ОСВІТА ЗА РУБЕЖЕМ

UDC [37.09:330.1]+378.013-057.8:004:371.5(07)
DOI https://doi.org/10.32782/2410-2075-2022-15.19

STEM TRAINING – A FORMULA OF SUCCESS

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Abstract. The information revolution, creation of the computers, the Internet and especially information and communication technologies have radically changed the opportunities and learning environment. The new educational paradigm and "Teaching learners to discover knowledge to solve problems". The problems in science and life are most often interdisciplinary, and schooling is conducted discipline by discipline.

The article proposes a transition from subject-centric organization of the learning process (vertical organization, subject, after subject) to interdisciplinary organization (horizontal organization, problem-oriented).

STEM training is proposed as the basis for this change. The origin of this training and the stages it goes through are considered. An analysis of its goals and advantages has been made. The difficulties of its implementation are also pointed out.

Soft skills achieved through STEM training include problem solving, critical thinking, creativity, curiosity, decision making, leadership, entrepreneurship, acceptance of failures and more. Regardless of the future career path chosen by these children, these skill sets have a long way to go to prepare them to be innovative. However, with the right curriculum, STEM subjects also provide children with opportunities to develop basic traits, including empathy, perseverance and cooperation. STEM adds quality to the educational program.

An overview of STEM training in New Zealand, Australia, England, the United States, India, Finland, South Korea and France.The types of laboratories for building STEM environment in the educational institutions of Bulgaria are also considered.

Keywords: *STEM, STEAM, STREAM, training, soft skills, stages of STEM, STEM around the world.*

Introduction. According to the traditional educational paradigm, the goal of education is the formation of "Knowledge-skills-habits". It is based on knowledge that becomes skills, and skills become habits. This paradigm was indispensable until the advent of computers, the Internet and information and communication technologies. Why? Because before their appearance, the teachers in the educational establishments and the teachers in the universities were the bearers of the knowledge and only in school and libraries the children could acquire knowledge.

Since the end of the last century, as a result of the information revolution, knowledge has suddenly become much easier to access. This has led to a change in the educational paradigm. Now the goal of the learning process is: "To teach learners to discover knowledge to solve problems." It is based on the problems to be solved (the activity), and knowledge is a means for that.

In this article we will present an interdisciplinary approach called STEM (Science, Technology, Engineering, Math) in which knowledge is formed in the process of problem solving. Why an interdisciplinary approach? Because jobs in the real world are interdisciplinary.

HORIZONTALLY AND VERTICALLY ORGANIZED LEARNING PROCESS

The first change that needs to be made in the learning process is the transition from vertical to horizontal organization. In the vertical organization of the learning process, also called subject-centric, each discipline is independent and the knowledge of its subject area is studied. In a horizontally organized learning process, the basis is the problems that can be solved with knowledge from several subject areas. That is why we need to educate children on how disciplines integrate and work together.

▪ They need to develop a variety of skills (especially soft skills) and a passion for research and development.

– Education is no longer about memorizing facts. Instead, it is about learning how to think critically and evaluate information.

– How to apply knowledge, research and problem-solving skills.

– Skills should be taught in an applied way, as part of a larger whole, rather than the traditional approach of individual subject lessons.

In England, for example, they do not have the disciplines of physics, chemistry and biology, but study these three traditional subjects, such as Science. In our country in grades 1-4 there are disciplines Man and nature (physics, chemistry and biology) Man and society (geography and history). When these subjects are studied separately from the 5th grade, the children experience difficulties. Why? Because for them Geography and history are Man and society.

STEM training is such an interdisciplinary approach.

STEM is a curriculum based on the idea of teaching students in four specific disciplines – science, technology, engineering and mathematics – in an interdisciplinary approach based on real-life applications.

However, the STEM approach is much more than "gluing" concepts together. This is a philosophy of education that encompasses teaching skills and subjects in a way that resembles real life. Instead of teaching the four disciplines as separate and discrete subjects, it integrates them into a consistent learning paradigm based on real application.

STAGES IN THE DEVELOPMENT OF STEM TRAINING

Stage I – STEM political agenda. The emergence of STEM is a US response to its possible postponement of global supremacy. In the 1990s, the acronym SMET (Science, Mathematics, Engineering and Technology) was first used by the US National Science Foundation (NSF) to create an educational initiative. STEM arises from the initial abbreviation "SMET" after negative feedback. The aim of this educational initiative is to provide students with critical thinking skills that will enable them to solve problems and better realize themselves in the labor market.

