

PROJECT "STEAM EXHIBITION: TOUCH THE SCIENCE"

The Kharkiv region, like many other regions of Ukraine, has faced serious challenges in the field of education due to recent events. The war and other crisis situations have not only disrupted the usual rhythm of the educational process but have also left a significant mark on students' academic achievements. In response to these challenges, we have developed the "STEAM Exhibition" project, aimed at restoring and developing educational opportunities for children and teenagers in the region.

As of September 2024, the Kharkiv region, like most regions of Ukraine, continues to experience serious challenges in education, which are caused not only by the consequences of the COVID-19 pandemic but also by the repercussions of Russia's full-scale invasion. The situation is complex and multifaceted, requiring urgent and comprehensive solutions to ensure access to education for all students.

The COVID-19 pandemic, which began in 2020, has left a significant impact on the education sector, creating a series of problems that continue to affect the learning process. Due to restrictions on mass gatherings and the transition to remote learning, many students and teachers faced difficulties in adapting to new learning formats. Online learning proved to be not only technically challenging but also psychologically difficult for many participants in the educational process. In particular, the low level of digital skills, lack of internet access, and appropriate equipment significantly hampered the quality of distance learning, especially for students from low-income families.

Russia's full-scale invasion of Ukraine in 2022 created even greater difficulties for education in the Kharkiv region. Regular shelling, destruction of infrastructure, and forced displacement of people significantly disrupted the learning process. The safety of students and teachers became a priority, leading to the temporary closure of schools, absence of regular classes, and interruptions in providing basic conditions for learning.

As of September 2024, many educational institutions in the Kharkiv region have still not fully resumed their operations. Schools are facing problems such as damaged buildings, lack of educational materials, a shortage of teaching staff, and difficulties in restoring a normal learning process. Thousands of

children who were forced to leave their homes due to hostilities continue to learn in temporary conditions that do not provide adequate educational quality.

To overcome these challenges, comprehensive efforts are needed to restore educational infrastructure, improve access to learning resources, and provide psychological support for students and teachers. Only through coordinated cooperation between state structures, local communities, and international organizations can the restoration and development of the educational process in the region be ensured.

Project Objective

The primary goal of the "STEAM Exhibition" is to provide students with new opportunities for learning and creative development in the fields of science, technology, engineering, arts, and mathematics (STEAM). We aim not only to compensate for educational losses but also to equip students with tools for developing critical thinking, creative abilities, and practical skills.

Long-term Goals:

1. **Improving the Quality of Education:** To establish a sustainable STEAM education module by integrating new methodologies and resources into the curricula, ensuring long-term improvements in the quality of education in the Kharkiv region. This will help mitigate educational losses and prepare students for modern challenges.
2. **Stimulating Interest in Scientific and Technological Careers:** To develop skills in students that foster their interest in scientific and technological careers, which may provide them with competitive advantages in the labor market in the future.
3. **Strengthening Partnerships and Support:** To build stable partnerships with local communities, educational institutions, and international organizations to ensure sustainable funding and support for STEAM initiatives and further expansion, contributing to the sustainable development of educational programs and resources in the region.

Short-term Goals:

1. **Updating the Learning Experience:** To conduct a traveling interactive STEAM exhibition that will allow students to actively engage in scientific and creative activities, helping to restore their interest in learning and compensate for knowledge losses that occurred due to interruptions in the educational process.
2. **Engaging Students in STEAM Disciplines:** To organize workshops and demonstrations that provide students with practical experience in science, technology, engineering, arts, and mathematics, fostering active knowledge and skill acquisition through participation in exciting projects.
3. **Conducting a STEAM Exhibition in Secondary Educational Institutions of the Kharkiv Region:** To recognize and further analyze the current needs of students and educational institutions in the area, as well as to identify potential resources and support necessary for the further development of STEAM education in the region.

Target Audience of the Project "STEAM Exhibition: Touch the Science"

Students in the Kharkiv region are the key target audience for the "STEAM Exhibition: Touch the Science" project, as they need support to restore their knowledge, develop essential skills, and socialize after periods of educational interruptions and crisis situations. Overall, approximately 223,500 students are enrolled in 629 general educational institutions in the Kharkiv region, highlighting the importance of creating opportunities to improve their education amid the war. The project addresses these needs by providing interactive, motivating, and inclusive learning experiences.

Students who have experienced educational disruptions require new and effective teaching methods to stimulate their interest and motivation. The interactive elements of the STEAM exhibition, such as practical workshops, scientific experiments, and project activities, will help students regain their interest in learning and better grasp the material through active participation.

