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TEACHING CHEMISTRY TO LEARNERS WITH SPECIAL EDUCATIONAL NEEDS IN KAZAKHSTAN

Abstract

At the present stage of the reform of the education system, every general education institution should accept and meet the special educational needs of all students, i.e. it should be inclusive. Because the number of students entering inclusive classes is increasing, the education of children with special educational needs is becoming an urgent educational issue. Teachers working with these students have trouble for several reasons. This study aimed to investigate the possibilities of improving students' pedagogical skills in the context of inclusive education in chemistry. The pedagogical experiment was conducted in the secondary school 73 in Karaganda from 18 January 2022 to 3 April 2022. 8 "A" class was the control class and 8 "B" class was the experimental class. Three students, recommended by the chemistry teacher were selected for the pedagogical experiment and observed throughout the experiment. The students participated in the inclusive education programme and were assigned to the experimental class 8 'B'. According to the results of the final test, the quality of knowledge of the students in the experimental class with inclusive students increased by 4.6% in chemistry.

Keywords: *inclusive education, chemistry, testing, questionnaires, 8th grade.*

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ҚАЗАҚСТАНДА ЕРЕКШЕ БІЛІМ БЕРУГЕ ҚАЖЕТТІЛЕРІ БАР ОҚУШЫЛАРҒА ХИМИЯ ПӘНІН ОҚЫТУ

Аңдатпа

Білім беру жүйесін реформалаудың қазіргі кезеңінде барлық оқушылардың ерекше қажеттіліктерін қабылдауы және қанағаттандыруы керек және инклюзивті болуы тиіс. Инклюзивті білім беруде оқушылардың саны артып келе жатқандықтан, ерекше балаларды оқыту білім берудің өзекті мәселесіне айналады. Ерекше білім беруге қажеттіліктері бар оқушылармен жұмыс істейтін мұғалімдер бірқатар себептерге байланысты қиындықтарға тап болады. Бұл мақалада химия пәні оқытуда инклюзивті білім беру шеңберінде оқушылардың білім алу дағдыларын арттыру мүмкіндіктерін зерттеуге бағытталған. Педагогикалық эксперимент Қарағанды қаласының №73 орта мектебінде 2022 жылдың 18 қаңтарынан 3 сәуіріне дейін жүргізілді. 8 "А" бақылау сыныбы, ал 8"В" сыныбы эксперименттік болды. Педагогикалық эксперимент бойынша химия пәнінің мұғалімі ұсынған үш оқушы таңдалынып, олар эксперимент барысында бақылауға алынды. Оқушылар инклюзивті білім беру бағдарламасы бойынша білім алып, соңында эксперимент барысында 8"В" сыныбының көрсеткіштері анықталды. Қорытынды тестілеу нәтижелері бойынша инклюзивті оқушылармен жүргізілген эксперименттік жұмыста олардың білім сапасы химия пәні бойынша 4,6%-ға артқандығы анықталды.

Түйін сөздер: инклюзивті білім беру, химия, тестілеу, сауалнамалар, 8-сынып.

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ПРЕПОДАВАНИЯ ХИМИИ ДЛЯ ОБУЧАЮЩИХСЯ С ОСОБЫМИ ОБРАЗОВАТЕЛЬНЫМИ ПОТРЕБНОСТЯМИ В КАЗАХСТАНЕ

Аннотация

На современном этапе реформирования образовательной системы каждое общеобразовательное учреждение должно принимать и удовлетворять особые образовательные потребности всех учеников, то есть должно быть инклюзивным. В связи с тем, что число учащихся, попадающих в классы инклюзивного обучения растет, обучение детей с особыми педагогическими особенностями становится актуальным вопросом образования. Учителя, работающие с данными учащимися, испытывают трудности, обусловленные рядом причин. Данное исследование было направлено на изучение возможностей повышения образовательных навыков учащихся в рамках инклюзивного образования по химии. Педагогический эксперимент проводился в средней школе №73 г. Караганды с 18 января 2022 года по 3 апреля 2022 года. 8 "А" класс был контрольным, а 8 "Б" класс – экспериментальный. Для педагогического эксперимента были отобраны три ученика, рекомендованные учителем химии, за которыми велось наблюдение на протяжении всего эксперимента. Ученики участвовали в программе инклюзивного образования и были распределены в экспериментальный 8 «Б» класс. По результатам итогового тестирования уровень качества знаний обучающихся в экспериментальном классе с инклюзивными учениками повысился на 4,6 % по химии.

