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PRACTICAL IS MORE LOGICAL

PROJECT NO: 2023-2-PL01-KA210-SCH-000177447

“Practical is more logical”

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TABLE OF CONTENTS

ABOUT THE PROJECT "PRACTICAL IS MORE LOGICAL"

1.

ABOUT THE PROJECT

The project "Practical is more logical" with the number 2023-2-PL01-KA210-SCH-000177447 was implemented in cooperation:

1st Junior High School
of Ioannina
from Greece,

The General Nikodem Sulik
School Complex
in Dąbrowa Białostocka

High School Gymnasium
"Sv. Kliment Ohridski"
from Ohrid, North Macedonia.

In the period from February 29, 2024 to August 28, 2025 – 18 months. Financed from the European Union with 60 000 euros for all partner countries.

BENEFICIARIES

Students and their families of participating schools and teachers participating in project activities. The scenarios prepared in the project groups were carried out after returning from the mobility in elementary schools in each country where the project was implemented. They are also published and disseminated to schools and libraries in the area of operation of each school. The materials are published online. They are available, both on Erasmus + platforms and on the schools' websites.

PROJECT GOALS

- To promote interest and improvement/perfection in science, technology, engineering and mathematics, also using arts education (within STEAM).
- To improve English communication skills.
- Improving social skills (groupwork, creativity)
- Participants developed their knowledge about the culture of other countries and their inhabitants (North Macedonia, Greece, Poland)
- Participants got acquainted with the education systems in the participating countries and the range of information contained in the school curricula in North Macedonia, Poland and Greece in the field of mathematics and science.

DESCRIPTION OF PROJECT ACTIVITIES

The project "Practical is more logical" in its intention is an interdisciplinary project, using knowledge from various subjects: biology, chemistry, geography, mathematics. Workshops were held on individual mobilities with the goal of developing a scenario for an urban city game using knowledge from different school subjects (Biology, Chemistry, Geography, Mathematics). The goal of the project activities was to develop scenarios for various games using knowledge from the above subjects, e.g. a city game, an educational game (board game, mobile game) and to test them on a sample of 200 pupils. The project is also result in a publication. There are also 3 scenarios of practical activities taking into account different scientific disciplines. The work on the scenarios were carried out by pupils under the supervision of teachers. Between the mobilities, students in all project countries presented the developed results in primary schools (at least 2 schools - 4 classes), where young leaders standardised the developed products. The results of this standardisation were presented during the next mobility. A presentation of the project activities were made to the local community.

PROJECT RESULTS:

- The publication of 300 copies, of which 90 copies of 30 in each country must be distributed to libraries,
- The publication includes information about the project, contains at least 36 pages, of information about the project and:
  - 3 scenarios of city games,
  - 3 scenarios of educational games,
  - 9 scenarios of interdisciplinary activities.

- The 6 mobilities involved 8 students and 3 teachers from each country, the participants deepened their knowledge in mathematics and science subjects,
- After the mobility, a workshop was held to standardise the developed materials in 2 primary schools in each country (in at least 2 classes).
- 3 presentations on the activities carried out in each of the mobility countries were prepared and presented during a meeting with representatives of the local community (parents of students, representatives of institutions and local authorities).
- Also conclusions related to the project developed jointly by all participants.
- A project Facebook page was also create, which containes materials developed during the project.

INFORMATION ABOUT THE SCHOOLS

2.

The General Nikodem Sulik School Complex

in Dąbrowa Białostocka is a high school situated in the north-eastern part of Poland, in Podlasie, in the Sokółka District, Dąbrowa Białostocka Municipality, close to the border with Belarus.

General Nikodem Sulik School Complex in Dąbrowa Białostocka is a high school with traditions and modernity at the same time. It is also a well-equipped, aesthetic and safe educational institution. It was founded in 1962. In 2002 a convention was held, during which the school was named after General Nikodem Sulik. The headmaster of the school is Jarosław Budnik.

Types of schools

Currently the General N. Sulik School Complex consists of three types of schools:

- High School,
- Vocational School with multi-professional classes,
- High School for Adults.

The school currently has 378 pupils in 16 departments, 41 teachers and 16 administrative and support staff.

Modern school base

The school has 11 classrooms, 3 science labs, a Renewable Energy Lab, and an IT Lab, all of which are fully equipped with projectors, laptops, interactive whiteboards, and wired and wireless Internet connections. In addition, we have a modern full-size sports hall, a combat sport room, an indoor and outdoor gym, an outdoor multipurpose field, a conference room, 2 shooting ranges: virtual and pneumatic gun. Students can also live in a boarding dormitory (100 places) and eat their lunches in the canteen.

In our school there are 4 different departments:

- Humanistic – Law and Media;
- Polytechnic and Medical;
- Certified military classes;
- Sport classes.

Each student can choose any three extended subjects from the following list: Polish, English, Russian, History, Social Studies, Mathematics, Physics, Biology, Chemistry, Geography.

International projects

Since 2004, our school has implemented many projects co-financed by European funds (a total of 22 major projects with many foreign partners). It has a wealth of experience and human capital in this regard. Some of the implemented projects are cyclical projects with schools, e.g. in Kalvarija and Sołeczniki in Lithuania, Ierapetra and Ioannina in Greece, Cordoba in Spain, Cassino in Italy. Others are one-off projects e.g. with schools in **Turkey, Germany, Spain, Malta, Cyprus, North Macedonia, Romania.**

In the 2023/24 and 2024/25 school years, 178 students from three different programs took part in international mobilities at our school: the Erasmus+ program and Interreg Lithuania-Poland financed from European Union funds „Meet Polish Traces in Europe" from the Ministry of National Education. The amount of international projects implemented (excluding the Interreg program) was 638,523 euros (PLN 2,745,649).

Accreditation

We are the only school in Sokolka District with accreditation for **Erasmus+ program** from the School Education Sector.

Successes of our students

Our students participate in many competitions and Olympiads and achieve significant successes, both at the national level (Security and Defense Knowledge Olympiad, Ecological Knowledge Olympiad, election law competitions, literary competitions) and significant successes at the provincial level (artistic, literary, language competitions).

Dabrowa Bialostocka – the Podlasie capital of handball

Sports achievements are also an important asset of the school - the school is famous in Poland for its success in handball, and is called the Podlasie capital of handball due to the results of the handball players. The school also has achievements in cross-country running, shooting sports and "Fit as soldiers" competitions.

1st Junior High School "Zosimaia School"

1st Junior High School "Zosimaia School" is located in the city of Ioannina, the capital and largest city of Epirus, an administrative region in northwestern Greece.

In the past

The 1st Junior High School of Ioannina is housed in the emblematic preserved school building of the Zosimaia School, which was built with money from the Brotherhood of the Brothers of Zosima in 1905. Its facade is a copy of the building of the University of Athens. Since then it has functioned as a school under different names and is inextricably linked to education not only for the city of Ioannina and the country, but also for neighboring countries.

Nowdays

It is a general junior high school that provides general educational courses in accordance with the regulations of the Ministry of Education & Religious Affairs. The school currently has 193 students and 31 teachers.

It is developed on three levels, with 11 classrooms, an ICT laboratory, a science laboratory, an art laboratory, a technology laboratory, an amphitheater and a ceremonial hall. All of the above are fully equipped with projectors, laptops, interactive whiteboards and wired and wireless internet connection. It also has an indoor gym of Olympic dimensions.

Students have relatively high potential and the parental environment is quite supportive towards learning. An Inclusion Department has been operating in the school since 2014 - 2015 to support students with learning difficulties or deficits. In addition to French and German, Italian is taught as a second foreign language.

Our aim: Our intention is to create a school open to society that promotes equality, accepts diversity and uses innovative teaching methods. One of the ways to achieve this is through our participation in projects. The teachers of our school perform a multidimensional role, working daily for the smooth operation of the school unit in a climate of cooperation, responsibility and mutual respect, both between teachers and in the relationships between students and teachers. The aim is to create positive role models for students based on characteristics such as cooperation, dignity, courtesy, reward, humor, trust, empathy, inclusion, acceptance of diversity, a sense of security and justice and a democratic teaching style.

