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Improving Steam Technologies by Strengthening Modeling, Programming and Robotics in Higher Steam Education and Lifelong Learning

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KEYWORDS
STEAM education in continuous education, STEAM at kndergarden, at school, STEAM in Higher Education, computer programs for 3d modeling, TinCerCad, Trik Studio Rootics, AlgoDoo, EduBlock, Ardublock, Arduino block, Scratch, S4A block, nblock, Python.

ABSTRACT:
This article shows the improvement of STEAM learning by strengthening the use of simulation and computer programs for modeling, simulation robotics, the use of profiling programs in physics, in electronics. The author shows the example of using a number of programs, such as: Sistems onShape, Sketchup, FreeCad, LibreCad, SolidWorks, SolveSpace, AutoDesk AutoCad, Autodesk Fusion 360, Tinkercad, progeCAD Smart 2009, Autodesk Fusion 360, Autodesk TincerCad, Microsoft 3d Builder, 3D Orchard , ZW3D, Bricscad, AutoDesk Inventor, Autodesk dasturlari - AutoCAD, 3ds Max, Alias, Revit, Navisworks, SolidWorks PDM, SolidEdge, Compass-3D , T-FLEX,RTS Creo, NX Siemens PLM Software, CATIA, Cloud CAD, TRIK STUDIO-SIMULASTION ROBOTICS, ALGOLDOO in physics, Tincercad Circuits in electrical engineering. The article shows what programs are to be taught in the areas of continuous education before and after higher education.

Introduction

Our research in the field of STEAM education has led to the need to organize this education from the preschool level.

And continue to train him at the subsequent stages of training and then, when he is already a person, he tries to become a specialist, i.e. at all stages of further education: preschool, school, university, after university education and at the stages of advanced training and strengthening their professional skills in connection with innovations in science and technology.

STEAM education, i.e. training in several directions in integration, in several subjects is necessary due to the fact that a person always thinks about his lifestyle, thinks about improving his life, living conditions, improving his home and its amenities, he dreams of a Smart house, apartments that work on the basis of web applications, online programs and the house can be controlled thanks to them at the tip of your finger.

For the construction of such houses, specialists are needed who can work in automated systems, create a Smart Home system for working online, know programming and web programming, and they must also be able to work in various systems, know how to build a site and work with building external and the internal side of the site, which is associated with knowledge of such programs as backend and ftontend, which requires knowledge of such programs as HTML, CSS, Bootstrap, JavaScript, PHP. MySQL, JavaReact and others.

In addition, these specialists must have knowledge of modeling, programming, robotics. Such specialists should have knowledge in the field of design, engineering, modeling, robotics and programming. And training in this area a person must bear on himself

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throughout his life. It is for the knowledge of these directions and further, in order to become a full-fledged specialist, a person must be trained from childhood, from an early age and further until becoming a specialist and then to improve their skills, i.e. this is exactly the kind of STEAM education that a person should conduct in the areas of continuing education and after. He must learn this all his life. We offer consistent, systematic teaching of STEAM education at the stages of lifelong learning, starting from preschool education with the help of computer programs, online platforms and resources to prepare children for school, to acquaint them with the environment, the properties of objects. At this stage of education, we use programs created by us for teaching mathematical numbers, the alphabet of three languages, for concentrating memory, and others. For children of preschool education, in addition to programs that prepare children for life and for school, it is necessary to teach lego design, use of Scratch JR for Arduino, Edu block, Lego Education and Lego Mindstorms programs. Next, we offer STEAM training at school using the Scratch program, Lego Mind Storms, designed by year of study, then in additional education courses or in computer science circles at school, we offer training in the mblock program, Scratch for Arduino, Arduino block, mblock, and then smoothly transition to Python using the mblock program. n higher education, it is necessary to study programs related to robotics at Trik studio, electrical engineering at TinCerCad Circuits, mechanical engineering at Algodoo, in simulation programs. Further study and improve their abilities and knowledge throughout their education after high school and continue their education all their lives to become a good specialist in this field. Here it is necessary to pay attention to engineering education, robot assembly, physics, which will help create the arms and legs of robots. The future STEAM specialist needs to be trained and improve his knowledge in the areas of continuous education systematically and continue it throughout his life. In this area, attention should be paid to the education of girls and girls who may find it difficult to acquire knowledge in engineering and technical education. The development of girls in this area will greatly increase the level of gender balance in this area.

Literature review

We looked through the literature and a number of works that define the types of robots, industrial, medical (David Cook.,(2009)), (Douglas Williams, (2009)), (Gurstelle W., (2002), (David Cook,, (2010)),(Newton S. Braga, (2007)), (Douglas Williams, (2006)),(Predko M., (2004)), (Solovieva L.,(2021 y.)), (The book “Learning Arduino. 65 DIY projects. 2nd edition”, (2022)), (Vorotnikov S.A. ,(2005)),(Yurevich E.I., (2005)), (Yunusova G.N., (2021 y)), (Yunusova G.N.,(2021 y.)), (Yunusova G.N., (2021 y.).,(G.N.Yunusova.,.,2022 y.). And we are determining that it is possible to teach a robot to move on Arduino (The book “Learning Arduino. 65 DIY projects. 2nd edition”, (Appeal 05.17.2022.)), (Michael Margolis, (2012)).

.Considered a movement system with piezoelectric drives, reviewed the materials of information robotic systems (M.A. Komarov, (2007)), (Vorotnikov S.A.(2005)). In the modeling and programming of robotic systems, the future specialist must be able to work in modeling and robotics programs, and be able to work in such programs, which requires early and phased training in robotics programs, starting from preschool age by year of study and then teaching at school to assemble and program more complex devices, learn how to assemble your robots and machines in higher educational institutions (). We put forward the hypothesis of training a future specialist at the stages of continuous education from preschool age, teaching him Lego design and robotics with such programs as Lego Mindstorms Wedo 2.0, Lego Mindstorms EV3, programs of the series. LEGO Education. It is necessary to give the first skills to use Arduino (Michael Margolis.,(2012)).

In the initial period, as a specialist of the future, we must give the child the basics of block programming, and the child must learn the secrets of block programming using Scratch Junior for Android, Scratch, mblock, S4Ablock, Arduino block and others. And it is necessary for children of preschool and elementary school education (Scratch JR for Android, Lego Mindstorms Wedo), school education (Lego MindStorms EV3, Scratch for Windows, mblock, S4Ablock, Arduino block, for high school gradually complicating the Lego Mindstorms assembly training program and programming of robots). At the stages of higher education in training, deeper stages of training in the modeling of a future specialist are necessary, which is associated with the study of programs for 3D

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modeling (Predko M., & J. Williams, (2006)), (Predko M., &. Solovieva L., (2021)),(Randolph C. H. Chan ., (2022)), ,(3D modeling programs.,(2021),(21 Best 3D Modeling Programs, (.2021)). At the stage of higher education, the future specialist should learn the basics of using computer programs in modeling, get acquainted with the on Shape system, Trik Studio simulation robotics programs for modeling the robot itself, as well as programs for designing and modeling robotic systems and robots. In the research (Chih-Hung Wu, Chih-Hsing Liu and Yueh-Min Huang, (2022)) . helps students know what to expect from their instructors and courses. The messages used by the instructors, which differ in content and approach on the first day, shape the social dynamics in the classroom and can influence later learning within the course. This study combined day one classroom observation data with student survey results to measure how easily students in introductory STEM courses detect instructor's non-substantive conversations. Works (Jonathan H. Tomkin and Matthew (2022)) are aimed at identifying grades between courses using a graded GPA model. STEAM courses are more difficult, college and university grades in STEM courses are an important determinant of student perseverance in STEM fields. This article highlights recent research that used grade/penalty bias to find out why students get lower grades in STEM courses than their GPA would predict. Using a predictive model of student achievement, the researchers obtained a more accurate estimate of academic performance than the observed GPA. (Laura Starr, Katherine Yngve and Lan Jin., (2021)) research identifies living and learning communities and global or diverse learning experiences have been identified as educational practices that often have a "big impact" on student success, and provide interpersonal skills that are highly valued by employers. The aim of this study was to determine whether participation in a "global science" living and learning community can enhance the intercultural competence of international and domestic first-year students, as measured by a well-known quantitative instrumentю In (Logan Fiorella, So Yoon Yoon, Kinnari Atit, Jason R. Power, Grace Panther, Sheryl Sorby, David H. Uttal and Norma Veurink., (2021)) discusses how motivation is critical to sustaining perseverance and achievement in science, technology, engineering, and mathematics (STEM). In this study, we will focus on assessing the mathematical motivation of secondary school students. We provide evidence for validity and reliability for the Math Motivation Questionnaire (MMQ), adapted from the Science Motivation Questionnaire designed for college students, using data from 2551 high school students from seven US states.

