PROGRAMMING AND ROBOTICS BASED ON STEAM LEARNING

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PROGRAMMING AND ROBOTICS BASED ON STEAM LEARNING.

Based on the dissertation material prepared for the degree of Doctor of Science on the topic: **STRENGTHENING THE INTEGRATED STEAM OF TECHNOLOGIES IN THE ENVIRONMENT OF INFORMATION TECHNOLOGIES AND COMPUTER PROGRAMS.**

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CHAPTER 1. THE LATEST INFORMATION TECHNOLOGIES AND COMPUTER PROGRAMS IN INTEGRATION AND IN IMPROVEMENT WITH THE METHODOLOGY OF TRAINING AND UPBREAKING FRYEBEL AND ITS "GIFTS"

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Annotation

This monography shows the integration of the latest information technologies and computer programs with F. Froebel's methodology in the early period of early childhood education in children's educational institutions. The famous teaching method of F. Froebel, his exercises and "gifts" with the help of which the child begins to cognize objects and the world around him in general, is well known. He begins to get acquainted with objects, understanding their properties of smoothness, roughness, and then roundness, sharp edges and other properties. Fröbel's "gifts" gradually prepare the child and introduce him to the world of interest to him. ...

The most interesting is the use of the latest information technologies, platforms, sites for the development of the child along with these gifts. Computer programs and websites created by the author will come to the rescue here. Ready-made online resources of other scientists and educators. As a result of the research, the author determined the effectiveness of integrated teaching of children by F. Froebel's method in the environment of information technologies and computer programs, proving the effectiveness of integrated teaching with updated modern methods.

Introduction

We know that in the 40s, F. Froebel's idea of creating kindergartens in Germany was in great demand; he officially created a kindergarten a year. Before him, there were various boarding houses for children, but training was only started in F. Froebel's kindergartens. he believed that one should not punish children, one should be gentle with them, in this his opinion and the authorities did not coincide, for which his

kindergartens were closed, some later acted secretly. I would like to note that F. Froebel's idea has not lost its meaning even now ... As a teacher teaching computer science at a university, I involuntarily come across students who study at the faculty of mathematics, but do not know mathematics well, and I think that this is not their fault, but the whole fault is that they were not directed in childhood to the correct teaching methods, maybe they did not attend kindergartens at all, the school also had flaws and gaps in the continuity of their learning and assimilation of material on their part. When asked how these flaws can be removed and corrected, the answer is unambiguous, it is necessary to retrain, retrain, go to additional courses, attend circles.

So that in the future knowledge of students there are no flaws, gaps and misunderstandings, it is necessary in the present to educate children continuously and prepare from a young age throughout their lives, so that they become good specialists. We notice that there is a huge difference between a child who attended preschool educational institutions and those who did not attend. communication and games in a group, in the environment, activates the child as a person. But if you teach him according to a special method in the form of games, you gradually prepare him for the impact with the outside world, using special exercises and "gifts" by F. Froebel in integration with the latest information technologies, websites, platforms for children, with created computer programs that develop memory and logical thinking of children, teaching children the alphabet of three languages, etc., I would like to note that many parents who have not yet formed their child's native language send them to study in another language, probably at the beginning the child should learn the alphabet of his language, learn to write, study numbers, letters, learn to make syllables, and then you can teach him the alphabet of other languages, including a foreign languages. It is at this moment that the use of computer programs

is inherent, which will teach children the necessary knowledge through games. The child will playfully gain knowledge. Early education should be done with parents. They can engage with children in existing learning platforms, in sites for children, based on early child learning materials. In our research, we looked through and selected the necessary material for training by the selection method. Interested in online resources, platforms for teaching children, computer programs, various environments for child development. We have used methods of selection, analysis and synthesis of materials, computer developments and online resources, sites, platforms, learning environments on a computer, computer programs for the development of logical thinking of children, for the spatial representation of figures, etc. In our work, we relied on the methods of analysis and synthesis, selection, comparison, relied on the methods and methodology of the earlier known methods and on the methodology of exercises and "gifts" of F. Froebel. The methods of mathematical statistics chi-square are used. On the basis of which the control and experimental groups of the pedagogical experiment were selected, in one group the children studied according to the traditional methodology according to the "Initial Step" program, and in the other we tried to teach children in the direction of integrated teaching of materials for children with the aim of the gradual development of the child for children 4- 5 years. In preschool educational institutions, for children of an earlier age from 2 to 3 years old at home, from 3 years to 4 years old in children's educational institutions in order to develop the child and determine the truth of our hypothesis that teaching children under the Initial Step program in an information environment technologies: sites, platforms, online resources, computer programs created by us will greatly increase the level of development of the child, help the assimilation of knowledge. It will help its intellectual development in acquaintance with the real world, accelerate its impact, perception, representation,

its impact with the environment and the surrounding world. The truth of the hypothesis that in this aspect the use of information technologies and computer programs will increase the level of the child's development and facilitate his assimilation of materials, is proved by the method of mathematical statistics. The obtained results of data on determining the level of assimilation of materials on the basis of individual and group interviews were grouped into tables. The data in the table were processed by the chi-square method of mathematical statistics.

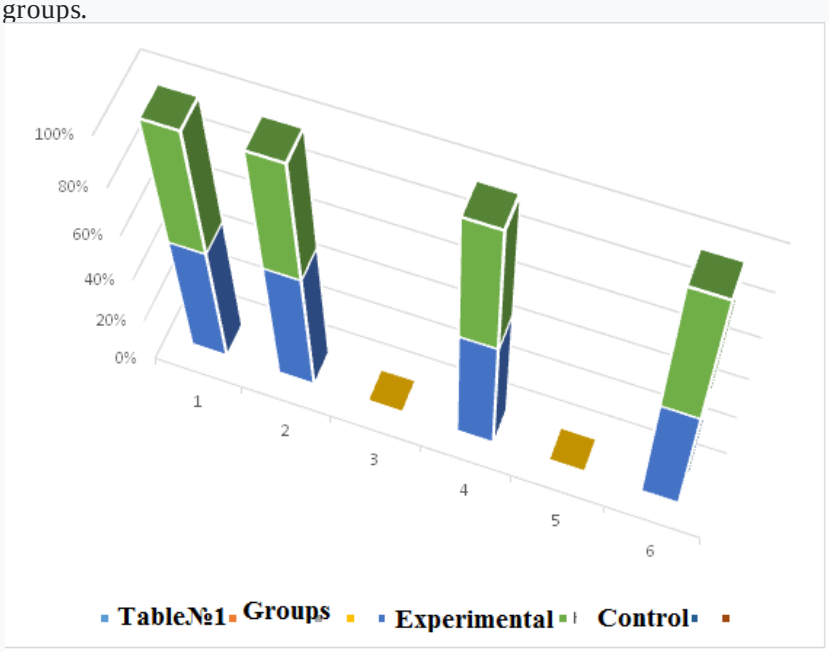
The level of knowledge of children when teaching children according to the traditional method according to the program "Ilkkadam" - "Initial step".

Table №1

Groups	Number of pupils with preschool educational institutions	The level of assimilation of knowledge on the integration of several subjects		
		Low	Medium	High
Eksperimental	100	56	24	20
Control	100	52	25	23

Let's look at the following diagram, which clearly shows the dependence of children's knowledge on the criteria in the samples of the control and experimental

groups.



Calculations are performed according to the following formula:

$$T_{куз} = 1/n1^{*}n2^{*}\sum_{i=1}^{C}\frac{(n_1{}^{*}Q_2 i\ n_2{}^{*}Q_1)^2}{Q_1 i + Q_2 i} = 0{,}5,$$ where Tkuz is the observed value (Table 2). Ткуз – это наблюдаемое значение (Таблица №2).

Table №2

Groups	Number of pupils with preschool educational institutions	The level of assimilation of knowledge on the integration of several subjects		
		Низкий	Средний	Высокий

Eksperimental	100	12	30	58
Control	100	38	24	38

According to this table and diagrams, it is possible to establish the growth of the assimilation of knowledge, which proves the effectiveness of the application of our methodology. And the truth of our hypothesis of the effectiveness of the results of integrated learning in the information technology environment and the computer programs we have created. According to the table from the source, we will compare it with the value for the first method T observed <Tcritical, Tnab. = 0.5, Tcr. = 5.991. 5.991> 0.5. In the method carried out according to the second method, T observable = 18.3, it can be seen that this value is more than the critical value by about more than 3 times. From these conclusions, we can conclude that with the strengthening of the supply of materials for teaching and learning by children in the environment of information technologies and computer programs, the result of mastering the material is much higher, and the activity of children turned out to be high. We conducted an experiment and used the method of statistical data processing according to the Chi-square test. With this method, we conducted an experiment, teaching pupils of children's educational institutions No. 5, No. 20 and obtained similar results, experimenting with children aged 2-3 years, from 3 to 4 years old, 5-6 years old and preschoolers aged 6-7 years old, who proved the reliability of our hypothesis of strengthening the learning of integrated education, which will lead us to the ultimate goal of improving the efficiency of assimilation of knowledge in the integration of subjects and even more effective assimilation of materials using information technologies and computer programs. Discussion

Early child development is very important today and in many kindergartens groups for very young children are opening. A huge number of upbringing methods are available to modern parents and educators.

Photo 1. Famous German teacher, founder of the world's first kindergartens in Bad Blankenburg in Germany and Zorbich.

In the new material we will talk about F. Froebel's system and his "gifts". The birth of the kindergarten dates back to 1837. It was then that Friedrich Froebel called the “kindergarten” the institution he founded for toddlers in the city of Bad Blankenburg in Germany (more precisely, “Kindergarten”, because Froebel is German). The history of the name is not limited to one version. The most widely held belief was that the educator considered children to be “God's plants” in need of nurturing care. Hence the "kindergarten", that is, the garden of plants. Another assumption puts the birth of kindergarten in the 40s. XIX century: the German teacher then allegedly opened the "first childcare institution" in the former hotel "At the Palace Garden" in Zorbich. The inhabitants of the town, bringing their children here, exclaimed: "We are going to the garden." Finally, it is known that his kindergarten was a garden of its own design, with trees and flower beds. It is noteworthy that Frebel also called the teachers "gardeners". The merit of Friedrich Froebel was not only the opening of a kindergarten, but also the creation of a methodology for preschool education (although the famous teacher did not release the methodology as a manual during

his lifetime, limiting himself to several works). It is based on a solid foundation - boundless love for children. Let's outline the main aspects of the Friedrich method. Froebel is an outstanding German educator and preschool theorist. He is the founder of the first kindergartens, the task of which, unlike orphanages, was to teach and educate children. The main goal of Froebel's kindergartens was to promote the development of the natural abilities of the child. In his opinion, children grow like flowers (hence the term "kindergarten") and the task of educators is to take care of them and contribute to their fullest development.

The main aspects of the Froebel technique:

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The main aspects of the Froebel technique:

Game: Learning is based on a system of games with specific didactic materials, the so-called "gifts of Froebel". These are objects that differ in color, shape, size and method of action with them: knitted balls of all colors, cubes and cylinders, balls of different colors and sizes, sticks for laying out, paper strips for weaving and appliqués, etc., creative, fantasy, imitative, etc. - any games Froebel considered the indestructible basis of children's education and singled out the basis of his own methodology/Froebel considered the indestructible basis of children's education and singled out the basis of his own methodology. He was convinced that "children's play is a mirror of life and a free manifestation of the inner world." However, the teacher urged adults to direct the game in the right direction, as if controlling the

will of the child, but not to insist on anything (by the way, many teachers consider this fact to be a very negative feature of Froebel's methodology).

Speech development: Fröbel proposed to form speech with the help of the development of fine motor skills, since he was convinced that a child who performs a lot of exercises with small objects will begin to speak much earlier than other children. Working with paper, sticks, paints, modeling, gluing, sawing out were integral activities in Froebel's kindergarten. Also, during the game, children had to talk and speak. The topic of the conversation was prepared in advance. Froebel was convinced that the development of fine motor skills: working with paper, sticks, paints, plasticine has a positive effect on speech. During creative activities, children talk and discuss what is happening. The connection with the word makes the child's actions and sensory experience meaningful and conscious.

Surrounded by love: One day Fröbel realized that children are very fond of animals - and immediately began to tell them a huge number of stories about animals. Then he caught a love for flowers - since then, his pupils have taken care of the flower beds on their own. Finally, I noticed the positive impact of music on children. In his institution, children began to sing and listen to the singing of the "gardeners". Everything is for children.

In Froebel's system, the main emphasis is on the activity of the child himself, on the need to motivate and organize his own activities. The scientist insisted that children should do what they really like. So, in his kindergarten, children sang a lot, listened to stories about animals and looked after flowers. No punishment: The teacher denied cruelty of any kind towards children. Comparisons of children with each other and any other assessments are also unacceptable. Friedrich Froebel was a humanist and denied any manifestation of cruelty towards children. This aspect abhorred the opinion of the clergy, and later the opinion of the authorities about

working with children: they believed that discipline, memorized catechism, "knitted stockings" and harsh punishment for any violation should lie at the heart of education. Now it seems incredible, but precisely because of this disagreement between the kind teacher and strict high-ranking officials from 1851 to 1860, kindergartens were banned and continued to exist only secretly.

Collective education: The spirit of collectivism was considered by Friedrich Froebel to be the foundation of humanity. Therefore, he advocated the obligatory presence of the child among other children, that is, in kindergarten. The teacher wrote about this: “Children need to be actively involved in collective activities, develop their bodies, exercise external manifestations of feelings, acquaint them with people and nature; in games, fun and innocent amusements to prepare for school, helping to develop, like plants in a garden. " However, he urged not to forget about the individuality of each baby. That is why there were both large flower beds in the garden, where children looked after flowers in groups, and single pots with a plant assigned to one baby. Froebel's "gifts"

The first "gift"

These are textile balls on a string of all colors of the rainbow and white. The ball is held by a string and shows the child different types of movements with it: right and left, up and down, in a circle, oscillating movements. Ball games teach the child to distinguish colors and navigate in space

Second "gift"

The ball, cube and cylinder are the same size. This gift introduces geometric bodies and the differences between them. The ball rolls, but the cube is motionless, it has edges. Other "gifts"

Froebel's third, fourth, fifth and sixth gift is a cube divided into small pieces (small cubes and prisms). These shapes were used as a constructor. So preschoolers got acquainted with geometric shapes, got an idea of the whole and its parts.

Order Froebel developmental kits

Based on the works of Friedrich Frebel, educational kits have been developed that meet the requirements of the Federal State Educational Standard for preschool education. The kits correspond to all educational programs implemented in preschool organizations, are harmoniously included in the Montessori environment and are an integral part of the STEM education program.

Educational tasks that are solved using these sets:

• Experimenting with objects of the surrounding world;

• Mastering mathematical reality by acting with geometric bodies and figures;

• Mastering spatial relationships.

• Construction in various angles and projections.

Froebel's gifts

Speaking about Friedrich Frebel, it is impossible not to mention his "gifts". "Gifts of Frebel" is a didactic material developed by a teacher, a toy system that trains various skills and abilities of a child. Each toy implies certain rules of use and contributes to the development of the child. Their description deserves a separate material, therefore, we will restrict ourselves to listing the “gifts”, of which there are 6.

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material, so we restrict ourselves to listing. Each toy implies certain rules of use and contributes to the development of the child. Their description deserves a separate material, therefore, we will restrict ourselves to listing the “gifts”, of which there are 6.

• "Gift 1" - the ball. This is the first toy, as the ball has no corners and is comfortable for the baby. Wool was most often used as a material.

• "Gift 2" - wooden cube, ball and cylinder.

• "Gift 3" - a cube cut into 8 cubes.

• "Gift 4" - a cube divided into 8 tiles.

• "Gift 5" - a cube cut diagonally in half into cubes.

• "Gift 6" - a cube divided into 27 "bricks", some of which are accordingly divided along, and some - across. Thus, the goals and principles of Froebel's kindergarten were:

• reference point for 3 types of activity - play, study, work;

• development of the child's feelings;

• strengthening the body and spirit of the baby;

• acquaintance with nature and knowledge of the world using the visual method;

• communication with people;

• development of the natural qualities of the child;

• manifestation of boundless love for children.

Now the theses may seem rather primitive, but let's not forget that we are talking about the beginning and middle of the 19th century, when slavery and serfdom were still oppressed with might and main.

Information technology and computer resources, video materials that we offer together with Froebel exercises:

site for the earlier development of the child together with his mother "Mother and her child";¬

a platform for teaching children interesting topics;¬

video materials, resources for electronic teaching according to Froebel's method;¬

computer programs for e-learning and child development.¬

Figure 2. A site created by us for a mother and her child, so that the mother checks the child's development data from 1 month to 1 year old, and works with him from 1 year to 7 years old, using computer programs in the form of games to focus attention, develop memory, logical thinking, as well as teaching alphabets of three languages: Uzbek, Russian, English. As an integrated education of two methods, F. Froebel's methodology and e-learning, we offer a website created by us for observing a child by their mothers from one month to one year old, as well as the use of games for the development of memory, logical thinking, as well as the use of programs for preparation for school, for teaching the alphabet of three languages, Uzbek, Russian and English. B platforms for teaching children various exercises, for the development of their fine motor skills, for the development of their intellectual abilities, we offer the iQsha.ru platform. here, too, are collected many exercises for teaching children in various fields, to prepare them for the next stages of their life.

CHAPTER 2. PROGRAMMING AND ROBOTICS BASED ON STEAM LEARNING.