Ключевые слова: инклюзивное образования, химия, тестирование, анкетирования, 8 класс.

Introduction. Inclusive education as an educational theory is based on the worldview of social inclusion (integration of all members of society into the social environment). It is a component of the development strategy of a democratic society, as equality, accessibility and quality assurance of education are a basic requirement for its functioning. Persistent education system reformation characterized by provisions demands that every general education institution has to include all students and meet their special needs, that is, they have to be inclusive. Students with different educational needs can learn effectively in a favourable environment where these needs are taken into account by all teachers working with them and their parents.

This requires educators to:

- Be prepared to accept the diversity of the student body;
- Have the skills to organise the learning process for different children within the same class;
- Strive to help each student reach a higher level and ensure their success in learning.

This study sought to explore the opportunities for enhancing students' educational skills within the framework of inclusive chemistry education

In Kazakhstan, one of the most critical areas of development is the education of children with special needs education. Unfortunately, these children, unlike other ordinary ones, can only reach their optimal capacity when their education and growth are well-planned and properly timed. This challenge is more prevalent today since there are usually few learning activities that can be pursued by children with special educational needs. Accordingly, in several cases, the mission of education of a child with special needs is a priority. Today society is concerned with developing the survival skills required of graduates in the marketplace. Consequently, there is a clear trend towards the need for a new type of specialist who, in addition to technical know-how, can cultivate and negotiate business relationships plus show high intelligence levels, and general and environmental knowledge. This specialist should also be interested in individual creativity and be able to orient himself/herself in the new world of information. Moreover, society needs a young generation, which is sure of itself and ready to assume subjectively calculated responsibilities [1].

Integrated education refers to a situation in which children with special needs are placed within the normal classroom setting and join other normal children in school. Inclusive education does not expect the child to conform to the process and procedure of learning rather the process of learning is modified to fit the child.

Considering inclusive education, it is reported that students with learning special needs learn better in mainstream schools because they can also acquire social experience. Furthermore, it is thought that children who join classmates with special needs who learn in the regular classroom setting learn more tolerance, responsibility, and independence. Inclusive education, as defined by international organisations (UNESCO, UNICEF, etc.), should ensure the right to quality education for all children by meeting their basic educational needs. However, special attention should be paid to children who, due to psychophysiological, ethnic, religious, linguistic and other characteristics, are at the greatest risk of lowering the level of education and social adaptation [2].

Inclusive education is realised as education through an extensive network of support for children with special developmental needs and those who fall under the concept of “atypical” in comparison with the majority of their peers. This circle includes children who need quality services and provision of socio-psychological, pedagogical, counselling and preventive or other services [3].

The main part. Kazakhstan is taking some steps to develop a framework for inclusive education. However, in reality, there are only a few inclusive general education institutions in the country - both public (for example, in Karaganda, 160 inclusive classes have been opened in 28 schools. Here 230 children with disabilities study together with normal children) and non-state (“First Hybrid Inclusive School”, “Dana”, “Author's School of Zhania Aubakirova” in Almaty, etc.). It is important to highlight that these schools operate based on the experiences of other countries [4]. For domestic scientists, the problem of the development of inclusive education in Kazakhstan is relevant and such that it requires careful study.

Research by A. Kolupaeva [5] is devoted to the analysis of inclusive education in terms of organizing educational processes in schools with an integrated approach, organizing work with families, elaborating and improving children's individualized plans and determining basic criteria for evaluating children in conditions of an inclusive classroom. The process of involving the world community in the integration of children with special educational needs into mainstream educational institutions is based on the child's right to quality education. In addition, the process of integrating students with special educational needs into society is a stage of development not only of the special education system but also of society in general. Unfortunately, the model of inclusive education should not be generic because the given educational model reveals different features based on the country, region, or community. But it can be attributed to humanitarian policy which is a common norm.