Within the framework of STEAM education, the gender issue is also important, obtaining the necessary skills in programming and technical subjects most clearly contributes to obtaining an education in the direction of STEAM ((Ute Soroessor, Markus Vogel, Tobias Dörfler and Andreas Eichler., (2022)),(Randolph C. H. Chan ., (2022) . We made an analysis of the works that are devoted to the first lessons on STEAM, what needs to be kept in the first lessons so that students would have an incentive to education, to learning. In addition, changes and reforms in STEAm learning help to better assimilate the material, assessing students' knowledge leads to lower results, because. STEAM education is not easy to learn, it requires knowledge of logic, programming, craftsmanship and the art of using knowledge in many areas of education (Randolph C. H. Chan ., (2022)) . We saw articles of International journal of SREAM education, whichi shows gender's problem of education. Girls lik learn mathematics, programming, but it is difficult to learn tecnics, but they like information technologies. We saw many articles of STEAM Education, which shows us gender problems (see:)) and programs of modeling. In STEM education, it is necessary to conduct engineering training in connection with it (Xi Wang, Minhao Dai and Robin Mathis., (2022)).

Results

We conducted experiments on teaching children programming, robotics, mathematics and Lego construction using information technology and computer programs aimed at STEAM education. We used a series of programs created by us according to the method of Frederick Froebel, Eduard Seguin, Maria Montessorri, which are aimed at teaching children in preschool education several sciences in integration: mathematics, lego design, engineering, the use of information technology and technology, assembly of robots and block programming, robotics and technology. We selected experimental and control groups to determine the results of STEAM training in the information technology environment, websites created by us, computer programs. We have created

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programs for the above methods that help the development of children at an early age and offer its use in preschool institutions. We selected experimental and control groups for the use of such training in preschool educational institutions. Then we trained our proposed methodology in the schools of the city of Namangan on the use of a number of programs related to block programming from Scratch to Arduino block, SA4 block, mblock and to programming in Python. They also conducted training in the Lego Mindstorms programs, based on the age series of the program set.

Such experiments with STEAM learning using our methodology and traditional learning have been carried out in all areas of lifelong education, including pre-school and primary, school, higher stages of education.

Experiments were carried out and the results were calculated by the methods of mathematical statistics Chi-cavadrat(Grabar M.I., Krasnyanskaya K.A. (202)),(Nabiullina Luiza Mahmudovna., (2020)).

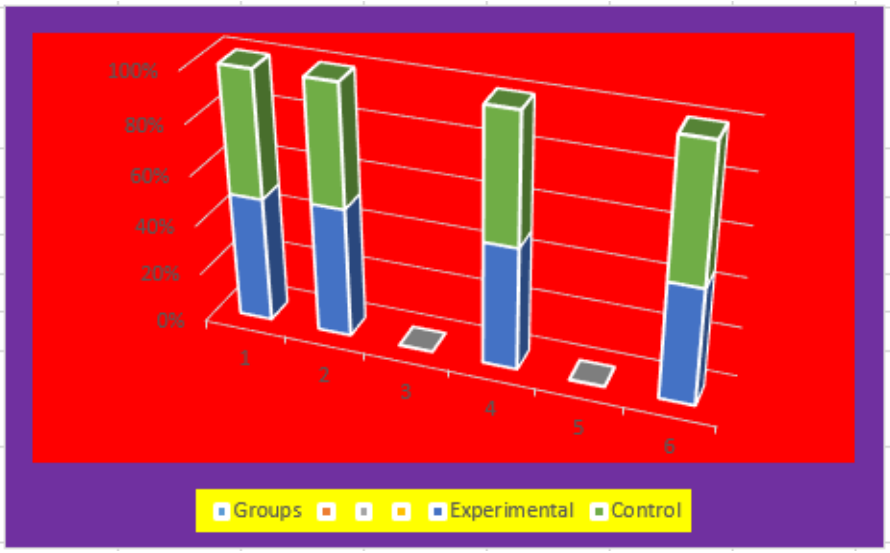
Consider the data obtained after conducting experiments in our study, use the methods of mathematical statistics Chi-square (Grabar M.I., Krasnyanskaya K.A. (2020)), look at the table of experimental data, and then apply the calculation formula and draw a diagram of the experimental data processing.

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

Table №1

Groups	**Number of pupils in children's educational institutions**	**The level of assimilation of knowledge on the integration of several subjects**		
		Low	**Medium**	**High**
Experimental	**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.



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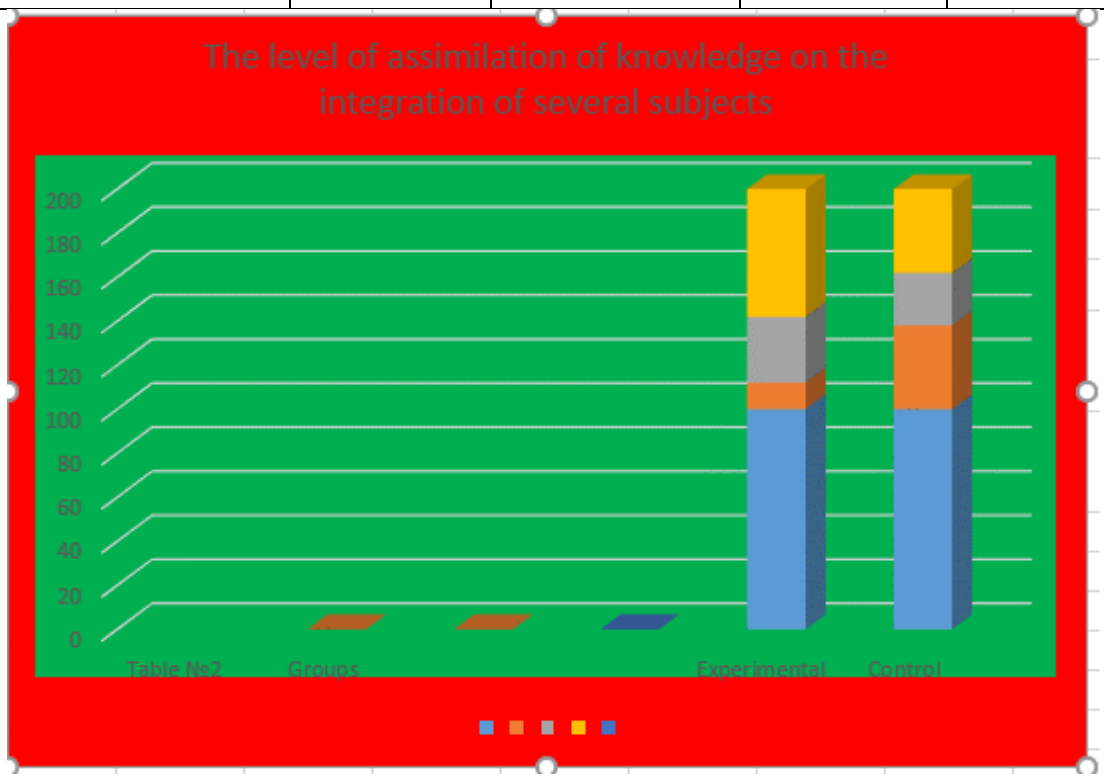
Calculations are performed according to the following formula:

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

Table №2

Groups	Number of pupils in children's educational institutions	The level of assimilation of knowledge on the integration of several subjects in STEAM		
		Low	Medium	High
Experimental	100	12	30	58
Control	100	38	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:

If according to the table from the source we will compare with the value in the first method T observed <Tcritical, Tobser. = Tкуз= 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 (Nabiullina Luiza Mahmudovna., (2020)).), (Vodovozova E.N.,(2021)), (Grabar M.I., Krasnyanskaya K.A. ., (2020))

With this method, we conducted an experiment, teaching pupils of school №31, № 7, as well as university students and obtained similar results, which

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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 №3, obtained when teaching schoolchildren by traditional teaching methods.

Table №3

Group	**Number of pupils in school**	**The level of assimilation of knowledge on the integration of several subjects**		
		Low	**Medial**	**High**
Experimental	**100**	**52**	**23**	**25**
Control	**100**	**53**	**24**	**23**

Table № 4 obtained when teaching schoolchildren STEAM learning

Table №4

Groups	**Number of pupils in school**	**The level of assimilation of knowledge on the integration of several subjects in STEAM.**		
		Low	**Medium**	**High**
Experimental	**100**	**11**	**31**	**59**
Control	**100**	**36**	**24**	**36**

Let's look at the tables on the results of experiments conducted for graduate students of 4 courses in the direction of computer science, applied mathematics of Namangan State University. **Table №. 5** determines the level of assimilation of knowledge on training according to the traditional teaching methodology.

