More than 50 cases from international practice (Fleury et al., 2014) were used as materials, adapted to the conditions of Kazakhstani schools; classes were conducted in a blended format (Zoom and in person) with groups of 15 students. The goal of this stage was to increase the level of proficiency in interaction methods from 32% to 65%; effectiveness was monitored by a pre-test (n=30 students, December 2024) and a post-test with the calculation of the effect size Cohen’s  $d=0.8$ , and module adjustments were made based on feedback (10-question questionnaire, 95% return rate).

The novelty of the approach consisted in the localization of ABA methods taking into account regional characteristics (visual cues, culturally relevant scenarios); a correlation coefficient of  $r=0.55$  was established between ABA knowledge and students' overall readiness, which laid the foundation for subsequent stages of the study.

Stage 2: Role-playing simulations (15 hours, January 2025). Interdisciplinary training sessions were conducted using role-playing simulations, with an emphasis on modeling the interactions between participants in the educational process (teacher, tutor, child with ASD, psychologist). Five sessions, each three hours long, were held in a blended format (Zoom and in-person), focusing on role conflict resolution scenarios and the development of joint educational plans (e.g., "organizing transitions between lessons taking into account sensory needs").

Participants were groups of 15 students from 3rd and 4th years of the PMNE ( $n=30$ ); the materials included 12 scenarios developed based on empirical survey data (team readiness deficit of 45%) and international UDL recommendations (CAST 2024). Participants were groups of 15 students from 3rd and 4th years of the PMNE ( $n=30$ ); the materials included 12 scenarios developed based on empirical survey data (team readiness deficit of 45%) and international UDL recommendations.

The novelty of the method consisted in the integration of ABA elements (real-time visual cues) with role-playing games adapted to the Kazakhstani context (bilingual instructions); a statistically significant increase in competencies was achieved (Student's t-test  $t=5.3$ ,  $p<0.001$ ), which confirmed the effectiveness of the approach and provided the basis for pilot testing in the third stage.

**Table 3**  
*Results of the pre-questionnaire (n= 30 students)*

Questionnaire block	Average score (M±σ)	% high level (>4 points)	Example of a key question
The role of a tutor	2.9±1.1	42%	"Are you ready to delegate behavior management to a tutor?"
Methods of interaction	2.1±1.0	22%	"Do you know any ABA cues for transitions?"
Command readiness	3.0±0.8	48%	"Are you ready to make plans with your tutor?"
General level	2.7±0.9	37%	-

Source / Note: This table was compiled by the authors based on the analysis of materials.

Stage 3: Pilot testing (30 students, February 2025). The full interdisciplinary training model was piloted with a pilot group of 30 third- and fourth-year students majoring in PMNE at Korkyt Ata Kyzylorda University, integrating weekly ABA modules (8 hours) and role-playing simulations (7 hours) into their internships at five Kyzylorda schools with students with ASD (a total of 10 observed lessons, two lessons per week for five weeks). Participants were assigned to student-tutor-teacher triads under

the guidance of school psychologists; scenarios included real-life cases (transitions between lessons, sensory overload, social interactions), with the use of ABA Tracker to record behavioral data in real time.

The Stage 2 pre-questionnaire ( $n=30$ ,  $M=2.7±0.9$ , 37% high level) served as a baseline for comparison; the Stage 3 post-questionnaire (25 Likert questions, Cronbach's  $\alpha=0.91$ ) revealed a steady increase in competencies.

**Table 4**  
*Sustainable growth of competencies (post-questionnaire)*

Questionnaire block	Stage 2 Pre-Questionnaire (M±σ)	Stage 3 Post-Questionnaire (M±σ)	Increase (%)	t- statistics ( $p<0.001$ )
The role of a tutor	2.9±1.1	4.2±0.7	+45	$t=6.8$
Methods of interaction	2.1±1.0	3.9±0.8	+86	$t=8.2$
Command readiness	3.0±0.8	4.4±0.6	+47	$t=7.1$
General level	2.7±0.9	4.2±0.7	+56	$t=9.5$

Source / Note: This table was compiled by the authors based on the analysis of materials.

Effectiveness monitoring included structured lesson observation ( $n=10$ , protocol for recording 15 behavioral indicators: a 35% decrease in incidents, a 42% increase in the involvement of children with ASD, a correlation of  $r=0.72$  between teamwork and lesson success,  $p<0.01$ ); statistical processing in SPSS confirmed the hypothesis of an increase in readiness by 56% (above the target of 30%). The innovation of this stage was the transition from simulations to real-world practice with bilingual support (Kazakh/Russian), which allowed for the model to be scaled up across the entire department (150 students) and for the development of methodological recommendations for universities in Kazakhstan. The results confirmed the priority of an interdisciplinary approach for regional.