Stage II – the struggle for the introduction of STEM. Encouraging governments to increase the number of students choosing STEM subjects is a challenge for teachers. STEMs are considered as separate disciplines.

Stage III – STEM is interpreted as SteM Science and mathematics are the most recognizable STEM fields and most teachers feel comfortable teaching them, creating "educational silos". Teachers adhere to the traditional teaching of science and mathematics, and have virtually ignored technology and engineering components. Educators who are not involved in engineering or technology are disturbed by the processes involved.

Stage IV – rise of STEM training. To the name STEM was added "training", which becomes "STEM training" to emphasize the role of teachers in the implementation of the political agenda. The two main factors considered are: curriculum structure and the level of skill and / or teacher training.

– The STEM movement calls for the integration of these subjects into local curricula to prepare learners for the technology age.

– Professional realization in the 21st century requires a set of unique life skills.

– In addition, the complex challenges presented need complex solutions.

– In this way, STEM education helps learners gain access to state-of-the-art knowledge and training to deal with tomorrow's problems.

Stage V – integrated STEM training. It is defined as the teaching and learning of two or more STEM subjects, or between a STEM and a non-STEM subject (eg arts). That's why "A" (from Arts, Arts) stands happily in the middle of the acronym STEM (Science, Technology, Engineering, Mathematics), which is becoming STEAM: a modern, interdisciplinary approach to research and innovation that is currently entering school education.

– STEAM adds "Arts" to the elements of STEM, which takes advantage of the creative and innovative thinking caused by the arts.

– STEAM is a way to bridge the conventional link between science and art and use the principles of the arts to maximize the outcome of STEM training

– Creative miracle and imagination hidden from hearing about the arts mixed with STEM

– Also the arts and sience help to teach morality, values, ethics and responsibility.

– Allows students to link their learning to these critical areas, along with the arts, element design principles and standards, to provide the full range of learning at their disposal

– History shows us again and again how knowledge and skills in the absence of empathy can be really catastrophic. In this way, the arts make the growth and development brought about by STEM inclusive and sustainable.

VI "Reading" is added to STEM and STEAM, and a fundamental tool for development

– STREAM includes another layer to STEM and STEAM by adding "Reading" to the equation.

– Reading or literacy encourages critical thinking and creativity.

– By introducing reading as a key element in discovering new knowledge, STREAM provides a complete learning experience.

Why should STEM be expanded?

– The change of STEM to STREAM makes education more accessible and inclusive for more children

– STEAM and STREAM develop empathy in learners, encouraging them to use their knowledge and skills for moral values. These added layers act as the moral compass of the STEM movement, constantly questioning its goals and ultimate goal.

– The arts and reading encourage people with an analytical mind to be more creative and think outside the box. They drive innovation that is crucial to navigation in today's rapidly changing world.

– STEM has a controversial reputation among learners. Many students prefer to do almost anything rather than study STEM subjects.

– Combining the arts and reading with STEM makes everyday learning more exciting and exciting. It enhances students' inherent motivation and connects them through shared experiences. STEAM and STREAM help to better define the real application of STEM.

– Playing with strengths is important for success. However, it is even more important for people with values to grow up. For young children in particular, holistic education is crucial for the development of their overall well-being. In addition, the challenges of tomorrow are complex and unpredictable. Thus, today's children need extensive interdisciplinary knowledge and skills, as well as the ability to work together to succeed in the future.

– The science and literacy, combined with STEM studies, provide the foundation needed for students to thrive in life.

We need to educate children on how different subject areas integrate and work together.

– They need to develop diverse sets of skills (professional and soft skills) and a passion for research and growth.

– Education is no longer about memorizing facts. Instead, it is about learning how to think critically and evaluate information.

– How to apply knowledge, research and problem-solving skills.

– Skills should be taught in an applied way, as part of a larger whole, rather than the traditional approach of individual subject lessons.

STEM subtopics

– Learning about STEM through creative expression.

– Wider connection of STEM with the arts / music, dance, theater, crafts, creative writing, photography / – connection between art and science.

– Connecting crafts with computers, electronics, laser technology, sensors, robots, design and technology.

– Pedagogical approaches, challenges or training based on real world problems.

OBJECTIVES OF STEM TRAINING

– "The implementation of the program aims to motivate students to study science, mathematics and technology, increase educational outcomes, acquire a system of competencies, lasting, comprehensive knowledge, key skills and attitudes oriented to the practice, development and career guidance of students, their focus on technological professions".