Table №5

Groups	**Number of students**	**The level of assimilation of knowledge on the integration of several subjects**		
		Low	**Medial**	**High**
Experimental	**100**	**50**	**25**	**25**
Control	**100**	**55**	**24**	**21**

Table № 6 obtained when teaching high school students STEAM learning

Table №6

Groups	**Number of students from High**	**The level of assimilation of knowledge on the integration of several subjects in oriented by STEAM**

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	education	Low	Medial	High
Experimental	**100**	**11**	**30**	**59**
Control	**100**	**36**	**25**	**39**

Thanks

We received certificates of appreciation, gratitude from kindergartens № 20, № 5 of the city of Namangan and Namangan region, from schools in Fergana and Namangan, they expressed gratitude for holding training seminars in their children's institutions and schools. The universities were also grateful for our presentations with illustrative examples of programs. We conducted training seminars in higher educational institutions, the results were processed by the methods of mathematical statistics according to Pearson's chi-square and Student's tests (Nabiullina Luiza Mahmudovna., (2020).), (Vodovozova E.N., (2020)), (Grabar M.I., Krasnyanskaya K.A.,(2020)).

Discassion

The abbreviation STEAM consists of the following words (science - science, technology - technology, engineering - engineering, arts and math - art and mathematics) implies both the acquisition of knowledge in these sciences and the ability to apply them in practice, i.e. to form knowledge at the level of art and craftsmanship. This is an integrated approach of using several items at once. Thanks to the STEM approach to learning, children can develop in several subject areas at once - computer science, physics, technology, engineering and mathematics, design, being carried away by the technological process itself, realizing that the boring theory being studied also has an applied character. For example, LEGO educational solutions are aimed specifically at developing STEAM competencies and skills: research, engineering, mathematics, and design.

STEAM education is an association of sciences aimed at the development of new technologies, innovative thinking, and meeting the need for well-trained programmers, inventors, designers, mathematicians, and engineering personnel. The basis of STEAM - learning lies in the independent research work of students in the course of solving the problem[1].

With STEAM-learning, children apply knowledge from various fields: mathematics, physics and other exact sciences, engineering, design, use digital devices, computer programs, innovations in science, engineering and technology. In this way, students acquire a general understanding of the process of creating and working on a project. STEAM is a universal, practice-oriented approach that allows students to cope with tasks of any complexity. Children receive practical implementation of their knowledge. When solving a problem, a person must use knowledge from different areas. This approach is useful and necessary in the development of additional general educational programs in robotics. Learning with the presentation of information has lost its meaning, information can be read in a book, on the Internet, but in practice it gives a different meaning. After all, if you agree to write a program in C ++, implement it on a controller, see the movement of a robot on a black or white line is much more interesting than listening to or reading theoretical material. It has a different meaning of designing or modeling in programs to get the look of a robot, animation of its slow movement in a clockwise direction. Educational sets on robotics can be used to study such subject areas as: physics, technology, engineering, computer science, mathematics, as well as the development of creative thinking and conducting classroom and extracurricular project activities. The kits are designed in such a way that students are immersed in the implementation of practical projects within the system of additional education, motivating to think critically, learn to solve problems and interact effectively with each other. Educational sets can be used based on the age and mental abilities of students at various stages of continuous education. The use of computer programs and information technology at the level of art and craftsmanship provide clear solutions to applied problems, so students learn to harmoniously combine science and creativity in their work.

The ideologists of the STEAM approach are inspired by the examples of great scientists who combined

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scientific pursuits with creativity, and thanks to the developed non-linear thinking and imagination, were able to give the world revolutionary discoveries: the writer Galileo, the artist Leonardo Da Vinci, the musician Einstein, the philosopher Heisenberg.

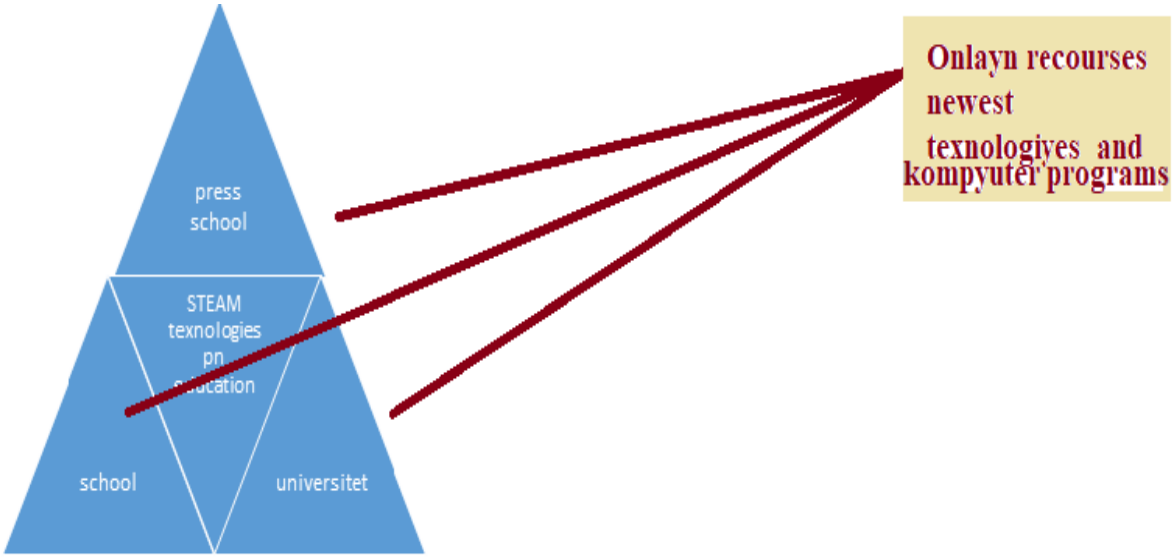

Diagramma №1. Roads of forming of STEAM.

At the methodological level, the STEAM approach assumes that, in project activities, students:

learn to constructively criticize and defend their opinion;

recognize the creative potential of technology in a variety of fields

acquire teamwork skills;

master presentation skills;

learn to generate ideas under conditions of uncertainty;

apply design and marketing principles to create and promote a product.

At the school stage of education, robotics training can be organized at school, especially based on the competitive competitive activity of students. Participation in international FIRST® LEGO League competitions requires not only the ability to build and code well, but also the ability to work effectively in a team, quickly generate ideas and present results competently, you need to be sociable, sociable, quickly navigate through many different ideas and make one decision[2]. One of the most well-known and recognized tools for implementing both approaches in the school are LEGO® Education[3] solutions(Owen Bishop, The Robot Designer Handbook, Programming Lego Mindstorms NX., (2011)),(Predko M. (2006)),(Predko M., (2004)), (Solovieva L., (2021)) LEGO Education sets of varying complexity are designed to work with children in the age range from 4 to 16 years. These solutions are attractive and recognizable (almost everyone has been familiar with LEGO since early childhood), bright, simple and intuitive assembly methods, and most importantly, they have ample opportunities for setting complex educational tasks using knowledge of all subjects of the natural science cycle. Each age group in the LEGO Education line has its own sets. Here are some of them: For preschoolers, this is the Young Programmer Express in the form of a train and a railway. Elements of algorithmization and programming are studied with its help without a computer. For younger students, LEGO Education WeDo 2.0 is suitable. and BricQ Motion Prime. The latest solution helps to study the world around and physics, completing projects related to sports and a healthy lifestyle. BricQ is a STEAM solution that does not involve programming at all. There are also no motors or other parts containing electronics in the set, which makes the work of subject teachers easier: teachers of physics. For middle and high school - LEGO Education SPIKE Prime[4] . It is designed for use

[2] www.google.com

[3] www.google.com

[4] www.google.com

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in experimental activities in the lessons of the entire natural science cycle. For example, almost any project from the "Fitness Sensors" course allows not only to consolidate the material of the physics course at school in practice, but also to work out the mathematical patterns that are used to build graphs illustrating experiments. Here there is a relationship between physics and mathematics, that is, an inter-substantial connection is formed between these subjects. Here, the variety of models and the ease of programming in the Scratch language allows you to use the constructor to study various disciplines.

For high school - Lego Mindstorms. At this stage of education, it is necessary to apply more complex projects of the robot assembly program.

