

PROJECT PROPOSAL

"STEM classroom - the path to knowledge, science and innovation" – PHASE II BIOLOGY LABORATORY

Project title	<i>STEM classroom - the path to knowledge, science and innovation</i>
Implementing organization	The Centre for Lifelong Learning
Location	Travnik, Central Bosnia Canton, The Centre for Lifelong Learning
Project beneficiaries	Primary and secondary school students
Project duration (minimum)	2 years
Total budget	26 513 EUR
Required funds	13 250 EUR
Project goals	<p>Main goal</p> <ul style="list-style-type: none"> - to strengthen STEM skills in primary and secondary school students <p>Specific goals</p> <ul style="list-style-type: none"> - through STEM workshops to help primary and secondary school students to progress in our high-tech world, so that the country remains competitive in the global economy - through the STEM Biology Laboratory to understand the world of nature and the ways in which its many species (including humans) are functioning, developing and interacting to improve the quality of life.
Expected results (annually)	<p>At least 300 students will improve their STEM skills.</p> <p>At least 4 modules of the program will be implemented through the classroom.</p>
Main activities -workshops (3 hours a week)	<p>STEM I – ENGINEERING</p> <ul style="list-style-type: none"> -acquaintance with engineering terminology, development of basic scientific skills - way of thinking and approaching to the problem, principles of design and application of relevant IT solutions <p>STEM II – ROBOTICS</p> <ul style="list-style-type: none"> -learning the mechanics of robot operation, the use of sensors, lights, motors to control the robot through programming <p>STEM III - NATURAL SCIENCES</p> <ul style="list-style-type: none"> *biology - laboratory experiments -connecting the structures and functions of living beings, connecting recent biodiversity on Earth with geomorphology, climate, historical change and evolution, analyzing the interrelationships of Mendel's experiments *physics - laboratory experiments -fluid mechanics, electromagnetism, thermodynamics *chemistry - experiments in the laboratory -recognition of the impact of chemical substances on the environment, differentiation of the composition and type of substance, differentiation of basic procedures for separation of mixtures of substances <p>STEM - IV COMPUTER PROGRAMMING</p> <ul style="list-style-type: none"> -learning the basics of programming in the Small School of Coding

INFORMATION ABOUT THE APPLICANT

About us

The Center for Lifelong Learning is an NGO founded in 2015. It is a place of exchange of knowledge and experience of renowned experts and users who want to improve knowledge and build skills. The Center is a support on the path of development, both business and individual – by developing the personal and business competencies of the individual.

Our mission is quality education and participants who ultimately aim to be hired or work independently, develop small and medium-sized entrepreneurship.

Our vision is to establish a Center of New Technologies and Entrepreneurship and be leaders of the digital age in Central Bosnia who will help companies and individuals to recover / digitize – by offering new technologies.

In recent years, SCU has continuously maintained and implemented education in the fields of IT, entrepreneurship, digital marketing and foreign languages. We have implemented several projects within these areas in cooperation with other organizations from BiH, surrounding countries, as well as the EU.

Our support

Center for Lifelong Learning has signed a **memorandum of cooperation** with the Faculty of Information Technology of the University of Vitez, Travnik International University, Open University Zagreb, Canton of Central Bosnia, Municipality of Travnik, Organic Federation of Bosnia and Herzegovina, Diaspora for the Development of Bosnia and Herzegovina, Starkmacher e.V. amoGermany, Association for The Economics of Communion from the Republic of Croatia. We would like to point out that we have a fair cooperation with the Ministry of Education SBK/KSB, which is familiar with our goals for STEM classroom and it provides support in the form of communication with school principals/principals, in order to animate our future students together.

It is precisely the civil sector that plays an important role in promoting various STEM fields, i.e. it represents an additional force that can design, initiate and carry out a number of significant activities, and therefore it is necessary to expand their existing capacities and respond to the demands of citizens.