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This CHAPTER shows which areas of Steam education need to be developed to train small and highly qualified specialists. The author shows the future development of production, mechanical engineering and robotics, engineering and invention, now and in the future, the creation and application of Smart technologies, the construction of Smart houses and apartments, Smart cities is based on the level of knowledge and preparedness of small and highly qualified specialists who need to be trained on

additional education courses, because there is barely enough time in an educational institution to cover the material on the curriculum and the standard of education.

The article reveals the material and gives definitions of concepts like STEM; STEAM; STREAM. An idea of the development of the components of STEAM education is given: science, technology and communication with them technology, art, mathematics, technology. This requires the development of such robotics modules in the TRIK studio and programming in Scratch and C ++, Python, Arduino and teaching Scratch, Tinkercad, Arduino programs, knowledge of electrical engineering in TinkerCad Circuits is required; programming in Scratch and C ++, Python; Mechanics in Algodoo; 3D modeling; knowledge is required in onShape; in imitation robotics at TRIK studio., skills in working with Scratch, TinkerCad, Arduino programs, programming in Python, C ++.

Keywords: Electrical Engineering at TinkerCad Circuits; Scratch and C ++ programming; Mechanics in Algodoo; 3D modeling; Required knowledge in onShape;

Simulation robotics in TRIK studio., Scratch program, TinkerCad program; TinkerCad Program, Arduino Program, Python Programming.

Introduction

The problem of training good specialists has been and remains one of the main tasks in any state, including ours. Innovations in science and technology, carries with it the development of modeling, programming, design, engineering and mechanical engineering, and at the present stage and robotics.

The development of society, the economy and the power of the country depends on the correct solution to this problem, since the ability to use the necessary programs, technologies, assembly of parts, devices of large complexes leads to the strengthening of the power of our state, and in order to collect parts of machines,

devices, equipment, installations programs require knowledge of design, engineering, machine parts, programming, biology to represent the work of a robot, to make the arms and legs of a robot that are somewhat similar to parts of the human body. And to solve this problem, you need good specialists who know all these technologies in general, who have potential in several sciences at once, who are able to design, program and use this knowledge in creating machines, robots, and in engineering.

And for this, we must raise the level of such learning by developing all the elements of STEAM learning, starting with preschoolers and schoolchildren in the direction of Steam learning, starting with electrical engineering in TinkerCad Circuits; programming in Scratch and C ++; studying mechanics at Algodoo; studying 3D modeling; knowledge in onShape; raise the level of imitation robotics in TRIK studio, teach children from an early age to work on a computer, work with a flash drive, be able to save their projects, work and create original block logic codes from logical blocks in the Scratch Program, be able to simulate in the TinkerCad program; be able to control the movement of a robot in a straight line, along black and white lines on an Arduino board, be able to program in C ++ and Python, develop your skills and update them throughout your life.

This problem also applies to such our works as the teaching methodology of Scratch, Tinkercad and others. Steam education at this stage is very relevant, it is already being studied and applied in life, although all aspects and connections between objects have not been deeply studied.

Photo 1. A robot assisting the teacher in conducting scientific conferences, controlled from a distance at the teacher's fingertip.

But an innovation in this education is the use of computer programs and information technologies, step by step in the stages of education, as well as the methodology of teaching work in the field of studying the Scratch program in preschool education and at the more initial and subsequent stages of education.

Also, involving children at an earlier age in entering ready-made short codes on graphics that would display very beautiful patterns on the screen, a small number of such lessons together with mentors or parents, with the most beautiful results of various ornaments and patterns on laptop screens. It is necessary to consistently and step-by-step for continuous training of the Tincercad, Scratch programs to form deep knowledge and skills, work experience in them, for the application of knowledge at later stages of education.

We put the idea of using Lego learning for children on the basis of block programming higher than writing the codes itself. We put forward the following hypothesis: the improvement of children from an early age on the basis of games and computer programs of lego-design, programming, creation of mini programs using various blocks of programs in Scratch, teaching them the basics of modeling

in the Tincercad program, which will serve to study and use these programs at the subsequent stages of continuing education, which ultimately will serve to train highly specialized specialists

There is a hypothesis of a deeper and more accurate assimilation of knowledge through the use of information technologies and programs in teaching, suggesting that such an idea will lead to a deeper improvement in the assimilation of innovations and knowledge on the use of information technologies and programs, with their implementation. One of the first hypotheses is the use of information and communication technologies and programs at continuing education levels and the second hypothesis is the development and improvement of learning elements or constituent elements of STEAM education, such as science, technology, technology and education, art and mathematics, teaching these subjects at the level of art and craftsmanship.

This will greatly help future specialists to be able to orient themselves to work in a technological environment, rely on their knowledge of mathematics and programming, on scientific and technical knowledge at the skill level.

The development of science and technology, technology requires from a modern person the ability and skills to use them in various industries, mechanical engineering, robotics and education. The requirement by the century of knowledge in these areas, which is associated with the development of science and technology, requires education from education to prepare knowledgeable, intelligent small specialists in this area.

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Indeed, at this stage, although the demand for highly specialized specialists in all areas is growing, admission to the university for each school graduate is not guaranteed, it depends on their knowledge and skills. And in order to guarantee him a job in small enterprises, in business structures and in production, we must train them with highly qualified small specialists, and this is where STEM education will help us, which has now grown into its other forms, such as STREAM and STEAM. In addition, the construction of Smart homes and cities, robots that help teachers in education or provide their high-quality services in all industries and services and education, or the creation and invention of Smart devices, Smart devices require a modern person to simultaneously know all subjects. So let's discuss what STEAM is, where the letter A is ART, art, skill, skills and in what ways all the elements of this education can be developed in order to form the knowledge of future small specialists or highly specialized personnel, scientists who can easily integrate in the process of production, science and technology, after graduation from school and university.

So let's define what kind of education we need to develop and raise its level, what elements of such training we need to develop in order to prepare young specialists for their future profession as a specialist. So that he could easily rotate in this environment of requirements for a specialist and could perform the work allocated

to him without labor and effort, intellectually understanding devices, mechanisms and parts, using modern programs, equipment, detailing devices and machines.

STEM (Science, Technology, Engineering, Mathematics) education is a model that combines natural sciences and engineering subjects into a single system. It is based on an integrative approach: biology, physics, chemistry and mathematics are taught not separately, but in connection with each other to solve real technological problems. At the present stage, the STEM approach is used by philologists as a STREAM approach, where R is Reading - "Reading" in the modern world, thanks to the development of technology, technology has moved to the level of STEAM technologies, where the use of the Internet, programming, technology is brought to the level of art, or vice versa, art is used in teaching. Science, technology, engineering, mathematics (STEM) is a term commonly used in defining educational methodology and curriculum selection in schools to improve competitiveness in science and technology development. STEM education takes part in the development of the workforce, national security interests and immigration policy.

The acronym's popularity spread shortly after the famous Science Education Meeting held at the US National Science Foundation under the direction of NSF Director Rita Colwell. The director of the Science Office of Human Resource Development for Educators and Scientists, Peter Faletra, proposed changing the acronym from the legacy METS to STEM. Colwell, expressing some dislike for the old acronym, suggested that NSF accept the change of the acronym. One of the first NSF projects to use the acronym was STEMTEC: Science, Technology, Engineering, and Mathematics in Teacher Education at the University of Massachusetts at Amherst, which was founded in 1998. Communicating with e-learning on the Internet, online resources, using specialized computer programs. Further, we offer preschool education at 4-5 years old using Seguin electronic

boards, Montessori boards for the development of mathematical abilities and increasing the knowledge of children. We propose at this stage the use of the programs we have created for the Development of Memory, which is called "Computer + Memory + Logical Thinking", "Computer + the alphabet of three languages: Uzbek, Russian and English.

Materials and methods. Our idea of teaching children from an early age in preschool institutions according to the Froebel, Montessori method, based on his gifts, on his teaching methods using colored balls suspended on a thread or painted in different colors of glass bottles, using rainbow colors, rotating balls or bottles on threads, volumetric figures: a ball, a cube, a parallelepiped and a demonstration of such figures that are found in everyday life.

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Further, for children of 5 years of age, we propose to use and study the Tincercad program with their parents at home or with mentors of preschool institutions for the development of their volumetric representation of geometric shapes, for the development of their knowledge at the level of art. This process must be carried out as an experiment in preschool institutions that are equipped with laptops, tablets. You can also organize a scientific experiment in preschool institutions.

Our research objects are STEAM education, with its components: science and technology, technology, education, art and mathematics, and here you can use the

art of using computer programs and technologies, including teaching science and technology using information technology and computer programs at the level craftsmanship, art. We investigate this process of development of STEAM education components at various stages of lifelong education, including preschool, school and higher education.

Next, we consider learning in the STEAM environment for schoolchildren from 4 to 5 years old, from 6 to 7 years old, then for schoolchildren from 8 to 9 years old, from 9 to 16 years old and older. We consider training in this environment for graduate students in the specialty "Informatics", "Information technology". At the stage of preschool education for children 4-5 years old, as a preparation for school, we use STEAM training using the Froebel methodology, Montessori methodology, for children 5 years old we use programs and information technology, online resources using information technology and computer programs. The programs “Computer + memory + logical thinking”, “Computer + alphabet of three languages: Uzbek, Russian, English” were used. In order for children to learn well the alphabet of their native language and the alphabets of the Russian and English languages in order to better understand the similarities and differences between letters and their pronunciation. Further, for children 5 years old, we offer small mini-programs of games, stories on the SCARTCH program, with a sequential presentation of the meanings of each block, i.e. with a logical interpretation of the execution of small block structures with their logical explanation. We offer lessons with mentors or with parents at home.

Further, for preschoolers 6-7 years old, the long-term use of the "ILK KADAM" program is used - the initial step, with the entire methodology and structure and exercises for preparing children for school, together with the consistent and long-term use of computer programs "Computer + memory + logical thinking",

"Computer + alphabet of three languages: Uzbek, Russian, English ". An experiment of control and experimental groups is carried out with the use of STEAM training and computer programs according to the program "Ilk kadam" -Initial step. Further, for preschoolers 6-7 years old, the long-term use of the "ILK QADAM" program is used - the initial step, with the entire methodology and structure and exercises for preparing children for school, together with the consistent and long-term use of computer programs "Computer + memory + logical thinking", "Computer + alphabet of three languages: Uzbek, Russian, English ". An experiment of control and experimental groups is carried out with the use of STEAM training and computer programs according to the program "Ilk qadam" -Initial step.

This process can be done in several steps and lessons. Here you can choose e-learning methods, traditional, combined, methods of using computer programs and information technology. In training in higher educational institutions, the subject of informatics and the methods of teaching it is taught, here you need to prepare students for teaching topics in continuous areas of education, and in particular at school. It's no secret that the computer science curriculum included the Scratch program, starting from grade 5, for children from 11 years of age and older, and in earlier periods of study, as well as learning the Python programming language, starting from grade 9 for teenage children in from the age of 15.

And therefore, a special teaching methodology is needed in Scratch and Python programs. To prepare future specialists, teachers of the subject of computer science with the study of these programs and programming in these languages. In this work, the following methods were used: analysis and comparison of the work done, observation and comparison of objects, survey, testing, experimental analysis, the initial stages of modeling, study, generalization, etc.

For graduate students, training and acquisition of skills and abilities, experience in the use of Scratch, Tinkercad programs are offered, as well as we have been trained and introduced into this learning process of other programs such as the study of the Electrical Engineering program in TinkerCad Circuits, Scratch and C ++ programming,

Mechanics in Algodoo, 3D modeling. Tincercad, onShape, TRIK studio-simulation of robotics.Figure 1. A robot helping a teacher conduct conferences and lectures

Analyzing our hypothesis of enhancing the learning of children from an early age in the STEAM style of learning with enhancing the learning of its components: Science, Technology, Art, Mathematics. And at the same time, continue such training[26] at all stages of continuous education: kindergarten, school, university. We analyzed a number of works in the field of teaching children programming and robotics from an earlier age, suggesting in kindergarten to give concepts about Lego-design, about creating their first buildings in toy Lego-design, replacing it with the Scratch program, working in this program with parents who will create their own animations, fairy tales or cartoons together using logical constructions.

Studying the article by the authors You involuntarily think that you can change the development of a child using STEAM teaching even for children with some developmental disabilities, scientific article [28], shows the effects of a humanoid robot at an experimental stage in a pediatric clinic for hospitalized children not to mention normal children who attend childcare, then go to school, then enter university.

“This suggests that the hypothesis put forward by us is reliable. Which we needed to check and prove during the experiment. In articles published in the journal "Procedia-computer-science", based on the results of the international 24th conference, it is also possible to note a number of works devoted to this topic, as

well as teaching children of early making of algoritms, etc., [3., p 1]. We analyzed Melanie Schranzb's., Wilfried Elmenreicha's., article "A study using the low-cost swarm robotics platform spiderino in education" and highlighted in it the essence, that "This literature review covers articles and books about STEAM (Science, Technology, Engineering, Arts, and Mathematics) in early childhood education. STEAM learning is considered to be an appropriate approach to answering the challenges of the 21 century as it integrates the hard and soft skills needed by children. It is exciting to note that in most articles, STEAM is a popular pedagogical method to improve creativity, problem-solving skills, scientific inquiry and critical thinking, and to provide other cognitive benefits»., [3. p.1]."The literature also discusses that the impact of STEAM learning makes children more active and able to take initiatives in their own knowledge. Teachers who are influenced by the integrated professional development of STEAM positively influence children through their professional learning. Another finding from this review is that experience of STEAM can increase children's self-confidence. STEAM learning is considered to be able to integrate the skills, needed by children. STEAM encourages children to build knowledge about the world around them by observing, investigating and asking questions. This review aims to consider advanced learning in early childhood education through STEAM", [3., p. 1].

We looked through a lot of literature, articles, books in the field of steam education, looked through articles included in the highest indexing bases of scientific papers

"This book describes recent approaches in advancing STEM education with the use of robotics, innovative methods in integrating robotics in school subjects, engaging and stimulating students with robotics in classroom-based and out-of-school activities, and new ways of using robotics as an educational tool to provide diverse learning experiences ….. The book also provides effective strategies and emerging

trends in using robotics, designing learning activities and how robotics impacts the students' interests and achievements in STEM related subjects". John Williams Professor of Education and Director of the STEM Education Research Group Curtin University, Perth, Australia ., [25., p.3]

"Learning with educational robotics provides students, who usually are the consumers of technology, with opportunities to stop, question, and think deeply about technology. When designing, constructing, programming, and documenting the development of autonomous robots or robotics projects, students not only learn how technology works, but they also apply the skills and content knowledge learned in school in a meaningful and exciting way. Educational robotics is rich with opportunities to integrate not only STEM but also many other disciplines, including literacy, social studies, dance, music, and art, while giving students the opportunity to find ways to work together to foster collaboration skills, express themselves using the technological tool, problem-solve, and think critically and innovatively. Educational robotics is a learning tool that enhances students' learning experience through hands-on mind-on learning. Most importantly, educational robotics provides a fun and exciting learning environment because of its hands-on nature and the integration of technology. The engaging learning environment motivates students to learn whatever skills and knowledge needed for them to accomplish their goals in order to complete the projects of their interest. For school-age children, most robotics activities have mainly been part of informal education, such as after school programs and summer camps (Benitti in Computers & Education, 58:978–988, 2012; Eguchi 2007b; Sklar and Eguchi in Proceedings of RoboCup-2004: Robot Soccer World Cup VIII, 2004), even though it has the potential to make learning more effective in formal education. It is very difficult for teachers to include robotics in regular curriculum because of the heavy focus on standardized testing and pressure to cover academic standards set by the government and/or their States. This chapter aims to promote robotics in classroom by connecting robotics learning with various STEM curriculum standards". [4., p.3]

"This literature review covers articles and books about STEAM (Science, Technology, Engineering, Arts, and Mathematics) in early childhood education. STEAM learning is considered to be an appropriate approach to answering the challenges of the 21century as it integrates the hard and soft skills needed by children. It is exciting to note that in most articles, STEAM is a popular pedagogical method to improve creativity, problem-solving skills, scientific inquiry and critical thinking, and to provide other cognitive benefits. It is taught in integrated learning in early childhood education and is conducted through children's daily observation. The literature also discusses that the impact of STEAM learning makes children more active and able to take initiatives in their own knowledge. Teachers who are influenced by the integrated professional development of STEAM positively influence children through their professional learning. Another finding from this review is that experience of STEAM can increase children's self-confidence. In addition, STEAM learning is considered to be able to integrate the skills needed by children. STEAM encourages children to build knowledge about the world around them by observing, investigating and asking questions. This review aims to consider advanced learning in early childhood education through STEAM", [33], [34., p.34].

"Technology and smart devices have become ubiquitous staples in every aspect of human life. Given the rise of computation in everyday life, introducing technology to early childhood students requires exposure to logical thinking and problem-solving skills throughout programming approaches or computational thinking. This research addresses an inquiry into a comprehensive elaboration of early childhood computational thinking development. A novel programming toy was introduced as an educational tool based on designated themes in accordance with early-childhood education curricula. Five stages were administered to reveal parent and children engagement in robotics activities and later interview children cognitive development from parents' perspective. Children were seen exploring various ways by concentrating and paying attention, doing the given activities, and expressing their excitement and happiness. The notion that children learning from their social

network environment highlighted that children involved in the KARIN programming toy's hands-on activities drive children to be more actively engaged in the exercise. It turns out that in addition to parent-student engagement, the use of KARIN Programming Toys helps shed light on how early-childhood students learn while away from their social relations during pandemic"., [10., p.33].

