

# Preparation of the future preschool teachers for mathematical competence formation in inclusive education

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## Abstract

The article highlights new approaches to social adaptation of children with special needs. Based on the analysis of scientific and educational literature basic principles of inclusive education have been formulated. The study also affected educational field of Mathematics, so extra attention is required for training of the future preschool teachers in order to form mathematical competence in an inclusive education. The author stresses that an important element of formation mathematical competence is not only to create conditions for a successful educational inclusion, but the primary consideration needs of the child. The article highlights benefits of inclusive education and features of the children with special needs on the basis of normative documents which were referred to while conducting training in an inclusive class. It points out that one of the ways to optimize the process of forming mathematical competence among children with special needs is the use of experimental textbooks.

**Keywords:** preschool teacher, mathematical competence, inclusive education, normative documents, adaptation, optimize, educational paradigm.

## Przygotowanie nauczycieli przedszkola do rozwijania kompetencji matematycznych w edukacji włączającej

### Abstrakt

Artykuł przedstawia nowatorskie podejście do kwestii edukacji włączającej dzieci ze specjalnymi potrzebami edukacyjnymi. Ukazuje jej podstawowe założenia formułowane w oparciu o literaturę przedmiotu i wyniki badań. Omawia kluczowe składniki procesu kształtowania kompetencji matematycznych u dzieci w wieku przedszkolnym, wskazując m. in. na potrzebę profesjonalnego przygotowania w tym zakresie przyszłych nauczycieli. Ponadto, oprócz tworzenia odpowiednich warunków dla prawidłowego przebiegu procesu edukacji włączającej, istotne jest również uwzględnienie indywidualnych potrzeb dziecka. W artykule ukazano korzyści płynące z edukacji włączającej, opracowane na podstawie doświadczeń zgromadzonych podczas zajęć w grupach integracyjnych. Praktyka, wskazała również, że jednym ze sposobów optymalizacji procesu kształtowania kompetencji matematycznych u dzieci ze specjalnymi potrzebami edukacyjnymi jest stosowanie eksperymentalnych podręczników.

**Słowa kluczowe:** nauczyciel przedszkola, kompetencje matematyczne, edukacja włączająca, dokumenty normatywne, adaptacja, optymalizacja, paradygmat edukacyjny

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## **Підготовка майбутніх вихователів дитсадків до формування математичної компетентності в інклюзивній освіті**

### **Анотація**

У статті висвітлюються нові підходи до соціальної адаптації дітей з особливими потребами. На підставі аналізу наукової та навчальної літератури сформульовані основні засади інклюзивної освіти. Дослідження також стосується освітньої галузі математики, тому потрібно приділити додаткову увагу підготовці майбутніх вихователів дитсадків з метою формування математичної компетентності в інклюзивній освіті. Автор підкреслює, що важливим елементом формування математичної компетентності є не лише створення умов для успішної освітньої інклюзії, але, в першу чергу, врахування потреб дитини. У статті висвітлюються переваги інклюзивної освіти та характеристики дітей з особливими потребами на основі нормативних документів, на які робилося посилання при проведенні навчання в інклюзивному класі. Це вказує на те, що одним із шляхів оптимізації процесу формування математичної компетентності у дітей з особливими потребами є використання експериментальних підручників.

#### **Ключові слова:**

вихователь дитячого садка, математична компетентність, інклюзивна освіта, нормативні документи, адаптація, оптимізувати, освітня парадигма.