Ivanova, V. [6] analyses the functions of the social pedagogue in an educational context as well as underlining the important role of this professional as regards the social development of the learners within inclusive settings of the general education school. Ivanova was right in arguing that in inclusive education the humanistic pedagogical relation of the social pedagogue is the personal and social responsibility, the sense of kindness and justice the sense of assistance and support and the corresponding professional skills which define the complete personal and professional competencies and the effective problem solving and the successful participation of the social pedagogue in the different challenges.

A. Taranchenko [7] considers inclusive education in the conditions of a rural comprehensive school. The possibility of general and corrective-developmental, preventive and health-promoting, and rehabilitative socialization components when integrating and socializing a child with psychophysical developmental disorders in a rural community is possible with positive results. The author singles out support services for families with children having developmental disorders, including counselling, methodological, and rehabilitative aids. Further, the author of the study maintains that placing children of different backgrounds including children with special educational needs in a single group in a rural school can go along with preserving the rural setting and the improvement of the chances for the rest of the rural society on the other hand, solving several pedagogy issues.

V. Revyakina and E. Akulova [8] address the issue of general education teachers' readiness to implement inclusive education for children with disabilities in mainstream schools, emphasizing it as a key challenge that necessitates the development of professional training programs and psychological support for participants in the inclusion process. The authors present data highlighting the primary parameters of teachers' professional and psychological preparedness to integrate a "special" child into the general education system. They discuss the professional challenges faced by mainstream school teachers, including a lack of knowledge about the developmental characteristics of children with special educational needs, as well as methods and technologies for working with them, alongside psychological challenges related to emotional acceptance. Special attention is given to the need for a comprehensive support system for general education teachers, provided by specialists in correctional pedagogy, special education, and psychology, to assist them in navigating the inclusive education process.

For positive implementation, development and improvement of inclusive education in Kazakhstan, it is necessary to study the experience of leading foreign countries. For this reason, M. Maksimenko [9] looked at the inclusion of students with special educational needs in the United States of America. In several respects, the country's experience of implementing inclusive education is as follows:

- The enhancement of social policy is essential, as a systemic resolution of the issue requires active state involvement in establishing a qualitatively improved regulatory and legal framework.
- Reforming the educational system (defining the organisational and content bases of educational institutions).
- Training of professionals to work in inclusive educational institutions.

In response to the current issue of the interaction of children with special educational needs, S. Dzhabadova [10] observes that these interactions depend on multiple factors. These include the psychophysical development features of each learner enrolled in the classroom; perceptions that normally developing children and parents have towards learners with special educational needs; efforts that the classroom teacher and other personnel involved; and the level of cooperation among professionals. The problem of forming coherent teams in heterogeneous classrooms is acute in the context of insufficient competence of some educational workers. Kept away from the aspects mentioned above, educators and class teachers are required to pay attention to several important points. The students should establish positive relationships with each other and team spirit through parallel activities for extracurricular besides, on individual education programs for children with special educational needs. Individual curricular and children with psychophysical disabilities must be integrated during the process of learning. In this context, the long-term experience of other countries in organising inclusive education at all levels is particularly important. The Scandinavian countries have their specificity in this respect, which is close to the domestic one, due to the predominantly paternalistic models and technologies of social protection of the population. Traditionally, the Scandinavian countries are Finland, Sweden, Norway, Iceland and Denmark.

More effort should be directed on learning systems in the Scandinavian nations, and the part played by integration in the systems. The presented review of the scientific and theoretical advances made regarding inclusive education in these countries makes it possible to classify the academic literature according to institutional criteria. In one way or another, researchers note that the education systems in Scandinavian countries are highly democratized, humanized and globalized. Such attributes make indications for the promotion and intensification of Inclusion which is being seen as a fundamental part of their general education systems. Nonetheless, one must remember that, based on scholars' findings, no model in which a particular country practices inclusive education should be seen as the perfect model to be emulated in domestic systems of education [11].