"Robotics is one of the key learnings in a world where learners will interact with multiple robotic technologies and operating systems throughout their lives. However, school teachers, especially in the elementary and primary education stages, often have difficulties incorporating these tools in the classroom. Four elementary teachers in three schools in Catalonia were trained to introduce robotics in the classroom to seventy-five students. The main actions consisted in classroom accompaniment by a university-trained support teacher, curricular materials' development, and assessment of the students' and teachers' learning. The designed contents and evaluation criteria took into account the potential of educational robotics to improve soft skills and to promote Science, Technology, Engineering, Arts, and Mathematics (STEAM) interdisciplinary learning. Teachers perceived the training to be supportive and useful and ended the school year feeling confident with the used robotic platform (KIBO). The assessment of the students' learning showed an average mark of 7.1–7.7 over 10 in the final evaluation criteria. Moreover, students' learning was higher in the classes where the teachers had higher initial interest in the training. We present and analyze the actions carried out, with a critical and constructive look at "[14., p.1 of 29]

"New technologies have offered great alternatives for education. In this context, we place robotics and programming as innovative and versatile tools that adapt to active methodologies. With the arrival of COVID-19 and lockdowns, physical resources were kept out of use, and the virtual lectures did not propose to incorporate these elements in a meaningful way. This recent situation raises as an objective of study the need to evaluate if robotics and programming are content that can be taught virtually in these circumstances, without physical resources and without face-to-face

lectures. To do this, a mixed methodology consisting of questionnaires and interviews has been incorporated, aimed at primary education teachers, families, and primary education grade students. The results suggest that the virtualization of robotics and programming is a feasible and beneficial alternative for students, which allows the development of digital skills, while it is enhanced with the use of audiovisual materials and online resources. Even though face-to-face classes have other benefits not offered by virtualization, and teacher training needs to be up to the task to face this situation, it is a matter of time to respond to these situations and to guarantee a high-quality distance education"., [14., p.2,3]

This chapter presents "a systems thinking approach for the conceptualization, design, and implementation of robotics curriculum to scaffold students' learning of important Science, Technology, Engineering, and Mathematics (STEM) concepts and processes", [7., p. 33]. "This approach perceives the curriculum as a system of integrated elements and allows for the investigation of the interdependencies amongst the elements and the dynamics of the curriculum as a whole. Through this approach, we believe that students can be provided with robotics curriculum units that facilitate the learning of STEM "Big Ideas" of and about STEM. A STEM "Big Idea" is central to the understanding and application of STEM across a wide range of fields, one that links numerous STEM discipline understandings. Robotics is a rich context in which students can establish deep knowledge and robust understanding of STEM "Big Ideas". Curriculum units based on this systems thinking approach can do much to ensure that students engaged in robotics activities focus not only on the completion of robotics tasks but also on the social construction of integrated networks of authentic STEM knowledge centred around "Big Ideas" of and about STEM", [7., p. 33].

"Learning with educational robotics provides students, who usually are the consumers of technology, with opportunities to stop, question, and think deeply about technology. When designing, constructing, programming, and documenting the development of autonomous robots or robotics projects, students not only learn how technology works, but they also apply the skills and content knowledge learned

in school in a meaningful and exciting way. Educational robotics is rich with opportunities to integrate not only STEM but also many other disciplines, including literacy, social studies, dance, music, and art, while giving students the opportunity to find ways to work together to foster collaboration skills, express themselves using the technological tool, problem-solve, and think critically and innovatively. Educational robotics is a learning tool that enhances students' learning experience through hands-on mind-on learning. Most importantly, educational robotics provides a fun and exciting learning environment because of its hands-on nature and the integration of technology. The engaging learning environment motivates students to learn whatever skills and knowledge needed for them to accomplish their goals in order to complete the projects of their interest. For school-age children, most robotics activities have mainly been part of informal education, such as after school programs and summer camps (Benitti in Computers & Education, 58:978–988, 2012; Eguchi 2007b; Sklar and Eguchi in Proceedings of RoboCup-2004: Robot Soccer World Cup VIII, 2004), even though it has the potential to make learning more effective in formal education. It is very difficult for teachers to include robotics in regular curriculum because of the heavy focus on standardized testing and pressure to cover academic standards set by the government and/or their States. This chapter aims to promote robotics in classroom by connecting robotics learning with various STEM curriculum standards",

[4., p.3].

«In order to promote and support STEM+C (Science, Technology, Engineering, and Mathematics plus Computing, Coding, or Computer Science) education, a student-centered robotics festival and competition called Robofest (www.robofest.net) was launched in 1999. Robofest's primary focus is the learning of STEM subjects together with computer science through autonomous robotics. When we make robots think, we will learn more because we have to think more. We believe programming team-built robots provide an effective environment to learn and exercise STEM disciplines in a truly integrated fashion. Furthermore, Robofest challenges are designed in such a way that dead reckoning is discouraged, which means students

must program their robots with sensors to accomplish tasks in a dynamic and partially unknown environment. Through the challenges with unknown factors that require programming without adults' direct help, students learn, reinforce, and master STEM+C knowledge for twenty-first-century jobs. Robofest meets the needs of students based on their respective age, interest, learning style, and prior experience by offering diverse competitions such as Game, Exhibition, Vision Centric Challenge (VCC), Global Robotics Art Festival (GRAF), and Unknown Mission Challenge (UMC). As entry-level challenges for beginners, Robofest offers BottleSumo, RoboParade, and Carnival. After 17 years, there are currently over 2500 students participating in our programs annually in fifteen US states and fourteen other countries. Assessment and survey results have shown that the Robofest robotics experience has provided on opportunity for thousands of participants to learn more about STEM. Importantly, more students in the post-survey have indicated that they would consider a career involving STEM after Robofest exposure»,[8, p.131].

Good results were obtained in calculations using the program, as well as raising the level of development of creativity in packaging design with the help of Steam education.

«**EarSketch** was developed as a program to foster persistence in computer science with diverse student populations. Objective: To test the effectiveness of EarSketch in promoting intentions to persist, particularly among female students and under-represented minority students. Method: Meta-analyses, structural equation modeling, multi-level modeling, and qualitative analyses were performed to examine how participation in EarSketch and other factors affect students' intentions to persist in computing. Findings: Students significantly increased their intentions to persist in computing, g = .40[.25,54], but examination within just the five quasi-experimental studies did not result in a significant difference for students in EarSketch compared to students not in EarSketch, g = .08[−.07, .23]. Student attitudes towards computing and the perceived authenticity of the EarSketch environment significantly predicted intentions to persist in computing. Implications: Participation in

computer science education can increase students' intentions to persist in programming, and EarSketch is one such program that can aid in these intentions.», [9,p.1]

«STEAM education is a method for driving student engagement in STEM topics through personal expression, creativity and aesthetics. EarSketch, a collaborative and authentic learning tool which introduces students to programming through music remixing, has previously been shown to enhance student engagement and intent to persist in computing. The goal of EarSketch is to broaden participation in computing through a thickly authentic learning environment that has personal and real world relevance in both computational and music domains. This mixed methods study extends previous work by 1) using a newly- developed instrument to assess creativity and 2) testing a theory of change model that provides an explanatory framework for increasing student engagement in STEAM. The results suggest that students who used EarSketch express statistically significant gains in computing attitudes and creativity. Furthermore, a series of multiple regression analyses found that a creative learning environment, fueled by a meaningful and personally relevant EarSketch curriculum, drives improvements in students' attitudes and intent to persist in computing. This work makes a significant contribution to computer science education by establishing the effectiveness of an authentic STEAM curriculum and advancing our knowledge of the underlying mechanisms driving students' motivations to persist in STEM disciplines..», [31, p.183]. This article has shown the effectiveness of the use of information technology and computer programs for pupils and students, proving one of our hypotheses.

"Implications: Participation in computer science education can increase students' intentions to persist in programming, and EarSketch is one such program that can aid in these intentions.", [31, p.188].

"The mean of the repeated measurements for the creative score of packaging design from the ANOVA multivariate test was significantly less than the target significance level ($p<0.05$). This showed that the independent variable (i.e., the practice score from using our STEAM method) affected the dependent variable

(i.e., the score assigned for creativity in the student assignment) submitted in the Packaging Design course. The posttest (Posttest: 2) scores were significantly higher than the pretest scores ($p<0.05$) and the scores two weeks after graduation (Follow up: 3) were also higher than the pretest scores ($p<0.05$). Thus, retention of the key ideas taught in the course, was high. Furthermore, the posttest and follow up phase scores were not significantly different, thus confirming good retention."[32, p.21].

"This study determined the effect of using the STEAM method on classifying the ability of objects in children aged 4-5 years, using the quantitative and quasi-experimental design method with a non-equvalent control group design. Data was obtained from Class A Kindergarten Family Length 03 Ambarawa with AI and A2 as the experimental and control groups respectively. In addition, the preetest and posttest methods were used to retrieve data which were analyzed using prerequisite, hypothesis and independent sample t-test. An average pretest of the experimental group of 5, 45 and posttest of 9, 60, were utilized and the data analysis showed a significance of 0,000 on the basis of decision making when $\rho > 0.05$. The results of the study explaned an influence on the use of the STEAM method to classify objects in children aged 4-5 years. This is evidenced by the significance level with the pretest and posttest greater and less than 0.05 respectively, which indicates difference" [14., p 1.]. Analysis of researched works on the effective assimilation of calculations and other knowledge of educated children's educational institutions, schoolchildren and university students using computer programs, proves the reliability of the hypothesis: the use of STEAM education with the strengthening of the training of its components, as well as integrated training using information and computer programs created by us. With our hypothesis, we continue to analyze the scientific research done, the articles written for them, we look through the necessary books in order to prepare a highly qualified specialist who graduated from a

university or a small specialist who graduated from a school or lyceum, since after graduation, not everyone can enter universities.The analysis of many works confirms our idea of purposeful education of children from an early age, using STEAM training, using the latest information technologies: websites, online resources, computer programs and the continuation of such training in all areas of continuing education.

By reviewing new articles from international journals indexed in Scopus, Science direct etc. [3,4,7-10,14,17, 24-29,32-34]. We realized that we were on the right path, that our hypothesis was correct, that teaching engineering, programming, engineering and technology should be started from childhood [28,34], this is even noticeable in children with physical disabilities and scientific works reviewed in this area, written articles by foreign researchers and scientists, materials of international conferences, as well as the works of scientists from neighboring countries and our republic served us as the basis of our methodology [1,2,20,21,31,36-40].

Making a literary review of materials and existing articles, developments, books and various literature, I would like to dwell on some important aspects that teachers, specialists and scientists relied on and which we can take as a basis. Considering the works [5], [41]: Belova G.V., Yudina A. "Programming in the Logo environment", which is aimed at teaching children logo design, using logical constructions, which is very important at the initial stages for introducing a child into programming, methodological developments and manuals for teachers of grades 2-4, on teaching computer science in games and tasks [15,41,42,43]: Goryachev A.V., Volkova T.O., Gorina gives information on teaching children computer science in the early period of education, based on games, starting from grade 2, the following works are important for the environment of use and for teaching Scratch [12] : Eryomina E.A., on programming, because it should be taught at the level of art [11,12,13, 16,18]:

Knut E. Donald, Python programming [14-18], [44]: Zlatopolsky D.M., Lutz M., Lubanovich, Bill, Reitz K., Schlusser T, textbook analysis is done and materials for elementary grades teaching computer science [5,6,10,11,13,15], [19]: Konopatova N.K., Matveeva N.V., Pankratova L.P., Chelak E.N., Nurova N.A., Pervin Yu. A.., Sheludko, V.M. on working with preschoolers and schoolchildren in computer science, on the methodology of teaching computer science at an early age and at school [29,41,42,43]:Pervin Yu.A., Yashuyev R.G., Yakhovsky N.G., on algorithmization and making of programms [12,13];Ershov A.P. studied materials for schoolchildren and for elementary grades, as well as for preschoolers on programming [42], [43]: Yashuev R.N.,. Yakovsky N.G. give ideas for teaching computer science, programming for children from an early age, in stages based on specially developed methods, techniques and existing programs. We studied the methodology of teaching computer science in our country, the introduction of innovations in the education system of computer science, the introduction of the Scratch 5th grade program, Python programming from the 9th grade. I would like to note a number of works by major scientists in the field of computer science M. Aripov, U. Yuldashev, A.A. Aduqodirov A.A., Zakirova F.M.., Khusanov K.O., Saluimova N. [1,2,20,21,30,36], whose made a huge contribution to the science of computer science and also support the idea of comprehensive training from early childhood using information technologies and computer programs, introducing children from an early age to technology, to computers and tablets. Among the works devoted to the use of computer programs in the early development of children, I would like to mention the works of Yunusova G.N.[40].

In this methodology, we present the idea of teaching children using Froebel's gifts through traditional classes and classes on a computer online, preferring to conduct special exercises according to Froebel's method, on Seguin boards, teaching

mathematics on the basis of Montessori boards, using her methodology and exercises. Learning at an early age the alphabet of three or five languages, some basic words in three languages, we offer exercises for the development of the children's hand, for its motor skills, as well as for older children who are preparing for school to teach them to write, starting with dashes and lines, circles and stars, etc., and then smoothly moving on to the study of letters and numbers.(Figure 1).

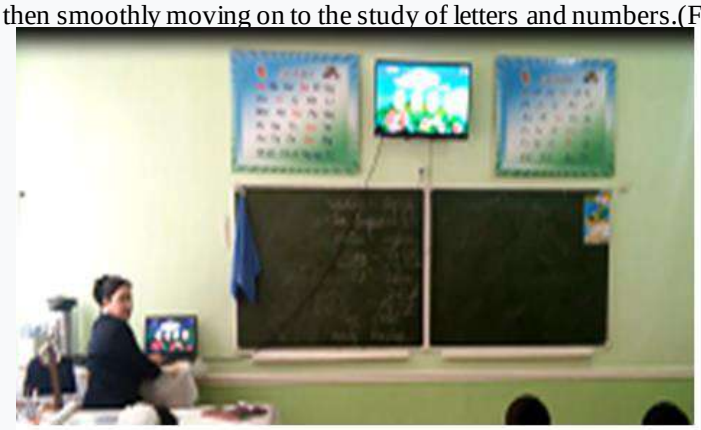


Figure 2,3. Conducting a master class lesson for grade 2 students with the aim of effectively teaching the English alphabet using information technology to compare the English alphabet with the alphabet of the native Uzbek or Russian language.

E-learning is very important here, so that children are not time consuming, bored, they need to be taught with the help of games, this is where computer games are

very important.(Figure 2)

Results

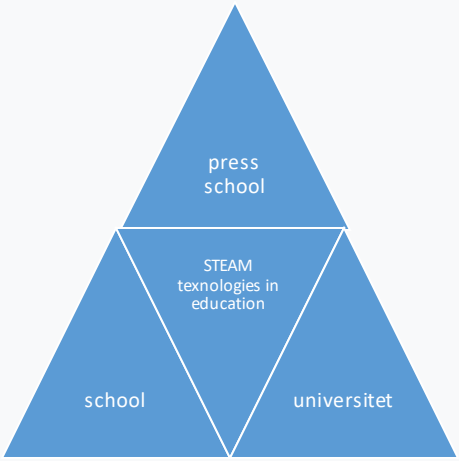
We hypothesized that training with the development of the components of STEAM education in the environment of information technology and computer programs enhances the degree of assimilation of the material and prepares the strongest person or future specialist for the next stages of training, has brought good results.

We have conducted pedagogical experiments in this area for those brought up in children's educational institutions, for schoolchildren and university students. In our research, we used the methods of comparison and analysis of traditional teaching methods, conducted experiments on the correctness of our hypothesis of enhancing the learning of STEAM education components, subjects related to them, as well as related sciences on which these subjects are based. When conducting an experiment on the reliability of the hypotheses identified by us for strengthening the components of STEAM education, as well as improving the assimilation of these materials with the help of information technologies and computer programs created by us. We conducted an experiment on the reliability of our methodology and hypotheses using the Chi-square method, as an experiment, we conducted master classes in children's educational institutions (preschool educational institution № 5 in Namangan),

general educational schools (school № 7, "№. 49, № 1, № 7, № 31 of the city of Namangan, schools № 23,№24 of the Namangan region of the Namangan region), among the educated and students, trainees were selected for the control and experimental group.

After teaching by the traditional method and our methodology, a survey, questionnaires, testing were organized, knowledge on the topics of the master classes held according to the traditional methodology and according to the new methodology of teaching children, pupils and students improved by us, i.e. STEAM training using information technology, online resources, platforms and computer programs created by us in the areas of continuing education (DOE + SCHOOL + UNIVERSITY). Figure 1. The STEAM Learning Connection Triangle is used in continuing education sections. Picture 1.:

Picture 1. STEAM learning communication triangle.



We taught the children and thus reviewed the traditional method of using the teaching of children under the "Ilk qadam" - "Initial Step" program in preschool educational institution № 5 in Namangan. Then we held a master class on the use of

the proposed methodology for teaching children, using the Froebel methodology with the use of computer programs for Froebel exercises, exercises on Seguin boards, on Montessori boards and other computer programs:

Exercises with multi-colored balls of woolen threads suspended from an iron rail, in multi-colored colors of the rainbow, a clear example of the movement of these balls on their threads, backward, forward, left and right;

- Exercises to familiarize children with various spatial figures: a cube, a parallelepiped, a ball suspended from a rail on a string, their movement backward, forward, left and right, up and down, observation exercises;
- Using an intellectual computer game of the Seguin board, an electronic method of using this technique;
- Using the mathematical game of the Montessori board, an electronic version of this technique;
- The first simple constructions in the Scratch program, mini programs, fairy tales, cartoons in the form of a game, outlining the implementation of each block structure, performing exercises with a mentor;
- Elements of modeling in the Tincercad program, work together with a trainer-mentor;
- Elements of programming in Python.