Projects

Our school is distinguished for its participation in the public and cultural life of the city while it organizes musical events, theatrical performances, visits to social institutions and foundations. Some examples are mentioned:

Health Educational Projects

- Cooperation with the Ministry of Health and implementation of actions and interventions related to sexual education and relaxation techniques for the prevention and control of stress.
- Collaboration with the Psychiatric Clinic of the Ioannina University Hospital and the Stavros Niarchos Foundation on issues related to the mental health of adolescents.

Cultural Projects

- Collaboration with the School of Fine Arts of the University of Ioannina for the realization of an art exhibition entitled "In the basements of the Zosimaia School".
- Participation in the artistic and literary action "Art and Word" with the presentation of students' artworks in the exhibition space of the General archives of the Greek State.

European projects

- Etwinning programmes
- Participation in the 9th European Students' Conference in Munich.
- We have offered hospitality to schools from abroad in the frame-work of Erasmus+, for example from Poland, Lithuania, Turkey.
- Participationing Erasmus+ KA210 (ID: 2023-2PL01-KA210-SCH-000177447) "Practical is more Logical" project with partners from Poland, Greece and North Macedonia

Environmental Projects

As teenagers and active citizens, they are concerned about climate change and participate in actions carried out by the Municipality of our city:

- Cooperation with the Municipality of Ioannina on issues related to recycling and environmental protection.

Also

Every year our students participate in physics and mathematics competitions, e.g. "Aristotelis", "Thalis", Interschool Mathematical Games, where they achieve with significant success. It is also worth mentioning our students' participation in competitions related to Technology and IT (STEAM, AI, and Cybersecurity).

OSU "St. Kliment Ohridski" of Ohrid

Little of our history

Where Legacy Meets Tomorrow

Rising in the heart of Ohrid, our school is more than bricks and walls—it's a living legacy. Born from bold ideas over a century ago, its neoclassical halls echo with the dreams of reformers and visionaries.

Built from 1908 to 1912 on a French blueprint, it was sparked by Eyub Sabri Beg and the Ohrid intelligentsia—later completed with royal support after war halted its birth. Today, over 800 students and 55 mentors keep that flame alive. Here, tradition meets innovation. Latin dances with IT, Ethics with the Arts. Our four-year curriculum does not just educate—it awakens minds. Students choose tracks in Humanities, Sciences, or Languages—but they all leave with something more: courage, clarity, and a sense of purpose.

Our alumni light up global stages—not just for what they know, but for who they have become. At "St. Kliment Ohridski", we do not just teach—we shape legacies.

Ж ж, З з, S s, И и, J j, К к, Л л,
Љ љ, М м, Н н, Њ њ, О о, П п,
Р р, С с, Т т, Ќ ќ, У у, Ф ф, Х х,
Ц ц, Ч ч, Џ џ, Ш ш.

Empowered Educators, Inspired Students — A Symphony of Minds and Hearts

At OSU "St. Kliment Ohridski," classrooms hum with more than facts—they pulse with curiosity, creativity, and connection. Our teachers are dream-weavers and trailblazers, speaking in both equations and poetry. They lead with empathy and wisdom, teaching not just for exams, but for life's unfolding journey.

Students meet this challenge fearlessly - questioning, imagining, creating. Together, they compose a rare harmony, blending ideas, cultures, and generations into a living symphony. This is more than a school - it is a place where minds think boldly, hearts beat warmly, and souls dare to soar.

Projects

We blend STEAM—Science, Technology, Engineering, Arts, and Mathematics—with heart and vision. Our students do not just observe the world; they invent its future.

Science in the Wild

Partnering with Galicica National Park and the Hydrobiological Institute, students dive deep-testing waters, tracking species, and tackling climate change head-on.

Green by Design

Upcycled art and eco-fashion shows turn creativity into climate action-bold and beautiful.

Beyond Borders

Thanks to Erasmus+ and eTwinning, our classrooms stretch from Ohrid to France and Estonia, weaving cultures, friendships, and a shared digital future.

Hands-On, Minds-On

From simulating the European Parliament to crafting keychains from recycled jewelry, students build practical skills that matter.

Symphony of Talent, Legacy of Excellence

At OSU "St. Kliment Ohridski," brilliance is our daily beat. From choir harmonies to scientific precision, from athletes' grit to literary and mathematical mastery - every talent shines on its own stage.

We do not just win medals in physics, history, sports, or language - we tell stories of passion, perseverance, and pride. Equations, melodies, and goals all sing the same truth: success wears many faces, and we celebrate them all. This is more than achievement. It's excellence in motion, harmony in action. This is who we are.

Erasmus+: Learning Without Border

Across 18 journeys, we have explored Europe's soul - challenging fake news, fighting exclusion, planting ideas, and raising our voices. At our school, Erasmus+ is more than a project - it is the heartbeat of change, courage, and connection.

LESSON SCENARIOS PREPARED BY THE TEACHERS FROM THE SCHOOLS PARTICIPATING IN THE PROJECT

3.

3.1.1. Preparing a coffee scrub from natural materials

Objectives of the lesson

Main objective:
Students learn about the chemical properties of coffee and its use in cosmetics by preparing a coffee scrub themselves and analysing its effects on the skin.

Specific objectives:
Student:
- analyses the chemical composition of coffee and its effects on the skin,
- understands the mechanism of action of mechanical peeling,
- applies the principles of safety and hygiene when working with cosmetic substances,
- makes a natural coffee scrub and evaluates its properties,
- compares homemade scrub with drugstore equivalents, analysing their chemical composition,
- develops an environmental awareness by learning about the benefits of recycling coffee grounds.

Form of work:

- group work
- experiment
- discussion

Teaching methods:

- chat
- student experiment
- problem method
- analysis of the composition of cosmetics

Teaching resources:

- a multimedia presentation on coffee composition and types of scrub
- pictures of the composition of drugstore scrubs
- laboratory glassware
- ingredients for preparing a coffee peel

Course:

a. Introduction:
Theoretical part - introduction to the topic using guiding questions:
- what uses do you know of coffee beyond consumption?
- can coffee have an effect on our skin?

Explanation: coffee contains, among other things:
- caffeine - stimulates microcirculation, has an anti-cellulite effect.
- antioxidants - neutralise free radicals, delay the ageing process.
- organic acids - gently exfoliate dead epidermis.
- lipid compounds - moisturise the skin.

b. Types of peelings - a brief overview
Slide presentation with a breakdown of peelings:

- mechanical (containing abrasive particles, e.g. coffee, sugar, salt, fruit stones).
- chemical (containing AHA, BHA acids, enzymes - explain what these abbreviations stand for),
- enzymatic (dissolving dead skin without friction).

c. Experiment - preparing a coffee peeling

Discussion of health and safety rules:

- use of gloves,
- caution when mixing ingredients to avoid contamination,
- work hygiene - we do not use the face peeling in class, we test it on our hands.

Preparing the peeling - step-by-step instructions:

Ingredients:

- 4 tbsp coffee grounds (or freshly ground coffee for a stronger effect),
- 2 tbsp cane sugar or sea salt (extra exfoliating action),
- 2 tbsp coconut oil/ olive oil/ almond oil (moisturise and protect skin),
- optional: 1 teaspoon of honey for additional moisturising effect.

Implementation:

- the pupils mix the ingredients,
- everyone tests the peeling on their hands, massaging for about 1 minute and then rinsing with water, they transfer the remaining peeling to the prepared jars,
- observing the effects - pupils record their observations on their worksheets (e.g. 'Skin has become smoother, moisturised').

d. Analysis and discussion

Comparison of homemade and drugstore peelings.

Students are given labels of drugstore scrubs. The pupils' task is to:

- analyse the composition (whether they contain natural ingredients, preservatives, etc),
- discuss the environmental benefits of homemade peelings.

e. Summary of the properties of the coffee peeling (answers are written on cards by each group) appendix 1

- What active substances does coffee contain and what effect do they have?
- Why is a coffee peeling better for the environment than some drugstore cosmetics?
- What other home-made ingredients can be used to make a peeling?