PROJECT DESCRIPTION

Acting in the domain of the above activities, we recognized the need to work more intensively on innovations - the popularization of science and technology. The organization of civil society has a great influence in the popularization of science, and in relation to educational institutions, they have a greater freedom to create content in accordance with the interests and needs of children, young people and the general population of citizens and can be a good partner through non-formal education programs in the implementation of both teaching and extracurricular activities.

For this purpose, and listening to the needs and wishes of young people, the team of the Center for Lifelong Learning Travnik has designed a series of different workshops that would be realized through the establishment of STEM (Science, Technology, Engineering, Mathematics) classroom, with the aim of bringing primary and secondary school students into the world of science, technology, engineering and mathematics through play and workshops, in order to improve their lives and to encourage children from the earliest ages to innovation. The STEM Classroom Program aims to encourage and develop curiosity, creative and logical thinking, problem-solving skills, to familiarize students with the basics of scientific research, technological and digital competence, social skills and teamwork.

SCU has started the implementation of the STEM classroom program. The first phase of this program was the establishment of a STEM classroom. In this phase, we have established the basic infrastructure with which we will be able to start with the programs:

STEM I - ENGINEERING

STEM II - ROBOTICS

STEM III - NATURAL SCIENCES (in process)

STEM IV - COMPUTER PROGRAMMING.

During the implementation of the first phase of the project, we noticed the need for

- completion of the interior
- equipping men's and women's toilets and
- establishment of a laboratory for natural sciences with an emphasis on biology. The need for the laboratory was expressed by high school and elementary school students, as well as their parents, at the recent fair in Travnik (October 22-24), where innovations were presented, in which SCU also participated, representing the STEM classroom.

We hereby address you with a request for approval of funds to complete the equipment of the facility - phase II. Along with the project proposal, we are sending you a layout of the STEM space.

Relevance of the project

We would like to emphasize that STEM in our country is not sufficiently represented, e.g., in relation to our neighboring Republic of Croatia and other European countries (there are only 4 STEM associations in B&H cities: Sarajevo, Mostar, Tuzla, Zenica). TIMSS and PISA results for Bosnia and Herzegovina have shown that current conditions and teaching methods do not adequately prepare our students for the jobs and labor market of the future. Studies show that 65% of children going to primary school today will be engaged in jobs that do not exist yet and for which traditional school systems do not prepare them enough. We recognize that education must meet the challenges of the fourth industrial revolution.

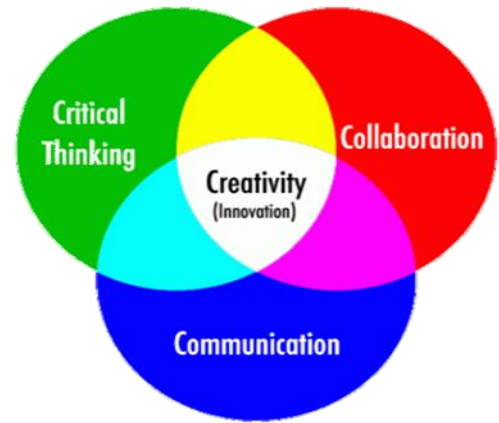
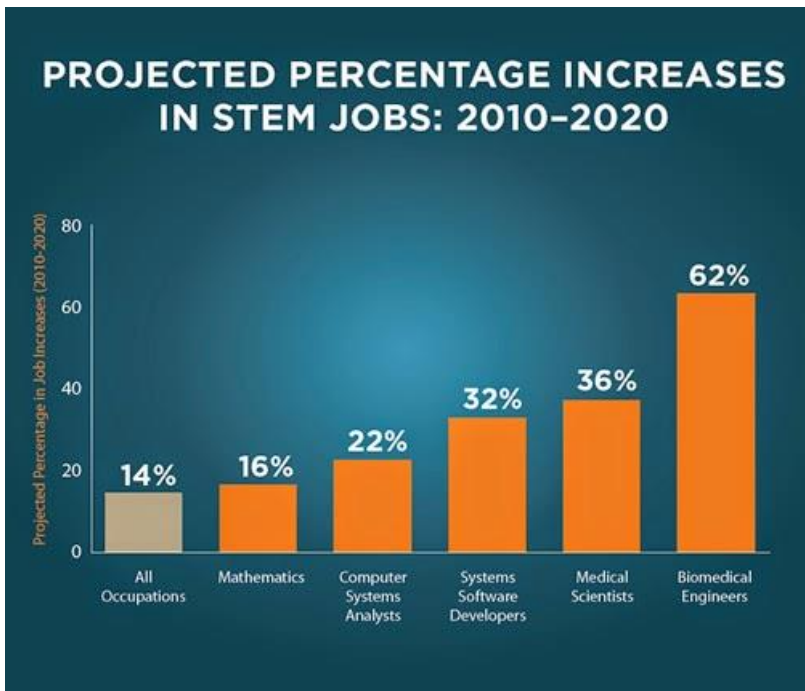
Education is today recognized as the foundation of the development and success of the knowledge society and economy. Knowledge and innovation are the most valuable assets, and quality education is the foundation of the success of society as a whole. The Center for Lifelong Learning has recognized STEM education as a combination of knowledge and innovation because, in addition to teaching STEM workshops, they "instill" a passion for innovation. Therefore, it is necessary to invest intensively in the lifelong learning and development of the individuals so that their knowledge, skills and abilities are in the function of achieving the strategic goals of the entire society.

