



Chapter IV. PROBLEMS OF EDUCATION AND UPBRINGING OF CHILDREN IN EDUCATIONAL INSTITUTIONS OF MOUNTAIN REGIONS

doi: 10.15330/msuc.2024.31.113-118

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УДК 373.3.015.31:688.727.9

ОСОБЛИВОСТІ ЗАСТОСУВАННЯ LEGO-ТЕХНОЛОГІЙ В ОСВІТНЬОМУ ПРОСТОРІ НОВОЇ УКРАЇНСЬКОЇ ШКОЛИ: ТЕОРЕТИЧНИЙ І ПРАКТИЧНИЙ АСПЕКТИ

Анотація. Стаття присвячена проблемі застосування LEGO-технологій в освітньому просторі Нової української школи. На основі вивчення джерельної бази та результатів проведеного дослідження зроблено висновок, що застосування LEGO в освітньому процесі початкової школи дає змогу вчителю розкрити пізнавальні можливості кожного учня, який є суб'єктом освітнього процесу. Доведено, що використання LEGO є ефективним під час розвитку мовленнєвих, математичних, природничих, технологічних, соціальних і здоров'язбережувальних, громадянських та історичних компетентностей і «навчання через гру» можливе з конструктором LEGO. Окрім того, LEGO-технології на уроках у початковій школі активізують розвиток пам'яті, уваги, уяви, логічного мислення, сприяють встановленню здобувачами освіти закономірностей. Як показали результати нашого дослідження, учителі початкових класів м. Коломиї ефективно використовують LEGO-технології на уроках під час ранкових зустрічей, для організації навчальної та дослідницької діяльності; для актуалізації опорних знань та життєвого досвіду учнів; для сприймання і осмислення навчального матеріалу; для узагальнення та систематизації знань, умінь та навичок учнів; для рефлексії тощо. Найчастіше на уроках «Я досліджую світ» педагоги застосовують LEGO-технології для узагальнення та систематизації знань – 83,3%, для рефлексії – 66,7%, під час проведення ранкових зустрічей – 55,6%, для актуалізації опорних знань, умінь та навичок – 47,2%, для сприймання та осмислення нового навчального матеріалу – 36,1%. LEGO-технології дають змогу організувати як фронтальну роботу молодших школярів, спрямовану на вивчення обраних тем, різних предметів у межах класно-урочної системи, так і самостійну творчу роботу, проектну форму організації занять. Організація навчально-ігрової діяльності вимагає від учителя відповідної методичної компетентності та високої майстерності, щоб знайти у грі з LEGO будь-який метод навчання.

Ключові слова: LEGO-технології; молодший школяр; початкова школа; учитель початкових класів; гра; інтегрований курс «Я досліджую світ»; формування мовленнєвих, математичних, природничих, технологічних, соціальних і здоров'язбережувальних, громадянських та історичних компетентностей.

PECULIARITIES OF USING LEGO-TECHNOLOGIES IN THE EDUCATIONAL SPACE OF A NEW UKRAINIAN SCHOOL: THEORETICAL AND PRACTICAL ASPECTS

Abstract. The article is devoted to the problem of using LEGO technologies in the educational space of the New Ukrainian School. On the basis of the study of the source base and the results of the research, it is concluded that the use of LEGO in the educational process of primary school allows the teacher to reveal the cognitive capabilities of each student who is the subject of the educational process. It is proved that the use of LEGO is effective in the development of speech, mathematical, natural, technological, social and health, civic and historical competences and that «learning through play» is possible with LEGO. In addition, LEGO technologies in primary school lessons activate the development of memory, attention, imagination, logical thinking, and help students to establish patterns. According to the results of our study, primary school teachers in Kolomyia effectively use LEGO technologies in the classroom during morning meetings, to organise learning and research activities; to update students' background knowledge and life experience; to perceive and comprehend educational material; to summarise and systematise students' knowledge, skills and abilities; to reflect, etc. Most often, teachers use LEGO technologies in «I Explore the World» lessons to summarise and systematise knowledge (83.3%), for reflection (66.7%), during morning meetings (55.6%), to update basic knowledge, skills and abilities (47.2%), and to perceive and comprehend new learning material (36.1%). LEGO technologies make it possible to organise both frontal work of younger students aimed at studying selected topics and various subjects within the classroom system, as well as independent creative work and



project-based learning. The organisation of educational and gaming activities requires the teacher to have appropriate methodological competence and high skill to find any teaching method in a LEGO game.