Summary of the lesson

Conclusions:

Students summarise what they have learned.

- coffee is not only a drink but also a valuable ingredient in cosmetics,
- coffee scrubs have an exfoliating effect, improve circulation and moisturise the skin,
- natural cosmetics can be just as effective as drugstore cosmetics and are often more environmentally friendly.

Attachment number 1

Coffee composition:	Function:

Environmental benefits associated with the use of natural peelings:

Examples of substances used in home peelings:

3.1.2. Upcycling of clothes: T-shirt bag without sewing

Purpose

The purpose of this scenario is to introduce students to the definition of upcycling, which involves minimising the generation of waste and processing existing resources in creative ways.

Objectives – Attitudes

Cognitive:

1. Understanding the concept of textile reuse and the positive impact of this practice in areas such as ecology.
2. Awareness of the value of saving natural resources and energy.
3. Familiarity with the process of making objects with old materials.

Pedagogical:

1. Developing ecological awareness and environmental responsibility through everyday practices such as reusing textiles.
2. Developing creativity and recognition of materials and encouraging students to think of creative ways to reuse fabrics and other materials in their daily lives.
3. Promote critical thinking and reflection on the impact of consumer habits.

Attitudes:

1. Strengthening the attitude of ecological responsibility, promoting the need for less consumption of new materials and more sustainable choices in everyday life.
2. Encourage attitudes of respect for natural resources, nature and the need to preserve them for future generations through reuse and conservation.
3. Developing an attitude of creativity where students can utilize existing materials around them to reduce waste and reuse, avoiding plastic and other non-recyclable materials.

Materials

- old T-shirt,
- tape measure or ruler,
- sewing scissors,
- something to write with (thin pencil, pencil, tailor's soap).

Course:

Step 1
(class discussion)
The teacher asks the students to answer if they transform old textiles and give them a new form and use. The teacher introduces students to the definition of upcycling.

Step 2
Students watch a short video presentation how to make T-shirt bag:

https://www.youtube.com/watch?v=fp61jijGYbU

Step 3
As a practical activity, students are asked to make a bag with old T-shirt. In this way they will be introduced to the idea of reusing old fabrics.

T-shirt bag - step-by-step instructions

1. To make a bag from a T-shirt, first cut off the sleeves. Make sure the cut-outs form a nice semi-circle so that the handles look neat later.

2. Cut off the collar of the T-shirt in a semicircle.

3. Time to prepare the tassels. To do this, lay your T-shirt flat in front of you. From the left side of the bottom edge, measure about 2cm to the right. Mark this point with a dot. At this point, measure 10cm up from the bottom edge and draw a line there.

4. Now measure 2cm to the right again and draw another line 10cm long. Repeat these steps until you reach the right edge of the shirt.
   Tip: You can also make longer tassels if you like this type of decoration.

5. Cut equal strips, which have been marked on the shirt, along the line drawn. It is important to cut both sides of the T-shirt (front and back).

6. Stretch each strip of fabric in turn. This will make it easier for you to prepare decorative tassels from them.

7. Now tie the opposite strips together (the fabric on the front and back of the shirt). Tie tight double knots.

8. Your no-sew T-shirt bag is now ready and you can take it with you for a little shopping or a walk!

3.1.3. Why is it worth building insect houses (hotels) ?

Objectives of the lesson

Main objective:
To understand the importance of biodiversity and the need to protect it.

Specific objectives in terms of knowledge
a) to be memorized (student) :
- identify the role of beneficial insects in the ecosystem,
- lists the threats to the life of beneficial insects,
- name 3 species of pollinating insects,

b) to be understood :
- identifies 3 species of pollinating insects,
- explains ways of protecting insects actively
- why pollinating insects are useful to the human economy and to nature,
- explains the main reasons for the decline in their numbers.

Specific objectives in terms of skills
a) in typical situations (student):
- observes and names 3 species of pollinating insects in the hotel (house),

b) in problematic situations :
- make an insect house from available materials,
- assesses the problem of the decline in pollinating insect populations and predicts its consequences for living beings, including humans.

Attitudinal specific objectives (student) :
- is aware of contemporary threats to biodiversity, including those posed by anthropogenic climate change,
- displays an attitude of responsibility for the protection of biodiversity in their immediate surroundings.

Methods:

- brainstorming, film work, field method
- idea carpet, mini-lecture, practical method

Forms of work:

- individual, • group

Methods:

- laptop, interactive monitor, sticky notes,
- film 'Pollinating insects - invaluable inhabitants of the earth',

https://www.youtube.com/watch?v=3-MROU3flJU

- natural materials to build an insect house: planks, pinecones, bamboo tubes, straw and hammers, nails and glue,
- instructions for building the hotel,
- pictures of insects and types of preferred materials to fill the hotel,

Course of the lesson:

1. Introduction to a new topic - mini lecture
In the countries of the European Union, it is estimated that around 84% of cultivated species and 78% of wild plant species depend on the work of pollinating insects for their existence. It is they who guarantee the diversity of our crops. The decline in their numbers threatens to upset the balance of ecosystems and exacerbate the problem of hunger. Climate change is causing us to face increasing heat waves and droughts, thus reducing the amount of food for these insects and nesting material.

2. Introduction of the new topic and lesson objectives - mini-lecture
Therefore, in today's lesson we will make houses for them and help insect populations. The hotels will enable pollinators to overwinter safely, create nesting sites, as well as hiding places from heat, cold, precipitation and predators. They will contribute to increasing biodiversity in our surroundings.

3. Main part - practical method
Building an insect house. We divide the pupils into 4 groups and distribute instructions for building the hotel and natural materials for the construction : planks, pinecones, bamboo tubes, straw and hammer, nails and glue. We remind the pupils that different insect species have different preferences for the material with which to fill the house.

4. Concluding part - work with the film, brainstorming, ideas carpet
We distribute sticky notes to each group and instruct the students to choose a leader (representative). Based on the educational video, pupils write on the cards suggestions for everyday actions that protect beneficial insects (e.g. planting honey plants, flower meadows, creating hotels and watering holes, reducing the use of pesticides, mowing the lawn less often, stopping grass burning)

Screening of the film 'Pollinating insects - priceless inhabitants of the earth'.

https://www.youtube.com/watch?v=3-MROU3fIJU

After watching the film, the teacher draws a circle on the blackboard and inscribes the question: How can we help pollinating insects?

Representatives of the groups take it in turns to come up to the board and read aloud one suggestion while sticking it in the circle. The whole exercise is repeated until all the ideas prepared by the pupils have been used up.

5. Concluding part - field method
Jointly hanging insect houses on trees in the school yard.

Assembly instructions for the insect house

* To assemble the structure we will need a hammer

Step 1
Join the left wall with the horizontal dividers using 4 nails at the marked points.
IMPORTANT! Please note the bevel of the longer side.

Step 2
Rotate the structure and repeat with the other wall.

Step 3
Connect the second vertical wall to the horizontal partitions using 4 nails.
IMPORTANT! Note again the bevel of the longer side.

Step 4
The structure thus prepared (see bevel direction) is ready for the installation of the rear panel.

Step 5
Fit the back wall so that it covers the entire back of the house. Now join the whole thing together using 5 nails (2 on the left, 2 on the right and 1 at the bottom, in the middle).

Step 6
Turn the house over, position it vertically and fit the canopy, which you connect to the vertical sides using the 2 longest nails provided. Take care that the pieces are snug and immovable when connecting.

Step 7
Now, using glue, place the bamboo pieces in the upper part of the house. If there is flesh in the bamboo sections you can scoop it out with a screwdriver. Place the bamboo with the longer sections open to the outside.

Step 8
Use all the pinecones and place them in the lower part of the house, you can also optionally place some dry grass or hay you have collected from the meadow or lawn.