To successfully integrate inclusive education into the general educational process in Kazakhstan, it is essential to develop a domestic model for implementing inclusive practices. This model should draw on the positive experiences of countries where inclusion has become an integral part of the education system.

The problems of inclusive education are vividly discussed in the works of foreign researchers: T. Salovita, J. Berhanu, K. Wickman, J. Kivirauma, K. Klemmele, G. Rinne, A. Arnesen, L. Lundahl, B. Persson and many others. In general, researchers in their work see inclusion as an embodiment of the concept of social justice. Educationalists argue that for several decades the main goal of educational policy in Scandinavian countries has been to ensure equal access to education for all children without exception [12].

The literature highlights several key challenges in the implementation of inclusive education [13]:

- Insufficient teacher preparation. Mainstream school teachers may consider themselves trained when in actual sense, they lack adequate knowledge, skills and techniques relevant to special education. Many fail to have the needed qualifications to both treat the impairments a child has and to place the child in a correct educational process.

- Societal resistance. Namely, the work establishes that there is still a social prejudice against children with special needs, manifested in such children experiencing developmental impairments. This includes such things as parents of children who do not have disability not wanting their children to be educated with special needs children.

- Inadequate funding. It is true that for inclusive educational institutions, there are many of financial concerns, such as inadequate funds to fund individually necessary technical reconstructions, as well as the absence of technical and educational equipment for assisting children with special educational needs.

The system of organising education in an inclusive classroom. The methodological problem of teaching in classes with special educational needs is manifested in the discrepancy between the pace of learning of such students and the requirements for learning outcomes that are common to all students, another - in the passivity of students in inclusive classes and the need to accept constant help from the teacher. Below are the stages of planning a differentiated lesson and the teacher's actions at each stage.

Stages of lesson planning:

1) Planning. Choice of materials; techniques/methods. Appropriateness of materials, forms and methods of work. Students' educational needs are evaluated, and learning activities are structured based on the outcomes of the pedagogical assessment.

2) Management of the educational process/classroom management. Effective work of a teacher involves solving a complex set of organisational, pedagogical and learning tasks, as well as managing students' behaviour, which is characteristic of any interaction in the classroom. Consequently, a teacher needs to find approaches and methods of work that enable him/her to control and maintain an orderly flow of learning activities. The teacher should structure his/her work to ensure that all established rules and procedures are followed; be prepared to respond to discipline problems and other situations that may disrupt the flow of the lesson; organise the time and physical space in the classroom to maximise the productivity of the lesson; maintain a positive and open atmosphere to enable students to learn new things, taking into account their learning styles, interests and preferences and special educational needs.

3) Implementing the teaching process. Methods of presenting new information are selected; the level of students' understanding of the material is monitored. The form of its presentation is adapted to the individual characteristics of the students to ensure effective formation of new knowledge, skills and abilities. Teaching material should be delivered effectively. Assignments and explanations of performance should contain sufficient information for the learner to understand what knowledge and skills he/she is expected to demonstrate. The learner's level of understanding should be monitored during the presentation of the material. Students should be helped to develop the thinking skills and personal learning strategies needed to complete the tasks. Tasks should be directly related to the topic of the lesson and aimed at achieving the learning objectives.

4) Assessment is an integral part of effective teaching:

- The learner must be actively engaged with the learning content. The educator continuously monitors the student's engagement with the learning content and encourages focus on the task when necessary.

- Appropriate adaptations or modifications to the instructional material are made (within reasonable limits) according to the individual and specific learning needs of the learner.

- The student's progress towards the identified learning goals is monitored on an ongoing basis. Up-to-date data on the learner's progress, level of mastery of the material and development of the skills and competencies envisaged by the subject are used to plan future work.

- Students should clearly understand the nature of the tasks and the methods for completing them. When teaching learners with special educational needs, it is essential to identify and build upon their strengths.