STEM is an interdisciplinary approach to learning that removes traditional barriers that separate the four disciplines: science, technology, engineering, mathematics and integrates them into real and relevant learning experiences for students. This means that education is no longer a memory of facts. Instead, it is about learning how to think critically and evaluate information; how to apply knowledge, research and problem solving skills. Thus, the key meaning of the term STEM is not the focus on these disciplines individually, but the integration of these areas in learning and the concrete and clear application of what has been learned by solving real problems.

Among the many advantages of STEM education, we would like to single out:

-PREPARATION OF STEM EXPERTS. STEM learning develops skills to solve problems, discover new ideas, ask questions, finding answers, making things - food, materials and products.

All these qualifications are in demand in the labor market and offer good long-term career prospects.



Even if a student does not pursue an education or career in a field related to STEM, the benefits of STEM learning include developing 21st century skills: Critical Thinking, Creativity, Collaboration, and Communication. These are all key development areas that can help our children progress no matter what they choose to be ultimately.

Between 2017 and 2029, the number of STEM jobs will grow 8 percent, a higher rate than non-STEM jobs—with positions in computing, engineering, and advanced manufacturing leading the way. Specifically, software development employment is projected to grow 22%. Employment in STEM occupations has grown 79% since 1990 (www.idtech.com).

Jobs such as engineers of autonomous and electric cars, people who repair automated and robotic systems, engineers who can develop sustainable solutions to make 3D printing faster, cheaper and on a large scale, as well as people who could manage, maintain and monitor these pieces of technology – can be expected in 2030.

Concentrating on logical thought processes and problem solving enables STEM participants to develop mental habits that will help them succeed in any field.

- **TEAMWORK AND COMMUNICATION.** STEM students don't have to be experts in every subject. STEM education exposes students to interdisciplinary communication.

-**SOCIAL AWARENESS.** STEM EDUCATION allows children to grow into active citizens who can make informed decisions in discussions.

-**SUSTAINABLE SOLUTIONS TO CHALLENGES.** Well-educated members of the community will use procedures that do not harm nature.

The world we live in is changing and we need to keep up with it. STEM education is changing society.

How to prepare for the future?

- **new skills** – with every day we can see how quickly the concept of skills change, and newer skills such as creativity, analytical thinking, leadership, active learning, etc. change skills such as manual dexterity, endurance, memory, verbal and spatial abilities.

- **STEM approach** – even traditional learning does not ensure the development of skills of this nature, the STEM approach allows students to quickly learn and nurture deep understanding by applying knowledge, principles and values to more than one discipline in STEM at a time.