Step 9
Place the netting in the bottom of the cottage and join it at the corners using 4 pins. From the back wall, nail a crocodile to hang the cottage. READY! Great

3.2.1. Production of Pendants Using Two-Component Epoxy Resin

Theoretical Reflection

The use of environmentally friendly epoxy resin for making pendants plays an important role and contributes to environmental protection from both ecological and chemical perspectives:

1. Durability of Epoxy Resin:
Epoxy resin is highly resistant to mechanical damage, chemicals, sharp objects, moisture, sunlight, heat, radiation, and many other influences. Hardened epoxy resin is almost indestructible. These characteristics (both physical and chemical) make it a favorable material with wide applications, primarily because it is not a pollutant to the environment. The use of epoxy resin significantly reduces the amount of chemical waste, which is one of the major environmental pollutants.

2. Ease of Processing and Decorating:
The processing and decoration of objects made from epoxy resin do not require special conditions or the use of harsh chemicals and paints.

3. Cost-Effectiveness and Energy Efficiency:
Epoxy resin is an inexpensive material, and its processing requires minimal energy, leading to financial and energy savings.

4. Safety and Accessibility:
The production of pendants and other items from epoxy resin is completely safe and can be managed and executed by students.

Purpose of Using Epoxy Resin

The purpose of this procedure is for students to gain practical knowledge of epoxy resin as a widely used material today and to understand its properties. Additionally, it aims to enhance students' environmental awareness, creativity, teamwork skills, and appreciation for the practical applications of chemistry as a natural science.

Objectives and Attitudes

Cognitive Goals:
1. Understanding the concept of using epoxy resin and the positive impact of this practice in fields such as chemistry and ecology.
2. Awareness of the value of conserving natural resources and energy.
3. Familiarity with the process of creating items from epoxy resin.

Pedagogical Goals:
1. Developing environmental awareness and responsibility through everyday practices, such as using epoxy resin to create pendants and other items.
2. Fostering creativity and recognizing the physical and chemical properties of materials while encouraging students to think of creative ways to design and decorate items.
3. Acquiring critical thinking skills and reflecting on the impact of consumer habits.

Attitudinal Goals:
1. Understanding chemistry as a practical science whose methods, processes, and materials can contribute to environmental conservation.
2. Strengthening the attitude of environmental responsibility, promoting the

need for reduced financial and energy consumption.
3. Encouraging respect for natural resources and the environment, highlighting the importance of preserving them for future generations through the use of environmentally safe materials.
4. Developing a creative mindset where students can utilize materials that reduce chemical waste and avoid non-recyclable materials.

Methods:

- Interdisciplinarity
- Presentation
- Group Discussion
- Practical Exercise/Experiment

Equipment and Materials for the Practical Exercise:

- Two-component epoxy resin
- Molds for pendant making
- Laboratory graduated cups
- Wooden stirrers
- Laboratory equipment for experimentation
- Decorative elements

Procedure for the Practical Exercise:

Step 1 (Classroom Discussion):
The teacher asks students if they have previously encountered epoxy resin or items made from it and what they know about its properties.

Step 2
The teacher briefly introduces students to the composition of two-component epoxy resin and its characteristics through an oral presentation. The teacher highlights the advantages of using epoxy resin, its contribution to environmental conservation, and its aesthetic appeal in creating pendants, jewelry, and decorative items. Students are encouraged to ask questions related to the practical exercise.

Step 3
As a practical activity, the teacher and students create pendants from two-component epoxy resin.

Implementation:

1. Preparation of Two-Component Epoxy Resin:
- In a graduated glass laboratory cup, mix the two components (Component A and Component B) of the epoxy resin in a 2:1 ratio.
- Stir the mixture with a wooden spoon or stick for approximately 10 minutes at a moderate speed to prevent premature hardening of the epoxy.
- Ensure the room temperature and the epoxy resin temperature are consistent.
- Continue mixing until the mixture becomes uniform and homogeneous.

2. Filling the Molds:
- Once the epoxy is prepared, carefully pour it into the molds up to the halfway point.
- Decorate the pendants with various embellishments of the students' choice.
- Fill the molds completely with the remaining epoxy.

3. Drying Process:
Leave the prepared pendants to dry for at least 48–72 hours at room temperature.

4. Finalizing the Pendants:
Remove the pendants from the molds and attach loops or rings to complete the pendants.

Discussion - Conclusions

After completing the procedure for making pendants, the teacher and students engage in a discussion about the process, materials, and equipment used.

Students draw conclusions regarding:
The practical applications of epoxy resin and its broader uses.
The environmental benefits of using epoxy resin as a sustainable material.

3.2.2. From Lithium Battery to Antidepressant

Theoretical Reflection

The process of recycling lithium batteries plays a significant role and contributes to environmental protection from both ecological and chemical perspectives:

1. Environmental Impact of Alkaline Batteries:
Alkaline batteries are among the most widely used materials today. Their natural decomposition is a major contributor to environmental pollution. Recycling lithium alkaline batteries is crucial for reducing chemical waste.

2. Recycling and $LiCO_3$ Production:
The recycling of lithium batteries to obtain lithium carbonate ($LiCO_3$), a key component in antidepressants, does not require expensive chemicals or special conditions, making the procedure financially and energetically efficient.

3. Practical and Pharmaceutical Benefits:
Producing a fundamental component of antidepressants through lithium battery recycling offers not only environmental advantages but also practical applications in the pharmaceutical industry.

4. Educational Value of Recycling:
Through the recycling process, students gain hands-on experience with practical chemistry, including laboratory conditions, criteria, and proper behavior in a chemical laboratory setting.

Purpose of Recycling Lithium Batteries

The purpose of this procedure is to demonstrate to students the method of recycling alkaline batteries to prevent their disposal and the resultant chemical waste. Additionally, the process illustrates how lithium extracted from these batteries can serve as a raw material in the pharmaceutical industry.

The primary benefits of this experiment include:
- Enhancing students' ecological awareness.
- Fostering creativity and teamwork skills.
- Familiarizing students with the practical applications of chemistry as a natural science.

Goals – Attitudes ; Cognitive Goals:

1. Understanding the concept of lithium battery recycling and its positive impact in fields such as chemistry and ecology.
2. Awareness of the value of conserving natural resources and energy.
3. Familiarization with the recycling process of lithium batteries and the production of lithium carbonate – a key raw material for antidepressants.

Pedagogical Goals:

1. Developing ecological awareness and responsibility through daily practices such as recycling lithium batteries and producing lithium carbonate.
2. Fostering creativity by recognizing batteries as potential major environmental pollutants and encouraging students to think of innovative ways to utilize products obtained through recycling.

3.Cultivating critical thinking and reflecting on the impact of consumer habits.

Attitudes:

1. Understanding chemistry as a practical science whose methods, procedures, and materials contribute to environmental conservation.
2. Strengthening the attitude of ecological responsibility and promoting the need for reduced financial and energy consumption.
3. Encouraging respect for natural resources, nature, and the need to preserve them for future generations by recycling harmful waste and obtaining safe materials.
4. Developing a creative mindset where students can utilize materials that reduce chemical waste through recycling methods and procedures.

Methods

- Interdisciplinarity
- Presentation
- Group Discussion
- Practical Exercise-Experiment

Equipment and Materials for the Experiment

- Lithium battery
- Distilled water
- $NaHCO_3$ (sodium bicarbonate)
- HCl (hydrochloric acid)
- Laboratory glassware: beakers, measuring cylinder, funnel, Erlenmeyer flask, separatory funnel
- Filter paper
- Stand
- Magnetic stirrer
- Laboratory equipment for experimenters

Procedure for the Practical Exercise

Step 1:
Class Discussion
The teacher initiates a discussion with students about recycling as a process, its applications, purposes, and the types of materials that can be recycled.

- The teacher highlights the benefits of recycling lithium batteries, focusing on the extraction of lithium carbonate and its contribution to environmental conservation.
- The practical benefits of the resulting product are also emphasized, especially its use in pharmaceutical applications.
- Students ask questions related to the practical exercise to clarify concepts and procedures.

Step 2
The teacher briefly introduces the students to the recycling process and the methods that will be carried out through an oral presentation. The teacher emphasizes the positive aspects of the process of recycling lithium batteries and obtaining lithium carbonate, as well as its contribution to environmental preservation and the benefits of the resulting product. The teacher writes the chemical reactions occurring throughout the process on the board. The students ask questions related to the practical exercise.