– Education in Science, Technology, Engineering and Mathematics (STEM) focuses on preparing future generations for career success. The skills acquired from STEM training go beyond those needed to succeed in STEM fields, preparing children with different interests that are realized in each professional field to have valuable sets of skills that allow them to be successful.

– STEM-based learning teaches children more than the concepts of science and mathematics. Focusing on hands-on learning with real-world applications helps to develop different sets of skills, including creativity and 21st century skills. 21st century skills include media and technology literacy, productivity, social skills, communication, flexibility and initiative.

– Soft skills achieved through STEM training include problem solving, critical thinking, creativity, curiosity, decision making, leadership, entrepreneurship, acceptance of failures and more.

– Regardless of the future career path chosen by these children, these skill sets have a long way to go to prepare them to be innovative. However, with the right curriculum, STEM subjects also provide children with opportunities to develop basic traits, including empathy, perseverance and cooperation. STEM adds quality to the educational program.

WHAT IS STEM EDUCATION IN DIFFERENT COUNTRIES?

SOUTH KOREA (L6)

– The South Korean Ministry of Education issued a nationwide policy program in 2011 that includes promoting the integration of science, technology, engineering, the arts and mathematics education.

– A unique feature of STEM integration in South Korea is the integration of STEM with arts that include the fine arts, language arts, liberal arts, and the physical arts.

– STEAM programs in South Korea call for the inclusion of all school subjects that can provide rich learning opportunities. STEAM's integrated initiatives in Korea include both in-school and out-of-school training.

– While the STEAM reform movement is in line with STEM reform in other countries, its added arts component is inspired by the simultaneous social discourse of educating creative and competent citizens in the 21st century.

NEW ZEALAND (L 1)

The New Zealand government recently encouraged schools to promote STEM training in the hope that it would alleviate STEM skills shortages. The Ministry of Education supports teacher training programs such as Teach First and Manaiakalani Digital Teachers Academy, which help place highly effective STEM graduates and digitally confident teachers in education.

The Nation of Curious Minds National Strategy Plan is a ten-year government initiative to promote the importance of science and technology in New Zealand. Since 2015, it has funded more than 175 projects worth more than NZD 6 million.

FRANCE (L 2)

A wide variety of STEM-related courses and programs are offered at each level. Enrollment and completion of STEM-related training courses at ISCED levels 5 and 6 in France is above the OECD and European Union (EU) averages and is also higher than in Australia.

However, the country remains concerned both that the share is not high enough to meet current economic needs and that the percentage of higher education students following these trends declined in the 1990s and 2000s.

While France is performing relatively well internationally, the problem of low and declining participation in STEM training continues to exist there. The review provides information on the French attitude towards STEM education, factors influencing student motivation and an analysis of the gender balance in the STEM areas in France. Increasing the number of researchers, especially in STEM-related areas, is an economic priority for recovery, stability and growth in the coming years.

FINLAND (L 4)

Finnish education focuses mainly on the education of its teachers. In Finland, every teacher decides what steps to take, the teaching profession is very popular, highly respected and it is difficult to become a teacher in Finland.

There is no classroom system in schools, but multidisciplinary training modules, where the focus is on practical work and the teacher must awaken a hunger for knowledge.

STEM training schools have been opened in the country. Innovative education – new ways of learning, new environment, project-based learning in integration with art classes

Museums and libraries are full of children and young people, and the purpose of education is to transmit skills needed in real life. This is due to the high results of PISA.

ENGLAND (L 6, L 7)

A 2016 report entitled UK STEM educational landscape, conducted by the Royal Academy of Engineering, emphasized that the UK needs better coordinated STEM education from an early age in order to have a long-term impact. This includes changing negative stereotypes related to STEM careers and providing better professional development for teachers to help them apply teaching in a real context.

The UK Government recognizes the importance of encouraging students from an early age to appreciate and increase their understanding of science.

There is a wide range of public, private and third sector initiatives aimed at supporting STEM engagement for young people. These include STEM training and the WISE campaign. These organizations can turn to the Foundation for Educational Funds (EEF) for funding, an independent charity that funds innovative educational approaches that have the potential to increase achievement and improve outcomes.