Given the economic and infrastructural difficulties, many students in the Kharkiv region have limited access to modern learning resources and technologies. The project will ensure equal access to quality educational resources and opportunities for students by organizing the exhibition and workshops, thereby helping to compensate for inequalities in access to education.

1. Demographic Characteristics of the Target Audience

Age: The project is aimed at students aged 6 to 18 years, encompassing pupils from primary, middle, and high school levels in the general educational institutions of the Kharkiv region. In 2024, approximately 223,500 students are enrolled in the region.

Educational Level: The target audience includes students from elementary grades to high school seniors. Educational programs and activities will be developed for each age group that correspond to their level of development and skills, and the exhibits will be designed to be accessible and understandable for any age.

Geographic Location: The project plans to hold the exhibition in schools across the Kharkiv region, ensuring accessibility for a wide audience of students. The main exhibition will be located in the safe space of Karazin University, allowing events to be conducted in comfortable and secure conditions.

2. Socio-Economic Characteristics of the Target Audience

Economic Status: Students from various socio-economic groups, including those from more affluent families as well as children from low-income households. The project considers different levels of access to resources and technologies and aims to provide equal opportunities for all students. The exhibition itself will be free for visitors.

Access to Technology: The target audience has varying levels of access to modern technologies such as computers, tablets, and the Internet. The project will provide interactive elements and resources that will be accessible to students with different technical capabilities.

3. Educational Needs and Interests of the Target Audience

Focus on STEAM Disciplines: Students with an interest in science, technology, engineering, arts, and mathematics, as well as those who want to learn more about these areas through practical and interactive teaching methods. Government educational programs are being implemented in Ukraine to support the introduction of STEM approaches. The Ministry of Education and Science of Ukraine has approved the Concept for the Development of STEM Education,

which aims to integrate STEM education into the educational process by 2027. This concept provides for the support of STEM approaches at all levels of education, allowing students to gain knowledge from various disciplines in the context of practical applications.

Presence of Educational Losses: Children affected by interruptions in the educational process due to the COVID-19 pandemic or the full-scale invasion need additional support to recover knowledge and skills losses. According to statistics, approximately 40% of students in the Kharkiv region have faced serious learning interruptions.

4. Additional Categories of the Target Audience

Families in Difficult Life Circumstances: These families face economic difficulties, psychological stress, or social isolation. According to sociological research, about 30% of children in Ukraine grow up in such conditions. The exhibition will provide them with an opportunity to engage with the community, gain new experiences, and improve their emotional well-being.

Children with Disabilities: According to the Ministry of Social Policy of Ukraine, about 150,000 children in Ukraine have disabilities. The exhibition will be adapted for children with disabilities to ensure their accessibility and comfort. This includes ramps, sign language support, and interactive exhibits that accommodate different levels of perception and motor skills.

Families with Alternative Care Arrangements: Approximately 80,000 children in Ukraine are under alternative forms of care. The exhibition will be designed with their needs in mind, offering a friendly atmosphere for all participants.

Adaptation of the Exhibition for the Target Audience

Psychosocial Support: The exhibition will provide an opportunity for families from different social groups to share experiences, communicate with one another, and receive support. This will promote the formation of community connections and reduce social isolation.

Development of Communication Skills and Collaboration: All activities at the exhibition will be aimed at developing communication skills, including teamwork during workshops and interactive tasks. This will help

children learn to interact effectively with one another, fostering social bonds and supporting each other.

Why the STEAM Exhibition Will Help Students in the Kharkiv Region Overcome Educational Losses

1. Interactive Approach to Learning:

The STEAM exhibition offers an interactive and practical approach to learning that can engage students and restore their motivation to learn. Instead of traditional lectures and classes, students will have the opportunity to directly interact with scientific exhibits, conduct experiments, and participate in project activities. This allows them to better grasp knowledge through hands-on experience and visualization, which is especially important after interruptions in learning.

2. Restoration of Skills and Knowledge:

The exhibition provides students with the chance to revisit key concepts in science, technology, engineering, arts, and mathematics (STEAM) that may have been lost or underdeveloped during periods of remote learning or due to disruptions in the educational process. Practical workshops and demonstrations help students better understand and solidify this knowledge.

3. Development of Critical Thinking and Creative Skills:

The STEAM exhibition stimulates the development of critical thinking and creative skills through participation in various projects and tasks. This enables students to develop essential competencies such as problem-solving, creativity, and innovation, which are crucial for successful learning and professional growth.

4. Opportunities for Socialization and Collaboration:

Participation in the STEAM exhibition provides students with the opportunity to work in teams, exchange ideas and experiences with peers, promoting socialization and the development of communication skills. This can be particularly important for children who have been cut off from their classmates and familiar social environments due to crisis situations.