Step 3
As a practical activity in the laboratory, an experiment for recycling a lithium battery is conducted.

Implementation:

1. Carefully open the lithium battery and remove the lithium foil.

2. **Obtaining LiOH:**
In a laboratory glass, add distilled water and carefully introduce small pieces of the lithium foil, as the reaction between lithium and water is vigorous (explosive). This is an exothermic reaction. The product needed for the next step is LiOH. The chemical reaction is represented by the following equation:

2Li+H2O=2LiOH+H22Li + H_2O = 2LiOH + H_22Li+H2O=2LiOH+H2

3. **Isolating CO2:**
For this purpose, set up the necessary apparatus. In an Erlenmeyer flask, place NaHCO3 and add distilled water. Gradually, concentrated HCl (which is in a separatory funnel connected to the Erlenmeyer flask) is added, and a chemical reaction takes place, represented by the following equation:

NaHCO3+HCl=NaCl+CO2+H2ONaHCO_3 + HCl =
NaCl + CO_2 + H_2ONaHCO3+HCl = NaCl+CO2+H2O

The reaction takes place in the Erlenmeyer flask. The carbon dioxide (CO2) produced in this chemical reaction is transferred through a tube to the container where lithium hydroxide is located.

4. **Obtaining Lithium Carbonate:**
When lithium hydroxide reacts with carbon dioxide, a precipitate of lithium carbonate is formed.

2LiOH+CO2=Li2CO3+H2O2LiOH + CO_2 = Li_2CO_3 + H_2O2LiOH+CO2=Li2CO3+H2O

5. A supersaturated solution of Li2CO3 is obtained. The lithium carbonate is isolated from the solution by filtration. Finally, a white powder, lithium carbonate, is obtained, which is the active substance in some antidepressants.

Discussion - Conclusions:

After the experiment is complete, the teacher and students discuss the recycling procedure, the chemicals and equipment used, the products obtained, and their applications.
Students draw conclusions regarding the process of recycling alkaline batteries as one of the most important methods and measures for environmental protection.

3.2.3. Production of Soap Using Eco-friendly Dyes and Fragrances

Theoretical Reflection

The process of producing soap using eco-friendly and safe raw materials plays a crucial role in environmental protection, both from an ecological and chemical perspective:

1. The composition of soaps, as one of the most commonly used materials by humans, is important to avoid environmental pollution and any negative health impacts. The use of natural oils and fats, along with eco-friendly dyes and fragrances as integral components in soap production, is highly significant from a health, environmental, and biological perspective.
2. The process for producing eco-friendly soaps does not involve expensive raw materials but rather carefully selected ingredients, and it does not require special conditions for implementation. This makes the method both economically and energetically justified.
3. Producing eco-friendly soaps meets two of the most important criteria for a quality life: human health and a clean, healthy environment.
4. Through this procedure, students are introduced to practical chemistry, the conditions, criteria, and behavior in a chemical laboratory.

Purpose of Soap Production

The purpose of this process is for students to practically learn how soap is made from natural fats and oils, using eco-friendly and safe dyes and fragrances. Additionally, students gain knowledge that using such soaps reduces chemical pollution in the environment.
One of the main benefits of this experiment is to strengthen students' ecological awareness, creativity, teamwork abilities, and understanding of the practicality of chemistry as a natural science.

Goals – Attitudes

Cognitive:

1. Understanding the concept of producing eco-friendly soaps and the positive impact of this practice in areas such as chemistry, biology, and ecology.
2. Awareness of the value of saving natural resources and energy.
3. Familiarization with the soap production process and the raw materials used in this process.

Pedagogical:

1. Developing ecological awareness and biological responsibility for personal health through everyday practices such as making soaps using eco-friendly and health-safe materials.
2. Fostering creativity and recognizing artificial and non-eco-friendly soaps as potential major environmental pollutants, as well as encouraging students to think about creative ways to use safe products.
3. Cultivating critical thinking and reflecting on the impact of consumer habits.

Attitudes:

1. Understanding chemistry as a practical science which methods, procedures, and raw materials can contribute to preserving human health and the environment.
2. Strengthening the attitude of ecological responsibility, promoting the need for reduced financial and energy consumption.
3. Encouraging attitudes to respect natural resources, nature, and the need to preserve

them for future generations through the use of safe raw materials in production.
4. Developing an attitude of creativity where students can use materials that reduce chemical waste.

Methods

- Interdisciplinarity
- Presentation
- Group discussion
- Practical exercise-experiment

Equipment and Materials for the Experiment

- Coconut oil
- Sunflower oil
- Olive oil
- Sodium hydroxide (NaOH)
- Distilled water
- Laboratory beakers, measuring cylinder, electronic scale, electric mixer, laboratory spoons, glass stirring rods, protective goggles, laboratory gloves, sieve
- Eco-friendly dyes
- Eco-friendly fragrances

Procedure for the Practical Exercise

Step 1 (Discussion in classroom)
The teacher asks students what they know about the saponification process, the composition of the soaps they use daily, and the raw materials used in these soaps. The teacher emphasizes the benefits of using safe materials for soap production. Students ask questions related to the practical exercise.

Step 2
The teacher briefly introduces students to the saponification process and the methods that will be applied during the experiment. The chemical reactions occurring during the process are written on the board. Students ask questions related to the practical exercise.

Step 3
As a practical activity in the laboratory, the experiment to make soaps using natural oils, eco-friendly dyes, and fragrances is conducted.

Implementation:

1. A solution of sodium hydroxide and distilled water is prepared. The dissolution of sodium hydroxide in water must be done carefully and gradually, as it is a highly exothermic reaction, releasing a large amount of heat.
2. The prepared solution which has been heated to a temperature of around 75°C is left to gradually cool to a temperature between 55°C-57°C.
3. In a larger container, specific amounts of coconut oil, olive oil, and sunflower oil are mixed, and the mixture is heated to a temperature of 55°C-57°C.
4. When the oil mixture and sodium hydroxide solution reach the same temperature, they are combined and mixed using an electric mixer.
5. Various eco-friendly dyes and fragrances are added to the resulting mixture.
6. The mixture is poured into molds of different shapes.
7. The resulting soaps are left for 72 hours to harden and then removed from the molds. The

Implementation:

soaps can be used at least 40 days after production when the saponification process is completely finished.

Discussion - Conclusions

Once the experiment is completed, the teacher and students discuss the soap-making procedure, the chemicals and materials used, the products obtained, and their application.

Students draw conclusions about the saponification process using eco-friendly and biologically safe raw materials as an important method and measure for protecting human health and the environment.

3.3.1. Looking for the cells!

Cognitive (knowledge) objectives

- To observe the different parts of an optical microscope with an adapted digital camera and understand how it operates.
- To observe freshly prepared cell samples of plant (onion cells) and animal origin (human epithelial cheek cells from the oral cavity and red blood cells).

Affective (attitude) objectives

- To collaborate in international team groups and perform cell sample preparation for an optical microscopy.
- To reconsider their perception on the size of different cell types of monocellular and multicellular organisms and to perceive cells as "living matter" and not as static images on a book.

Psychomotor (physical movement & coordination) objectives

- To apply and evaluate the acquired knowledge by performing group activities and by playing an online Quiz game (on Quizizz platform).

Expected learning outcomes

- Students should be able to describe the parts of an optical microscope with an adapted digital camera and know how to use it.
- To prepare cell samples to observe in an optical microscope.
- To identify onion cells, human epithelial cheek cells and red blood cells.
- To grasp the real size of cells and perceive them as "living matter" and not as static images on a book.
- To improve their skills of communication, collaboration and use of digital technology

Practical activities video

https://www.youtube.com/watch?v=qD-4T1HW4W0&t=22s

Figure 1: Representative photos from STEM Practical Activity "Looking for the cells!".

3.3.2. Experimenting with Earth and Water

Cognitive (knowledge) objectives

- To use simple experimental devices from everyday life materials to make rocket fuel from water.
- To measure different properties of the soil such as temperature, pH, water content and possibility to grow specific plant species, in an experimental plot.