The essence of the STEM approach is reflected in several key fields:

INTEGRATION

- Focusing on STEM subjects
- Focusing on outcomes
- Authentic tasks and projects – created by students with the aim of solving the problem
- Extensive use of formative grade
- Pedagogy oriented to students and based on asking questions, with a focus on understanding
- Based on phenomena, i.e. finding evidence and gaining understanding from real-world phenomena
- Interdisciplinary and transdisciplinary

DETERMINING RELEVANCE

The job of the teacher is to explain why the learned knowledge and skills are useful. Why does it matter? It is easy to explain the relevance when students are given real problems, current situations, global problems and any other attractive event.

HIGHLIGHTING THE SKILLS OF THE XXI CENTURY

The jobs our students will have need a workforce that can access information, solve problems creatively and collaborate with others.

MOTIVATING STUDENTS

Motivation is one of the biggest problems of today. It is necessary to provoke students; we want to give students challenges that are not so difficult to give up, nor are they so simple that their activity is boring.

Finally, mix it all up: learning opportunities that use problem-based approaches and project-based approaches. In problem-based approaches, students are given a problem for which they will come up with creative solutions. Project approaches give students a choice of how to produce products or develop solutions that will demonstrate their learning.

There are several ways to start preparing for a STEM future. One of them is STEM workshops at the Lifelong Learning Centre

Why did we decide to go to a STEM lab with an accent in biology?

As an area of science, biology helps us understand the living world and the ways in which its many species (including humans) function, develop and interact with each other. Advances in medicine, agriculture, biotechnology and many other areas of biology have brought improvements in quality of life. There are many aspects that indicate the importance of biology. First of all, biological science mainly studies life. Second, it provides an in-depth, scientific understanding of how all living and inanimate organisms interact with each other. Third, it gives an insight into how different life forms are. Moreover, biology includes other areas of research related to the sustainability of life, including the environment, ecosystem, food quality, causes of disease, drug development, the study of the human body...

Apparently, studying life somehow helped shape the world. It also gave so many credible and reliable answers that explain why things happen in a more scientific way.

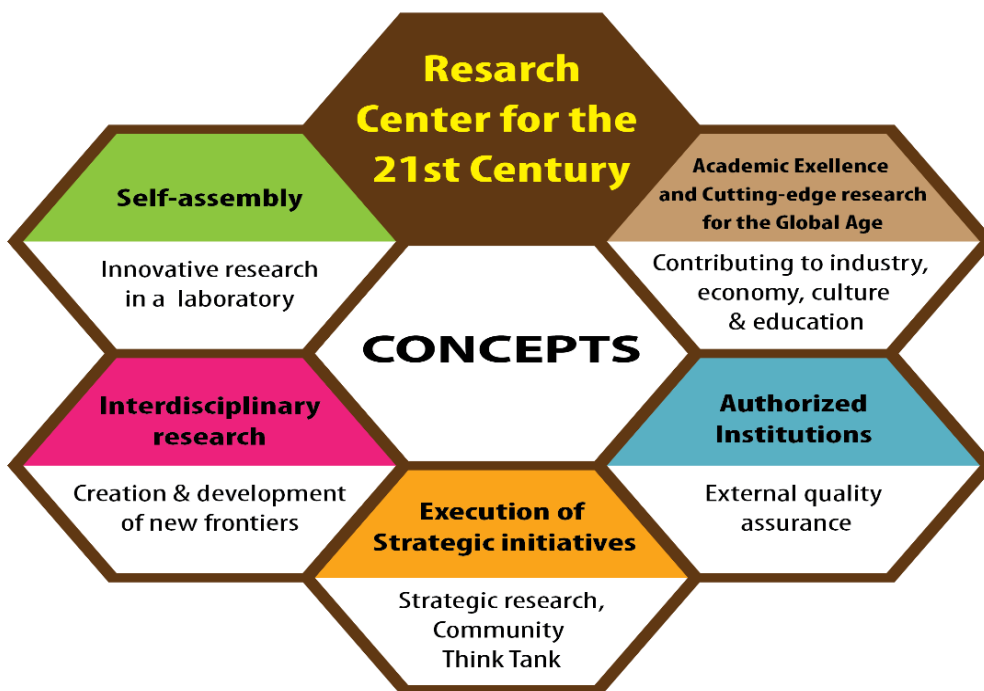
The importance of biology in general

1. Explains changes in human bodies
2. Shapes different careers
3. Provides answers to large-scale problems
4. Teaches concepts about basic life
5. Helps to answer fundamental questions about life
6. **"Paves" the way for scientific research**- special importance for our STEM laboratory