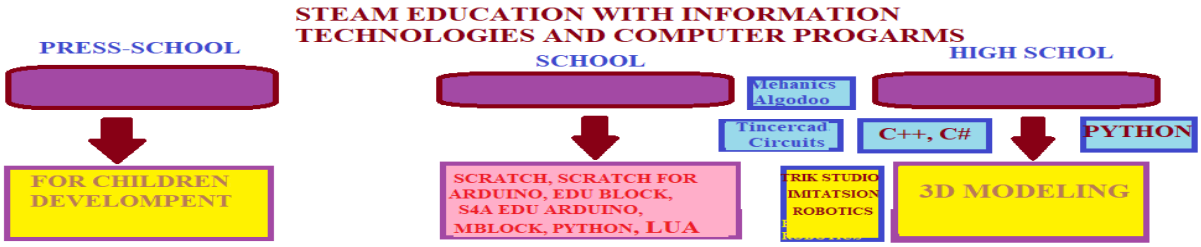

Diagramma №2. Steam Education with information technologies and computer programs.

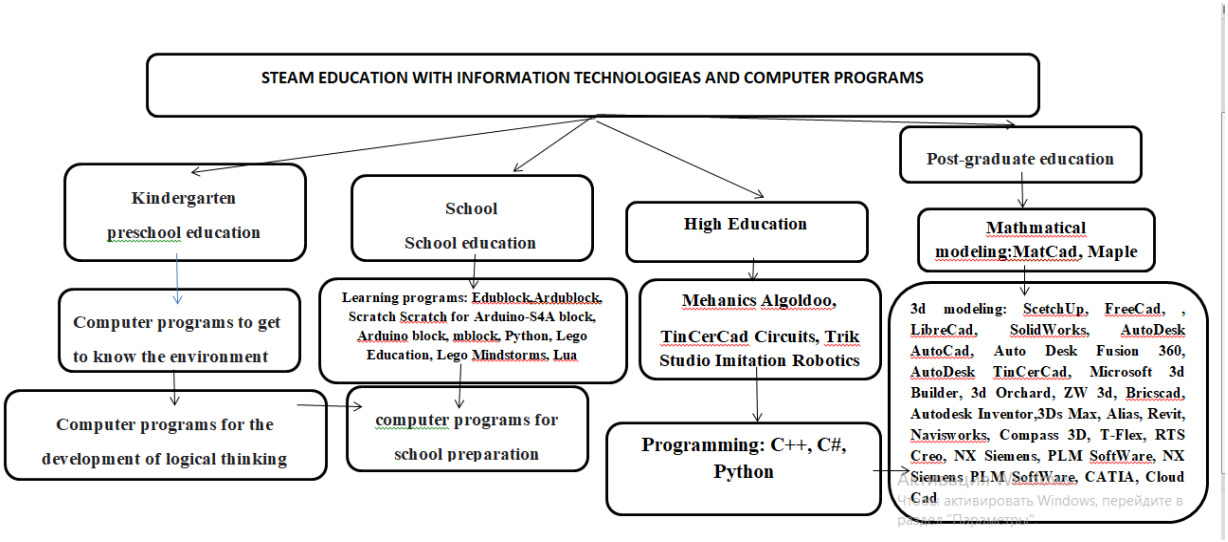

Diagramma №2-a. Steam Education with information technologies and computer programs.

For higher education at this stage, we offer training and work in Sketchup modeling programs, or rather, you can use the online version of this program, FreeCad, LibreCad, SolidWorks, SolveSpace, AutoDesk AutoCad, Autodesk Fusion 360, Tinkercad, progeCAD Smart 2009, Autodesk Fusion 360, Autodesk TincerCad, Microsoft 3d Builder, 3D Orchard, ZW3D, Bricscad, AutoDesk Inventor, Autodesk dasturlari - AutoCAD, 3ds Max, Alias, Revit, Navisworks, SolidWorks PDM, SolidEdge, Compass-3D, T-FLEX, RTS Creo, NX Siemens PLM Software, CATIA, Cloud CAD , which will help to form not only the concepts of modeling, but will also give skills and experience in designing, working with CAD, with cloud modeling programs, it is imperative to emphasize programming in Python, as well as work in TRIK studio, Tincercad, Tincercad Circuits.

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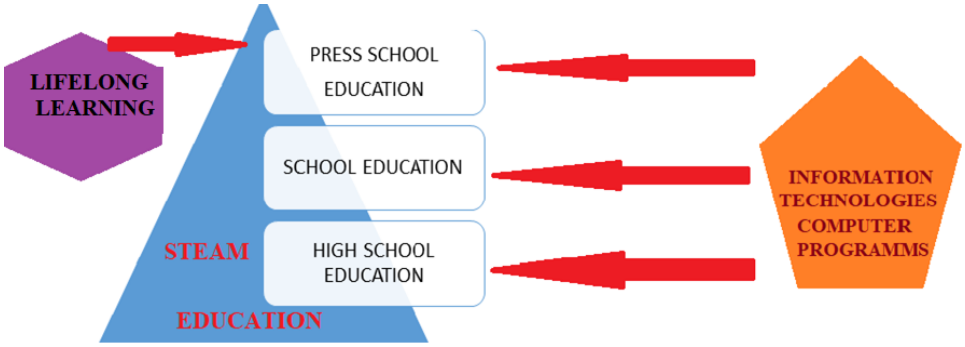

Diagramma№3. Steam continuous education.

At this stage of education, physics and physical animations can be taught using the AlgoDoo program. Here it is also necessary to study programs for simulation robotics Trik Studio Simulation Robotics, a program for modeling patterns in electrical circuits Tincercad Circuits, the Algodoo program in teaching and studying physics, to strengthen physical concepts and patterns in nature and technology, Tincercad Circuits in electrical engineering to understand the essence and connections in electrical circuits. It also requires training in the on Shape system. Scratch and C++ programming. Creating 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 receive key skills in working with the Scratch visual programming language and learn basic programming tools - conditions (simple and complex), loops (infinite and with a finite number of repetitions), learn how to work with variables, understand what arrays, procedures and functions. After learning the materials and basics of programming in Scratch, students will dive into 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, learning 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.

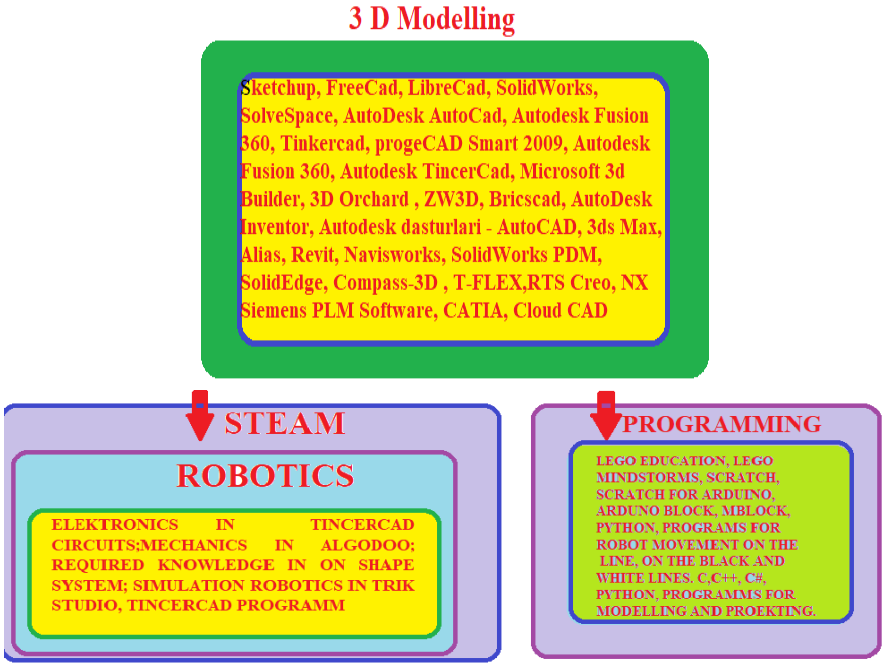

Diagramma №4. STEAM. Robotics. 3D Modelling.Using creating programs.