### **Introduction**

New approaches to social adaptation of children with special needs are closely related to the conceptual model of education in changing Ukraine. It is happening by educational system of reforms with the help of humanistic, learner-centered educational paradigm, where a dominant part is the focus on interests and needs of a child. Therefore, equal access for children with special needs towards a quality education is provided. Inclusive education has acquired actualization in order to increase basic education received by such children. Necessity of its development is reflected in the legislative documents of the state. The legal basis for the formalization of the term „inclusive education” and „people with special needs” is the Constitution of Ukraine, the laws of Ukraine „On preschool education”, „On education”, „On rehabilitation of the disabled in Ukraine”, „On foundations of social protection of disabled in Ukraine”, „On protection of childhood”, the decrees of the President of Ukraine dated on 20.03.2008, No. 244 „On additional measures of education quality improving in Ukraine”, dated 18.12.2007, No. 1228 “additional urgent measures to create favorable conditions for the life of people with disabilities” the order of the Cabinet of the Ministers of Ukraine dated 16.10.2008, No. 1352-p “On approval of the comprehensive plan for the education development in Ukraine for the period up to 2011, the Law of Ukraine „On State budget of Ukraine for 2010”, the Cabinet of the Ministers of Ukraine available from 03.12.09 No. 1482-p “On action plan approval for in-

clusive and integrated education implementation in secondary schools for the period up to 2012 and the Order of MES from 12.12.09 No. 1153.

Legislative documents define tasks for ensuring the disabled people rights, in particular, financing, logistics and scientific-methodological support of educational process (Zlenko, L.O., Gysak, R.V., Vakylenko. I.V., Pokrushka, V.O., 2013, p.78). The concept of inclusive education development declares the need for all school-age children involved in the educational process and underlines the need of educational conditions created for children with special needs in secondary schools (Kolypaeva, A. A., Savchyk, L.O., 2011, p.274). The implementation of inclusive education in Ukraine leads to the need for teachers' preparation towards work in an appropriate learning environment. The process of creating environment in which each student will be able to achieve success taking into account individual characteristics of each child, and his differences are a valuable experience for the number of competencies of the student's development which still depends on professional resources. Training of a future preschool teacher who, in spite of educational inclusion, should also exercise social inclusion of children with special needs in the team, is of particular importance. The reform also affected educational field of „Mathematics”, so extra attention is required for training of the future preschool teachers in order to form mathematical competence in inclusive education.

The analysis of recent research and publications on this issue has clarified some of the selected outstanding parts. Problems of inclusive education and disabled children upbringing at schools have been in the center of scientific interest of many researchers during last two decades, including scientists of the National Academy of Pedagogical Sciences of Ukraine (The Institute of Special Pedagogy: A. Kolupaeva, N. Dyatlenko, N. Sofiy, A., Taranenko, S. Efimova, S. Litovchenko, T.Sak, T. Skrypnyk, Y. Naida). They have developed and implemented the course „Introduction to inclusive education” in the educational process of the university.

The discipline „fundamentals of inclusive education” is included in the curricula of several universities of Ukraine, namely: Borys Grinchenko Kyiv University, National Pedagogical Dragomanov University, Kyiv Regional Institute of Postgraduation Education of Pedagogical Staff, Vinnytsia State Pedagogical University named after Myhailo Kotsiubynskiy, Khmelnytsky Institute of Social Technologies, Sumy State Pedagogical University named after A. S. Makarenko, Chernihiv Regional Institute of Postgraduate Pedagogical Education name K. D. Ushinsky, Chernihiv National Taras Shevchenko Pedagogical University.

Some theoretical and practical aspects of the problem of training future teachers for work in the conditions of inclusive education are reflected in the

works of such scientists as: B. Polischuk, K. Forlin, L. Aidol, A. Pryshlyak, T. Galadet (Kolypaeva, A.A., Sophiy, N.Z., Nayda, Yu.M., 2007, p.8-10).

Despite contemporary research in this area and public necessity, the preparation of teachers towards work in inclusive education system still has not been sufficiently investigated in Ukrainian education science.

The aim of the article is to study basic ways of preparation future pre-school teachers for mathematical competence formation in inclusive education.

Major provisions of inclusive education were identified, based on educational scientific literature analysis. According to the UNESCO inclusive education is „the process of treatment and responses to diverse needs of the learners through their participation in learning, cultural activities and community life, and reduction of the exclusion in education and educational process” (Kolypaeva, A.A., Savchyk, L.O., 2011, p.87). The aim of inclusive education is to improve the learning environment in which the teacher and his students are opened for using a variety of methods, forms of training that will ensure the needs of students and ensure respect for their abilities and opportunities to be successful.