A lesson using differentiated teaching in an inclusive classroom might look like this (figure 1) [15]:

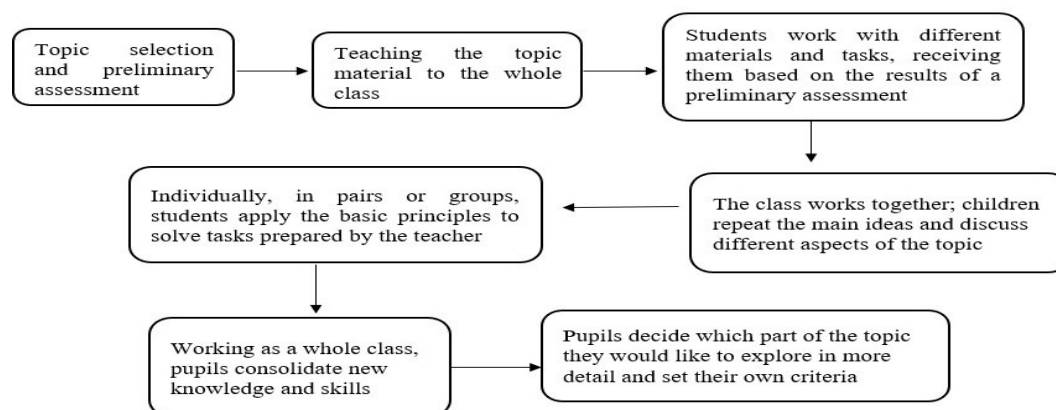


Figure 1 - Example of differentiated teaching in an inclusive classroom

Materials and methods. The pedagogical experiment was conducted based on the secondary school №73 in Karaganda from 18.01.2022 to 3.04.2022. 8 "A" (control classes) and 8 "B" (experimental classes) took part in the experiment. During the experiment, ten lessons were held for the students. Before the pedagogical experiment, a test was conducted in each class to assess the students' level of knowledge. The test included questions on different topics that the students had learned earlier in the class. The students were given questions with multiple-choice and extended response options. The school administration was also interviewed to identify the categories in which the students were studying under the "inclusive education" programme. Children with visual impairment, behavioural impairment, attention deficit disorder and diagnosed with mental retardation are studying in the inclusive education programme in this school. To implement the pedagogical research, tasks for independent solutions were developed, which included mini-tests with extended versions of answers, matching and calculation tasks.

For the pedagogical experiment, three students, recommended by the chemistry teacher, were selected and followed throughout the experiment. The students were in an inclusive education programme and were assigned to the 8 "B" experimental classes. All tasks and materials were of different levels of difficulty to suit each student's ability. The students helped each other in groups, which contributed to the development of the students' skills and abilities.

In the last lesson before the end of the pedagogical experiment, a final test was carried out, the results of which should show the success of the lessons in which different methodological techniques were used. In the final control work, the student's knowledge of chemical reactions, types of chemical bonds, and generalisation of knowledge about properties of the main classes of inorganic compounds was tested. This test helped to check the students' knowledge of chemistry and consisted of 20 questions.

The assessment of the learning environment for student groups, conducted by Zavyalova (2002), was used to evaluate indicators such as class mood, activity, efficiency, and conflict.

Results

1. Analysis of the learning outcomes

Entrance test results. The tasks required the ability to use theoretical knowledge and apply it in practice, but not all students were able to do this. According to the test results, all three students from the inclusive education programme received grades of 3 (satisfactory), and only students from the general programme received grades of 4 (good) and 5 (excellent). The test results were analysed and the students' problems were identified (diagram 1). The level academic of knowledge is 77,2 % in 8 "A" (control classes) and 63,6 % in 8 "B" (experimental classes).