5. Enhancing Accessibility to Education:

Organizing the STEAM exhibition can help overcome barriers to accessing quality education, especially for children from low-income families or those living in areas with limited access to educational resources. The exhibition can serve as a platform to showcase the opportunities available in the educational process and reduce inequalities in access to knowledge.

Expected Changes After the Implementation of the Project "STEAM Exhibition: Touch the Science"

1. Restoration of Interest in Learning and Education:

After the implementation of the project, a significant increase in students' interest in learning is expected. The interactive elements of the exhibition, including practical workshops and scientific demonstrations, will help revitalize the educational process and make it more engaging. This, in turn, will contribute to the restoration of students' motivation to learn and improve their attitude towards education.

2. Improvement in Knowledge and Skills in STEAM Disciplines:

The project will provide students with the opportunity to deepen their knowledge and skills in the fields of science, technology, engineering, arts, and mathematics. Through participation in practical activities and projects, students will be able to better understand complex concepts and apply them in practice, helping to compensate for educational losses caused by interruptions in learning.

3. Development of Critical Thinking and Creative Abilities:

The exhibition will stimulate the development of critical thinking and creative skills in children through interactive tasks that require problem-solving and a creative approach. This will not only aid in learning but also foster the development of important skills for students' future careers.

4. Improvement of Socialization and Teamwork:

Participation in the exhibition will allow students to work in groups and interact with peers, enhancing their communication skills and ability to work in teams. This will also contribute to the development of social skills, which are important for personal and professional development.

5. Increased Access to Educational Resources:

The project will help improve access to educational resources and opportunities for students who might be limited due to economic or infrastructural difficulties. The exhibition can serve as a platform to showcase modern educational tools and resources, making education more accessible and equitable for all students.

6. Contribution to the Psychosocial Well-being of Families:

Events for families in Kharkiv will support not only the educational potential of children and families but will also be an important contribution to their psychosocial well-being. Participation in the exhibition will create opportunities for families to join the community, exchange experiences, and gain new insights, which has become a significant challenge for many families in wartime conditions. This will help reduce stress, improve social support, and foster a positive image of educational initiatives in the region.

7. Preparation for Future Challenges:

The skills and knowledge acquired in STEAM disciplines will provide students with competitive advantages and prepare them for successful careers in a technologically advanced world.

Previous Experience in Implementing Similar Projects

From 2017 to 2019, the staff of the "Landau Center" gained significant experience by participating in traveling exhibitions and science shows. This was made possible through collaboration with organizations specializing in organizing science entertainment events, such as "Mad Scientists," as well as with interested students and faculty from Karazin University.

Joint outings were conducted approximately twice a month to regional centers, involving students, university faculty, and staff from the "Landau Center." During each trip, one educational institution was visited, often gathering students from neighboring communities. The number of visitors ranged from 100 to 200 individuals.

One of the important outcomes of such events was that many participants

of the traveling exhibitions expressed a desire to visit the main exhibition at the university. This highlights the significant interest of school students in interactive science exhibitions.

Based on this experience, it can be concluded that new exhibits for the upcoming exhibition should be created as closely as possible to the static exhibition without simplifications. Despite transportation costs and the need to pay for entrance tickets to the Center (the traveling exhibitions were free), the number of visitors to the university exhibition increased by 2-3 times.

Description of the Exhibition's Exhibition

The exhibition consists of interactive and mobile exhibits covering key areas of science. Part of the exhibition will be dedicated to renewable green energy, including the following exhibits:

- **Wind Generator** - converting wind energy into electricity, in two variations.
- **Solar Panel** - demonstrating the conversion of solar energy into electricity.
- **Hydrogen to Electric Energy Conversion** - a model illustrating this process.
- **Hydropower Station Model** - shows how water can be used to generate electrical energy.
- **AC/DC Generator** - demonstrating different types of electrical energy.
- **Thermal Energy to Electric Energy Conversion** - a model illustrating this process.

The main exhibits of the exhibition include:

- **Vacuum** - demonstrating three experiments in a vacuum environment: sound propagation, pressure, and lift force.
- **Air Gun** - illustrating Bernoulli's principle.
- **Electron Microscope** - for detailed examination of microscopic objects.
- **Funnel (Black Hole)** - showing centrifugal force.
- **Eddy Currents** - demonstrating the behavior of different materials in a magnetic field (magnetic pendulum and static magnets).
- **Mini Tesla Coil** - generating high voltages.