AUSTRALIA (L 1)

In 2015, all Australian Ministers of Education agreed to the National School Education Strategy STEM 2016–2026, which focuses on the development of mathematical, scientific and digital literacy; and promoting problem-solving, critical analysis and creative thinking skills. The strategy aims to provide improvements in STEM learning and has two main objectives:

– all students graduate with strong basic STEM knowledge and related skills;

– Students are inspired to take on more challenging STEM subjects.

Australian Government also funds several early learning initiatives. and school. This includes an investment of a $ 6 million in the Early Learning STEM Education Scheme (ELSA, a digital STEM learning platform for pre-school children). They will invest a $ 4 million in the Young Scientists STEM professional development program for early childhood educators and teachers. The STEM Professionals in Schools program facilitates partnerships between schools and industry to bring real STEM into the classroom.

United States (L 6)

The United States recognizes the need to invest in STEM education in order for young people to be competitive in the labor market.

In September 2017, President Donald Trump signed a presidential memorandum to expand access to high-quality STEM education for young people. This will put STEM education, in particular computer science, at the top of the Ministry of Education's priorities. It also aims to provide at least $ 200 million a year in grants to the area.

INDIA (L 6 L 7)

India is the second most populated country in the world. In 2015, Prime Minister Narendra Damodardas Modi launched the Skill India campaign, which aims to train more than 400 million young people in various skills by 2022. One such skill is STEM education. One challenge facing the country is the design of infrastructure and a curriculum in support of this goal.

Since the beginning of the campaign, the focus has been on developing innovation and production skills from an early age. The STEM Foundation of India is working in partnership with the Indian Department of Science and Technology to promote STEM training across the country.

Other organizations playing a key role in the development of STEM education in India include STEM Champ and EduTech.

All of these efforts in developed countries to reform STEM education must meet the challenges of the twenty-first century, which require strengthening the STEM workforce to address

True STEM education must increase students' understanding of how things work and improve their use of technology. STEM education also needs to introduce more engineering during pre-school education. Engineering is directly involved in problem solving and innovation, two high-priority topics on each country's agenda.

ESTABLISHMENT OF A NATIONAL STEM SKILLS ENVIRONMENT TOMORROW

The project "Creating a national STEM environment for tomorrow's skills" has started in Bulgaria. All 2243 schools will be able to apply for several major types of STEM projects.

Types of school STEM centers:

– **Workshop / Makerspace corners** – creating separate spaces in rooms or offices (corners) for creativity and digital technologies or transforming one or two classrooms in a similar place. Activities in this school space should be aimed at (but not limited to) solving problems of real life and the world of business, economics and modern global challenges, such as creating effective engineering solutions to environmental problems, creating industrial prototypes with 3D printers, decisions for social causes, etc.;

– **Research laboratories** – small or complementary projects for practical equipment and stations in natural sciences, provision of research needs, applied research and laboratory work. Equipping one or two office spaces, storage rooms or classrooms for a laboratory, or installing laboratory stations in several offices. The project may also include mobile / portable digital laboratory kits, technical equipment, licenses for access to platforms with electronic content in science, etc., necessary for the applied work of students;

– **Classroom for creative digital creators** – encouraging students' interest in digital science and the creation of digital content, but on a smaller scale – for example, one or two classrooms with adjoining common spaces. Building an innovative learning space and learning content and can include various hardware and software technologies – according to the needs of students, kits for robotics and engineering, 3D printer, electronic boards and microcomputers, creative corners, zoos, etc.;

– **Center for young researchers** study spaces should be organized in corners and areas, allowing a different, flexible curriculum and organization of the day. The environment may include areas for indoor and outdoor applications (biological and physical sciences), zoos, stations for applied programming projects (application development, visual products), robotics with age-appropriate tools, etc.;

– **Center for Technologies in Creative Industries** – will provide a technological learning environment and innovative learning content for students interested in developing training companies for digital / video games, mobile applications, media products, product development, digital marketing, graphics and design, etc.. The center may include equipping classrooms with computers and other technological solutions, specific software in accordance with the needs of the creative industries (for drawing, animation, modeling, editing, editing, 3D design, remote control, etc.); creative corners and spaces; video studio and filming equipment; recording studio; simulation equipment, virtual and augmented reality, video and audio equipment for linguistic activities;

– **Center for Digital Creators** – provides general education activities, including digital technologies, as well as creates motivation for career development in the following areas: application programmer, system programmer, profile "Hardware and Software Technologies", profile "Entrepreneur" and others. According to the vision and needs of the particular school, this type of center can offer 3D equipment, electronic boards and microcomputers, a set of programming tools and robotics. The center may also include the creation of makerspace workshops;