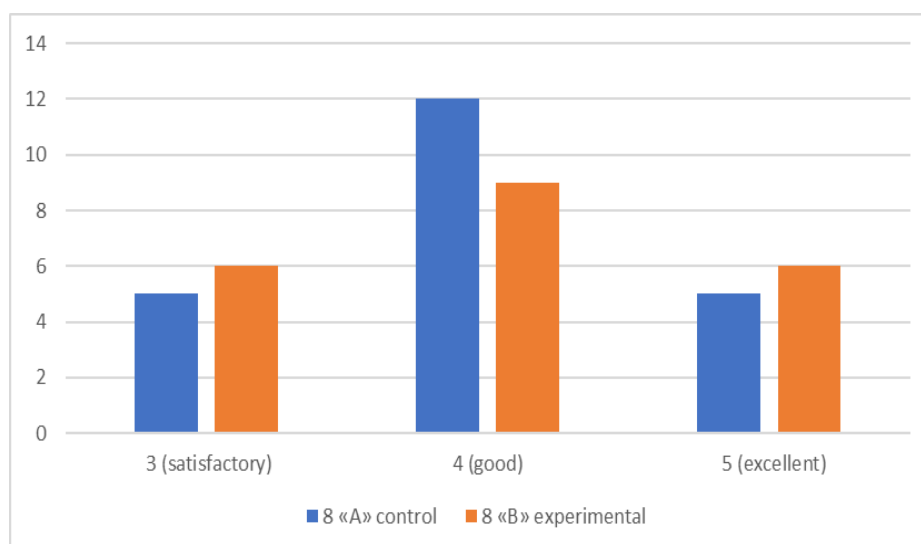


Diagram 1 - Results of the entrance test

Final test results. All three inclusive students scored 4 (good) in the final test results. The final test results indicate that the pedagogical experiment positively influenced the students' performance (diagram 2). The academic knowledge level reached 77.2% in 8 "A" (control classes) and 68.2% in 8 "B" (experimental classes).

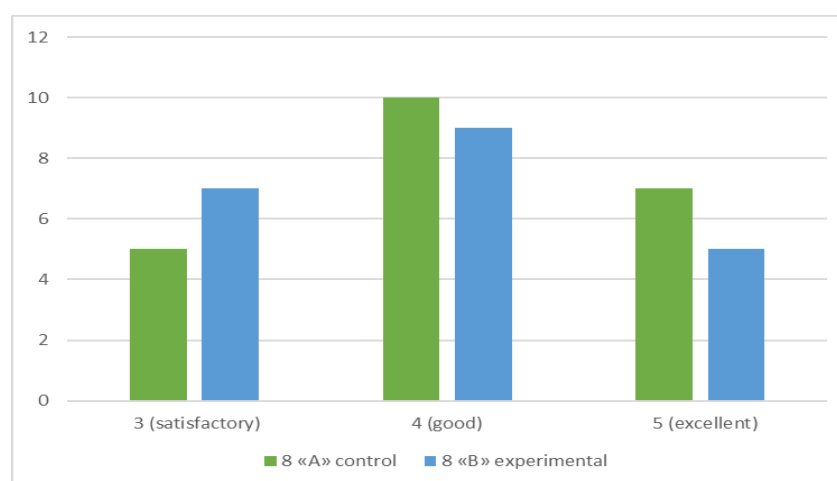


Diagram 2 - Results of the final test

The results of the final test indicate that the pedagogical experiment positively influenced student performance in inclusive classes.

2. The following data were obtained using the *learning environment assessment*.

Pre-test: The average obtained score of the control and experimental groups was 14, which represents the medium-low learning environment (diagram 3). In general, the groups can be characterized as inactive with irregular contact between members. The students lacked confidence in the group's support; they were restrained from taking public responsibilities and did not even want to be involved in the chemistry week event.

Post-test: In the case of the control group, the average score remained at 15 points, thus retaining the previous level of the learning environment as medium-low. However, the experimental group achieved an average score of 22 points, which is connected to the learning environment as the medium level of the learning environment and higher than the initial result. Again, the majority of

students confirmed that the group activity increased, leadership was encouraged during difficult situations, social activities were more interactive, and there was enthusiasm in attending lessons.