- **Van de Graaff Generator** - static electricity.
- **Newton's Cradle** - converting kinetic energy to potential and vice versa.
- **Coupled Pendulums** - converting kinetic energy to potential and vice versa without external influence.
- **Puzzles** - a large set of puzzles on three tables (up to 12 pieces) with the prospect of expanding the collection.
- **Interactive Laser** - demonstrating the refraction of light through various prisms and materials.
- **Optical Illusions** - illustrating different optical effects.
- **Light and Color** - spectra of light and the composition of white light.
- **Internal Structure of the Human Body and Its Organs** - interactive models for studying anatomy.
- **Gauss Gun** - transmitting energy using an electromagnetic field.
- **Resonance of Sound Waves** - demonstrating the phenomenon of resonance.

Additional exhibits dedicated to subjects such as geometry, chemistry, and biology will be purchased ready-made during the preparation of the exhibition.

Skills and Competencies Gained by Visitors of the Exhibition

Visiting such an exhibition can contribute to the development of a range of skills and competencies among visitors:

Field of Thinking	Competence	Skills
Scientific Thinking	Analysis and Synthesis of Information	Visitors learn to evaluate and compare information from different exhibits, forming their own conclusions about scientific principles.
	Critical Thinking	Evaluating demonstrations and experimental results helps develop

		the ability to ask questions and seek logical explanations.
Technical Skills	Understanding Technologies	Familiarization with the principles of wind generators, solar panels, electromagnetic fields, and other technologies increases technological literacy.
	Interactive Experiments	Interacting with exhibits allows practical observation of physical phenomena, developing practical skills.
Creativity and Innovation	Creative Thinking	Solving puzzles and participating in interactive experiments stimulates creativity and an innovative approach to problem-solving.
	Experimentation	Visitors can try different approaches to experiments, developing their ability for innovative thinking.
Communication Skills	Idea Exchange	Interacting with other visitors fosters communication skills, which are important for sharing knowledge and experience.

	Information Presentation	Studying new concepts and discussing them with others can improve presentation skills.
Understanding Environmental and Social Issues	Environmental Awareness	An exhibition focusing on renewable energy increases awareness of the importance of sustainable development and environmental preservation.
	Social Responsibility	Visiting the exhibition can contribute to understanding the role of science in addressing social and environmental issues.
Interdisciplinary Approach	Integration of Knowledge	Exploring exhibits related to physics, chemistry, biology, and other sciences encourages an interdisciplinary approach to learning and understanding the world.

Stages of Conducting Events Within the Exhibition Demonstration

The event script not only highlights the importance of science and technology but also promotes the development of communication skills, collaboration, and psychosocial support, which are crucial for children and families in the current times. Each stage of the event contributes to the acquisition of specific skills and competencies that will help participants adapt to modern challenges.

Stage	Description	Skills Developed
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<p>1. Greeting Guests</p>	<p>The exhibition host welcomes participants and presents the purpose of the event. Visitors share their expectations.</p>	<p>Communication Skills: Familiarization of participants.</p>
<p>2. Visitors Divide into Small Groups</p>	<p>Each participant talks about themselves and their interests in science.</p>	<p>Socialization: Interaction with peers, development of trust and friendliness. Communication Skills: Listening and expressing thoughts.</p>
<p>3. Interactive Tour</p>	<p>Groups move between exhibit stations, where guides explain the principles of operation.</p>	<p>Scientific Thinking: Analyzing information from exhibits. Critical Thinking: Questions for the guide, formulating personal conclusions.</p>
<p>4. Practical Workshops</p>	<p>Visitors perform tasks in teams, working with exhibits (e.g., experiments with wind generators).</p>	<p>Teamwork: Group interaction to achieve a common goal. Practical Skills: Applying scientific concepts in practice.</p>
<p>5. Group Activity "Scientific Project"</p>	<p>Each group develops a scientific project idea related to the exhibits and prepares a brief presentation.</p>	<p>Creativity: Developing new ideas. Presentation Skills: Preparing and presenting their ideas.</p>

6. Presentation of Group Projects	Other participants can ask questions and provide feedback.	Communication Skills: Ability to present ideas and receive feedback. Critical Thinking: Analyzing presented ideas and constructive discussion.
7. Summary and Feedback	Participants share their impressions and discuss what they learned.	Reflection: Analyzing personal experiences and impressions. Communication Skills: Ability to listen to others and share personal thoughts.