When conducting experiments for schoolchildren in schools in Namangan city № 31, № 7 and in schools № 23, № 24 of the Namangan region, in universities, we added material to the upper teaching methodology that should be taught to schoolchildren and students in order to become the most trained small and highly skilled professionals, integrating science and knowledge in multiple subjects, including simulation, robotics and programming: Electrical Engineering at TinkerCad Circuits;

- Programming Scratch and C + ;,
- Mechanics in Algodoo;
- 3D modeling: Tincercad;
- onShape;
- TRIK studio-simulation of robotics;

Experiments were carried out and the results were calculated by the methods of mathematical statistics Chi-cavadrat [6].

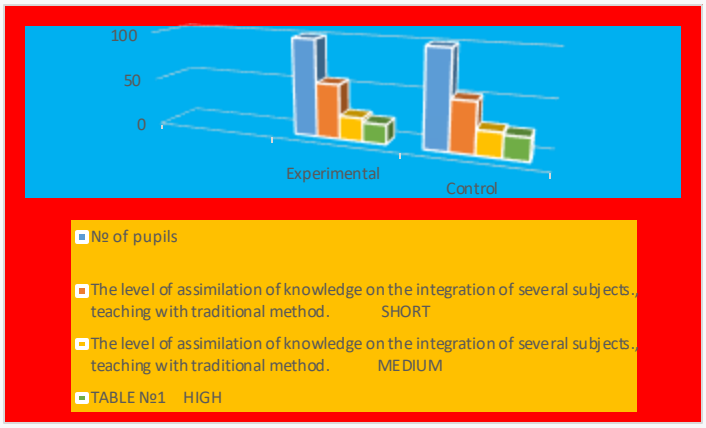
Consider the data obtained after conducting experiments in our study, use the methods of mathematical statistics Chi-square, look at the table of experimental data, and then apply the calculation formula and draw a diagram of the experimental data processing.

The level of knowledge of children when teaching children according to the traditional method according to the program "Ilk kadam" - "Initial step".

TABLE №1

№ of pupils	The level of assimilation of knowledge on the integration of several subjects., teaching with traditional method.		
	SHORT	MEDIUM	HIGH
100	56	24	20
100	52	25	23

Let's look at the following diagram, which clearly shows the dependence of children's knowledge on the criteria in the samples of the control and experimental (Diagamma №1):



groups.

Calculations are performed according to the following formula:

$T_{observed}$ is the observed value (Table №2).

TABLE№2

Groups	№ of pupils	The level of assimilation of knowledge on the integration of several subjects		
		Short	MEDIUM	HIGH
Experimental	100	12	30	58
Control	100	100	24	38

The following diagram clearly shows the higher level of learning when applying our proposed teaching methodology.

According to this table and diagrams, it is possible to establish an increase in the assimilation of knowledge, which proves the effectiveness of the application of our methodology(Diagramma №2):

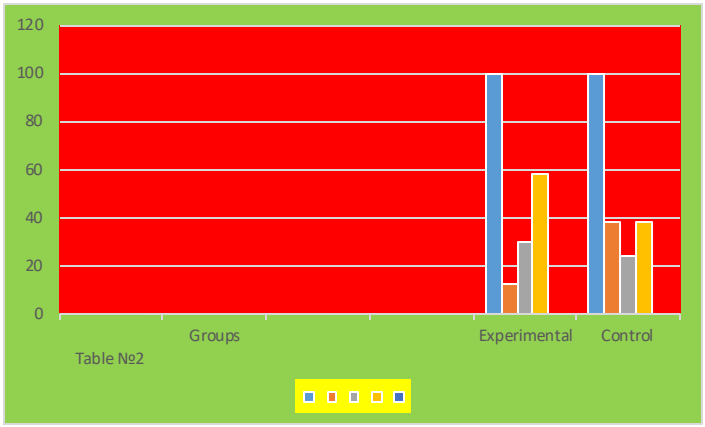


Table №2

If according to the table from the source [6] we will compare with the value in the first method T observed <Tcritical, Tnab. = 0.5, Tcr. = 5.991. 5.991> 0.5. In the carried out method according to the second method, T observed = 18.3, it can be seen that this value is about 3.5 times greater than the critical value.

From these conclusions, we can conclude that with the strengthening of the components of STEAM training and the use of information technologies and computer programs, the result of mastering the material is much higher, and the activity of children turned out to be high. We conducted an experiment and used the method of statistical data processing according to the Chi-square test.

With this method, we conducted an experiment, teaching pupils of school №31, № 7, as well as university students and obtained similar results, which proved the reliability of our hypothesis of strengthening the learning of the components of STEAM education, which will lead us to the final goal of improving the efficiency of assimilation of knowledge in the integration of subjects and even more effective assimilation of materials using information technology and computer

Our work is of a pedagogical nature and is aimed at a person's whole life, so that later, when he becomes a specialist, he continues to work on himself and to learn, to improve his skills, his skills and intellect. As a result of our training, the application of the methodology for teaching children computer games and information technology, with the teaching of Scratch and Tincercad, as well as the use of Froebel's methodology, Seguin boards, Montessori and computer programs at an even earlier age, then abundant training in block programming using Scratch, modeling in Tincercad and other programming skills in the Scratch and Python environment.

Further, we have developed methods of teaching Steam education using teaching computer science at an earlier age, and the same will create a continuous teaching methodology for Steam education, based on information technology and computer programs, as a result of which a new generation of future specialists will be formed, who will be comprehensively developed in all branches of science, technology, production, mathematics and technology, engineering and design, assembly of machines and robots for parts

Photo1. Assembly by parts of the object in robotics, the basics of design and engineering. Teaching children by parents. Or junior seniors.

Methods and methodology.

In our research, we used the methods of comparison and analysis of traditional teaching methods, conducted experiments on the correctness of our hypothesis of enhancing the learning of STEAM education components, subjects related to them, as well as related sciences on which these subjects are based. When conducting an experiment on the reliability of the hypotheses identified by us for strengthening the components of STEAM education, as well as improving the assimilation of these materials with the help of information technologies and computer programs created by us.

Discussion

Analyzing the literature and getting acquainted with examples of robots created in different countries of the world, with the development of various types of robots: in Germany, China, Russia, Dubai, Korea, we think about the sketch of the robot we are using. And we think that it costs a lot of money.

Figure 4. A robot that can be controlled from a distance.

To do this, for young people to have certain knowledge and skills in mathematics, in instrumentation, in detailing parts of a machine or robot, in engineering, in programming, in using ready-made software and the ability to program in block devices of programs that can be translated into highly required programming languages as C ++, Python.

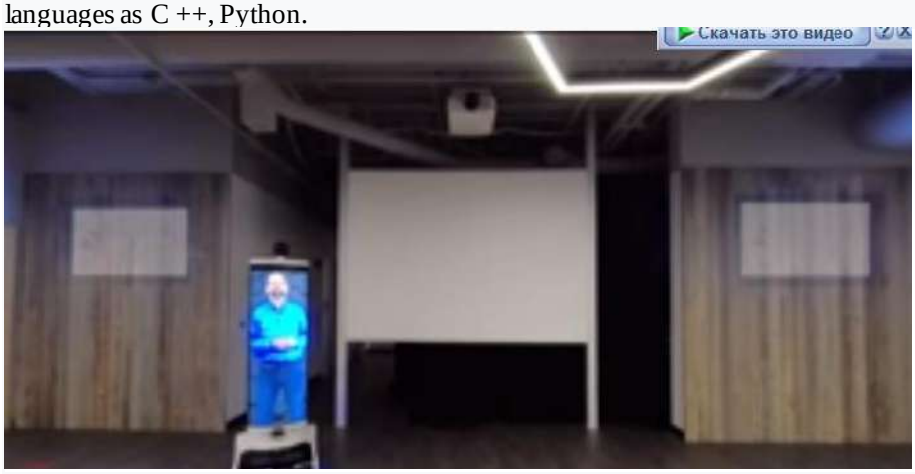


Figure 5. Robot assisting in teaching or presentations.

When you come abroad and see how robotic waiters are serving you or a robot making coffee and serving you, you involuntarily think about creating such robots that work not only in industry, but also in education, in everyday life and in household work.

Figure 6. A robot preparing and bringing coffee. Dubai.

Integral parts of robotics are such areas that are included in science: electrical engineering, programming, mechanics, circuitry and 3D modeling. The knowledge gained in these areas will allow students to move on to creating a virtual robot model in a special simulation environment. Children can create a working model of the robot and test it in many different programs, for example, when the robot moves in a straight line, when it moves along a black line, or along a white line.

Students should receive step-by-step knowledge of how to create a robot: from modeling the case to creating and programming in a virtual environment of an autonomous electrical device, so that students can link their knowledge into a single project and implement a simulation model of a real robot in real-world conditions. For this, the student must master a number of programs and knowledge on them

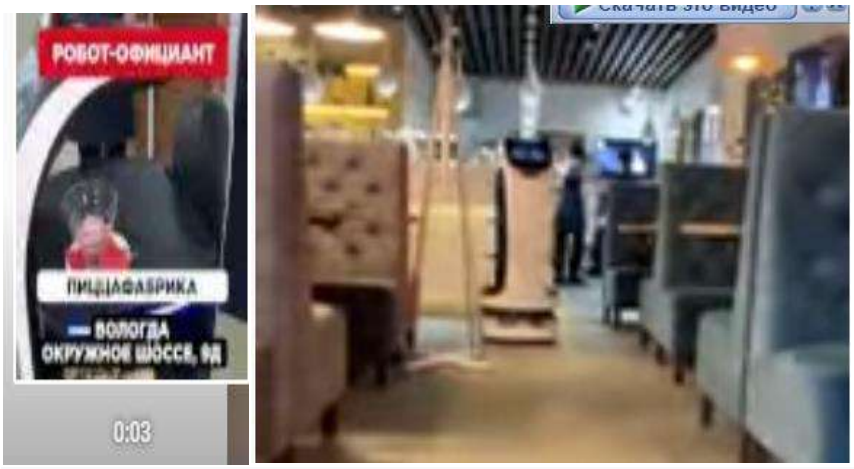
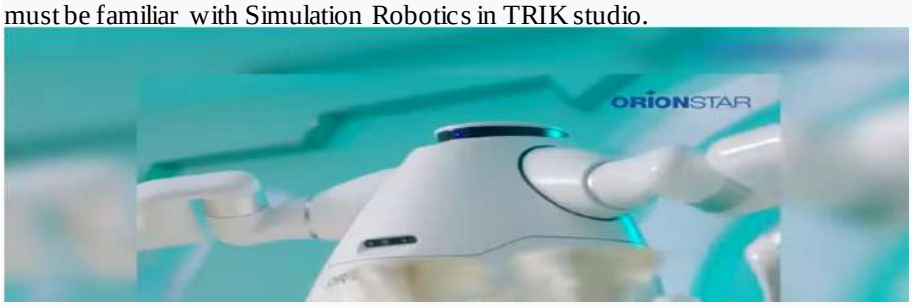


Figure 7. Robot waiter.

First is the Electrical Engineering program at Tinkercad Circuits.

Secondly, every student must learn the basics of programming in Scratch and C ++, Python. Thirdly, he must get knowledge of Mechanics in Algodoo, know 3D modeling (basic course in TinkerCAD and advanced course in onShape), and also must be familiar with Simulation Robotics in TRIK studio.



Electrical Engineering at TinkerCad Circuits.

Electronics helps to give knowledge about how the robot works, its movement, what programming languages it operates in, for example, it requires knowledge of programming in Scratch, C ++, python. In the study of electrical engineering using TinkerCad Circuits, an environment that simulates the operation of electrical circuits. In this part of the robotics course, students will become familiar with the

main electrical components: resistors and buttons of various types, LEDs, light bulbs, capacitors, electric motors, galvanic cells, and others.

Pupils will study the principle of operation of each of the listed elements and understand how they work. In addition, at this stage, children will master basic concepts such as: current strength, Ohm's law, parallel and series connection of elements in electrical engineering, voltage, resistance, and others. Students will instantly master the theoretical knowledge gained in practice, assembling electrical circuits with many elements in the TinkerCad Circuits simulation environment. They will learn how to use a virtual multi-meter to test student-assembled circuits. At the heart of robotics and electrical engineering, students will get acquainted with the most famous board for creating robots and smart home systems - Arduino.

Studying this part of electronics, pupils or students will program a seven-segment indicator, learn how to determine the level of carbon dioxide in a room (using a sensor), create a smart parking system (with a distance sensor) and many other projects that include working with sensors and programming.

Students 10-13 years of age and older should gain experience with LED strip, LCD displays and servo motors. Having mastered these electrical components and how to interact with them, children will be able to independently assemble an automatic lamp, a lighting system in the room (on addressable LED strips) and many other devices. In addition, they must learn to work in a 3D printer, learn the basics of creating a robot in parts. They should understand well the structure of the arms and legs of the robot, the function of its work and movement, the composition of the wires, etc.

2. **Programming Scratch and C ++.** The creation of a robot cannot be imagined without programming. It is the code that the developer puts into the microcontroller that turns an ordinary electrical device into an autonomous machine that makes

decisions on its own. As part of this module, children acquire key skills in the visual programming language Scratch and learn basic programming tools - conditions (simple and complex), loops (infinite and with a finite number of repetitions), learn to work with variables, understand what arrays, procedures, and function

After studying the materials and basics of programming in Scratch, students will immerse themselves in the basics of programming and the process of writing games. At this stage, children will create virtual models of game objects, master the process of creating character animation, changing costumes, learn to program the behavior and interaction of their favorite hero so that he can run, jump, shoot, catch up with others and perform many other actions at the same time.

The key project that unites the programming skills acquired by the child is the creation of a workable version of the popular games "Shooter", "Catch-up", "Dinosaur", "Cats and Mice", "Parrot Banana" or "Fruit Ninja". After that, the child will be able to independently write almost any games in Scratch. The acquired skills of programming virtual objects can be well applied to real robotic devices.Children 10-13 years old will also learn the basics of programming in the most common language for programming microcontrollers - C ++. They will need this in order to program the interaction of the Arduino controller with the LED strip, LCD display, IR remote control and keypad when studying advanced electrical engineering. It is necessary to write a program code to move the robot along a straight line or along a black line, etc. You need an Arduino board on which you can program using Scratch, C ++, Arduino.

At the end of the educational block, having received knowledge of mechanics, children will begin to master the laws of translational-rotational motion and implement a key project that combines all the skills they have acquired - they will independently assemble the mechanism of a walking robot.

3. **3D modeling**. This requires the ability to work in the Trencercad program and use the Scratch program blocks in its environment.

In robotics, the study of simulation is essential. After all, every detail of the robot, from the body to the wheels, is initially developed in a virtual environment and only then, according to drawings and models, is transferred to the real world. It has been and will always be so. Pupils and students find it difficult to learn the basics of 3D modeling. There are still more advanced modeling programs, but at the initial stage we offer a program

Trincercad. TinkerCAD is a free tool and can be used by beginners as a simple environment to build their first 3D objects and prepare them for 3D printing.

During online classes, children will learn how to create models of varying complexity, transfer objects from real life to a virtual environment, use precise dimensional positioning when building models and analyze the mobility of objects. Also, children learn to read various drawings.

Required knowledge in onShape

However, the modeling limited to the TinkerCAD environment is not enough to work confidently with 3D models. Therefore, after creating complex models, students will move on to a more serious level and learn how to work in onShape. onShape is a professional cloud-based computer-aided design (CAD) system.

4. Simulation robotics at TRIK studio. At the end, students will combine all the knowledge gained in electrical engineering, programming, mechanics and modeling classes and start working in a specialized environment that simulates robot behavior - TRIK studio.

In this environment, children learn to build special algorithms to perform specific tasks, for example, driving a robot along a line, along a white line or black line, white and black line.

At the end, students will combine all the knowledge gained in electrical engineering, programming, mechanics and modeling classes and start working in a specialized environment that simulates robot behavior - TRIK studio.

In this environment, children learn to build special algorithms for performing specific tasks, for example, driving a robot along a line, along a white line or black line, white and black line. As part of this block, students will get acquainted with proportional, differential and integral controllers, learn how to create programs, using which the robot will get out of any maze, help a person collect waste on the street, clean the yard from glass and debris, clean the room.