Keywords: LEGO-technologies; primary school student; primary school; primary school teacher; game; integrated course «I Explore the World»; formation of speech, mathematical, natural, technological, social and health, civic and historical competences.

INTRODUCTION

Formulation of the problem. In the context of reforming primary education and implementing the New Ukrainian School (NUS) in the direction of humanising education, primary school teachers are required to find the optimal combination of means, methods and forms of pedagogical influence on students, and to awaken in them a strong interest in learning about the world. According to the New Ukrainian School Concept, child-centeredness plays a leading role in primary education. This principle is understood as the maximum approximation of education and upbringing of a particular child to his or her essence, abilities and life plans. The State Standard of Primary General Education envisages the organisation of the educational process using an activity-based approach on an integrated subject basis with a predominance of game methods in the first cycle (grades 1-2) and an integrated subject basis in the second cycle (grades 3-4) (State Standard of Primary Education in Ukraine 2018). The main features of learning in the New Ukrainian School Concept are as follows: «learning will be organised through activities, playful methods both in and out of the classroom...» (New Ukrainian school: a guide for teachers, 2017, pp. 19-20). According to the State Standard of Primary Education, 'the purpose of primary education is the comprehensive development of the child, his or her talents, abilities, competences and cross-cutting skills in accordance with age and individual psychophysiological characteristics and needs, the formation of values, the development of independence, creativity and curiosity' (State Standard of Primary Education in Ukraine, 2018).

An important task of modern education is to rethink the factors that determine the quality of the educational process in primary school, to introduce innovative teaching tools, methods and technologies, among which LEGO is of great importance, which modern scientists consider as a teaching tool, method and technology.

The analysis of recent research. Despite the fact that the issue of using LEGO in the educational process of primary school has been studied by various scholars (O. Roma is the author of the dissertation «Preparing Primary School Teachers in the System of Postgraduate Education for the Implementation of Game-Based Teaching Methods with LEGO» (Roma, 2020); the importance of play for teaching younger students is highlighted in the works of P. Koposov (2021), O. Savchenko, O. Dychkivska, and Bibik. Koposov (Koposov, 2021), O. Savchenko, I. Dychkivska, N. Bibik (Bibik, 2022; New Ukrainian school, 2017); LEGO as a means, method and technology of teaching in primary school was considered by T. Zaporozhchenko, K. Myroshnychenko (Zaporozhchenko, & Myroshnychenko, 2023); features of LEGO technologies as a means of development of primary school students were analysed by A. Rakhmanina (Rakhmanina, 2021); L. Romanenko, N. Volovenko highlighted the use of LEGO technology in primary school mathematics lessons (Romanenko, & Volovenko, 2020); methodological recommendations for the use of LEGO in the educational space of the NUS were proposed by O. Roma. Roma (Playing in a new way, studying in a different way, 2018; Six bricks in the educational space of the school, 2018), N. Sirant (Sirant, 2020), etc.), there is a need for a deeper analysis of the problem of using LEGO technology in the educational process of primary school.

AIM AND TASKS RESEARCH

The aim of the article is to reveal the main aspects of using LEGO construction sets in primary school in the context of the New Ukrainian School.

RESEARCH METHODS

The following methods were used in the study: analysis of scientific sources on the use of LEGO construction sets in primary school; empirical research methods: observation, comparison, questionnaire survey of primary school teachers; methods of statistical analysis: correlation analysis, content analysis.

RESEARCH RESULTS

The State Standard (2018) provides for the organisation of the educational process of the New Ukrainian School using an activity-based approach on an integrated basis (State Standard of Primary Education in Ukraine, 2018). The NUS concept directs teachers in their work with younger students to make extensive use of the latest technologies, methods, tools and forms of learning based on game and research activities (New Ukrainian School, 2017). The importance of game activities in the organisation of the educational process with younger students in psychology and pedagogy has been proven both at the theoretical and practical levels. However, the methodology of organising educational and game activities requires even more systematisation and coverage due to the fact that this aspect has reached the level of not only the personal initiative of a scientist or teacher, but has become a requirement of regulatory documents on the organisation of the educational process in primary school (Bibik, 2022; Koposov, 2021; Roma, 2020).

Taking into account the factors of quality primary education: «full and timely coverage of all children of primary school age with education; diverse use of the achievements of the preschool period; modernisation and improvement of the educational environment; introduction of methods of personality and competence-based learning, education and development of younger students; technological teaching methods» (New Ukrainian School, 2017), we can conclude that a necessary condition for achieving quality results in primary education is possible only if the game is introduced into the educational process of primary school.