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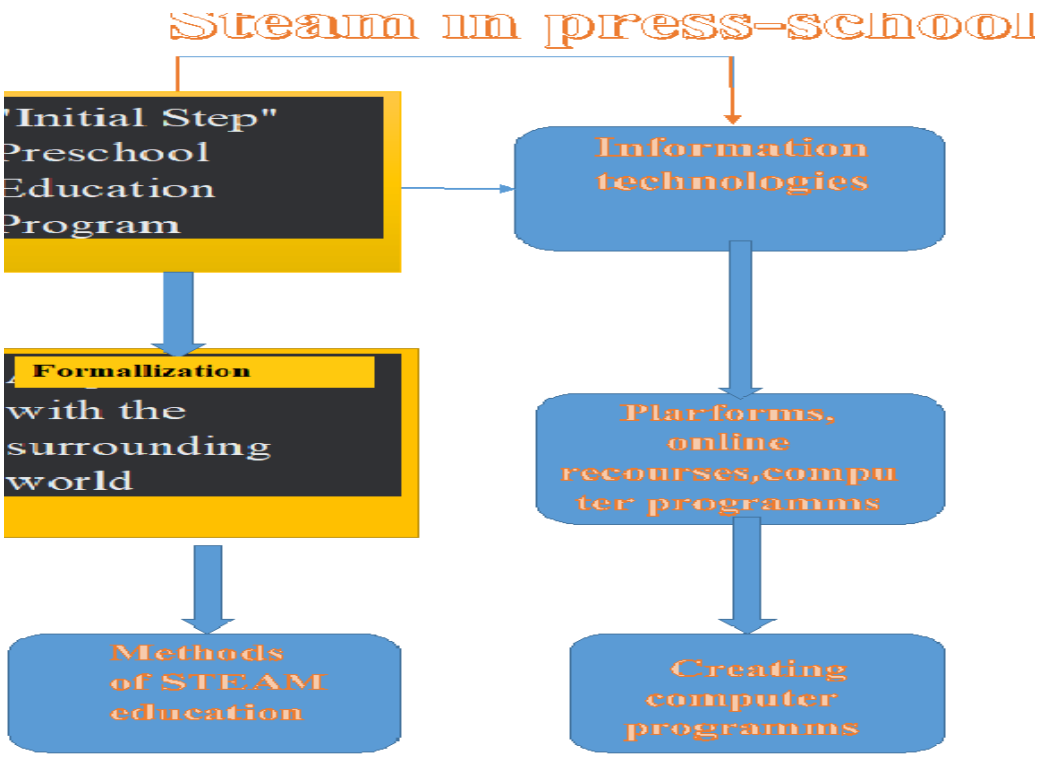

Diagramma №5.Steam in press-school and methods of teaching.

Mechanics at Algodoo. Each robot is a complex mechanism that moves due to the interaction of many mechanical elements: from various levers, gears, belts, gears and others. It is this section - mechanics - that is very important for the robot to clearly execute all the written programs and no forces (attraction, gravity, elasticity) interfere with it.

A specialized two-dimensional physics simulator is used, i.e. children need to know the basics of physics, in Algodoo children will learn how forces affect the mechanisms of the robot and our daily life in general.

Students will analyze the types of mechanical transmissions, get acquainted with the types and types of gear connections, assemble a belt drive, and create an analogue of an internal combustion engine.

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

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

In robotics, the study of simulation is necessary. 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 the drawings and models, is transferred to the real world. So it was and so it will always be. It is difficult for pupils and students to learn the basics of 3D modeling. There are even 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 an easy 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 accurate dimensional positioning when building models, and analyze the mobility of objects. Also, children learn to read various drawings.

Necessary knowledge in oShape

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

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Simulation robotics in TRIK studio. At the end, students will combine all the knowledge gained in the classes in electrical engineering, programming, mechanics and modeling and begin to work in a specialized environment that simulates the behavior of a robot - TRIK studio.

In this environment, children learn to build special algorithms to perform specific tasks, such as driving a robot along a line, along a white line or a black line, a white-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 and much more.

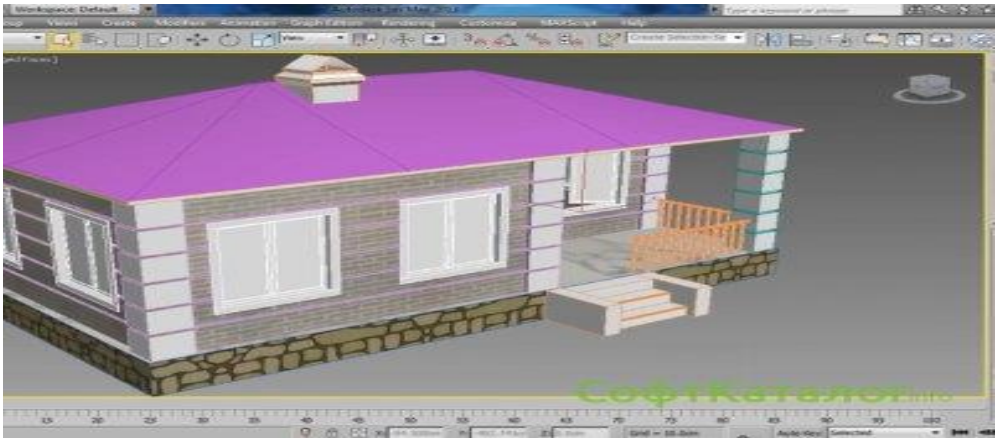
Education based on STEAM education should continue in all areas of lifelong education, especially they gave good results when using information technology, the Internet and online, e-learning, multimedia use of computer programs helped to better assimilate the material, since STEAM education itself provides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

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

In higher education, we offer training in several types of modeling programs: Sketchup, FreeCad, LibreCad, SolidWorks, SolveSpace, AutoDesk AutoCad, Autodesk Fusion 360, Tinkercad, progeCAD Smart 2009, Autodesk Fusion 360, Autodesk TincerCad, Microsoft 3d Builder, 3D Orchard, ZW3D , Bricscad, AutoDesk Inventor, Autodesk dasturlari - AutoCAD, 3ds Max, Alias, Revit, Navisworks, SolidWorks PDM, SolidEdge, Compass-3D , T-FLEX, RTS Creo, NX Siemens PLM Software, CATIA, Cloud CAD.

3D modeling has many uses: it creates computer graphics, realistic video games, tests, and prototypes. Every year 3D-modelers are becoming more and more in demand. Where there is robot modeling, there is also its creation. We cannot mention among these programs for modeling, using CAD in the design of robots and machines such programs as 3d max, 3d builder and others.

Autodesk 3ds Max is professional software with very powerful features. Provides an abundance of tools for 2D and 3D modeling. It is used in completely different areas, including: the development of computer games, animation, TV commercials and interior design. Contains a large number of special effects and filters for high-quality visualization.



Picture 1. Using of the program. www.google.com.

Autodesk Autocad is one of the benchmarks among computer-aided design systems. You will be able to model and design virtually any objects, as well as solve even the most highly specialized tasks. The developers have added all the necessary tools for the proper creation of design documentation for your work[5].

[5] www.goole.com

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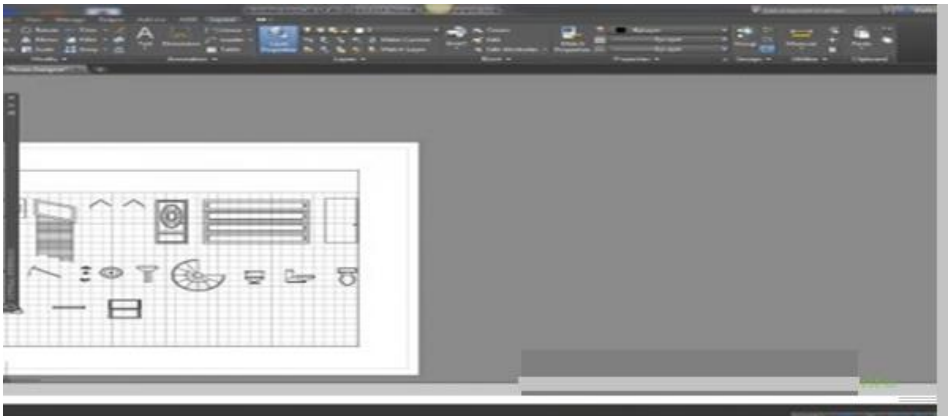
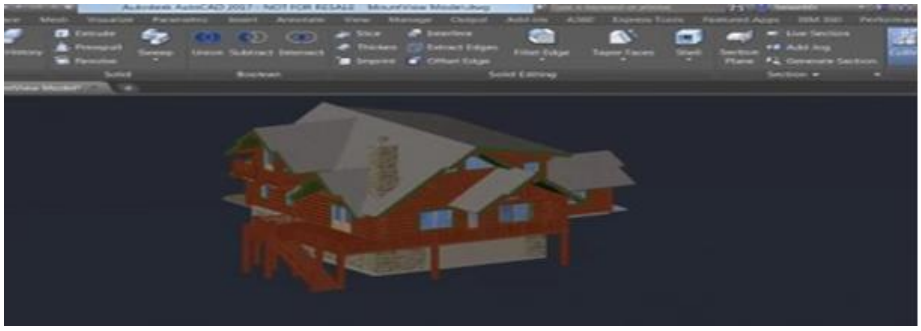
Supports parametric drawing and adding TrueType fonts. There is the possibility of printing a 3D model on a 3D printer. To master the interface rich in options, the built-in tooltip will help.