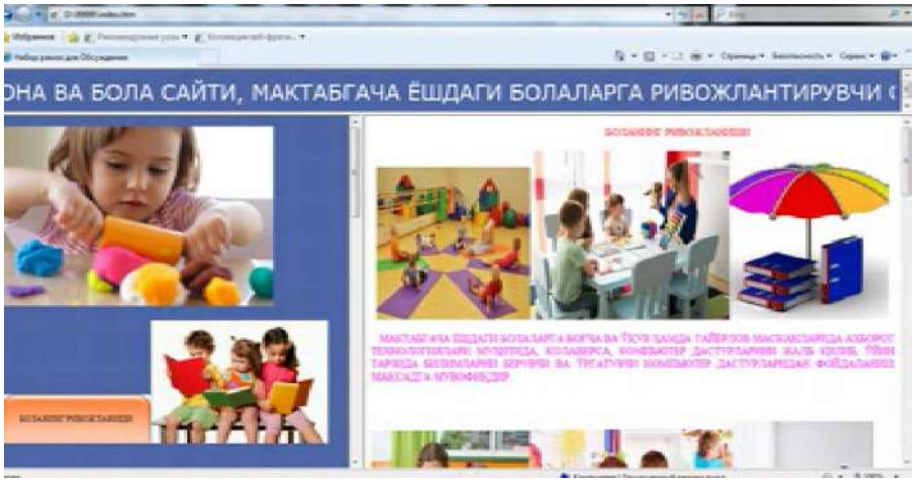


Figure 8a). We have created a website for children aged 1 month to 7 years, for learning from 3 years old with their parents and up to 1 year old to monitor the

development of the child and compare it with the development standard for each month.

.**Conclusion.** STEAM-based education should continue in all areas of lifelong education, especially they gave good results when using information technology, the Internet and online, e-learning, the multimedia use of computer programs helped to better assimilate the material, since STEAM education itself provides simultaneous material on several subjects.

The hypothesis of the development of Steam education through the development of the components of such an education, as well as our hypothesis of the use of information technology and computer programs in continuous areas of education, prepares young people, future specialists who are most deeply versed in electrical engineering, engineering, modeling, robotics, information technology and computer programs, in programming languages with programming skills from simple block structures to programming in Python or C ++ in Arduino.

Figure 9. Conducting master classes for informatics teachers on STEAM education.

Acknowledgments. We have gratitude and certificates from the intellectual property agency for the training seminars and master classes we conducted in preschool institutions and schools with the use and implementation of our proposed teaching methodology in the STEAM environment using computer programs and

information technologies to increase the level of mastering several subjects simultaneously.

Bibliography:

1.Aripov M.M., Informatika, informatsion texnologiyalar, T. 1999 yil.

2.Abdukadirov A.A., Fundamentals of Informatics and Computer Science, T. 1989.

3. Articles of the journal "Procedia-computer-science", based on the results of the international 24th conference, Science Direct., URL: https://www.sciencedirect.com/journal/procedia-computer-science/vol/176/suppl/C.

4.Amy Eguchi., Bringing Robotics in Classrooms., URl: https://www.researchgate.net/publication/318356697_Bringing_Robotics_in_Classrooms., Robotics in STEM Education., 2017., p.3-31.

5. Belova G.V. Programming in the LOGO environment. The first steps. - M .: Solon, 2007

6. Bokuchava T.P., Tour S.N. Informatics manual for teachers in grades 2-4. M .: BHV, 2007. Booch G. Object-oriented analysis and design with examples of applications - M .: Williams, 2008.

7. Christina Chalmers.,Rod Nason., Systems Thin king Approach to Robotics Curriculum in Schools., July 2017., -P. 33-57.

8. Chan-Jin CJ Chung., Christopher Cartwright., Joe DeRose., Robotics Festival and Competitions Designed for STEM+C Education., CHAPTER., Robotics in STEM Education., pp.131-170

9. Comput Sci Educ., Diana Linnell Wanzer, Tom Mcklin, Jason Freeman., Taneisha Lee.,Promoting intentions to persist in computing: an examination of six years of the EarSketch program., https://www.researchgate.net/publication/338727935_Promoting_intentions

_to_persist_in_computing_an_examination_of_six_years_of_the_EarSketch_program., Jan 2020.

10. Cucuk Budiyanto.,Faaizah Shahbodin., Muhammad Ulinnuha Khoirul Umam., Indah Widiastuti.,Developing Computational Thinking Ability in Early Childhood Education: The Influence of Programming-toy to Parent-Children Engagement.,April 2021.,IJPTE International Journal of Pedagogy and Teacher Education., 5(1):19-25.,URL:.https://www.researchgate.net/publication/351140940_Developing_Computational_Thinking_Ability_in_Early_Childhood_Education_The_Influence_of_Programming-toy_to_Parent-Children_Engagement, DOI:10.20961/ijpte.v5i1.44397., Project: Computational Thinking.

11. Dawson M. Programming in Python. - SPb .: Peter, 2014 .-- 416 p.

12. Eremin E.A. Informatika newspaper. The Scratch environment - first acquaintance. - M .: September 1, 2008 - No. 20 (573) - pp. 17-24.

13. Ershov A.P. and other Fundamentals of informatics and computer technology. Textbook for grades 10-11 of secondary schools. - M .: Education, 1985.

14. Elena Jurado., David Fonseca.,, Jorge Coderch.,Xavi Canaleta., Social STEAM Learning at an Early Age with Robotic Platforms: A Case Study in Four Schools in Spain.,URl: https://www.researchgate.net/publication/342628899_Social_STEAM_Learning_at_an_Early_Age_with_Robotic_Platforms_A_Case_Study_in_Four_Schools_in_Spain.,July 2020.,Sensors 20(13):3698.,DOI:10.3390/s20133698., Project: EduEnginy.

15.. Goryachev AV, Volkova TO, Gorina TI, Informatics in games and tasks: Textbook-notebook for grade 2 of a four-year elementary school: In 2 volumes. M .: Balass, 2006

16. Gaddis T. Let's start programming in Python. - 4th ed .: Per. from English - SPb .: BHV-Petersburg, 2019 .-- 768 p.
17. Judit Alamo., Eduardo Quevedo Gutiérrez., Alejandro Santana., Alberto Zapatera Llinares., al Robotics. Contingency Plan during Lockdown in Primary School. July 2021.
18. Knut E., Donald. The art of programming. Volume 1. Basic algorithms. - M .: Williams, 2007
19. Konopatova N.K., Matveeva N.V., Pankratova L.P., Chelak E.N., Nurova N.A. Textbook for grade 4. M .: Binom. Knowledge laboratory, 2007
20. Khusanov K.O., Integrated information technologies in education // Proceedings of the international conference "Computational mathematics, differential equations, information technologies", Ulan-Ude, Russia, August 24-28, 2009., -S.50-54.
21. Khusanov K.O., Ibrahimova I., Web applications of educational materials., Bulletin of the Turin Polytechnic University in Tashkent., Issue 08/2017.-P.17-19.
22. Lutz M. Programming in Python, Volume I, Volume II, 4th edition. - Per. from English - SPb .: Symbol-Plus, 2011 .-- 992 p.
23. Luciano Ramallo Python. To the heights of excellence. - M .: DMK Press, 2016 .-- 768 p.
24. Melanie Schranzb., Wilfried Elmenreicha., "A study using the low-cost swarm robotics platform spiderino in education" [ScienceDirect., URL: https: //www.sciencedirect.com/science/article/pii/S2666557320300033., Curtin University, Perth,Austria, 2020 Y.
25. Myint Swe Hine., Robotics in STEM Education: Redesigning the Learning Experience., URL: https://www.researchgate.net/publication/318761156_Robotics_in_STEM_

Education_Redesigning_the_Learning_Experience., July, 2017., Curtin University., 2017,-p.3-31.

26. MoncaPivettia., SilviaDi Battista., SilviaDi Battista., "Educational Robotics for children with neurodevelopmental disorders: A systematic review.", URL: https: //www.sciencedirect.com/science/article/pii/S240584402032003Xx., Sciencedirect , October., 2020 y.
27. Michael L Lachney., Mind the Mindstorms: Technocultures of Engineering Education in Three U.S. Elementary Schools., URL: https://www.researchgate.net/publication/344792993_Mind_the_Mindstorms_Technocultures_of_Engineering_Education_in_Three_US_Elementary_Schools., June 2019.,DOI:10.18260/1-2--33111.,Conference: 2019 .,SEE Annual Conference & Exposition.,, Michigan State University.
28. PiaBeyer-Wunscha., Christopher Reichsteina "Effects of a Humanoid Robot on the Well-being for Hospitalized Children in the Pediatric Clinic - An Experimental Study"., - URL: https: //www.sciencedirect.com/science/ article / pii / S1877050920321475ЮБSciencedirect , October., 2020 y.
29. Pervin Yu.A. Methodology for early teaching in informatics: Methodological guide for primary school teachers and methodologists Ed. 1st / 2nd. M .: Binom. Knowledge laboratory,
30. Salimova N., Khusanov K., Devolopment of an educational platform for the child education,, Bulletin of the Turin Polytechnic University in the city of Tashkent., Issue 08/2017.-C.20-24.
31. Shelly Engelman., Brian Magerko.,Georgia Institute of Technology.,Tom Mcklin.,The Findings Group., Creativity in Authentic STEAM Education with EarSketch.,URL:https://www.google.com/search?q=translate&oq=translate&aqs=chrome.0.69i59j0i433i512j0i131i433i512l2j69i60l4.5564j0j7&sourceid=chrome&ie=UTF-8., March., 2017.

32. Sirirat Petsangsri.,STEAM Education for Enhancing Creativity in Packaging Design.,
Background and Context: EarSketch.,, vol.34, no.1, pp. 21-31 (11 pages). 2021.

33. Siti Wahyuningsih/, Adriani Rahma Pudyaningtyas··· Ruli Hafidah··, Muhammad Munif Syamsuddin·, Novita Eka Nurjanah·, Upik Elok Endang Rasmani·,(Pendidikan Guru Pendidikan Anak Usia Dini, Universitas Sebelas Maret, Indonesia., Efek Metode STEAM pada Kreatifitas Anak Usia 5-6 Tahun., Vol 4, No 1 (2020)., Wahyuningsih., Indonesia.

34. Upik Elok Endang Rasmani.,Novita Nurjanah.,Siti Wahyuningsih.,The effect use of STEAM method on the classification ability in objects for children aged 4-5 years.,url:https://iopscience.iop.org/article/10.1088/1742-6596/1511/1/012119., April 2020 · Journal of Physics Conference Series.

35. Velikovich L., Tsvetkova M. Programming for beginners. - M .: Binom, 2007. 6. Grabar MI-., Krasnyanskaya KA, Application of mathematical statistics in pedagogical research., M., Pedagogy., 1977, -S.135.

36. Yuldashev U.Yu., Bokiev R.R .., Zakirova F.M., Informatics., Tashkent 2000 y., - p. 250.

37. Yunusova G.N., Project for the creation of a children's educational institution "Robo-Demo" with training a whole cycle of computer programs to prepare for school: the development of memory and logical thinking, teaching the alphabet of three languages: Uzbek, Russian and English, robotics, Lego -design, for the development of intellectual abilities and thinking, for the development of mathematical abilities, etc., a project that won the selection of 100 and innovative projects of women in Uzbekistan in 2019.

38. Yunusova G.N., Mobile learning of preparing children for school using the site "Mom and Her Child" is the basis of lifelong learning., Journal "Physics and Mathematics" 2019, issue No. 6. , Uzbekistan.

39. Yunusova G.N., Website development for young children and preschoolers from 1 month to 7 years, Journal "Interactive Science" 2020, -P. 70-74.

40. Yunusova G.N., Methodology for preparing preschoolers with the latest information technologies and computer programs., Journal "Interactive Science", 2020, -p. 8-14.

41. Yudina A. Informatics. Methodological guide to the workshop on informatics in the Logo Writer environment. Moscow: Mnemosina, 2005.

42. Yashuev R.N. Work with schoolchildren in the field of computer science. - M., 2007

43. Yakhovsky N.G. Teaching programming in elementary school. - M., 2008.

44. Zlatopolsky D.M. Fundamentals of Python programming. - M .: DMK Press, 2017 .-- 284 p.

CHAPTER 3. METHODS OF PRE-SCHOOL PRE-SCHOOL PREPARATION BY

THE LATEST TECHNOLOGIES AND COMPUTER PROGRAMS.

CHAPTER 3. METHODS OF PRE-SCHOOL PRE-SCHOOL PREPARATION BY THE LATEST TECHNOLOGIES AND COMPUTER PROGRAMS.

This chapter reveals new aspects of the use of computers and computer programs in the form of games for preschool children using the latest technologies and methods in order to effectively prepare them for school. The creation and application of programs in the form of games for focusing attention, developing memory, logical thinking in children, learning the alphabet of three languages, teaching robotics, designing and assembling robot parts, helps in preparing children for school. It shows a methodology for teaching parts of a machine or a robot by performing other exercises to learn English words or assignments in mathematics and bears the nature of the use of the latest STEAM technologies and the use of mnemonics in memory management for more effective memorization of new knowledge [1,2,3,4,6,7,8].

At the beginning of training in the form of a warm-up, programs can be used to focus the child's attention, to collect his thoughts, to develop memory and logical thinking. Then you can conduct other activities that are designed to gain new knowledge in various directions. The article reveals methods of teaching words of a foreign language, associating them with words of the native or Russian languages, based on the methods of mnemonics, comparison, analysis and synthesis of data. The result of the training by means of the programs eventually gave the children knowledge of the letters of the alphabets of three languages, it was possible before classes to focus the attention of children, to develop their visual and logical memory, the children independently understood the similarity and difference of letters, the pronunciation of the alphabet of three languages, training in the field of STEAM technologies and mnemonics gives a new approach to the comprehensive development of a child with his entry into the world of knowledge in the alphabet of three languages, the thesaurus of the words of the English language, based on effective methods of mnemonics [9,10,11,12,13,14,15,16].

Key words: attention focusing program; program for the development of memory and logical thinking; a program for children to teach the alphabet of three languages; program for children - a future inventor.

Preparing children for school material should begin from preschool age in preschool institutions with educators and methodologists. Parents have always sought to send their children to advanced preschool. Gradually teaching children about the phenomena of nature and the environment, what is hot and cold, the change of seasons, why it is cold and hot, giving them the concepts of thin and thick objects, short and long, high and low, gradually they need to be prepared for school, accustomed to gaining knowledge. A strict, deliberate step-by-step material is needed that will prepare the child for school. It is here that you can use information technology, computer learning with the help of game programs, the use of elements of mnemonics and STEAM - technologies in teaching numbers, digital counting to ten and vice versa, as well as work with memory in memorizing words of the English

language in consonance with your native language Russian, Uzbek, etc. [7,8,16,17,18,19] based on the association of familiar words. The question of preparing the future generation with the latest technologies has always been relevant, with the help of computer programs, a computer, its additional channels to bring the necessary skills and knowledge to the child's perception.

After reviewing a number of works performed in this section, we had to analyze the work performed on this topic, look through the literature on the creation of animations, animation frames, videos, video materials, audio lessons to use these created resources for preschool children, we had to study the existing learning environment [1,2,3,4]. While raising their children, teaching them the alphabet, reading and writing, to help educators and parents, the idea of creating game programs for children with the aim of teaching them language, counting, robotics, "engineering", using the latest technologies and teaching methods using Steam technologies and mnemonics. After all, teaching the future generation and raising it at a higher level has always been one of the main tasks in training future personnel, worthy of changing generations for the future [6,7,8,9]. This has always been one of the urgent tasks of the century. Mnemonics is a field or science dealing with ways of more effective memorization of material by a person, teaches how to memorize words of foreign languages, including English, as conveniently as possible, using various associations of words of the native language. Mnemonics teaches you to quickly and effectively memorize words in English or other languages, teaches a child from childhood to manage his memory, give her tasks and orders in memorizing certain elements of knowledge that the child needs in the future, associating them with existing words, the child can learn a large stock words of a foreign language [5]. At the present stage of education, when every three years schoolchildren participate in international programs for assessing knowledge in testing PISA, PIRLS, TIMMS, TALIS, preparation for this control is necessary, starting from preschool age, introducing elements of STEAM technology and mnemonics into learning at this stage of education for getting good results in these

tests. We know the abbreviation STEAM-S-science-science, T-technology-technology, E-education-education, A-art-art, M-mathematics-mathematics. In these areas, it is necessary to prepare children, and their ability to science, technology and technology, to mathematics and art, it is necessary to begin with education in preschool institutions and at home with their parents. Special programs like scratch, robotics platforms such as Arduino, LingMingshrom and others are very appropriate here [5]. To create such programs that teach children the knowledge necessary for them in the form of a game, we first studied the ready-made resources on the Internet, looked at their content, and determined what programs they used.

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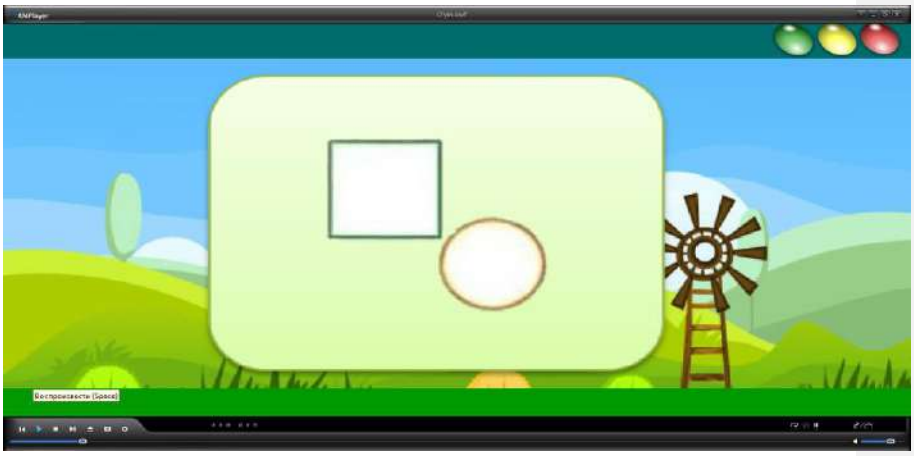
dissertations and scientific works [7,8,16,17-21]. The qualitative aspects of the research were determined and the results were made, the weaknesses were revealed that are subject to development and refinement in the area that we calculated on the basis of existing research methods based on existing materials.