This is one of the best (if not the best) importance of biology - to open the way to conduct scientific research, which is very useful in discovering new things, by the scientific method. Biologists do experiments to learn significant and interesting facts about the world.

These are just some of the reasons why people should know the importance of biology. It continuously provides vital information to everyone about living organisms here on Earth. It never ceases to look for solutions that can completely eradicate the different environmental issues that still exist today. In addition, it is looking for strong evidence of how life came to be.

STEM Biology – Tools for Biology of the XXI Century



To solve major challenges, biology is increasingly integrated at different levels of the organization, on different spatial and temporal scales, and has become associated with other disciplines. Twenty-first-century biology requires new tools involving new technologies; new applications of existing technologies; new tool adaptations with the established model have organisms on new models; new software; a new model of organisms; and new social structures to promote toolmaking, tool sharing, research collaboration and interdisciplinary training.

Modern biology is a vast and eclectic area composed of many specialized disciplines that study the structure, function, growth, distribution, evolution or other features of living organisms.

Twenty-first-century biology aims to fully understand the mechanisms of living cells and the increasingly complex hierarchy of cells in metazoan, right down to processes that operate at the level of the organism and even populations and ecosystems.

Planned STEM lab activities

Perform practical work using measuring and optical instruments (microscope, magnifying glass) and laboratory equipment to obtain information and ideas about the structural and functional properties of living and non-living nature.

In our STEM Laboratory of Biology, we would like to make "algae balls" – explain photosynthesis using algae wrapped in jelly balls; a workshop on researching our DNA; examining how healthy the trees around us are by raising the world about the importance of trees, using plant diseases as a tool to practice statistical tests, and encouraging students to think about appropriate sampling methods; different soil tests with the aim of making students look for signs of possible indicators for life; experiments on the effects of exposure of a living organism (e.g. yeast) to some extreme conditions and observing changes in reaction rates – indicating the range in which it can survive; experiments showing how bacteria grown on agar plates can be destroyed by UV exposure; use of wallpaper paste in a bag for modeling a bacterial cell. In STEM labs, our students will acquire practical skills by research-experimenting natural phenomena and problems in everyday life relevant to future STEM careers. It will handle a variety of laboratory accessories such as test tubes, droppers, menzures, chemicals, tarionicas, Petri dishes, scales, microscopes, didactic games, sampling materials, mesh, using protective equipment and with constant supervision of STEM educators.

Learning outcomes

Within each STEM field, learning outcomes are defined, specifying what the student should know, understand and be able to demonstrate after the workshop. The best way to present the workshop is through a simple and comprehensible STEM task (i.e. pencil) whereby it does not have to be too imaginative or difficult or monetary and time-consuming, but can only cover a few questions, such as: what material is the pencil built about? Where do we find this material in nature? How much weight does it take for a pencil to break in two? Can a graphite pencil absorb water? What is the volume of pen? Put a geometric figure or body by using pencils! Put along a model of the use item with ten pens. In what ways, except for writing, can we use a pen? Sketch the design of a new pen that will have at least two more applications, besides writing! Why is the price of a graphite pencil 1 EUR? Just imagine what students would have to do, think, design or discuss to answer some or all of these questions as independently as possible and how much knowledge they would "extract" from this task. Thus, STEM means putting tasks in front of students that encourage combining all the knowledge so far, critical thinking, detailed analysis, logical thinking, learning through the trial-and-error method, do-it-yourself principle, practical work, reasoned discussions, knowledge of the scientific method (how to test the premise) etc. often includes teamwork, and through well-placed tasks STEM content is good (demanding, but chievable to children) the ratio of the use of knowledge and skills. Through challenging tasks, patience, perseverance, precision, attitude towards solving problems despite obstacles are also encouraged, which is why lessons often exceed the STEM method and also enter that area of upbringing where the teacher has the opportunity to positively influence his/her students.