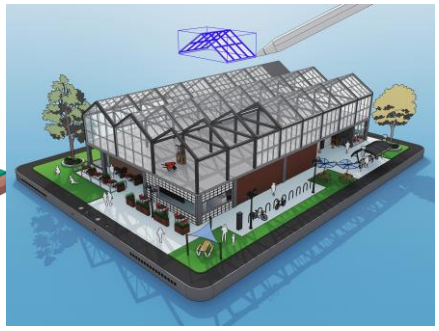
Picture 2,3 from google.com. Using of the program.



4 Pisture from google.com

SketchUp

SketchUp is a 3D design and architectural design software. Mainly used for modeling residential buildings, furniture, interior. There are tools for designing stairs, electrical wiring, plumbing and equipment. There are other programs for the interior of houses, schools, with the choice and insertion of furniture into rooms.



Pictures 3,4a from of www.gogle.com. School wth garden. Greenhouse from ScetchUp.

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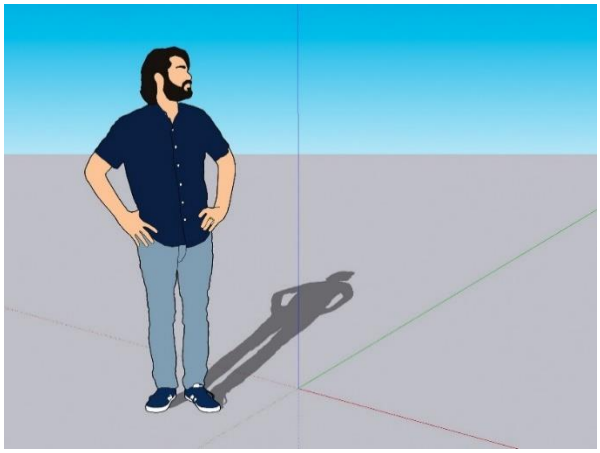
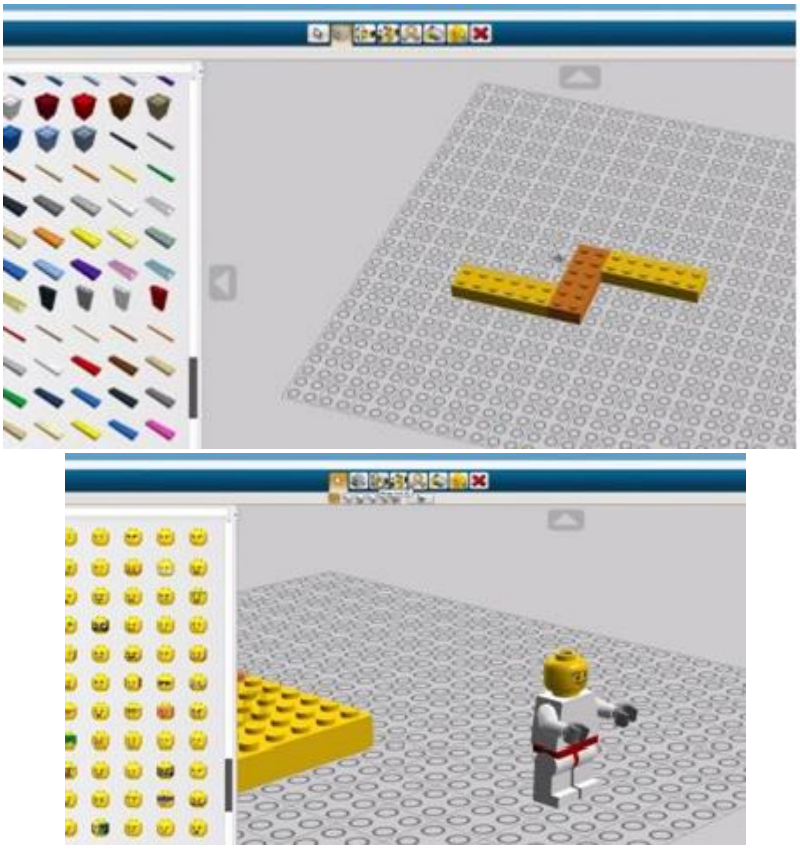


Picture 5, which we made from ScutchUp. Using personajes.

LEGO Digital Designer is a virtual constructor for creating 3D models from Lego (David Cook.,(2009)), (Chih-Hung Wu, Chih-Hsing Liu and Yueh-Min Huang., (2022)).

A program for creating models in three-dimensional space. This program can be taught at all stages of education, all levels of education are inherent in it. You will find a huge number of details, to the smallest detail, copying the original designer. Show your creativity and vivid imagination, plunge into the amazing atmosphere of childhood and try to collect something truly impressive. There is a function of volumetric viewing of the structure. Finished creations can be posted on the pages of the official LEGO website ("Photo Gallery" section) or published as a picture on social networks.



Pictures 6,7. Using pictures from Google.com.

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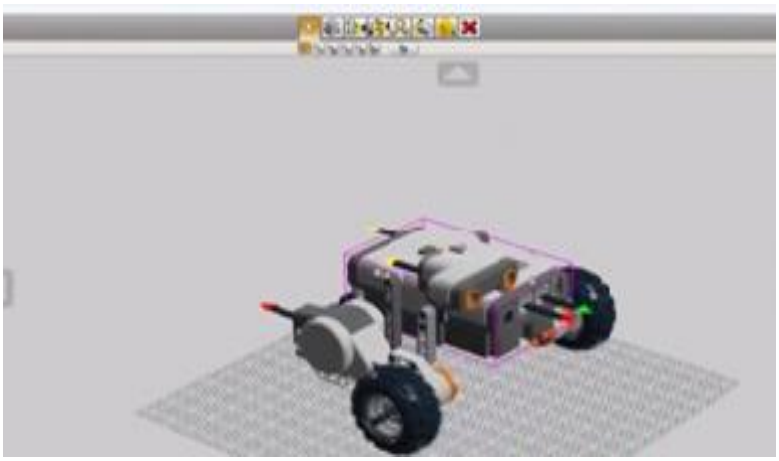

Picture 7 from Google.com

Let's at least consider several types of such programs:
3D Slash is a 3D modeling software that allows you to create models using a simple building block concept. This program includes block model construction In it, users create 3D structures by working on a cuboid using a variety of 3D modeling tools: Hammer, Spatula, Chisel, Wood and Drill - many of the process of creating models in 3D, Slash is somewhat reminiscent of Minecraft. 3D designing with these tools will be easy even for beginners. 3D projects in the program can be imported, modified (David Cook., (2009)), (Douglas Williams, (2006)). LibreCAD is a free 3D modeling software that contains the basic tools you will need to model and modify designs. The user interface of LibreCAD is not overloaded, so this 3D modeling software is suitable for beginners. Meshmixer 3.0 is a program that allows you to design 3D prototypes by combining several models, you can cut out parts of several models to get one model. Users can cut the desired parts from the models and paste them into others. In addition, the program allows you to create sculptures and prepare your prototypes for printing. SculptGL is the perfect option if you want to get familiar with 3D organic sculpting. The whole process of building models in this program resembles clay modeling. Using this program, you can get acquainted with modeling with the creation of sculptures from visual clay and modeling. Using dynamic topology modifiers, you can subdivide a 3D model to create more complex details, and importing a base mesh can save you a lot of time (David Cook., (2009)), (Douglas Williams, (2006)).
The software runs on WebGL, so it opens without problems in most browsers. It also has limited functionality - just a couple of brushes that mimic real sculpting tools. But in this case, it's more of a plus than a minus. With an intuitive interface, AutoDesk 123D offers a variety of tools for 3D modeling and computer-aided design. In addition, it supports 3D printing and laser cutting technology. Houdini Apprentice is a free version of Houdini FX with fewer tools. It is suitable for artists, students and amateurs who create three-dimensional models. Houdini Apprentice has a simple and intuitive interface (Predko M., Robot control devices. (2004).. (Solovieva L.,(2021),
(Randolph C. H. Chan., (2022)), (Predko M., (2004) &. Solovieva L., (2021 г)),(Randolph C. H. Chan ., (2022)), (V. Potapov, Yu. Khukhra.,(2021)), (Vorotnikov S.A. ,(2005)).