Detailed Project Implementation Schedule (including Exhibit Production)

Some exhibits will be presented as finished products, and the main stage will be the selection and integration into the exhibition. This part will be managed entirely by one of the staff members alongside the main projects and will not affect the project implementation timelines:

Preparation Stage (1-2 months)

- ◆ **Needs Analysis and Exhibition Concept:** Development of the concept for the interactive exhibition with a focus on science, technology, engineering, arts, and mathematics (STEAM). Consideration of challenges related to educational losses due to the war and pandemic.
- ◆ **Team Formation:** Involving educators, scientists, and specialists in the STEAM field to prepare the exhibition. Collaboration with teachers and students from V.N. Karazin Kharkiv National University.
- ◆ **Equipment Procurement:** Purchase of necessary materials for exhibits, including renewable energy models (wind generator, solar panel, hydropower station model, etc.).

Exhibit Development and Interactive Elements (3-4 months)

- ◆ **Manufacturing and Setup of Exhibits:** Creation of interactive exhibits, including models to demonstrate energy conversion processes, vacuum experiments, microscope operation, generators, and resonances.
- ◆ **Development of Educational Materials:** Creation of instructions for students and teachers, development of workshops and educational activities for each age group.
- ◆ **Testing of Exhibits:** Checking all exhibits for safety and functionality before their installation at the exhibition.

Logistics and Exhibition Setup (2 months)

- ◆ **Equipment Installation:** Setting up exhibits in the existing exhibition space, ensuring interactivity (sound systems, screens, interactive demonstrations).
- ◆ **Organization of Mobile Exhibition Version:** Preparation for a mobile version of the exhibition so it can be shown in various educational institutions across the region.

Marketing and Promotion (1-2 months, concurrently with setup)

- ◆ **Advertising Campaign:** Conducting an information campaign through local media, social networks, and educational institutions to draw attention to the exhibition.
- ◆ **Collaboration with Partners:** Establishing contacts with local and international educational organizations to support the project.

First Exhibition Run (6-8 months after project initiation)

- ◆ **Official Opening:** Organizing an official event with media, educational representatives, and students in attendance.
- ◆ **Exhibition Operations:** Conducting interactive workshops, science shows, and demonstrations for students in Kharkiv. Presentation of exhibits from various disciplines (physics, chemistry, biology, mathematics, geometry).

Exhibition Conclusion and Reporting (1 month)

- ◆ **Dismantling of Exhibits for Future Use:** Dismantling of equipment after the presentation exhibition concludes and restoring the venue to its original state.
- ◆ **Reporting:** Preparing financial and technical reports for analyzing the success of the exhibition, evaluating its impact on students and educational institutions.

Expected Project Implementation Timeline: 1 year

Estimated Budget for the STEAM Exhibition

Expense Category	Cost (UAH)
Purchase of Equipment, Materials, and Exhibit Production:	
1.1. Main exhibits (renewable energy models, electron microscope, generators, etc.)	720,000
1.2. Additional exhibits (biology, chemistry, geometry)	200,000
1.3. Equipment and tools	135,000
1.4. Transportation of exhibits	20,000
Logistics and Installation:	
2.1. Logistic costs for transportation	15,000
2.2. Labor costs for installation and dismantling	30,000
Salaries and Fees:	
3.1. Team of organizers and technical staff	100,000

Advertising and Promotion Campaign:	
4.1. Advertising in media, social networks, printing materials	40,000
4.2. PR events and promotional campaigns	20,000
Operational Expenses:	
5.1. Office supplies and needs	10,000
5.2. Contingency expenses (10% of total amount)	129,000

Total Budget: Approximately 1,419,000 UAH

Description of Qualifications and Experience of All Key Project Participants:

Dmytro Ruzhytskyi

Head of the Educational Center "Landau Center" at V.N. Karazin Kharkiv National University.

- Extensive experience in educational project management and development of interactive science exhibitions.

Dmytro Bulavin

Contractor at the Educational Center "Landau Center" at V.N. Karazin Kharkiv National University, former staff member (Deputy Director).

- Background in educational administration and coordination of scientific events.

Mykhailo Afanasyev

Senior Laboratory Technician at the Educational Center "Landau Center" at V.N. Karazin Kharkiv National University.

- Skilled in laboratory experiments and technical support for scientific demonstrations.

Sergii Kovaliov

Specialist at the "Landau Center," teacher of computer science and robotics, research engineer.

- Expertise in robotics education and technology integration in teaching.

Daria Bortnykova

Project Manager at the Charitable Organization "Foundation of Kharkiv Karazin University."

- Experience in project management, fundraising, and collaboration with educational institutions.

Svitlana Riabova

Accountant at the Charitable Organization "Foundation of Kharkiv Karazin University."

- Proficient in financial management and reporting for non-profit organizations.