– **Center for Natural Sciences, Research and Innovation** – the center could provide work to students on applied projects that solve real cases and problems of business, research, experiments and analysis. The center may contain practical laboratories in traditional natural sciences, as well as more specific environments such as laboratories in biotechnology, genetic analysis, pharmaceuticals, elements of food production, agricultural technology, soil analysis, etc. – according to the needs of the specific school;

– **High-tech equipped and connected classrooms (VOSKS):** Each school will be able to apply for VOSKS. Equipping classrooms to ensure efficient, unrestricted and equal access to modern and digital educational content available to all participants in the learning process through educational cloud platforms built by the Ministry.

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СТЕМ ОСВІТА – ФОРМУЛА УСПІХУ

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Проблема. *Інформаційна революція, створення комп'ютерів, Інтернету і особливо інформаційно-комунікаційних технологій докорінно змінили можливості та середовище навчання. На часі нова освітня парадигма та пошук інструментарію,щодозволить учням відкривати знання для вирішення проблем. Проблеми в науці та житті найчастіше мають міждисциплінарний характер, а навчання у школі відбувається в межах конкретної дисципліни.*

У статті пропонується перехід від предметно-центричної організації процесу навчання (вертикальна організація: предмет після предмета) до міждисциплінарної організації (горизонтальна організація: проблемноорієнтована).

Основою для цієї зміни пропонується навчання STEM. Розглядається походження цього навчання та етапи, які воно проходить. Проведено аналіз його цілей та переваг. Також вказано на труднощі його реалізації. М'які навички, отримані під час навчання STEM, включають вирішення проблем, критичне мислення, креативність, цікавість, прийняття рішень, лідерство, підприємливість, прийняття невдач тощо. Незалежно від майбутнього кар'єрного шляху, обраного дітьми, цей набір навичок допоможе пройти довгий шлях, щоб підготувати їх до інновацій. Крім того, за правильної навчальної програми предмети STEM також дають молодим людям можливість розвинути основні риси, зокрема емпатію, наполегливість та співпрацю. STEM додає якості освітній програмі.

Здійснено огляд навчання STEM у Новій Зеландії, Австралії, Англії, США, Індії, Фінляндії, Південній Кореї та Франції. Також розглянуто типи лабораторій для побудови STEM- середовища в навчальних закладах Болгарії.

Мета *– розкрити міжнародний досвід навчання STEM, представити міждисциплінарний підхід під назвою STEM (Science, Technology, Engineering, Math), у якому знання формуються в процесі вирішення проблем, в освітньому середовищі Болгарії.*

Методи дослідження. *Для досягнення поставленої мети застосовано аналітико-прогностичний та логіко-системний методи, які допомогли узагальнити та систематизувати зарубіжний досвід STEM-освіти та визначити пріоритети побудови STEM середовища в навчальних закладах Болгарії.*

Основні результати дослідження. *У Болгарії стартував проект «Створення національного середовища STEM для навичок завтрашнього дня». Усі 2243 школи зможуть подати заявку на кілька основних типів STEM-проєктів. Представлено типи шкільних STEM- центрів: куточки Workshop / Makerspace, науково-дослідні лабораторії, клас для креативних цифрових творців, навчальні приміщення, центр технологій у креативних індустріях, центр цифрових творців, центр природничих наук, досліджень та інновацій, високотехнологічно обладнані та підключені класи (VOSKS).*

Наукова новизна результатів дослідження. *Відповідно до традиційної освітньої парадигми, метою освіти є формування «знань-навичок-звичок». Вона базується на знаннях, які стають навичками, а навички*

стають звичками. Ця парадигма була незмінна до появи комп'ютерів, інтернету та інформаційно-комунікаційних технологій, адже до їх появи вчителі в навчальних закладах і викладачі в університетах були носіями знань і тільки в школі та бібліотеках діти могли здобувати знання.

З кінця минулого століття, в результаті інформаційної революції, знання стали набагато більш доступні. Це призвело до зміни освітньої парадигми. Тепер мета навчального процесу: «Навчити учнів відкривати знання для розв'язування задач». Вона базується на проблемах, які необхідно вирішити (діяльність), а знання є засобом для цього.