TinkerCAD is software that helps you create complex designs effortlessly. Recently, the TinkerCAD development team has added the ability to design objects using Codeblocks, allowing for more technical parametric modeling. Thanks to him, the quality of 3D models will not depend so much on how well the user has a mouse and keyboard. Wings 3D is a modeling software with many tools to create realistic prototypes.
With its help, you can texture models - the built-in AutoUV tool helps with this. The program does not support animation and represents only one OpenGl render, so it is often used in combination with other programs. Wings 3D uses the Erlang programming language. Design Spark is a free software that includes many common CAD modeling tools, but they are too much for a beginner to master.
The user interface is clearly inspired by AutoCAD, making DesignSpar a good alternative for 3D modelers who would like to use this software but can't afford it.

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Like some other programs, DesignSpark connects to online services. In particular, it allows you to load 3D models directly into free CAD software, as well as print and mail designs (Vorotnikov S.A. (2005)).

FreeCAD is 3D modeling software for real objects of any size and is free. Parametric modeling in this software allows you to easily modify 3D design, has various possibilities. The program is open source and can be further configured: the software is created in Python, so if you know this language, you can use it to create and implement new functions. This is where the skills and knowledge of programming in the Python programming language are needed. The service also offers a modular architecture, which allows you to connect plugins to the main application (M.A. Komarov, Zhimarchy Frederic, (2007)), (Newton S. Braga, Creating robots at home, (2007))

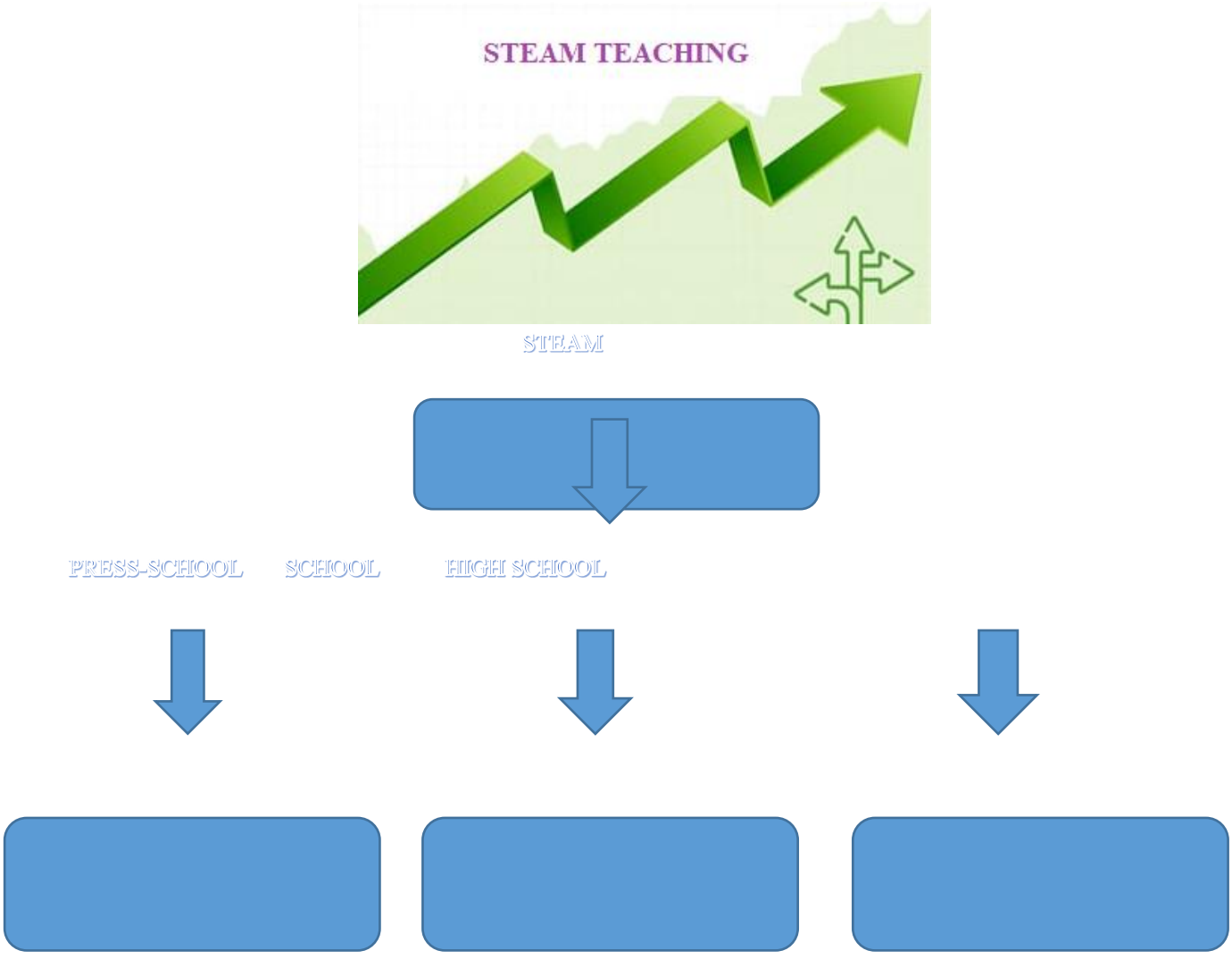

Diagramma №3.Steam in continuous education.

Conclusion.

Based on the above discussions, the arguments put forward by us are the hypothesis that the use of STEAM education is necessary for the training of highly qualified personnel with knowledge in several subjects at the same time. A person cannot live without ideas, without dreams, but he always dreams of a well-maintained house, with good facilities. Without dreams and ideas, it is impossible to build Smart houses and Smart apartments. But one dream is not enough to

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achieve the goal; knowledge, skills, abilities and experience in working in several areas of education are necessary. Knowledge of physics is required in order to understand the connection and principle of operation of certain devices, various technical devices, high-tech equipment, various electrical circuits, the connection between them, to know not only physical, but also mathematical patterns in the operation of an entire equipment system. It turned out that knowledge is needed to use the system.

Knowledge is required in assembling those and other parts and parts of the whole equipment, knowledge is also required in the use of information and automated systems. Knowledge of the use of ready-made web programs and the ability to work in the platform are required. The use of such devices and equipment is one thing, but the training of such personnel who can work in several directions at once is another. Such cadres must be trained from a young age. Continue to prepare it in all areas of continuing education. Preschool, school, university. It is necessary to train the future specialist at the level of higher education.

The results of the processing of the pedagogical experiment based on the methods and criteria of mathematical statistics, which we obtained, gave us good results, fully prove the hypothesis put forward by us and the idea that the use of information technologies and computer programs will enhance the formation of STEAM learning, will give good results at all stages of education, including and higher education. It is necessary to use a set of programs in teaching at a higher school for modeling ScratchUp, 3dMax, AutoDesk AutoCad and other programs, as well as Sratch, Scratch programs for Arduino, Lego Mindstorms. We have identified the main highlight in our research that STEAM education in the field of programming and robotics must be carried out throughout a person's life(Yurevich E.I, (2005)), (Yunusova G.N., (2021), (Yunusova G.N., (2021)),(Yunusova G.N., (2021), (Yunusova G.N.., (2022)).

Literature:

1. Chih-Hung Wu, Chih-Hsing Liu and Yueh-Min Huang., The exploration of continuous learning intention in STEAM education through attitude, motivation, and cognitive load., *International Journal of STEM Education* 2022.
2. Clara L. Meaders, Lillian G. Senn, Brian A. Couch, A. Kelly Lane, Marilyne Stains, MacKenzie R. Stetzer, Erin Vinson and Michelle K. Smith.,Am I getting through? Surveying students on what messages they recall from the first day of STEM classes., *International Journal of STEM Education* 2021 8:49.,ResearchPublished on: 6 August 2021.
3. Cristina Simarro and Digna Couso.,Cristina Simarro and Digna Couso., Engineering practices as a framework for STEM education: a proposal based on epistemic nuances., *International Journal of STEM Education* 2021 8:53., CommentaryPublished on: 8 September 2021.
4. Dustin Grote, Anita Patrick, Chelsea Lyles, David Knight, Maura Borrego and Abdulrahman Alsharif., STEM doctoral students' skill development: does funding mechanism matter?., *International Journal of STEM Education* 2021 8:50., Content type:ResearchPublished on: 17 August 2021ю
5. David Cook., Robot Building for Beginners, https://qna.habr.com/q/85960- 2009
6. Douglas Williams, PDA-controlled programmable robot., https://qna.habr.com/q/859602006
7. Froebel gifts. We take note of the "developers" of the 19th century., A blog about developmental techniques, baby books, nutrition, harmless cosmetics, laundry detergents and more., URL: https://mamazanuda.ru/dary-frebelya/., Date of access: 05/23/2021.
8. Grabar M.I., Krasnyanskaya K.A. Application of mathematical statistics in pedagogical research. Nonparametric methods. - M.: Pedagogy, 1977 - 136p. URL: tudmed.ru/grabar-mi-krasnyanskaya-ka-primenenie-matematicheskoy-statistiki-v-pedagogicheskih-issledovaniyah-neparametricheskie-metody_a8a01301619.html.
8. G.V.Akhmetzhanova., I.V.Antonova, Application of methods of mathematical statistics in psychological and pedagogical research., Electronic textbook., URL: https://dspace.tltsu.ru/bitstream/123456789/3403/1/AhmetzhanovaGV-1-69-16-Z.pdf.., p.46-49, p. 49-52.
10. Gurstelle W. - Building Bots. Designing and Building Warrior Robots ., URL: https://www.biblio.com/book/building-bots-designing-building-warrior-robots/d/1047120377– 2002.