According to the research of O. Roma, it was «with the introduction of the NUS Concept and the signing of the Memorandum of Understanding (2018) between the Ministry of Education and Science of Ukraine and The LEGO Foundation that a new educational strategy based on the integrative approach of «learning through play» entered the professional activity of primary school teachers, which combines child-oriented, accompanying and teacher-oriented learning in accordance with the characteristics of playful learning experiences and combines active learning, experimental and guided discovery learning, inquiry learning, problem-based learning, project-based learning» (Playing in a new way, studying in a different way, 2018; Roma, 2020, p. 72-73).

The integrative approach of «learning through play» focuses primarily on the teacher's use of any objects and materials from the environment to create a playful situation, but the basic means by which playful methods acquire their special educational and developmental capabilities are LEGO bricks. Let's focus on the general characteristics of LEGO bricks resources for the comprehensive development of children in educational institutions of Ukraine.

In accordance with the Memorandum of Understanding between the Ministry of Education and Science of Ukraine and the LEGO Foundation on cooperation in education and science, in order to provide quality and sustainable support for the implementation of the New Ukrainian School Concept, the LEGO Foundation has supplemented the educational environments of educational institutions with Six Bricks and LEGO Play Box sets. The LEGO game sets were able to implement the principles of the State Standard of Primary Education: the value of childhood, the joy of learning, and the development of the child's personality (State Standard of Primary Education in Ukraine, 2018). LEGO constructors have become universal technologies in the educational process of the NUS and have enabled teachers to explain educational material to younger students in a clear and accessible way, to develop critical thinking skills, speech, memory, attention, and the ability to work in a group, as the main method of teaching with LEGO is the principle of «learning through action» (Six bricks in the educational space of the school, 2018).

LEGO Education has offered the Ukrainian educational community new opportunities and practice-oriented tools for learning through play, which ensure the continuity of the educational approach throughout the entire period of study, starting from preschool. Such solutions stimulate the natural curiosity of each student, help develop children's self-confidence and ensure the formation of competencies that will be necessary in the future.

According to N. Sirant, the prospect of using LEGO technologies in the educational process is due to its high educational potential: multifunctionality, technical and aesthetic characteristics, and use in various play and learning areas. The use of LEGO technologies will take the educational process to a new level (Sirant, 2020, p. 173).

According to A. Rakhmanina, by using LEGO educational sets in the classroom, teachers can teach children to cooperate and interact in a team, develop communication and critical thinking skills. In addition, students learn to set goals for themselves and find real ways to achieve them by applying cognitive skills and information retrieval, rather than reproducing the algorithm of actions proposed by the teacher (Rakhmanina, 2021, p. 208).

In N. Bibik's research, it is noted that «game activity is not artificially separated from the holistic educational process of the primary level», and the game «is not considered autonomously, but on the basis of integration with other activities and organisational forms with their interpenetration: educational and labour, educational and sports, leisure, etc.» (Bibik, 2022, p. 83).

The most commonly used game sets in primary school lessons are Six Bricks (the so-called «6 bricks»), which are part of the LEGO DUPLO set. As O. Roma rightly notes, «the LEGO constructor «grows» with the child», that is, children are first introduced to LEGO DUPLO (Six Bricks) and gradually get acquainted with LEGO SYSTEM (Roma, 2020, p. 72-73).

In order to study the effectiveness of the use of LEGO constructors, we conducted a survey among primary school teachers of lyceums in Kolomyia (Ivano-Frankivsk region) using empirical and statistical research methods. Based on the results of the survey, it was concluded that teachers most often use LEGO DUPLO («Six Bricks») in the educational space of the NUS (Fig. 1).



Fig. 1. The results of a survey of primary school teachers in Kolomyia on the use of LEGO sets in the educational process

According to the survey results, the use of Six Bricks in the educational process of primary school enables younger students to acquire emotional, social, creative, cognitive and physical development. We agree with the opinion of the compiler of the manual «Six Bricks in the educational space of the school» O. Roma that ««Six Bricks» is a practical tool and an effective means of implementing game and activity-based teaching methods in primary school it is not a fixed set of tasks and instructions, but an open system that encourages students to make discoveries, explore, experiment, look



for their own answers to problem situations, set goals and develop an action plan, create and improvise to their heart's content» (Six bricks in the educational space of the school, 2018).