***Висновки та конкретні пропозиції авторів.** Справжня STEM-освіта має покращити розуміння студентами того, як усе працює, та покращити використання технологій. STEM-освіта також має впроваджувати більше інженерії під час дошкільної освіти. Інженерія безпосередньо бере участь у вирішенні проблем та інноваціях, двох високопріоритетних тем на порядку денному кожної країни. Зазначеному сприяють типи шкільних STEM центрів:*

***Куточки Workshop / Makerspace** створення окремих просторів у кімнатах чи офісах (кутках) для творчості та цифрових технологій або перетворення однієї чи двох класних кімнат на подібне місце. Діяльність у цьому шкільному просторі має бути спрямована (але не обмежуючись) на вирішення проблем реального життя та світу бізнесу, економіки та сучасних глобальних викликів, таких як створення ефективних інженерних рішень екологічних проблем, створення промислових прототипів за допомогою 3D-принтерів, рішення соціальних цілей тощо;*

***Науково-дослідні лабораторії** невеликі або додаткові проєкти для практичного обладнання та станцій у природничих науках, забезпечення потреб у дослідженнях, прикладних досліджень та лабораторних робіт: обладнання одного-двох офісних приміщень, складських приміщень або класних кімнат під лабораторію, або встановлення лабораторних станцій у кількох офісах. Проєкт також може включати мобільні/портативні цифрові лабораторні набори, технічне обладнання, ліцензії на доступ до платформ з електронним контентом з науки тощо, необхідні для прикладної роботи студентів;*

***Клас для креативних цифрових творців** – заохочення інтересу учнів до цифрової науки та створення цифрового контенту, але в меншому масштабі – наприклад, одна або дві аудиторії з суміжними загальними просторами. Інноваційний навчальний простір може включати різні апаратні та програмні технології – відповідно до потреб студентів, набори для робототехніки та інженерії, 3D-принтер, електронні дошки та мікрокомп'ютери, творчі куточки, зоопарки тощо;*

***Навчальні приміщення** центру молодих дослідників мають бути організовані в кутках і зонах, що дозволить зробити гнучкий навчальний план та організацію дня. Середовище може включати зони для внутрішнього та зовнішнього застосування (біологічні та фізичні науки), зоопарки, станції для проєктів прикладного програмування (розробка додатків, візуальні продукти), робототехніки з інструментами, що відповідають віку тощо;*

***Центр технологій у креативних індустріях** забезпечить технологічне середовище навчання та інноваційний навчальний контент для студентів, зацікавлених у розвитку навчальних компаній для цифрових/відеоігор, мобільних додатків, медіа-продуктів, розробки продуктів, цифрового маркетингу, графіки та дизайну тощо. Центр може включати оснащення навчальних кабінетів комп'ютерами та іншими технологічними рішеннями, специфічним програмним забезпеченням відповідно до потреб творчих індустрій (для малювання, анімації, моделювання, монтажу,, 3D-проектування, дистанційного керування тощо); творчі куточки та простори; відеостудія та знімальне обладнання; студія запису; імітаційне обладнання, віртуальна та доповнена реальність, відео- та аудіотехніка для лінгвістичної діяльності;*

***Центр цифрових творців** забезпечує загальноосвітню діяльність, у тому числі цифрові технології, а також створює мотивацію до кар'єрного розвитку за напрямками: програміст прикладних програм, системний програміст, профіль «Апаратні та програмні технології», профіль «Підприємець» та інші. Відповідно до бачення та потреб конкретної школи, цей тип центру може запропонувати 3D обладнання, електронні дошки та мікрокомп'ютери, набір інструментів програмування та робототехніку. Центр може також включати створення майстерень виробників;*

***Центр природничих наук, досліджень та інновацій** може надавати студентам можливість працювати над прикладними проєктами, що вирішують реальні справи та проблеми бізнесу, дослідження, експерименти та аналіз. Центр може містити практичні лабораторії з традиційних природничих наук, а також більш специфічні середовища, такі як лабораторії з біотехнології, генетичного аналізу, фармацевтики, елементів харчового виробництва, агротехніки, аналізу ґрунту тощо – відповідно до потреб конкретної школи;*

***Високотехнологічно обладнані та підключені класи (VOSKS):** кожна школа зможе подати заявку на VOSKS. Обладнання аудиторій для забезпечення ефективного, необмеженого та рівного доступу до сучасного та цифрового освітнього контенту, доступного всім учасникам навчального процесу через створені Міністерством освітні хмарні платформи.*

***Ключові слова:** STEM, STEAM, STREAM, навчання, soft skills, етапи STEM, STEM у всьому світі.*