In the process of using the created programs in practice, methods of analysis, comparison of materials, objects were used, analysis and synthesis, e-learning and combined learning were applied, and their comparison was carried out. Domestic, Russian and foreign methodologies of visual teaching, e-learning and other sources of literature were used. In teaching preschool children, we rely on e-learning, you can also conduct combined learning, i.e. traditional learning to communicate with electronic. In the learning process, if at first they are surprised to see why they are given computers, put on a large screen, but after they are involved in the learning process, we involuntarily notice that the barrier between the technology and the child instantly disappears, the children become active, they themselves, without noticing it, resort to computer to look at the images of objects from there. They are interested in cartoon characters, they try to find the correct images that the program showed them, they try to find the letters and words of the English alphabet, they are happy to assemble a robot, while doing exercises in mathematics and English to memorize words. It is effective to use such educational programs with animated cartoon frames to involve children in the education process.

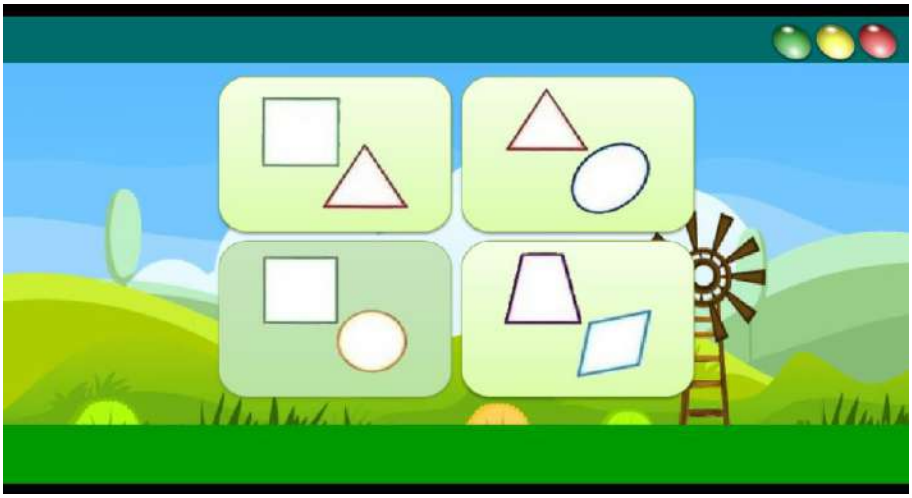
Our method of teaching preschool children is as follows. At the beginning, it is necessary to focus the attention of children, because we know that at the age of 3 to 5 years they are very mobile, they have very highly developed motor skills. In order to attract their attention, we propose a computer program using the character of Panda Bear, who needs to be transferred to the other side by transferring him across 10 bridges. The child is invited to view the image for memorization, and after 20 seconds he must view and remember it, and then find it among other objects, among the set. This program is called "Memory Adjustment" or "Computer + Attention + Memory + Logical Thinking" [17,18,19].

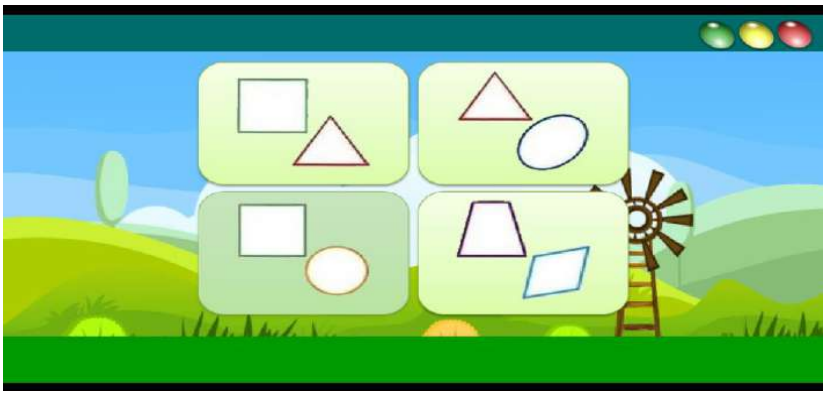
According to the program "Adjustment of memory" or "Computer + attention + memory + logical thinking" you can help the child to collect his thoughts, switch his attention to the necessary aspects of learning, develop his memory, including visual, logical thinking. The program begins with an interesting movement of Panda Bear, which must be transferred over 10 bridges and must go from one bank to another.

The use of a funny cartoon character in this matter generates an interest in the child to do the exercises. The child is presented with a picture for viewing, then he must remember it and find it among another set, which the program shows him the previously shown image.

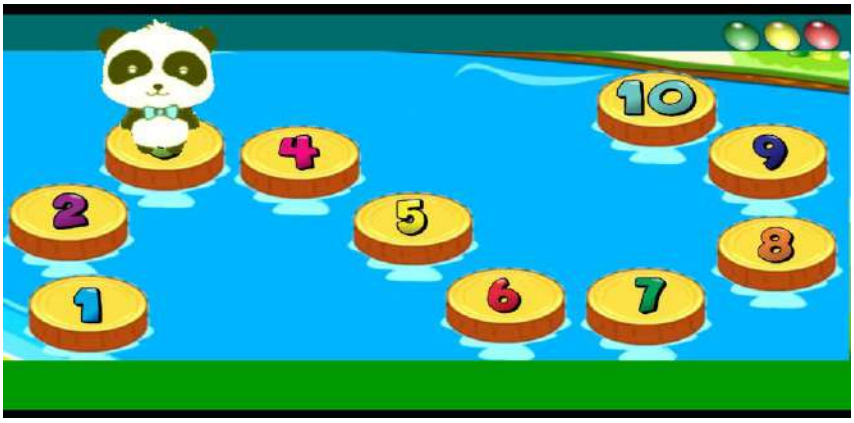


Having memorized this drawing, the child must find it among others.





Having chosen the correct answer, the child transfers Panda Bear to the next bridge, it should be noted that the Bear goes to the next bridge even if the answer is incorrect. Next, the child is given the task of memorizing the next picture. After the child chooses the answer, Panda Bear goes to the next bridge. He must find the picture or image shown to him within 20 seconds among others.

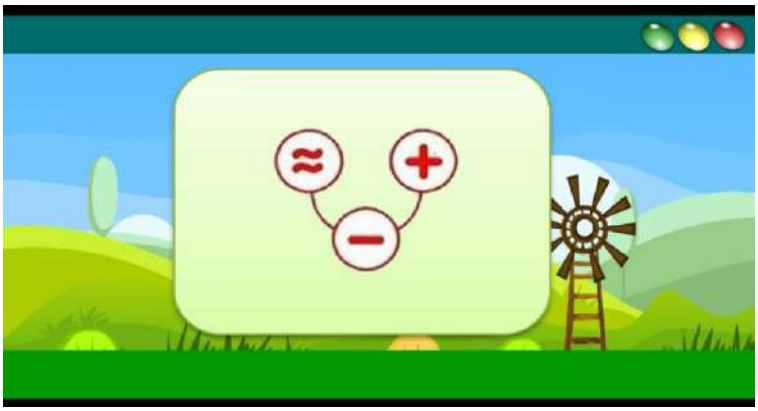


The child has to find an image among the multitude, he compares with these images, thinks, remembers, consciously refers to his visual memory. The object for remembering the child, as you can see, is constantly changing from simple geometric shapes to plants, flowers, mushrooms, leaves, and then again to more complex shapes, figures in which figures are inscribed or drawn, then moves to carpet patterns, to symbolism, to drawings with chips, dominoes, etc. On objects inside

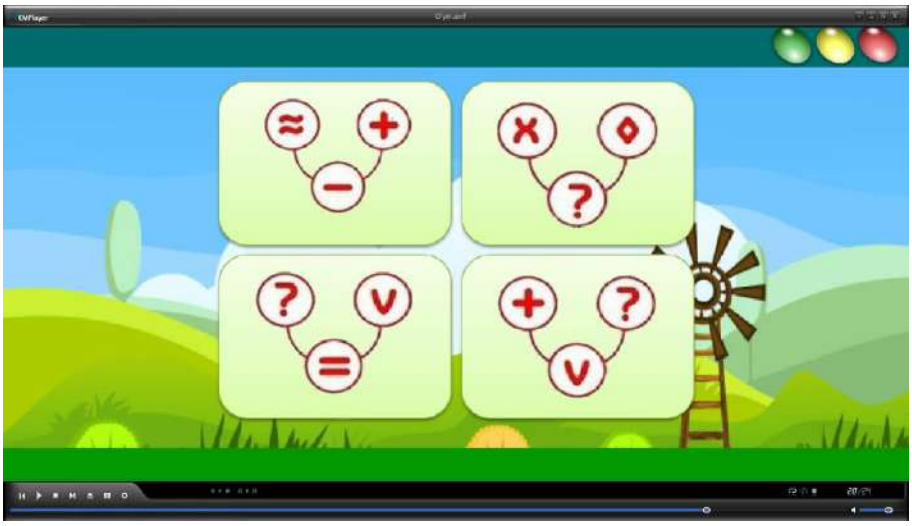
which there are other geometric shapes and segments are placed inside them, and they also have some form, draw a trajectory, a broken line.

Further, the demonstration object is changed by the image of a circle and triangles drawn in it, which must be found among other similar, but different images. In this task, the object is a circle in which triangles are drawn, i.e. the object of the geometric figure becomes more complicated, inside which other geometric figures are drawn. You need to find the image you saw, because in many images there are many circles with triangles, quadrangles drawn inward of the circle. The objects for recognition change one by one. And so the child comes to the end of the program. The search object changes again, and the properties of the object also change. The object looks like a symbolism that will come in contact in the future, in preparation for school and in the school itself again. Panda Bear performs the last jump, and the child must complete the last task [20].

Next, the next last task is executed.



This symbolism is to be found among others.



Further, the program shows from 10 questions and tasks how much the child answered correctly.

In the figure, he answered correctly to 9 tasks out of ten [17]. Next, we will consider a program for studying the alphabet of three languages: Uzbek, Russian and English. This program is called "Computer + alphabet of three languages: Uzbek, Russian, English". Analysis of the work performed on this topic, viewing Internet applications, viewing online programs for teaching the English alphabet, helped us to reveal that there are a lot of Internet applications and programs for teaching the English alphabet on the Internet, there are developments for teaching the Russian language, but for teaching Uzbek language as such, there are no Internet applications and programs.

There are no developments and articles, as well as Internet applications dedicated to teaching the alphabet of three or five languages in preschool age. Based on these beliefs and research, we have created a three-language alphabet training program. Next, we turn to the animation frame with a choice of three exercises, choose the first exercise for learning the English alphabet, with transcription of letters, with sound accompaniment [18].

Go to the "Alphabet" tab and look at this task, when you press the letters, we hear their sound and see the transcription, such training is important for a child from a young age, accustoming them to transcription and you need to rely on their visual memory, which needs to be trained from childhood in order so that they in an older age do not read the texts and pronunciation of words incorrectly, so that they are correct.

Next, the teacher or parents should work with the children on writing down their words, they should teach them some basic words, like a doll, princess, queen, robot, apple, etc. in English. This process should last quite a long time, until the children know the words by heart. You can learn them with flashcards, presentation, etc. And then, according to our program, you can perform the second task, to set words from pictures. Children have to arrange words in pictures.

You can click on the "New Words" item and get new words for placement. The "Yangi so'zlar" key is the key - new words.

Добавлено примечание ([s1]):

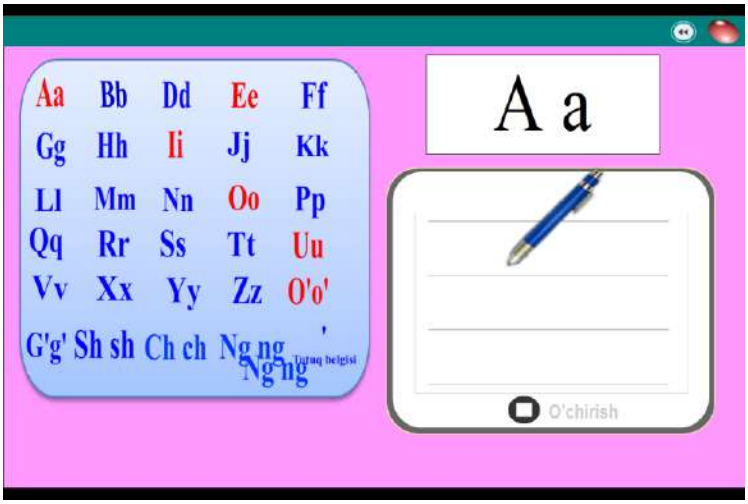
The third exercise that you can do in the English section is the May Bee exercise. In order for the bee to enjoy the nectar, it is necessary to find the necessary letter among other letters by the transcription of the word. Maya the bee must find a flower, the right letter to enjoy the nectar.

This is a kind of simulator for learning the English alphabet. Children's visual memory is trained here. The program is designed to teach the alphabet of three

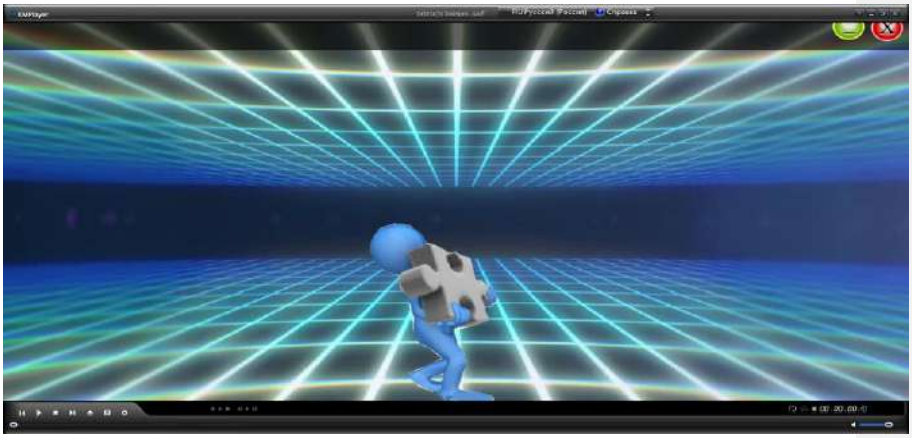
languages. We have dealt with English. Further learning the Russian alphabet is also necessary, because it is customary for us if parents speak Russian, they strive for children to also be fluent. The alphabet of the Russian language can be taught together with the teacher or parents, voicing letters and naming an object, fruits or vegetables for these letters, other words that begin with this letter.

The teacher or parents, clicking on the letters of the Russian alphabet, can pronounce a letter and words starting with this letter. This way you can train all the letters of the Russian alphabet. Each person should know his native language, be able to speak international languages, know foreign languages, and this he needs to learn from childhood. And due to the fact that there are no computer developments for children to teach their native language in consonance with international and foreign languages, we have introduced in our program the teaching of the Uzbek alphabet, not only with sounding letters, but also with teaching their spelling using an electronic pen. , which is not present in any of the created programs for teaching English, Russian, etc. In this case, you can use an electronic board, eraser and write

with an electronic pen.



Now let's look at the Child Inventor program, "ichtirochi - bolajon" for the development of children based on STEAM technology and mnemonic elements in learning and memorizing new words in the English language. The program, like the upper programs, has its own introductory part, where the robot brings a cube from Lego - construction, Lego - construction to the center of the scene [17].



Further, from the menu with animated frames of robots, you can select the rubric of teaching children robotics or design. And consider all the headings in order,

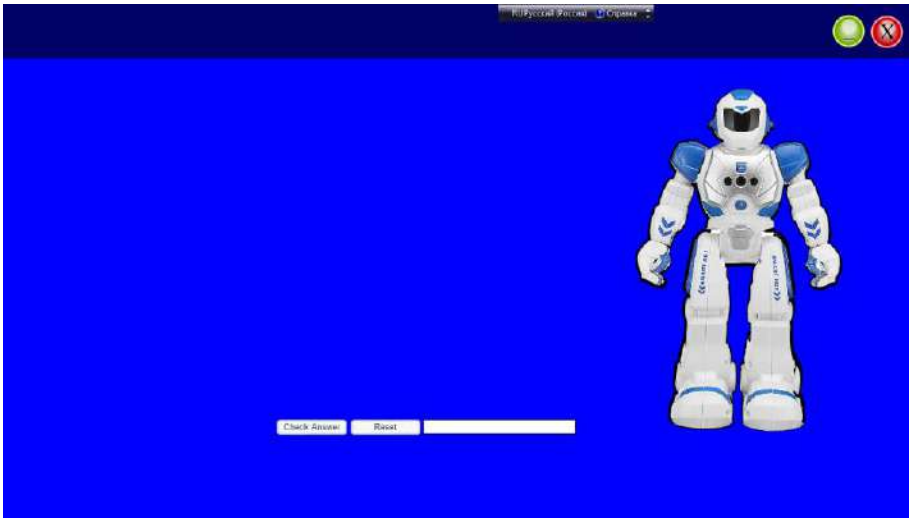
the first heading is building a robot, this heading belongs to the technology-technology heading. The first section relates to the assembly of the robot. It is dedicated to design and engineering.

In this section of the assembly of the robot, you can include elements for teaching English, Russian words in connection with the Uzbek language. For example, on a part of the robot's body, you can write the words hand-рука-қўл, leg-нога-оёқ, head-голова-bosh, body-тело-badan, etc. And the child, putting body parts on the sketch of the robot, will visually memorize body parts, names in three languages.