According to our observations of the educational process in primary schools in Kolomyia, «Six Bricks» exercises develop the skills of primary school children related to their perception of the world around them through sensory systems: visual-spatial perception; visual memory and recognition; auditory recognition and memory; touch recognition; fine motor skills; and coordination of children's movements. All of these visual recognition skills are necessary to prepare for formal learning of the Ukrainian language, Math, the integrated course «I Explore the World», and Art. The effectiveness of LEGO in the NUS educational space has been proven by time and the experience of European countries.

Teachers, methodologists, scientists, and trainers have described the possibilities of using LEGO in primary school. According to the results of the study, the majority of teachers - our respondents - indicated in their questionnaires that the didactic possibilities of using LEGO sets are most effective in the lessons of the integrated course «I Explore the World» and Math (Fig. 2).

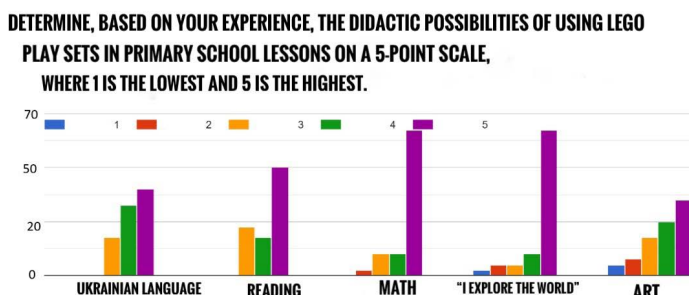


Fig. 2. The results of a survey of primary school teachers in Kolomyia on the didactic possibilities of using LEGO sets in the classroom

Teachers said that they usually use LEGO in primary school lessons to develop the cognitive sphere and emotions of younger students: memory («Memorise» exercise), thinking («Build with a cover»), sensation («Sorting – Folding»), perception («Skip the count»), attention («Understand each other», «Copy», «Spy game»), imagination («Build what you can», «Patterns», «What is it?»); development of organisational skills: working in a team («High Tower»), in small groups («Artists»), looking for a common solution («Skilful Fishermen»), working independently (Create - Finish), negotiating («Build without stapling»), respecting the opinion of others («Responding with bricks»), the ability to cooperate («The non-existent animal»), being proactive («Barriers»), communicating with classmates («Bricks with character»); competences: mathematical, language, natural, environmental, cultural, social, etc.

To develop competencies in the language and literary area of primary school education, the competency-based learning methodology «Six Bricks», «Playing in a New Way to Learn Differently» and other methodological guides provide exercises for learning the letters of the alphabet, word composition, stress, sound-letter analysis of a word, vowels and consonants, word structure, apostrophe, rules for writing dialogue, sentence structure, parts of speech, composing text, descriptions, etc.

The use of LEGO SYSTEM in the educational process of the New Ukrainian School is seen as a means of supporting creative thinking and developing coherent speech of younger students. This construction set has more potential for play and more opportunities for use in primary school lessons.

In the study, David Gauntlett describes the LEGO SYSTEM and its importance in the educational space: "1. A connecting set of parts: connections arise easily, sometimes unexpectedly. 2. Low initial level of skills. 3. An environment for mastery. 4. The ability to create something where there was nothing before. 5. An open system with endless possibilities. 6. Belief in the potential of children and adults and their natural imagination. 7. Belief in the value of creative play: respect for play as a powerful tool for learning and development. 8. A supportive environment: different ideas can be tried and experimented with, but without negative consequences, usually one good idea leads to another. 9. The LEGO system grows with the person: from the smallest child to the adult user. 10. The LEGO system also extends beyond the individual: at all levels of interaction with LEGO, from Duplo® to the AFOL LEGO world, LEGO bricks are a social tool that fosters connection and collaboration" (Gauntlett, 2014). As our observation of the educational process in primary schools in Kolomyia has shown. Kolomyia, these characteristics are taken into account by local teachers. In particular, they noted that the LEGO SYSTEM construction set provides more opportunities for use in the education and development of younger students, the sets contain small parts of different sizes, shapes, colours and plates. Important elements of the set are personalised figures with which students can recreate the plot of a fairy tale, story, fable, etc.