According to the interpretation of the notion in the concept of inclusive education development “inclusive education is a complex process of ensuring equal access to quality education for children with special educational needs by organizing their learning in secondary schools on the basis of personality-oriented teaching methods, taking into account individual peculiarities of the educational-cognitive activity of these children” (The concept of inclusive education, 2010).

The basis of inclusive education is the ideology which excludes any discrimination against children, ensures equal treatment of all people, but also creates a special environment for children with special needs (Kolypaeva, A.A., Savchyk, L.O., 2011, p. 274). The aim of inclusive education is to implement the rights of children with special educational needs in education by their place of residence, socialization and integration into society, attracting families to participate in the educational process. The main objectives of inclusive education, as convincingly proved by U.Kawun are:

- getting education at comparative level in the environment of healthy peers by disabled children according to the state standard of general secondary education for children with special educational needs;
- ensuring entire children’s development and implementation of their abilities;
- educating and improving the environment created for the needs of satisfaction of students with special abilities;

- creating a positive climate in schools with inclusive education, active interpersonal communication formation between children with special educational needs and other students;
- providing the differentiated psychological and pedagogical support of children with special educational needs;
- assistance over families who raise children with special educational needs, an involvement of parents in the development of individual plans and training programs (Kawun, U., 2007, pp.4-9).

These tasks performance makes it possible to form mathematical competence of students. Scientists interpret this mathematical competence as personal characteristics of the subject, which are characterized by the presence of mathematical literacy and experience of an independent mathematical activity, willingness to apply them in a new situation, but also focus on self-development. Mathematical competence directly depends on the level of individual mathematical activity, which is characterized by:

- cognitive activity and high need for achievement;
- ability to articulate some of the reality problems in the form of mathematical problems;
- evidence-based, logical and rational solution of mathematical problems;
- ability of self-control and self-analysis of mathematical activity;
- self-esteem (Strilets, S.I., 2012, p. 380).

Taking this into account, an important element in the formation of a child mathematical competence is not only a condition created for a successful school inclusion, but the primary needs of a child. Inclusive education is based on the psycho-educational study of the potential and characteristics of the disabled child development, anticipated possible difficulties in the process of learning and ways to overcome them, socio-educational interaction of the educational institution staff. Scientists have identified benefits of inclusive education. On the basis of their project work it is possible to:

- individualise strengths and talents development;
- accept all children, with no exception, to secondary school system and society;
- work to achieve individual goals while participating in class and community life;
- involve parents in the learning process and school life;
- develop a culture of respect and school affiliation, have an opportunity to learn and respect different abilities of others;

- develop friendship with other children;
- have a positive impact on the school, community, and respect diversity and inclusion on a broader level (Kawun, U., 2007, pp. 4-9).

The specific feature of educational process with disabled children is its correctional orientation. The curricula provide three to eight hours per week (number of hours depends on appropriate psychological, medical and educational consultations) for conducting remedial and developmental classes on the basis of individual progress. These hours are taken into account when the maximum permissible weekly teaching load allows children with special educational needs to be expended.

The success of such training and correction educational work of students with mental and physical deficiencies depends mainly on the teacher's professional competencies and skills in case of inclusive education. Professional training of future teachers is therefore an important factor in a child education. Researchers N. Radionova, A. Trapit-syna, I. Hafizullina define educational tasks which must be performed by a teacher while working with disabled children in order to:

- see, understand and know psycho-educational regularities and peculiarities of the age and individual development of children with special educational needs in terms of inclusive education environment;
- be able to select optimal ways of inclusive education organized, design the learning process for the joint education of children with special educational needs and without them;
- implement various methods of pedagogic interaction between all participants of the educational process;
- create an environment that contributes to correction and comprehensive development in conditions of an inclusive learning environment;
- use educational institution resources and opportunities directed towards children with special needs and their peers without outstanding features children without such features;
- engage in pedagogical design and implement professional development training, education and development of children with special educational needs as a part of inclusive learning environments (Fert, O., 2009, pp. 271-276).