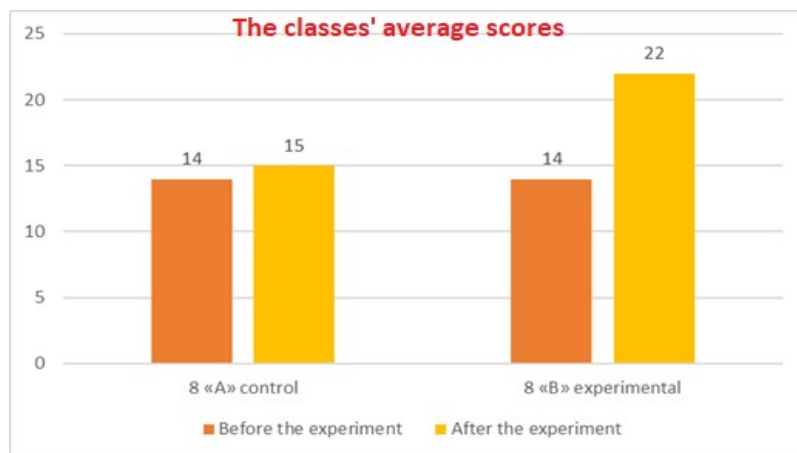


Diagram 3 - The learning environment of the student classes before and after the experiment

Discussion. In response to the current issues that exist in practice regarding the development of education for all, the development of the program to enhance the growth of inclusive education is relevant. Future developments in education to be inclusive wilfully depend on better legal and regulatory conditions, and financial, physical, technical, and human resource support. The fulfilment of inclusive education is determined by the child's achievements, parents' involvement and concern, and the availability of professional psychological, pedagogical, medical, and social assistance at any level of education.

As scientific studies by A. Sawatske et al [17] and F. Lani [18] have shown, the knowledge and ways of doing things that are 'discovered' by the students themselves, based on thoughtful work with specially selected and organised teaching materials, are the most firmly assimilated. Therefore, teaching methods that involve pupils in productive activities are used in special classes. The purposeful involvement of students in productive activities requires a certain amount of time on the part of the teacher. This is because task complexity within a given instructional unit can be adequately managed in addition to addressing the students' cognitive interests. The accomplishment of these elaborate tasks promotes students' independence in knowledge application and also increases their interest in learning[19].

A key component of chemical education in remedial classes is developing the ability to actively use and work with visual aids. The development of these skills occurs through focused and systematic efforts. Cards with questions significantly help to make a short, complete and structured outline of the lesson, which saves time, helps children to assimilate information in the course of solving practical problems, and helps children with impaired hand motor skills, as half of the necessary information is already available on the cards. For visualisation, the lesson is conducted with the help of a multimedia slide presentation containing diagrams, pictures and videos, which also has a positive effect on the productivity of the lesson and attracts attention [20].

Conclusion. The results of our tests show that students in the inclusive education program received positive marks. After calculating the percentages, it was found that the academic performance in chemistry in the experimental classes with inclusive students improved by 4.6%. The level of cohesion in the class has increased, not by much, but we can already say that the use of this methodology for teaching is acceptable. Inclusive students have poorly developed social activities, students communicate mainly with each other and have little contact with other pupils. By dividing the students into groups, we created a stressful situation for them in which they had to have more contact with other children. Initially, the children kept to themselves, but as time went on

the students became more and more integrated in the groups, which had a positive effect on the dynamics of the development of motivation to learn chemistry and social activity.

The main features of the chemistry teaching methodology include:

- Continuously engaging students in active cognitive activities through interactive teaching methods, such as organizing frontal training dialogues, standardized oral surveys, chemical dictations, and a variety of didactic games.
- Emphasizing the importance of both reproductive and productive independent work during chemistry lessons.
- Organizing teaching material using visual aids like graphics.
- Repeatedly revisiting the same chemical phenomena across different lessons, each serving a different purpose.
- Strengthening the practical relevance of the material by incorporating selected interesting facts and engaging information that highlights the connection between the content and real-life experiences of the students.

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