The formation of junior schoolchildren's mathematical competence in the NUS educational process is realised through the development of thinking, the ability to recognise and model processes and situations from everyday life that can be solved using mathematical methods, as well as the ability to make informed choices. One of the means of implementing the tasks of mathematical education in primary school is LEGO DUPLO – «Six Bricks» and LEGO SYSTEM. The effectiveness of their application was studied by N. Volovenko, T. Zaporozhchenko, K. Myroshnychenko, K. Romanenko, H. Svyrydenko, T. Fefilova. Scientists advise to consider the use of LEGO constructors along the following content lines: «Numbers, actions



with numbers. Quantities.»: formation of numbers and their names, comparison of numbers, composition of numbers, acquaintance with arithmetic operations, permutational and connecting laws of addition, establishing the relationship between parts and the whole; «Geometric shapes»: orientation on the plane and in space, modelling geometric shapes; «Expressions, equations, inequalities»: expressions, relations of equality and inequality; «Working with data»: to build bar and line graphs; «Mathematical problems»: creating models for problems, etc. (Playing in a new way, studying in a different way, 2018; Zaporozhchenko, & Myroshnychenko, 2023; Romanenko, & Volovenko, 2020).

The modern educational space of the NUS provides for the cross-cutting integration of seven educational areas of the State Standard of Primary Education, including: language and literature, mathematics, natural science, technology, informatics, social and health, civic and historical education. The use of LEGO DUPLO – «Six Bricks» and LEGO SYSTEM is possible in all educational fields and forms of the educational process, including the integrated course «I Explore the World» (Fig. 3).

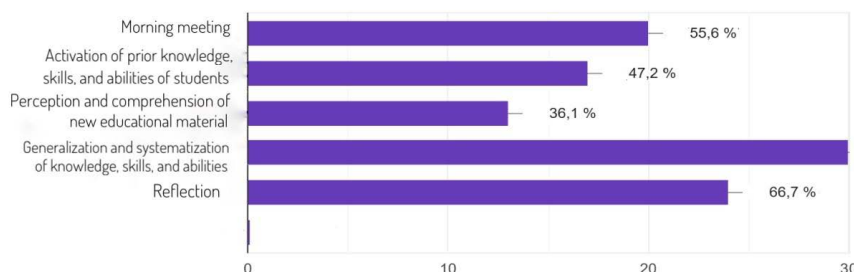


Fig. 3. Results of a survey of primary school teachers in Kolomyia regarding the use of LEGO play sets in lessons of the integrated course «I Explore the World»

As the respondents noted, LEGO technologies can be effectively used in lessons during morning meetings, for organizing educational and research activities; for updating basic knowledge and life experience of students; for perceiving and understanding educational material; for generalizing and systematizing students' knowledge, skills and abilities; for reflection, etc. Most often, in the lessons "I explore the world" teachers of Kolomyia use LEGO technologies for generalizing and systematizing knowledge - 83.3%, for reflection - 66.7%, during morning meetings - 55.6%, for updating basic knowledge, skills and abilities - 47.2%, for perceiving and understanding new educational material - 36.1% (Fig. 3). LEGO technologies make it possible to organize both frontal work of younger schoolchildren aimed at studying selected topics and various subjects within the classroom system, as well as independent creative work and a project-based form of organizing classes.

CONCLUSIONS AND PROSPECTS OF FURTHER RESEARCH

The educational process of the New Ukrainian School is increasingly using the latest modern methods, techniques, tools and technologies. Today, child-centredness and the joy of a child's exploration of the world around them are important for the implementation of any educational reforms. The use of LEGO in the educational process of primary school allows the teacher to reveal the cognitive capabilities of each student who is the subject of the educational process. It has been proven that the use of LEGO is effective in the development of speech, mathematics, science, technology, social and health, civic and historical competencies, and that «learning through play» is possible with LEGO. In addition, LEGO technologies in primary school lessons activate the development of memory, attention, imagination, logical thinking, and help students to establish patterns. According to the results of our study, primary school teachers in Kolomyia effectively use LEGO technologies in the classroom during morning meetings, to organise learning and research activities; to update students' background knowledge and life experience; to perceive and comprehend educational material; to summarise and systematise students' knowledge, skills and abilities; to reflect, etc. Most often, teachers use LEGO technologies in «I Explore the World» lessons to summarise and systematise knowledge (83.3%), for reflection (66.7%), during morning meetings (55.6%), to update basic knowledge, skills and abilities (47.2%), and to perceive and comprehend new learning material (36.1%). LEGO technologies make it possible to organise both frontal work of younger students aimed at studying selected topics and various subjects within the classroom system, as well as independent creative work and project-based learning. The organisation of educational and gaming activities requires the teacher to have appropriate methodological competence and high skill to find any teaching method in the LEGO game. This aspect will be the subject of our further research.

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Received
Accepted

11.10.2024
09.11.2024