Affective (attitude) objectives

- To collaborate and communicate within international groups in order perform experiments.
- To alter their views and understand that important molecules for life such as water comprise chemical elements with completely different properties.
- To understand why Hydrogen and Oxygen are environmental-friendly fuels and why until today using water as fuel is not energy efficient.
- To understand that STEM technology has important applications in everyday life.

Psychomotor (physical movement & coordination) objectives

- To use STEM based engineering tools and perform research experiments in group activities using scientific methods.

Expected learning outcomes

- Students should be able to know how to make rocket fuel from everyday life materials.
- To understand that the same atoms can make different molecules with entirely different properties.
- To understand why we still can not use environmental-friendly water electrolysis as an efficient fuel source.
- To know how to measure different properties of the soil such as temperature, pH, water content and possibility to grow specific plant species using scientific methods.
- To understand that STEM technology has important applications in everyday life.
- To improve their communication, collaboration, social and language skills.

Practical activities video

https://www.youtube.com/watch?v=qD-4T1HW4W0&t=22s

Figure 1: Representative photos from STEM Practical Activity "Experimenting with Earth and Water".

3.3.3. Making a pencil case from recycled fabric material

Theoretical reflection

The reuse of textiles at the household level makes important contributions to various aspects of chemistry and ecology, for example:

- Reduction of chemical waste: by reusing old textiles (e.g. for cleaning cloths, linings and various constructions), we reduce the need to buy new materials that include chemicals in their production. This helps to reduce the chemical waste generated by the consumption and disposal of new products.
- Saving natural resources and energy: In the production of new fabrics, large amounts of water and energy are used, while dyeing and processing require many chemicals. Re-use reduces the need to consume these resources, which helps to protect the environment and conserve natural resources.
- Reuse for cleaning cloths: old fabrics, such as T-shirts and towels, can be used as cleaning cloths instead of paper towels or disposable cloths or for various other utilitarian items, thus avoiding the purchase of other products with chemicals. This reinforces a greener approach to the home and reduces waste production.

Overall, reusing textiles at the household level offers a more sustainable and chemically safer option as it reduces exposure to hazardous chemicals, protects the environment and saves resources.

Purpose

The purpose of this scenario is to enhance students' ecological awareness, creativity and sustainability by highlighting the importance of recycling and responsible consumption in the context of protecting the environment from the chemical waste generated by the consumption and disposal of new products.

Objectives - Attitudes

Cognitive:
- Understanding the concept of textile reuse and the positive impact of this practice in areas such as chemistry and ecology.
- Awareness of the value of saving natural resources and energy.
- Familiarity with the process of making objects with old materials.

Pedagogical:
- Developing ecological awareness and environmental responsibility through everyday practices such as reusing textiles.
- Developing creativity and recognition of materials and encouraging students to think of creative ways to reuse fabrics and other materials in their daily lives.
- Promote critical thinking and reflection on the impact of consumer habits.

Attitudes:
- Strengthening the attitude of ecological responsibility, promoting the need for less consumption of new materials and more sustainable choices in everyday life.
- Encourage attitudes of respect for natural resources, nature and the need to preserve them for future generations through reuse and conservation.
- Developing an attitude of creativity where students can utilize existing materials around them to reduce waste and reuse, avoiding plastic and other non-recyclable materials.

Method

- Interdisciplinarity
- Presentation
- Group discussion
- Practical exercise

Materials

- Projector
- Pieces of fabric
- Ruler
- Scissors
- Pencil
- Eco-friendly fabric glue (alternatively thread and needle)
- Cord

Scenario procedure

Step 1.
A class discussion on whether students transform old clothes.

Step 2.
Students watch a short video presentation about textile waste and its impact on the environment.

https://youtu.be/xChnjKzfgos

Step 3.
Based on the above video, a class discussion is held on the pollution caused, for example, by overflowing landfills and harmful chemical waste released into the atmosphere.

Step 4.
As a practical activity, students are asked to make a school bag with fabrics that have had other uses in the past, for example an old pair of jeans, a sheet, a pillowcase, etc. In this way they will be introduced to the idea of reusing old fabrics.

Implementation

- Take 2 small pieces of fabric of the same size (e.g. from a jeans, pillow case etc.).
- On one piece of fabric, with the help of a ruler and a pencil, make small lines opposite each other and then open them with the help of a pair of scissors. These small holes will then be the places for our pencils. At the end of the fabric we make a small hole in the center to then tie the string that will close our case.
- Place one fabric on top of the other and glue them around with the eco-glue or alternatively sew around the perimeter with thread and needle.
- Our case is ready to be used!

Discussion - Conclusions

After the construction is completed the class teacher asks the students:
Evaluate the construction and the whole process.
To draw their conclusions about the need and importance for the environment of reusing old objects.

Practical activities video

https://www.youtube.com/watch?v=qD-4T1HW4W0&t=22s

SCENARIOS OF CITY GAMES PREPARED AS PART OF THE PROJECT "PRACTICAL IS MORE LOGICAL"

4.

4.1. Interdisciplinary City Game "A STEM Journey Through the City of Dąbrowa Białostocka"

Instructions for participants

1. The mobility participants are divided into 4 mixed international groups.
2. The teams receive a printed set of tasks and start the game 15 minutes apart.
3. The goal of each team is to get from point 1 to points 2, 3, 4, 5 by completing 5 different interdisciplinary exercises.
4. Each group is given a map and the tasks they must complete in the shortest possible time.
5. Errors in calculations or in answers will be penalised with a time extension of 5 min.
6. The group that has completed all the tasks in the fastest time is the winner.

Instructions for participants

Task 1 – From the life of trees

Objectives:
- identify the 4 species of trees growing on the school property,
- estimate the age of a selected tree.

Place: Schoolyard

Materials:
measuring tape, tailor's centimetre, calculator, tree age estimation table, photographs of selected native tree species

Description of the task to be performed:
Using the available materials, carry out the following instructions:

There are many trees on the school property. There are letters attached to several of them.

a) Find trees: with the letter A, B, C, D and identify their species from photos and your own observations

Tree A is ..... Tree B is .....

Tree C is ..... Tree D is .....

b) Determine the age of the tree A
Use a tape measure to measure the circumference of the trunk at breast height, i.e. 1.3 m from ground level. Divide the result by 3.14 to get the diameter you need to determine the age of the tree. Use the table to estimate the age.

Age of tree A ..... Age of tree B .....

Age of tree C ..... Age of tree D .....

Selected coniferous and deciduous tree species of Poland			
	Common spruce		Prickly spruce
	Scots pine		Caucasian fir tree
	Western hedgehog		European larch
	Pedunculate oak tree		Sessile oak

SPECIES		Age of the tree (in years)					
		10	20	40	70	100	120
		Tree diameter (in cm)					
Poplar white Poplar black	Populus alba Populs nigra	15	35	70	100	120	145
Beech Common	Fagus silvatica	-	17	35	57	78	92
Robinia Acacia	Robinia pseudocacia	7	13	26	45	62	75
Norway pine	Pinus silvestris	-	10	25	50	68	80
Sycamore Maple	Acer platanoides	-	12	25	40	55	67
Horse chestnut	Aesculus hippocastanum	-	20	38	65	87	105
Pedunculate oak Sessile oak	Quercus robur Quercus sessilis	-	8	18	35	47	55
Common spruce	Picea excelsa	-	12	25	50	70	83
European larch	Larix decidua	-	17	35	52	67	79
Field maple	Acer nagundo	-	27	54	85	-	-
Common willow	Betula verrucosa	-	12	25	50	70	83
Common birch	Ulmus laevis	9	15	30	51	73	90
Thuja	Thuja occidentalis	-	5	10	20	35	-
Black alder	Alnus glutinosa	-	17	30	50	70	-

Task 2 – Measure the area of the park using any method

Localization: City park

Experience:
After reaching the city park, each group uses the same method to compare the results.

Materials needed for the experiment - groups are given:
Tape measure or pedometer, pupils are also given a map with a drawn outline to measure the area. Pupils identify the geometric figures into which the area can be divided (e.g. two rectangles and a triangle).