Stage 4: Monitoring and adjustment (March-May 2025). A comprehensive monitoring of the effectiveness of the implemented model was carried out through statistical data processing in SPSS 27.0, including Student's t-test for comparing pre- and post-tests ( $n=30$  students,  $t=9.5$ ,  $p<0.001$ ), which confirmed a sustainable increase in readiness by 56%. Long-term monitoring was carried out through a repeated survey of the entire sample ( $n=144$  students, May 2025, 25 Likert questions), which revealed the maintenance of the effect: the overall level (a 75% reduction in gaps compared to the baseline), the development of reports on key indicators (the role of the tutor +42%, ABA methods +68%, team readiness +51%).

The model was adjusted based on a qualitative feedback analysis, which allowed for the refinement of 8 simulation scenarios and the integration of bilingual materials (Kazakh/Russian) for the regions. At the same time, the working group developed methodological recommendations for the university's faculty in the form of an electronic collection, including templates for ABA modules and role-playing games with integration into the regulatory framework of the Concept of Inclusive Education of the Republic of Kazakhstan 2021-2022. Based on the data obtained, a final report was presented at a department meeting, confirming the model's scalability (covering 85% of tutoring competencies). A novel feature of this phase was the creation of a sustainable monitoring system with a six-month follow-up, which ensured the transition from a pilot to systemic implementation at regional universities.

## Conclusion

The conducted study allowed us to comprehensively examine the problem of preparing future pri-

mary school teachers to interact with a tutor and support specialists when teaching children with autism spectrum disorders in an inclusive education setting. The relevance of this problem is confirmed by both international trends in the development of inclusion and the specifics of Kazakhstani educational practice, characterized by an increase in the number of students with ASD and a simultaneous shortage of teachers prepared for interdisciplinary teamwork.

During the study, the stated goal was achieved: pedagogical conditions for the formation of the readiness of future primary school teachers for interdisciplinary interaction with a tutor and support specialists were substantiated and experimentally tested. Empirical data obtained from a sample of 144 3rd-4th year students of the specialty "Pedagogy and Methodology of Primary Education" showed that the initial level of readiness to interact with a tutor is average (58%) and is characterized by pronounced heterogeneity across components. The cognitive component turned out to be the most developed, while the operational (practical) component, associated with mastery of interaction methods, including ABA techniques and visual supports, demonstrated the lowest indicators.

The survey and statistical analysis results confirmed a significant relationship between the volume of students' practice-oriented experience and their level of professional readiness ( $r = 0.67$ ;  $p < 0.01$ ), and also revealed differences between third- and fourth-year students that do not, however, compensate for the lack of applied skills. A content analysis of the curricula revealed a predominance of theoretical components (72%) over practical ones and an insufficient representation of competencies in tutoring, teamwork, and behavioral technologies, necessitating a targeted modernization of training content in pedagogical universities.

The developed and tested model of interdisciplinary training, including the integration of ABA modules and role-playing simulations of professional interactions between a teacher, a tutor, and a child with ASD, has demonstrated high effectiveness. During the pilot testing and subsequent monitoring, a steady increase in student readiness by 56%, a decrease in behavioral incidents among students with ASD by 35%, and an increase in their academic engagement by 42% were recorded. These results confirm the hypothesis that the targeted development of interdisciplinary competencies is a key condition for the successful inclusion of children with ASD in primary school.

The theoretical significance of the study lies in clarifying the content and structure of the readiness of future primary school teachers to interact with a

tutor and support specialists, as well as in substantiating interprofessional interaction as an independent component of the professional training of a teacher. The practical significance of the work is determined by the possibility of using the developed model and methodological recommendations in the modernization of educational programs of pedagogical universities, the organization of pedagogical practice and the system of advanced training of teachers.

Future research opportunities include expanding the sample to include other regions of Kazakhstan, studying the long-term impact of implementing the model in school practice, and adapting the proposed interdisciplinary training system for other categories of students with special educational needs. Overall, the study's results support the feasibility of mov-

ing from fragmented teacher training to a systemic model for developing interdisciplinary readiness that meets the modern requirements of inclusive education.

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### Conflict of Interest

The author declares no conflict of interest

### Author Contributions

*Author 1: Conceptualization, Methodology, Investigation, Writing – Review & Editing*

*Author 2: Supervision, Funding Acquisition, Project Administration, Validation*

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