Journal of Chemical Health Risks

www.jchr.org

JCHR (2024) 14(2), 1244-1262 | ISSN:2251-6727

11. Intermediate Robot Building, David Cook, URL: https://www.amazon.com/Intermediate-Robot-Building-Technology-Action/dp/1430227540 - 2010.
12. Jonathan H. Tomkin and Matthew West.,STEM courses are harder: evaluating inter-course grading disparities with a calibrated GPA model.,Grades in college and university STEM courses are an important determinant of student persistence in STEM fields. Recent studies have used the grade offset/grade penalty method to explore why students have low...., *International Journal of STEM Education* 2022 9:27., ResearchPublished on: 17 March 2022.
13. Kuang-Chao Yu, Pai-Hsing Wu, Kuen-Yi Lin, Szu-Chun Fan, Sy-Yi Tzeng and Chih-Jung Ku., Behavioral intentions of technology teachers to implement an engineering-focused curriculum., Citation:*International Journal of STEM Education* 2021 8:48,Content type:ResearchPublished on: 28 July 2021.
14. Laura Starr, Katherine Yngve and Lan Jin., Intercultural competence outcomes of a STEM living–learning community., Intercultural competence outcomes of a STEM living–learning community, 2021.
15. Montessori at home for kids., URL: https://mamazanuda.ru/montessori-doma/., Date of access: 05/23/2021.
16. Make an Arduino-Controlled Robot, Michael Margolis, URL: https://books.google.co.uz/books/about/Intermediate_Robot_Building.html?id=BDXBlfO-ALAC&redir_esc=y - 2012
17. Mechatronics and robotics. Micro-movement systems with piezoelectric actuators. Textbook, Smirnov Arkady Borisovich, Государственная публичная научно-техническая библиотека СО РАН.,URL: http://webirbis.spsl.nsc.ru/irbis64r_01/cgi/cgiirbis_64.exe?Z21ID=&I21DBN=CAT&P21DBN=CAT&S21STN=1&S21REF=&S21FMT=fullwebr&C21COM=S&S21CNR=20&S21P01=0&S21P02=0&S21LOG=1&S21P03=K=&S21STR=%D0%9C%D0%B8%D0%BA%D1%80%D0%BE%D1%8D%D0%BB%D0%B5%D0%BA%D1%82%D1%80%D0%BE%D0%BD%D0%BD%D0%B0%D1%8F%20%D0%B0%D0%BF%D0%BF%D0%B0%D1%80%D0%B0%D1%82%D1%83%D1%80%D0%B0%20%2D%20%D0%90%D0%B2%D1%82%D0%BE%D0%BC%D0%B0%D1%82%D0%B8%D1%87%D0%B5%D1%81%D0%BA%D0%BE%D0%B5%20%D1%83%D0%BF%D1%80%D0%B0%D0%B2%D0%BB%D0%B5%D0%BD%D0%B8%D0%B5 - 2003.
18. M.A. Komarov, Zhimarchy Frederic, Assembly and programming of mobile robots at home. (Robots mobiles programmables Techniques advances) . Translated from French.,URL: - 2007.
19. Newton S. Braga, Creating robots at home, 2007.
20. Nabiullina Luiza Mahmudovna., Using the χ2 (CHI-SQUARE) criterion for statistical procession of pedagogical experiment data., URL: https://cyberleninka.ru/article/n/ispolzovanie-kriteriya-2-hi-kvadrat-dlya-provedeniya-statisticheskoy-obrabotki-dannyh-pedagogicheskogo-eksperimenta.
21. Owen Bishop, The Robot Designer Handbook, Programming Lego Mindstorms NX., URL: https://www.sciencedirect.com/book/9781597492782/programming-lego-mindstorms-nxt#book-description; https://www.oreilly.com/library/view/programming-lego-mindstorms/9780080569963/ [2011].
22. Predko M. - 123 experiments in robotics.,Programmable robots. We create a robot for our home workshop, J. Williams, book., https://qna.habr.com/q/85960 - 2006.
23. Predko M., Robot control devices. Circuitry and programming, https://qna.habr.com/q/85960-200425. Solovieva L., All to the "Start"! Robotics educator about the new LEGO Education kit. URL: https://pedsovet.org/article/vse-na-start-pedagog-po-robototehnike-o-novom-nabore-lego-education ., Date of the application: 23.05.2021 г.
25. Randolph C. H. Chan ., A social cognitive perspective on gender disparities in self-efficacy, interest, and aspirations in science, technology, engineering, and mathematics (STEM): the influence of cultural and gender norms, article № 37 (2022).
26. The book “Learning Arduino. 65 DIY projects. 2nd edition”, Appeal 05/17/2022.

27. 3D modeling programs., URL: https://mar3dt.ru/company/articles/programmy_dlya_3d_modelirovaniya/.б., Date of the application: 23.05.2021 y.
28. 21 Best 3D Modeling Programs, URL: https://lifehacker.ru/programmy-dlya-3d-modelirovaniya/., Date of the application: 23.05.2021 г.
29. V. Potapov, Yu. Khukhra., Aerobatic radio-controlled models of aircraft- 1965.
30. Vodovozova E.N. "Mental and moral education of children from the first manifestation of consciousness to the age of eight", URL: https://mamazanuda.ru/obzor-knigi-vodovozovoy-umstvennoe-nravstvennoe-vospitanie/.
31. Vorotnikov S.A. - Information devices of robotic systems (Robotics)., https://www.researchgate.net/publication/277614920_A_Robotic_System_for_Inspection_and_Repair_of_Small_Diameter_Pipelines – 2005.
32. Ute Soroessor, Markus Vogel, Tobias Dörfler and Andreas Eichler., Changing between representations of elementary functions: students' competencies and differences with a specific perspective on school track and gender., 2022 y.).
33. Who was Friedrich Froebel (1782-1852)., journal Early Education Journal, 2020 y.,., URL: /https://early-education.org.uk/books-resources/early-education-journals/., https://early-education.org.uk/friedrich-froebel/ , https://app.sheepcrm.com/early-education/journal/ Date of marriage: 05/23/2021 /.
34. Yurevich E.I., Modeling and programming of robotic systems., Fundamentals of robotics, https://qna.habr.com/q/85960.,2005.
35. Yunusova G.N., Programming and robotics., India., Monography., https://novateurpublication.com/index.php/np/catalog/view/83/68/1049-., Published by Novateur Publication 466,Sadashiv Peth, M.S.India-41102021 y.
35. Yunusova G.N., Programming and robotics., American Journal of Interdisciplinary Research and Development., http://ajird.journalspark.org/index.php/ajird/article/view/18 Monography., 2021 y.
36. Yunusova G.N., Strengthening The Integrated Steam Of Technologies In The Environment Of Information Technologies And Computer Programs., Texas Journal of Engineering and Technology., USA., https://zienjournals.com/index.php/tjet/article/view/1442., 2021 y.
37. Yunusova G.N.., Based on strengthening STEAM education of children (programming and robotics) with the help of new information technologies and computer programs.,Monography., URL: https://hemis.namdu.uz/science/publication-scientifical-edit?id=2416.;, https://hemis.namdu.uz/static/uploads/29/TX94FODGwVSHKR0zb--utfhwcj7iReml.pdf; https://hemis.namdu.uz/static/uploads/29/H7bZPz_O0m-pq8J4CZVJsvQQE82Ms20F.pdf; https://hemis.namdu.uz/static/uploads/29/NHN7XQnmLZNMIGOQm_IG74vh3gzdo2BM.pdf; https://hemis.namdu.uz/static/uploads/29/Ru864YP23eGJLf6pDEA-QgS1M3V1YiJl.pdf.,2022 y.
38. Xi Wang, Minhao Dai and Robin Mathis., The influences of student- and school-level factors on engineering undergraduate student success outcomes: A multi-level multi-school study., *International Journal of STEM Education* 2022 9:23.,ResearchPublished on: 5 March 2022.