The course “Inclusive education” has been introduced at Chernihiv National Taras Shevchenko Pedagogical University with the aim of future preschool training program of teachers in the system of inclusive education according to the education reform (the Department of Elementary Education). The aim of the course is mastering the foundations of an inclusive education divided into sections of theory and methodology, legal and organization and methodology. It is as-

sumed that as a result of the study the students will acquire the following knowledge and skills:

- knowledge of main provisions of inclusive education, particularly in the process of implementation of inclusive education in the national education system, build strategies for cooperation with fellow teachers and the parents of students with special needs;
- ability to communicate effectively with other teachers, specialists, parents of students with special educational needs, develop individual learning curricula for children with special needs, implement necessary adaptation/modification of curriculum and the teaching methods, use effective communication strategies while interacting with the participants of the educational process.

The development of this course will make it possible for the future preschool teacher to be professionally competent in teaching children with special needs at secondary schools. There is also an urgent need for future preschool teacher training programme to lecture each subject, particularly Mathematics, but also referred to other fields to form mathematical competence among their students.

The future preschool teachers training scheme in mathematical competence formation in inclusive education involves an introduction to teaching a methodical complex of the learning area of Mathematics for children with special needs. Class inclusive education is implemented with standard curricula, programs, textbooks and materials, recommended by the Ministry of Education and Science of Ukraine for secondary schools, including special tutorials. The standard curriculum assumes an introduction of mathematical competence subject for students. This competence is manifested in the following features:

- holistic perception of the world, understanding the role of mathematics in reality;
- recognition of the problems, which are solved by using mathematical methods;
- ability to solve a story problem, to reason logically, perform steps according to the algorithm and justify their actions;
- ability to use mathematical terminology, symbolic and graphical information;
- ability to navigate the plane and space;
- ability to apply computational skills and experience in the measurement of quantities in practical situations (Educational programs, 2013, p. 139).

The educational process in an inclusive educational classroom at secondary schools is carried out according to the curriculum of the school, based on the standards of curricula at secondary schools approved by the Ministry of Educa-

tion and Science of Ukraine and taking into account individual peculiarities of the educational-cognitive activity of children with special educational needs. An individual educational plan for children with special educational needs (hereinafter referred to as an individual learning plan) with the conclusion of the psychological-medical-pedagogical consultations is developed based on the curriculum. The individual learning plan defines a list of the training subjects, sequence of their study, number of hours spent on studying each subject according to the year of study and weekly hours. The plan accounts for additional hours of individual and group courses, elective courses, electives, etc.

One of the ways to optimize mathematical competence formation process among children with special needs is the use of experimental textbooks. The Ministry of Education and Science of Ukraine recommends to use the textbook by Skvortsova S.A. „Mathematics” as an additional mathematics textbook. A specified tutorial consists of 4 parts accompanied by workbooks to each the tutorial. It contains a basic set of information on mathematics, necessary for full assimilation of the course, the development of intellectual and creative abilities of the child. The material is arranged systematically, according to the age of students. On the structure, style, and methodological approaches of the textbook it differs in many aspects from the current mathematics textbooks for elementary schools. The main function of this tutorial is to guide all kind of students into cognitive activity, developing observation, thinking and range of practical actions that meet the main goals of developmental education – focus on the overall student development. This significant role is played by the elements of the problem method of presenting knowledge based on problematic tasks. Each task is focused on an intellectual development of the child. With this matter, a comparing or contrasting technique is widely used both on reproductive and creative level. The educational material has an interesting character and is used not just as an acquisition of knowledge and skills, but also as a diverse child’s intellectual, emotional and aesthetic mental activity inclusion in educational process. Assignments and instructions help organize dialogue with the students and the process of reasoning. This tutorial makes it possible not to take only into account the individual characteristics of students, but also to ensure the effectiveness of teaching children with special needs (Skvortsova, S.O., 2011, p.80).