We have these and more complex tasks for all ages of elementary and secondary schools. We hope to have the opportunity in the laboratory to do both more demanding and imaginative experiments.

Project results

- At least 300 students will improve their STEM skills.
 - At least 200 students will be educated in the field of natural sciences (biology, chemistry, physics)
 - 4 program modules (STEM I-IV) were held for primary and secondary school students
 - Improved student skills such as critical and logical thinking skills, problem solving skills, creativity, technological and digital competencies, experimentation skills - precision, patience, problem-solving orientation despite obstacles
 - Increased rates of socialization of students through socializing - developed so-called makers culture that emphasizes learning through work in a specific social environment through non-formal, networked, peer and community learning, motivated by fun, personal and social development
 - Handling various equipment in the laboratory
 - Improved grades of students in the field that will be covered in the workshops
 - Strengthening partnerships between the NGO sector and public educational institutions
- The results can be checked through the lists of participants, media records, SCU reports.

Sustainability of the project

- After the completion of the second phase of the project, the arranged space and purchased equipment will ensure the continuation of the STEM classroom and the implementation of the STEM workshop program. Also, SCU will continue to procure new equipment from its own revenues and thus have the opportunity to introduce new types of programs that will contribute to the development of science, technology, engineering and mathematics.

Added value of the project

-STEM workshop will be available for all students (not only talented), both genders, all religious affiliations, from rural and urban areas. Our vision is to enable STEM skills learning for preschool children as well, and thus encourage the institutions that care for these children to participate in this future project.

- Our educators possess competences that are a combination of knowledge, skills and attitudes, and integrate educational, upbringings, intercultural and many other goals in teaching. Our team of educators has designed and elaborated an innovative model of access to children and after completing the project we will present this model to the Ministry of Education SBK/KSB with who we have very good cooperation, and with the hope that it will serve teachers in the implementation of STEM popularization activities through fun interactive classes.

PROJECT BUDGET

PROJECT IMPLEMENTATION COSTS

<i>Cost Item Name:</i>	<i>The amount claimed from this contracting authority</i>
Project manager costs	-
Adaptation of classroom space - establishment of men's and women's toilets - interior design	3.750,00 EUR
Total:	3.750,00 EUR

EQUIPMENT COSTS

<i>Cost Item Name:</i>	<i>The amount claimed from this contracting authority</i>
Procurement of a central laboratory workbench	5.411,00 EUR
Procurement of a single laboratory work table with sinks	2.850,00 EUR

Microscopy equipment and micropreparations	1.236,00 EUR
Set for performing 50 different experiments	400,00 EUR
Apparatus and instruments, accessories, glass and consumables	1.037,00 EUR
Tripod with stand and accessories	291,00 EUR
Anatomical model of man	480,00 EUR
Botanical models	496,00 EUR
Protective equipment	320,00 EUR
Total:	12.521,00 EUR

COSTS OF INTELLECTUAL AND PERSONAL SERVICES

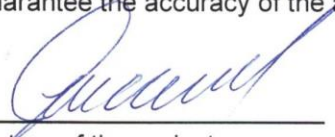
<i>Cost Item Name:</i>	<i>The amount claimed from this contracting authority</i>
Educator costs	-
Total:	-

TOTAL REQUEST FROM THIS CONTRACTING AUTHORITY: 16,271.00 EUR

TOTAL FUNDS FROM OTHER SOURCES OF FINANCING: 13,263.00 EUR

TOTAL FUNDS FOR PROJECT IMPLEMENTATION: 29,534.00 EUR

* I guarantee the accuracy of the above information under material and criminal liability.


Signature of the project manager
(in the legal entity - the applicant)



Travnik, December 6th, 2021
Place Date