The child will have to find these parts by name, of course, this exercise is offered for children who cannot read the inscriptions in the parts of the robot, and older children who are ready to go to school and know the letters have already learned to read and write, you can observe them as they with interest they perform a task in which the names of the parts of the robot's body are written in Russian, Uzbek and English. This tab is called "Robot Assembly" [19].

So a child can create a connection between these words in three languages in his native Uzbek, in the second native Russian and in English, a foreign language too.

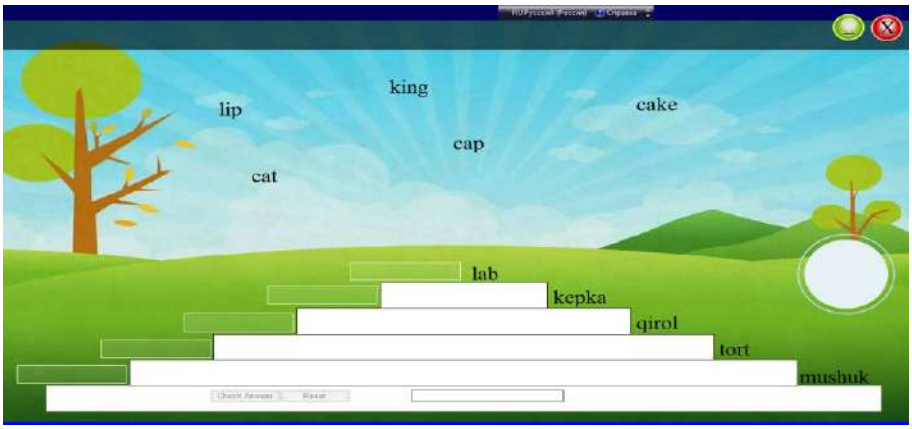
At the end of the assembly, it looks like a robot.



The next menu includes the goal of teaching children the words of the English language in consonance with their native language or Russian, based on similar associations, for example, кэпка - a cap. Торт-Кэкс-cakes, a cake and others.

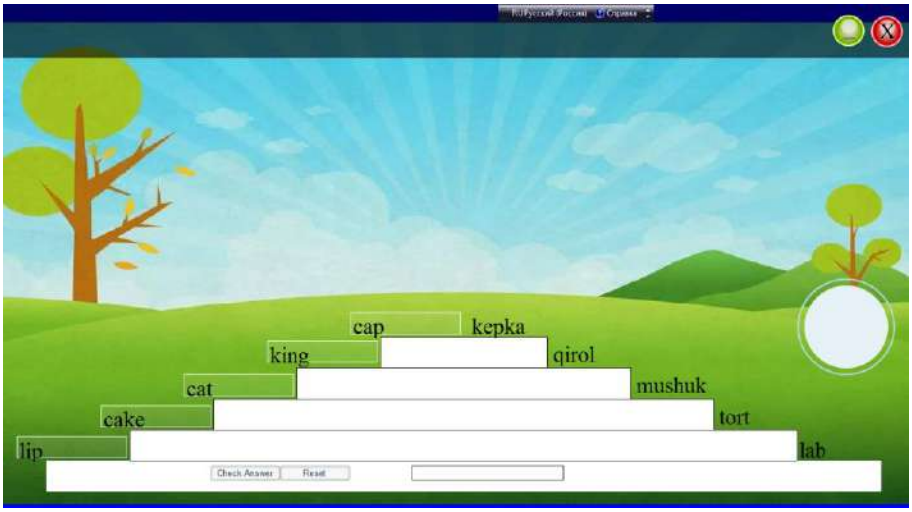
«Til cho'qqisi» menyu is the "Top of the Language" menu, which provides for the learning of new words in the English language. On the ladder of words, they put

its translation in English next to the word. So from many words, a child can create his own ladder of words and memorize.



The next menu is devoted to teaching «numbers and counting them, at the beginning, before performing this exercise, the child must learn to count, he must know the numbers, on the basis of pictures and associations he must learn to count, represent the number 1,2,3,4,5,6,7 , 8,9,10 in the association of the number of objects, for example, apples, pears, sweets, etc. The child, together with the teacher or his parents, must correctly arrange the translation of words on the stairs. Til cho'qqisi menyu is the "Top of the Language" menu, which provides for the learning of new words of the English language. On the ladder of words, they put its translation in English next to the word. So from a variety of words, a child can create his own

ladder of words and remember.



The next step is to study the numbers, their layout in ascending or descending order. The next stage of the program and its menu relates to mathematics, to the introduction of preschool children into this science.

Menu Mathematics - "Matematika olami" - the world of mathematics. It is aimed at teaching numbers, their arrangement in ascending order and vice versa. How can one enter the world of mathematics without knowing numbers, without

knowing them ?! It is necessary to start learning the numbers from 1 unit to 10 ten, with their name, writing and content, teaching using pictures of numbers: one apple, two lemons, three garlic, four cats, five socks, six flowers, seven shells, eight dogs, nine roses, ten books, etc., and count from one to ten. A child who has mastered this exercise can enter the world of mathematics in the program and arrange numbers in ascending or descending order. In the learning process, as you can see, we rely on the analysis and synthesis of the material being taught, on the process of memorizing the material, comparison, synthesis. We use visual learning [19]

After the creation of these programs, we received a certificate from the Intellectual Property Agency and began working in kindergartens, teaching children in this program. We got positive results on perception, development of mnemonics in children, on memorizing words, images, if we got these results in 20 seconds, then we got good results in 4-5 seconds. An unexpected result was that children, who were considered weak in the knowledge of knowledge in a preschool institution, were actively involved in e-learning and showed high results in memorizing images, words, numbers and other objects. This proved that children can freak out what they held in themselves, embarrassed by others or their peers. The children memorized the words of the English language well, they were happy to count and put numbers in ascending and descending order, which proved their good psyche and assimilation of materials at the proper level.

Conclusion of chapter

To summarize the results, control and experimental groups were selected to conduct classes traditionally, without using the program and the same training using the upper programs. The indicators of research work were high, statistical processing of the data was carried out using the Pearson Chi-square method, i.e. on training using computer game programs, which we described above [5]. Processing of the results was performed. According to the data obtained after working out, the result of the experimental group was much higher than the control one. This also proves the effectiveness of the training we offer.

Acknowledgments

For conducting training seminars in preschool institutions on this topic with the involvement of teachers and parents of Ph.D. in training, Associate Professor G.N. Yunusova received awards and letters of commendation, written gratitude was received from the parents of the children being raised. The Ministry of Public Education and Professor Kakhramon Olimov supported the initiative of G.N. Yunusova to create a website using these games for preschool children as online education with parents at home and with educators in preschool institutions. At the selection of "100 innovative projects of women of the Republic of Uzbekistan" under the project "Organization of a kindergarten of a school with information technology and with an online resource for children from 1 month to 7 years", the resource included these programs. G. N. Yunusova received the 1st place in the nomination "The best innovative education project" [17,18,19].

List of references:

1. Albert Macromedia Flash Professional 8. Designer handbook / Albert, Albert Dmitry; Elena. - M .: SPb: BHV, 2006 .-- 544 p.

2. Albert Self-instruction manual Macromedia Flash Professional 8 / Albert, Albert Dmitry; Elena. - M .: SPb: BHV, 2006 .-- 724 p.

3.August, Wilhelm Iffland Allzu scharf macht schartig / August Wilhelm Iffland. - M .: Book on Demand, 2011 .-- 127 p.

4. Voronin, I. Programming for children. From the basics to the creation of robots / I. Voronin, V. Voronina. - SPb .: Peter, 2019 .-- 304 p.

5. VK Kalosha, SI Lobko, TS Chikova, Mathematical processing of experimental results, –C. 88.

6. Denis Golikov, Scratch for young programmers, https:// scratch.mit.edu/scratch2download/ - P.15., 2014.

7. Imanova A.N., Samuratova R.T., Zhumanbaeva A.O., Technologies of innovation in natural science education, https://cyberleninka.ru/article/n/steam-tehnologii-innovatsii-v-estestvenno-nauchnom -obrazovanii / viewer - C.63-64., 2014.

8. Mnemonic, mnemonic - a set of special techniques and methods that facilitate memorization of the necessary information and increase the amount of memory through education. Definition of mnemonics., Quote from the Internet, www.google.ru.

9. Panfilov, I. Macromedia Flash 8 from scratch! / I. Panfilov. - M .: Best books, 2007 .-- 368 p.

10. Reinhardt Macromedia Flash 8. User's Bible (+ CD-ROM) / Reinhardt, Dowd Robert; , Snow. - M .: Nauka, 2006 .-- 981 p.

11. Reinhardt Macromedia Flash MX 2004 ActionScript. User's Bible (+ CD-ROM) / Reinhardt, Lott Robert; , Joy. - M .: Gostekhizdat, 2006 .-- 960 p.

12. Scratch - Programming language [electronic resource] // http://progopedia.ru/language/scratch.

13. Sorokina TE, “From Steam to Steam Education through the Scratch Software Environment, pp. 362-366.

14. Rosanne Zinniger., Gourmet Cupcakes: From Scratch: Simple and Easy., -P 40., 2012.

15. Sweigart, E. Programming for Children. Make games and learn Scratch language! / E. Sweigart. - M .: Eksmo, 2015 .-- 200 p.

16. Campbell Parallel Programming with Microsoft® Visual C ++® / Campbell. - Moscow: Gostekhizdat, 2011 .-- 784 p.

17. Certificate for the computer program "Computer + memory + illogical thinking"., Uzbekistan intellectual property agency., 2019

18. Certificate for the computer program "Computer + alphabet of three languages: Russian, English, Uzbek.", Uzbekistan Intellectual Property Agency., 2019.

19. Certificate for the computer program "child inventor", Uzbekistan Intellectual Property Agency., 2019

20. Tim Roncevich Cisa, Steven Primm CPA. Custom Scratch Post Company, -P.110., 2010.

21. Finkelstein Macromedia Flash 8 for Dummies / Finkelstein, Ellen. - M .: IL, 2006 .-- 416 p.

CHAPTER 4. STEAM TECHNOLOGIES IN THE ENVIRONMENT OF INFORMATION TECHNOLOGIES AND COMPUTER PROGRAMS.

CHAPTER 4. STEAM TECHNOLOGIES IN THE ENVIRONMENT OF INFORMATION TECHNOLOGIES AND COMPUTER PROGRAMS.

STEAM technologies enhance the training of the necessary knowledge, skills in the integration of several subjects, teaching the innovations of science, technology and helping to prepare highly qualified specialists and personnel, as well as organizing the training of both small and highly specialized specialists at all stages of continuing education.Indeed, after graduating from school, lyceums, not all students enter universities and in order to be in demand as a small specialist or in demand by a highly qualified and highly paid specialist who, after graduating from school or university, will be able to work in highly equipped organizations, corporations or factories, which in practice will perform what they learned. This article reveals aspects of STEAM education, pointing to learning in relation to all its components: science, technology and technology, mathematics, engineering, robotics at the level of skill and art or learning, using art itself in isolation. After all, only an erudite specialist who knows his subjects well, at the level of skill and art, can teach children from an early age, using computer programs to prepare for school, give the initial basics of design, create block structures, and design it, at school, as additional training, teach by various methods and programs, the beginnings of the basics of block programming and design, gradually developing in children the logical thinking that they will need in their further work in creating programs, in writing code.

The author puts forward the idea of creating good conditions and comfort for humans in order to create SMART technologies, SMART houses and SMART apartments, new types of robots, etc. And this requires good specialists with all kinds of these sciences. This is where STEAM education will help us, this type of learning technology that will lead to the highest results. Here, the hypothesis of the use of information technologies and computer programs for human development at all stages of lifelong education, starting from the early years throughout life, is also acceptable.

The author offers computer programs created by him for preparation for school, a website and online resources, as well as online applications of other authors, for

human development in early childhood, in the school period and at the stage of higher education to improve knowledge of Lego design, modeling, use of various computer programs, for the formation of logical thinking, working with block structures of the Scratch computer program, geometric representation of figures in space, using the Tincercard program, further on at higher levels of education, computer scientists need training in Electrical Engineering at TinkerCad Circuits; on programming in Scratch and C +; mechanics at Algodoo; 3D modeling: Tincercad; onShape; TRIK studio-simulation of robotics.

In our scientific research, we used methods of analysis and collection and selection, comparison, methods of mathematical statistics in the formation of the reliability of our hypotheses and ideas. We processed the results of the pedagogical experiments on the basis of the Chi-square method of mathematical statistics, using the formula we made the calculations:

$$\chi_n^2 = \sum_{i=1}^{n} \frac{(O_i - E_i)^2}{E_i}$$

Pedagogical experiments were carried out for the control and experimental groups for students at three stages of continuing education using our proposed methodology. For children at an early age, when studying in children's educational institutions, it is necessary to use special sets of toys corresponding to Froebel's gifts, the use of computer programs corresponding to these gifts, i.e. the use of cognitive toys and computer programs. Froebel's gifts are only 6, we will not describe them, they are as follows:

• "Gift 1" - the ball. This is the first toy, as the ball has no corners and is comfortable for the baby. Wool was most often used as a material.

• "Gift 2" - wooden cube, ball and cylinder.

• "Gift 3" - a cube cut into 8 cubes.

• "Gift 4" - a cube divided into 8 tiles.

• "Gift 5" - a cube cut diagonally in half into cubes.

• "Gift 6" - a cube divided into 27 "bricks", some of which are accordingly divided along, and some - across.

Thus, the goals of our work in preparing the child for life, for communicating with the environment, and the principles of Froebel's kindergarten have been improved:

• 2 types of activity - computer games, teaching;

• development of the child's feelings through computer games;

• acquaintance with nature and knowledge of the world using a visual and electronic method by means of a computer;

• communication with parents, kindergarten teachers through a computer and online

At an early age, we offer learning using Seguin boards, learning mathematics using Montessori boards, introducing the child to the concepts of fat and thin, hot and cold, high and low, small and large, forming their logical thinking, what is more and what is less. In this direction, our methodology offers the use of computer programs, with exercises for children to select and select larger and smaller, high or low, thick or thin, narrow or wide objects. Next, we propose the next level of development of the child in preschool education - this is preparing him for school. At this stage of the child's development, we offer at the beginning the teaching of the alphabet of their language. And then learning the alphabet of three languages together with the native Uzbek, Russian and English. At this level of education, from 3 to 5 years old, you can teach your child online using the sites of Russian and English developers, for example, such as iQsha.ru, the sites we have created that contain programs we have created to teach children the alphabet of three languages, as well as a program for focusing the child's attention, for the development of his memory and logical thinking. At an earlier age, the child literally for 15-20 minutes together with parents or mentors in a children's educational institution performs exercises together, gradually, at an older age, he forms an independent exercise, skills and mastery will appear along this line. Colorful, interesting, cartoon-like computer programs in the game mode contribute to the assimilation of materials,

strengthening the skills of logical thinking with the help of the created programs at the level of art and skill. At an earlier age, the child literally for 15-20 minutes together with parents or mentors in a children's educational institution performs exercises together, gradually, at an older age, he forms an independent exercise, skills and mastery will appear along this line. Colorful, interesting, cartoon-like computer programs in the game mode contribute to the assimilation of materials, strengthening the skills of logical thinking with the help of the created programs at the level of art and skill.Here we use the methods of computer games, cognitive exercises for logical representation and thinking, for training and hardening of memory, for focusing the child's attention, for logical thinking. By teaching the alphabet of three languages, our methodology helps the child learn the alphabets of three languages, at the end of the training with the results of comparing the letters of the alphabets of three languages, their spelling, their pronunciation, comparing the similarities and differences in spelling and pronunciation of the same letters by learners.This is precisely the most important moment in preparing a child for school, so that he has a complete understanding of the alphabets and can already be able to write letters. What you agree to in a traditional school, the primary school teacher spends a lot of time. This is where the IT mentor can help eliminate this difficult process, and we suggest that you think about this state too. In preschool education, the mentor must develop in children the spatial imagination, which begins with Froebel's exercises, with the help of computer programs we have created. And here you can also use the Tincercard program, starting training with a mentor or a computer science teacher in a kindergarten. You can continue to study the program Tincercard, Scratch with parents at home.

Further, our method moves to the next stage of lifelong education. In the first grade, the child begins to read syllables, writes various hooks, sticks, lines, circles, etc. smoothly switches to writing letters, numbers, etc. We invite them to use the programs we have created for the development of memory, focusing the child's attention during recess. Programs for teaching the alphabet of three languages, they will gladly repeat what they already know, and this will help them learn a foreign

language in the second grade, learn the alphabet of the Russian language, if the child is attending a school with training in Uzbek. And vice versa, if he studies in a school with instruction in Russian, then this repetition will help him in learning the Uzbek language and English, its alphabet and materials, which will help him learn the material more easily in the second grade. At the lessons of additional education, we offer from the third grade to acquaint children with the Scratch program, with its characters, with the possibilities, creating fairy tales, cartoons, games before their eyes. And this process is done in conjunction with a mentor or teacher of computer science in primary education, this is the state that needs to be thought about at the present time. And so gradually, until the fifth grade, you can develop the skills and abilities of students in using the Scratch program according to a specially created curriculum for additional education. This will help in the fifth grade to more easily master block programming in the Scratch program, gain programming skills, which will help students write program codes in high school in Python. For students who are studying computer science and preparing to become highly qualified specialists, we offer additional training in the following courses so that, as future specialists, they can be ready to work in high-tech enterprises that require knowledge in several industries together. And with this in mind, to the top teaching methodology, we have also added material to be taught to schoolchildren and students in order to become the most prepared small and highly qualified specialists, integrating science and knowledge in the field of several subjects, including modeling, robotics and programming:

- Electrical Engineering at TinkerCad Circuits;
- Programming Scratch and C + ;,
- Mechanics in Algodoo;
- 3D modeling: Tincercad;
- onShape;
- TRIK studio-simulation of robotics.