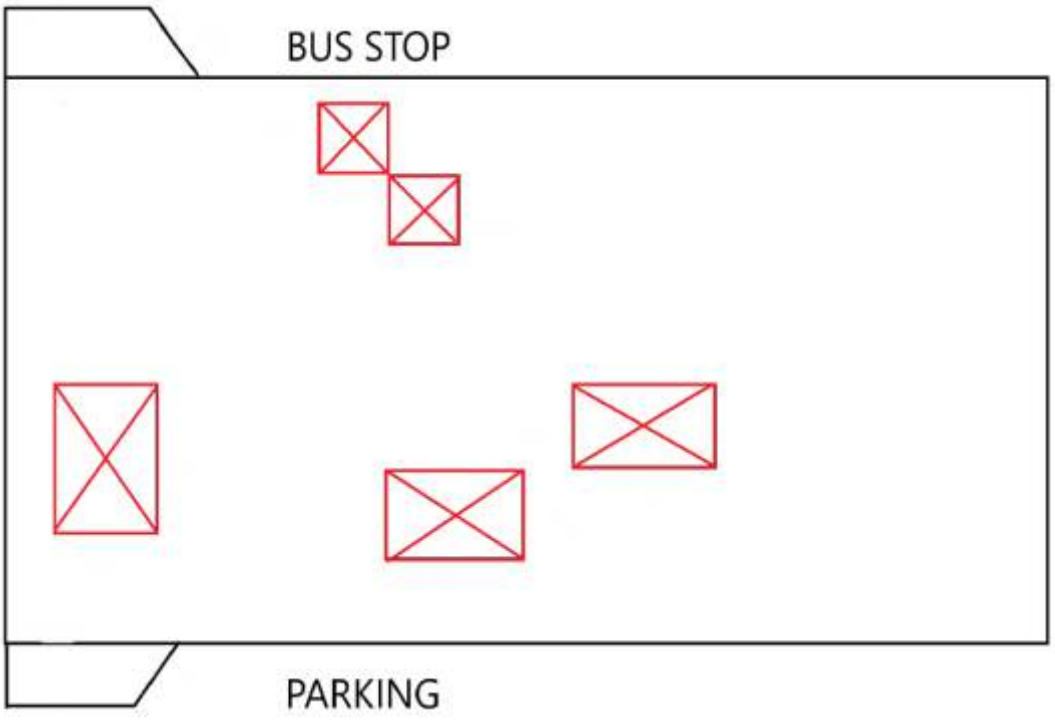
Measuring side lengths:
Using a tape measure or steps, they measure the lengths of the sides of each figure. They record the results on a sketch. Pupils apply the appropriate formulae:

Rectangle:
$P = a \times b$

Triangle:
$P = ½ \times a \times h$

Trapezoid:
$P = ½ \times (a + b) \times h.$

They add up the areas of each figure to get the approximate area of the whole area. Once they have obtained the final result, they give it to the punters and obtain information about the further course of the game. If the result obtained is within the margin of error the group can proceed to the next point. If the result is incorrect the group waits 5 min before continuing. Calculate the area of the park according to the diagram below, excluding the red rectangles.



Task 3 - testing pH of river water

Place: city river

Teaching methods:
practical experience, problem solving method, data analysis

Introduction:
Natural river water should have a pH of 6.5 - 8.5.
- pH < 6,5 may indicate acidification of the water (e.g. by acid rain);
- pH > 8,5 may indicate pollution, e.g. by municipal or industrial effluents.

a. Discussion of health and safety rules and work organisation
- Students work in groups of 6.

b. Safety rules:
- do not touch the water with bare hands (use gloves),
- do not spill samples of water on the ground,
- watch out for slippery river banks.

c.Procedure:
- taking a water sample,
- pH measurement,
- recording of results and analysis.

Stages of the experiment:

Step 1: Taking water samples

- each group has a designated place to take a sample,
- they take water in plastic containers (about 100 ml).

Step 2: pH measurement
Method 1: Indicator papers
- dip indicator paper in water for 5 seconds,
- wait for a moment and compare the colour with the colour scale given,
- read and record the result.

Step 3: Analysis of the results
- each group analyses the result obtained,
- read out the pH value and state its reaction,
- in the case of an incorrect reading or miscalculation of the solution's pH,
- a waiting period of 5 minutes is imposed.

Task 4 - A forest in a jar - city forest

Location: city forest

Material: glass jar, magnifying glasses, photographs of biological material.

Description of the task to be carried out:
Based on macroscopic observation (using a magnifying glass) and the naked eye, carry out the following instruction:

Find in the forest:
- a common pine cone,
- a common spruce cone,
- a lichen of golden wallflower,
- wood moss,
- needles (leaves) of the Scots pine.

Use magnifying glasses and photographs of the objects you are looking for identification. Place the collected natural material in a glass jar.

Selected coniferous and deciduous tree species of Poland	
	needles (leaves) of Scots pine
	Scots pine cone
	common spruce cone
	lichen scales of wall goldweed
	wood moss

Task 5 – Counting the windows In the school building

Place: school yard

Material: card and pen

Description of the task to be carried out:
Groups of pupils at the last point of the city game are to count the windows in the whole school building (including the sports hall and the boarding school). The number of windows and glazed doors should be counted. Regular doors and vents are not included in the result.








4.2. City Game Scenario "A STEAM Journey Through the City of Ioannina"

Cognitive (knowledge) objectives

- To understand the basics of navigation using the four cardinal directions (North, South, East, and West) and navigate through the city using a smartphone compass and a map.
- To use Earth's Geographic Coordinate System (latitude and longitude) to find a location using the Google Maps app.
- To identify different plant species by taking a photo and using the Google Lens app.
- To calculate the surface area (m2) of a city square on a map by using the scale of the map and converting units of distance.

Affective (attitude) objectives

- To collaborate in international team groups to solve problems, to offer cultural exchange and re-evaluate the use of digital technology in everyday life.

Psychomotor (physical movement & coordination) objectives

- To apply the acquired knowledge by performing group activities using ICT in a city game.
- To get to know the City and to visit useful spots for their stay in Ioannina, from street food places and restaurants to cafeterias and patisseries.

Expected learning outcomes

- Students should be able to navigate through the city using a smartphone compass and a map.
- To find a location using the latitude and longitude coordinates in the Google Maps app.
- To identify different plant species using the Google Lens app.
- To calculate the surface area (m2) of a city square on a map by using the scale of the map.
- To explore the City through a STEAM journey discovering useful places to visit during their stay and to improve their skills of communication, collaboration and use of digital technology.

Expected learning outcomes

- 1 hour course presentation in the school providing game guidelines and 1 hour city game.
- Resources provided: city game scenario, notebook, pen, smartphone with compass, Google Maps, Google Lens and Viber apps.

Instructions for participants – Task for each step.

Step 1. Match the map's North direction with the North direction of your smartphone's compass.

Step 2. Define your course direction, in degrees, towards Location 2 using your smartphone's compass. Post the degrees on the Viber app. Follow this direction for 200m to find the ZOSIMAIA Library building at Location 2.

Step 3. Take a photo of the library building and post it in the Viber app.

Step 4. On the left of the library, look for a tree with red and yellow fruit. Take a photo and use Google Lens app to identify the plant species. Post its Latin name and photo in the Viber app.

Step 5. Take a course South-East (SE) for 140m and look for the Clock Tower of the City at Location 3. Take a photo of the Clock Tower and post it in the Viber app.

Step 6. In the Clock Tower area look for the flower plant indicated on page 5. Take a photo and use Google Lens app to identify the plant species. Post its Latin name and a photo in the Viber app.

Step 7. Next to the Clock Tower head South-East (SE) and look for the Tomb of the Unknown Soldier monument at Location 4. Take a photo and post it in the Viber app.

Step 8. Walk North-East to the "Litharitsia" Park at Location 5.

Step 9. At Location 5, look for a big Eye-shaped sculpture. Take a photo looking through the Eye, at the lake view and post it in the Viber app.

Step 10. Go to the North border of the park and look for the plant indicated on page 9. Take a photo and use Google Lens app to identify the plant species. Post its Latin name and a photo in the Viber app.