While forming mathematical competence of a student the teacher should know the features of his psycho-physiological development, be able to apply the material adequately to the child level, in particular when the child with special needs lacks of readiness of all components of the psyche and above all, has a disruption of the cognitive processes. Diversity in the development of sensation, perception, memory, imagination, speech or attention is clearly revealed. Such



children have reduced ability to generalize information while solving intellectual problems. Teaching this category of children is directed primarily at a formation of general social-adaptive skills, practical preparation for life in society, communication and appropriate social behavior. It is common for students with special needs to have the disorders in the structure of the so-called „prerequisites intelligence, covering health, cognitive activity, emotional and volitional components of activity, attention, memory, perception, whereas the „actual intellect” (various forms of mental activity, especially verbal-logical thinking) retains a relatively high ability to develop, which is implemented in the process of adequate and timely corrective actions. It is also necessary to consider that the child should be given more time to master certain skills. The teacher should systematically study the results of the doctors’ consultations and take them into account in the educational planning process.

However, deviations in the development of an individual which requires attention from the teacher and his constant interaction with health care professionals can be found. Therefore, future preschool teacher must possess the necessary knowledge and skills:

- get acquainted with the individual’s history, to have an idea about the main types of impaired mental and physical development of the child;
- examine the state of attention, fatigue and pace of each child;
- take into consideration the level of hearing, sight, especially motor skills and physical development of the student. The teacher should be familiar with devices used by his students with visual and hearing impairments, to examine suitability of a hearing aid, to monitor the cleanliness of the glasses, learn how to identify, assess, and create a learning environment for children with different needs. To understand the importance of appropriateness of work with children, family members, establishment of partner relations with them it is crucial to:
  - learn about the basic principles and strategies of collective team work;
  - learn how to observe children and assess their development in the classroom;
  - finish the lesson, when children are tired or become inattentive;
  - learn how to adapt the curricula, methods, materials and environment to the specific needs of children;
  - create optimal conditions for dialogue, to contribute to the establishment of friendly relations between children and formation of a team;
  - help children develop building and maintaining relationship experience in society, skills of adaptation to the social environment (Raduonova, N.F., Tryaputsuna A.P., 2006, pp. 8–9).

In order to form such skills and knowledge of a future preschool teacher the specific training system should be established, learning process at the expense of other students knowledge degradation should be avoid. According to the curricula for secondary schools individual plan should be developed for children with special needs. A separate strategy of the educational upbringing process has the aim to plan individual developing formula of the child with special educational needs, that will help to adopt the environment to the child's needs, provide additional services and support in the learning process, organizing constant monitoring of the child's success. The individual plan is developed by the group of experts (the headmaster's assistant, teachers, teacher assistant, psychologist, speech pathologist etc.) with an emphasis of parents' involvement or the person who takes their place to define strategies and ways of the teaching process. The individual plan includes general information about the student, system of additional services, types of information and modification, individual plan and if it is necessary the schedule.

To sum it up, forming mathematical competence should be carried out according to the curricula, which are adapted to the child's needs. That is why it's important to stress on the education individualizing referred to traditional education while training future preschool teachers.

Still it is worth paying attention to the evaluation of mathematical competence relevant to the child's development. Evaluation achievements of children with special educational needs are carried out in accordance with the criteria of assessment of the student's learning process and the level of an individual educational program.

## **Conclusions and perspectives direction**

Observing current trends in implementation of inclusive education, there is a need for training of future preschool teachers. It is important to focus on the peculiarities of psycho-physiological development of these children during a future preschool teachers training preparation of teachers towards formation of mathematical competence of children with special needs. Thus a necessary prerequisite to a successful formation of mathematical competence can be considered as the awareness of the future teacher's learning characteristics of children with special needs in the traditional system of learning. In our opinion, the system of evaluation of educational achievements of children with special educational needs should be stimulating. Creation of a portfolio is an appropriate way to track the educational progress of the child. It can be formed and determined by the teacher. The information collected in the portfolio will help to make an objective assessment of the child, facilitate interaction with parents and develop individual programs for a successful progress of the student.

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