Experiments were carried out and the results were calculated by the methods of mathematical statistics Chi-cavadrat [9].

We looked through a lot of literature, articles, books in the field of steam education, looked through articles included in the highest indexing bases, looked through articles of scientists, sorted out their opinions and ideas, compared them with our ideas and hypotheses, and identified many similarities [2]. Let's analyze the work of the authors of the articles that we reviewed in journals indexed in Scopus, ScinceDirect, Google Scholar [1-14], articles on the work done and projects carried out within the framework of our topic, and the same articles of international journals [2,14]. As we noted, teaching according to the teaching methodology proposed by us requires training in several directions or several subjects at the same time; great preference is given to the elements of robotics, which is based on programming, i.e. a future specialist must have an understanding of programming in order to take up robotics. Amy Eguchi, Brining robotics in classrooms., Emphasizes "Learning with educational robotics gives students, who are usually consumers of technology, the opportunity to stop, wonder, and think deeply about technology. When designing, constructing, programming, and documenting the development of autonomous robots or robotics projects, students not only learn how technology works, but also use the skills and knowledge gained in school in a meaningful and engaging way. Educational robotics is rich in opportunities to integrate not only STEM but many other disciplines, including literacy, social studies, dance, music, and the arts, giving students the opportunity to find ways to work together to develop collaboration skills, self-expression through: technology tool, problem solving, critical and innovative thinking. Educational robotics is a learning tool that enhances the learning experience of students through hands-on, intelligent learning", [1, p.29]. We reviewed a number of works of scientists and researchers who deal with the problems of early teaching children to program [1,2,3,4,5,10,13,16,17], researchers CucukBudiyanto., FaaizahShahbodin., Muhammad UlinnuhaKhoirulUmam., Indah Widiastuti believes that "Technology and smart devices have become an integral part of every aspect of human life. With the rise of computing in everyday life, familiarity with technology for younger students requires proficiency in logical thinking and problem-solving skills as part of programming or computational

thinking approaches. This study aims to comprehensively examine the development of computational thinking in early childhood. The new software toy was introduced as an educational tool based on specific topics in line with the preschool curriculum. Five steps were taken to identify parent and child involvement in robotic activities, and then to interview children about cognitive development from a parent's perspective. It was noticed that children explore different ways of concentration and attention, perform certain actions and express their excitement and happiness ", [5., p.22]. We looked at books on teaching computer science at an early age and developing abilities in programming, lego construction and robotics [3-4, 7-12, 15-22]."This book describes recent approaches in advancing STEM education with the use of robotics, innovative methods in integrating robotics in school subjects, engaging and stimulating students with robotics in classroom-based and out-of-school activities, and new ways of using robotics as an educational tool to provide diverse learning experiences …. . The book also provides effective strategies and emerging trends in using robotics, designing learning activities and how robotics impacts the students' interests and achievements in STEM related subjects". John Williams Professor of Education and Director of the STEM Education Research Group Curtin University, Perth, Australia ., [15., p.3]. After reading and analyzing the studies of MoncaPivettia., Silvia Di Battista., Considering their article "Educational robotics for children with mental disabilities: a systematic review", we conclude that our hypothesis of enhancing the assimilation of students' knowledge using steam technologies, components, as well as the use of information technology and computer programs gives an effective result is correct, since researchers have proven that such training, this method raises the level of knowledge of children with mental disorders [16]. To train good specialists in the future, who know several subjects, who are versed in design, robotics and programming, who know mathematics, who have knowledge of subjects and computer programs at the level of mastery and art, STEAM training is needed in children's educational institutions, in a school for training a small specialist and at the university for the training of highly qualified specialists [1-4, 5, 6, 10, 12-22]. This is confirmed not only by the

articles we have reviewed in the indexed databases, but also by books intended for this area, presenting the idea of teaching computer science, programming from an early age [2,3,5,7,,10,11,12,14], as well as teaching robotics and other areas with using the created computer programs and the latest computer technologies online applications, sites, platforms for children [1,12,13,14,15,17-22].

STEAM education requires both its application in children's educational institutions and in schools and universities. The quality of training of future specialists depends on this, who will easily navigate factories, enterprises with high-tech equipment, will create Smart technologies, houses, apartments, will manage the city, various technologies, if it is necessary to create such systems, applications for managing the whole city, using information technology and computer applications, programs.We have proved the hypothesis put forward by us about the effectiveness of steam education by strengthening its constituent or subjects in integration in the environment of information technology and computer programs, the ideas of the effectiveness of learning using computer programs in computing and for other purposes have been proven in the works of many researchers.

We used statistical methods in our pedagogical experiments and used Pearson's Chi-square test. Let's look at the experiment data table, and then we apply the calculation formula and draw a diagram of the experiment data processing.

The level of knowledge of children in teaching children according to the traditional teaching method. Table № 1.

Table №1

Groups	Number of pupils of kindergarden	The level of assimilation of knowledge on the integration of several subjects		
		Low	Medial	High

Experimental	100	56	24	20
Control	100	52	25	23

The level of knowledge of children using STEAM training with the development of components and using information technology and computer programs

Table №2

Groups	the number of pupils from a children's educational institution	The level of knowledge of children using STEAM training with the development of components and using information technology and computer programs		
		Low	Medial	High
Experimental	100	12	30	58
Control	100	38	24	38

According to this table and diagrams, it is possible to establish an increase in the assimilation of knowledge, which proves the effectiveness of the application of our methodology:

If according to the table from the source [6] we will compare with the value in the first method T observed <Tcritical, Tnab. = 0.5, Tcr. = 5.991. 5.991> 0.5. In the

carried out method according to the second method, T observed = 18.3, it can be seen that this value is about 3.5 times greater than the critical value.

From these conclusions, we can conclude that with the strengthening of the components of STEAM training and the use of information technologies and computer programs, the result of mastering the material is much higher, and the activity of children turned out to be high. We conducted an experiment and used the method of statistical data processing according to the Chi-square test.

With this method, we conducted an experiment, teaching pupils of school №31, № 7, as well as university students and obtained similar results, which proved the reliability of our hypothesis of strengthening the learning of the components of STEAM education, which will lead us to the final goal of improving the efficiency of assimilation of knowledge in the integration of subjects and even more effective assimilation of materials using information technology and computer programs.

Table No. 3, obtained when teaching schoolchildren using traditional teaching methods.

TabLe №3

Groups	the number of pupils from a children's educationa	The level of knowledge of children using STEAM training with the development of components and using information technology and computer programs

	l institution			
		Low	Medial	High
Experimental	100	52	23	25
Control	100	53	24	23

Table number 4, obtained when teaching pupils STEAM +information technologies and computer programms training

TabLe №4				
Groups	the number of pupils from a children's educational institution	The level of knowledge of children using STEAM training with the development of components and using information technology and computer programs		
		Low	Medial	High
Experimental	100	11	31	59

Control	100	36	24	36

Let's look at the tables on the results of experiments carried out on 4-year graduate students in the field of computer science, applied mathematics of Namangan State University. Table 5 determines the level of knowledge assimilation on teaching according to the traditional teaching method.

Table №5

Groups	the number of pupils from a children's educational institution	The level of knowledge of children using STEAM training with the development of components and using information technology and computer programs		
		Low	Medial	High
Experimental	100	50	25	25
Control	100	55	24	21

Table number 6, obtained when teaching students STEAM +information technologies and computer programms training

Table№6

Groups	the number of pupils	The level of knowledge of children using STEAM training with the development of components and using

	from a children's educational institution	information technology and computer programs		
		Low	Medial	High
Experimental	100	11	30	59
Control	100	36	25	39

We carried out pedagogical experiments, teaching students, traditional teaching and with the help of steam education, by strengthening the teaching of its components with various methods, enriched by the computer programs we have created, throughout the lifelong education. For children's educational institutions, we offer training for children from three years old with mentors and parents using Froebel's method, using his gifts, we offer the use of video materials and computer programs on this topic, and the same use of Seguin boards to determine the level of the child's intellectual ability, to identify his development mental abilities. Further, we offer a number of programs based on the Montessori method for teaching the basics of mathematics, for teaching numbers, addition and subtraction operations, i.e. This is the consolidation of the operations of addition, subtraction and division, which we teach children with Froebel's gifts, adding cubes or subtracting tiles or cubes from cubes, getting other volumetric figures that do not reach the perfect cube or go beyond its boundaries. Using a cube cut diagonally in half into cubes, Froebel's "Gift 5", as well as "Gift 6", a cube divided into 27 "bricks", some of which are accordingly divided along, and some – across. By adding and subtracting cubes, you can create shapes with your parents or mentors. This is how the child develops ideas about addition, subtraction, multiplication and division. During the period of study

in children's educational institutions and schools, we need the development of memory, focusing the child's attention, his logical thinking, we offer in this system the programs we created “Computer + memory + logical thinking”, “Computer + alphabet of three languages Uzbek, Russian English” . It is during the preschool period of learning that it is important to teach the alphabet of three languages, so that the child can learn the alphabet by independently matching letters, sounds.It is in the preschool period that it is important to teach the alphabet of three languages so that the child can learn the alphabet, can match letters, sounds on his own, determining the connection and similarity letters, their pronunciation, the difference between the alphabets of languages, and the similarity.

Further, we offer education of children at an early age with the Scratch program, mentors and parents, teaching created demonstrative stories, cartoons, animations with various characters. We propose to form the development of spatial imagination by working with the objects of the Tincercard program.Teaching this program will help to form in children the imagination of spatial figures, which is very necessary at the next stages of education when teaching geometry and stereometry.

Further, starting from the 5th grade, according to the school curriculum, the Scratch program is taught - here you can organize additional lessons and circles on the creation of block construction of various games by the children themselves. Block design should gradually move to programming in the form of code, introducing them to the graphical possibilities of programming, by drawing various drawings and spirals, you can proceed to entering the code of these drawings and spirals, smoothly introducing the child into programming in the form of code. This is how you can start learning programming in Pyhon.In order to have the already necessary concept about variables, structures of the programming language, about programs for mathematical calculations, about linear, branching and cyclic structures of the language, for a more advanced understanding of this programming language in the 9th grade. It is in this part of lifelong education that a deep study of the programming language with its connections with the Scratch program is

necessary. We must give the student the necessary programming skills in Arduino, showing the connections between robotics and the Scratch program, introductory courses on programming in C ++ are also needed here, additional master classes in this area are needed in order to indicate the connection between Scatch, C ++, Python.In the near future, high-tech enterprises, in highly equipped production, will need specialists knowledgeable in various areas of science and technology, technology and mechanical engineering, to create robots, machines, various SMART technologies, information systems, used in the management of modern houses, apartments, SMART cities, in their construction and launch of information systems to control a smart home or apartment, its ability to open and close blinds, watering flowers, house surveillance, security. The application of the above proposed methodology in lifelong education, starting from childhood and continuing this training and further throughout life, will serve as a solution to the training of such highly qualified specialists and comprehensively trained, knowledgeable personnel.Acknowledgments

During the period of our research, we conducted master classes and training seminars at preschool educational institutions for children and their parents, students at schools, students at universities. It was interesting for children and pupils to participate in the lessons, they worked with interest in computer programs. And we found that the effectiveness of integrated learning, STEAM education can be even more enhanced by using information technology and computer programs.

In conclusion, I would like to note that it is necessary to select and apply computer programs in the most important areas of children's cognition of the world, learning the most important topics and topics of the sciences they need in knowledge of the language, in the study of the alphabet of three or five languages, as well as the study of numbers, letters, operations addition, subtraction, subtraction and division, using Froebel's technique, to study logic using Seguin and Montessori boards, to use them

in teaching mathematics, technology and programming, starting with preschool age and developing it in school, and then in higher education.

Acknowledgments

During the period of our research, we conducted master classes and training seminars at preschool educational institutions for children and their parents, students at schools, students at universities. It was interesting for children and pupils to participate in the lessons, they worked with interest in computer programs. And we found that the effectiveness of integrated learning, STEAM education can be even more enhanced by using information technology and computer programs.

Literature:

1. Amy Eguchi., Bringing Robotics in Classrooms., URl: https://www.researchgate.net/publication/318356697_Bringing_Robotics_in_Classrooms., July 2017., DOI: 10.1007 / 978-3-319-57786-9_1., In book : Robotics in STEM Education (pp. 3-31)

2. Articles of the journal "Procedia-computer-science", based on the results of the international 24th conference, Science Direct., URL: https://www.sciencedirect.com/journal/procedia-computer-science/vol/ 176 / suppl / C

3. Belova G.V. Programming in the LOGO environment. The first steps. - M.: Solon, 2007

4. Bokuchava T.P., Tour S.N. Informatics manual for teachers in grades 2-4. M .: BHV, 2007. Booch G. Object-oriented analysis and design with examples of applications - M .: Williams, 2008.

5. CucukBudiyanto., FaaizahShahbodin., Muhammad UlinnuhaKhoirulUmam., Indah Widiastuti., Developing Computational Thinking Ability in Early Childhood Education: The Influence of Programming-toy to Parent-Children Engagement., April 2021., IJPTE International Journal of Pedagogy and Teacher Education., 5 (1): 19-25., URL :.

https://www.researchgate.net/publication/351140940_Developing_Computational_Thinking_Ability_in_Early_Childhood_Education_The_Influence_of_Programming-toy_to_Parent-Children_Engagement, DOI: 10.20961 / ijpte.vTE.): 19-25

6. Christina Chalmers., Rod Nason., Systems Thinking Approach to Robotics Curriculum in Schools., July 2017., -P. 33-57.

7. Chan-Jin CJ Chung., Christopher Cartwright., Joe DeRose., Robotics Festival and Competitions Designed for STEM + C Education., CHAPTER., Robotics in STEM Education., Pp. 131-170.

8. Elena Jurado., David Fonseca. ,, Jorge Coderch., Xavi Canaleta., Social STEAM Learning at an Early Age with Robotic Platforms: A Case Study in Four Schools in Spain., URl: https: //www.researchgate. net / publication / 342628899_Social_STEAM_Learning_at_an_Early_Age_with_Robotic_Platforms_A_Case_Study_in_Four_Schools_in_Spain., July 2020., Sensors 20 (13): 3698., DOI: 10.3390 / s201336E Project

9. Grabar MI-., Krasnyanskaya KA, Application of mathematical statistics in pedagogical research., M., Pedagogy., 1977, -S. 135.

10. Goryachev A.V., Volkova T.O., Gorina T.I. Informatics in games and tasks: Textbook-notebook for grade 2 of a four-year elementary school: In 2 volumes. M .: Balass, 2006.

11. Gaddis T. Let's start programming in Python. - 4th ed .: Per. from English - SPb .: BHV-Petersburg, 2019 .-- 768 p.

12. Judit Alamo., Eduardo Quevedo Gutiérrez., Alejandro Santana., Alberto ZapateraLlinares., Al Robotics. Contingency Plan during Lockdown in Primary School. July 2021.

13. Khusanov K.O., Integrated information technologies in education // Proceedings of the international conference "Computational mathematics, differential equations, information technologies", Ulan-Ude, Russia, August 24-28, 2009., -S.50-54.

14. Khusanov K., Ibahimova I., Web applications of educational materials., Bulletin of the Turin Polytechnic University in Tashkent., Issue 08/2017.-P.17-19.

15. MyintSwe Hine., Robotics in STEM Education: Redesigning the Learning Experience., URL: https://www.researchgate.net/publication/318761156_Robotics_in_STEM_Education_Redesigning_the_Learning_Experience., July, 2017 ., Curtin University.,-p.3-31.

16. 1Monca Pivettia., SilviaDi Battista., SilviaDi Battista., Educational Robotics for Children with Mental Disabilities: A Systematic Review, URL: https: //www.sciencedirect.com/science/article / pii / S240584402032003Xx., Science , October, 2020

17. Novita Nurjanah., SitiWahyuningsih., UpikElokEndangRasmani., Muhammad MunifSyamsuddin., STEAM Learning in Early Childhood Education: A Literature Review., URL: 2017 .-p. 34-44.

18. *SitiWahyuningsih, Novita EkaNurjanah, UpikElokEndangRasmani, RuliHafidah, AdrianiRahmaPudyaningtyas, Muhammad MunifSyamsuddin.,* STEAM Learning in Early Childhood Education: A Literature Review., IJPTE, International journal of pedagogy, UniversitasSebelasMaret
Indonesia

19. Salimova N., Khusanov K., Devolopment of an educational platform for the child education,,Bulletin of the Turin Polytechnic University in the city of Tashkent., Issue 08/2017.-C.20-24

20. Velikovich L., Tsvetkova M. Programming for beginners. - M .: Binom, 2007.

21. Yunusova G.N., Mobile learning of preparing children for school using the site "Mom and her Child" is the basis of lifelong learning., Journal "Physics and Mathematics" 2019, issue No. 6., Uzbekistan.

22. Yunusova G.N, Methodology for preparing preschoolers with the latest information technologies and computer programs., Journal "Interactive Science", 2020, -p. 8-14.

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