Step 11. Take AVEROF Boulevard and walk North-East (NE) for 300m until you find the Gyros Restaurant "Οι Βλάχοι" (Oi Vlachi) at Location 6. In this area you can visit VIRONOS and KALARI streets with several cafeterias, bars and street food places.

Step 12. Walk North-East (NE) for 200m to find the Castle Gate at Location 7. Take a photo of the Castle Gate and post it in the Viber app. In the Castle area you can find street food (gyros, crepes, sandwiches), bakery, taverns and a patisserie.

Step 13. Find Location 8 with geographic coordinates 39°40'23.6"N 20°51'20.1"E. Insert coordinates in the search box of the Google Maps app and look for the "WHITE HEART". Take a photo with your team on the "WHITE HEART" of Location 8 and post it in the Viber app.

Step 14. Map scale 1:700. Calculate the surface area in m 2, of the indicated rectangle in Mavili Square. Post the result in the Viber app.

Next to Mavili Square you can find several cafeterias and patisseries. North-West of Mavili Square at Papagou street you can find taverns and restaurants. Look at the map on page 14 as a guide.

End of the city game. Thank you all for the participation! Have a nice day in Ioannina!

City game presentation:

https://www.youtube.com/watch?v=qD-4T1HW4W0&t=22s

Figure 1: Representative photos from the City Game "A STEAM Journey Through the City of Ioannina"

4.3. City Game Scenario: With mathematics, biology and culture through Ohrid

Theoretical Reflection:

The goal of City Game, is to encourage students to apply their knowledge of mathematics, biology, geography and culture through real-life practical activities in the city of Ohrid. The key focus is on practical learning, where students are actively involved in researching, measuring, and solving tasks in the real world. Through direct field experience, students will see the significance of theory in practice and learn how to apply the concepts they have learned to everyday life.

Goal of the City Game:

The purpose of this activity is to encourage students to apply mathematical and physical concepts in the real world by active participating in the exploration of the city. The game involves physical activity where students will move around different locations and use their mathematical logic to calculate heights and geometric shapes while also becoming familiar with the historical and natural values of Ohrid.

Exploring Geometric Shapes and Shadows:
Students will visit various locations in the city of Ohrid, identify the geometric shapes of objects, and calculate their heights by applying mathematical formulas and principles of triangle similarity.

Historical Elements:
At the Paper and Printing Museum, students will participate in paper-making activities and print a replica of Gutenberg's press, allowing them to familiarize themselves with ancient printing methods and the historical significance of this technology.

Biological Component:
By exploring endemic species in Ohrid and the surrounding area, students will learn about the natural richness of the region and the importance of nature conservation.

Goals – Attitudes:

Cognitive:
- Understanding and applying geometric principles and triangle similarity in calculations.
- Interaction with city spaces and their use in mathematical and physical tasks.
- Exploring the natural and historical aspects of Ohrid and actively participating in cultural activities.

Pedagogical:
- Encouraging teamwork and communication.
- Developing practical skills such as measuring, calculating, and identifying geometric shapes.
- Applying research approaches to solving complex tasks.

Attitudes:
- Developing empathy for nature and the importance of preserving endemic species.
- Encouraging creativity and historical awareness.
- Promoting the integration of natural and cultural values.

Methods:

- Interdisciplinary (mathematics, physics, history, biology)
- Practical activity – exploration through the city
- Creative play with reflection
- Teamwork and support in problem-solving
- Presentation of results and discussion

Required Materials:

- Task cards with geometric shapes
- Measuring tape
- Paper and Printing Museum (for paper-making and printing with a replica of Gutenberg's press)
- Maps of the city of Ohrid
- Cameras or mobile phones for documenting endemic species

Procedure for Practical Exercise:

Introduction and Grouping:

- The moderator begins the activity with a brief explanation of the game's purpose.
- Students are divided into teams and given maps of locations where they need to search for geometric shapes and calculate the heights of objects using shadows.

Exploration of the City: Geometry and Shadows

- Students will explore the city by identifying and photographing geometric shapes in historical landmarks, churches, and architectural buildings. In addition, they will observe how light and shadow interact with these structures, creating dynamic patterns that emphasize the mathematical beauty embedded in urban and cultural heritage. This activity encourages students to see geometry not only as a mathematical concept, but also as an artistic and visual experience shaped by nature and architecture.

Paper-Making and Printing on Gutenberg's Press:

- After the exploration, students will head to the Paper and Printing Museum, where they will participate in a practical workshop and learn about the traditional paper-making process. This hands-on educational process will allow them to experience the basics of old crafts and learn about the significance of paper in the history of humankind.
- As part of their exploration, they will also visit a replica of Gutenberg's 15th-century press. This interactive presentation will allow them to personally experience the technology that changed the history of printing. They will learn how books and other documents were printed, enriching their understanding of the development of communication and the impact of these historical innovations. The practical learning, in this context, will enable them to experience historical processes in a lively and logical way.

Exploring Endemic Species:

- Students will continue their adventure through the city, but now their task will be much more specific and exciting – to discover endemic plant species in Ohrid and its surroundings. Using mobile phones, they will document their research through photos and notes, creating a digital journal of all the discovered species.
- Their focus will be on the unique endemic species living in and around Lake Ohrid – one of the oldest and deepest lakes in Europe. This area, known for its biological diversity, will become their field of discovery and learning, with practical experience connecting them to nature in a new and interactive way.

Discussion and Presentation of Results:

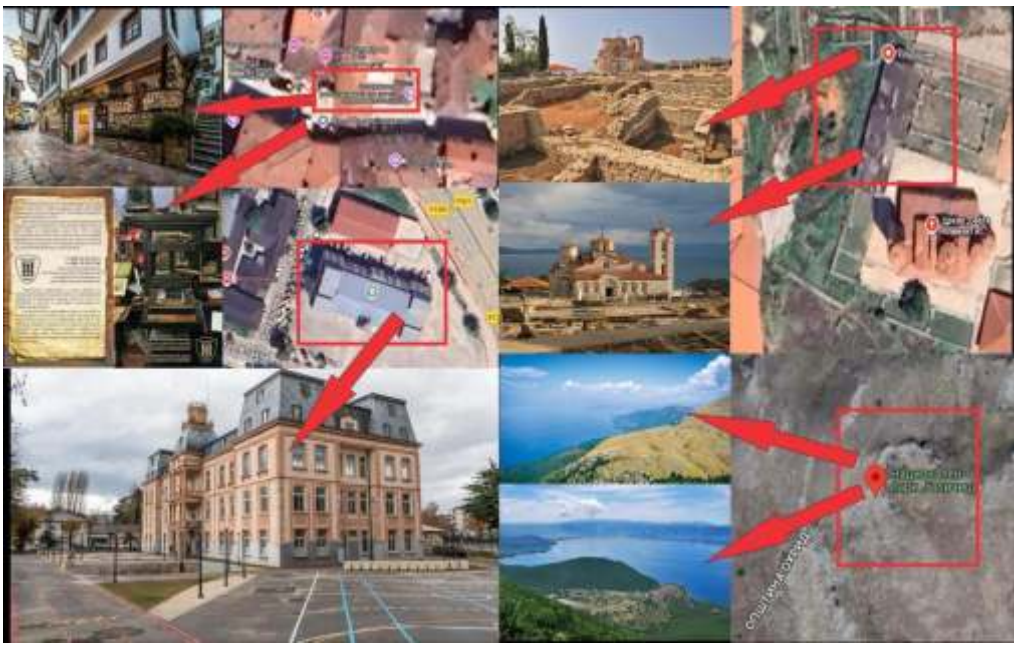
- After completing the research and activities, each team will present their results and discuss the tasks and outcomes.
- The discussion will focus on the significance of mathematics and history in everyday life, as well as the importance of nature conservation.

Conclusion:

"City Game" is not just a game but a real journey into the world of knowledge where theory and practice merge in the most interesting way. Through the activities across the city of Ohrid, students discover the importance of applying mathematical, biological, and historical concepts to the real world. This is much more than classroom learning — it is an opportunity to experience and understand how theoretical knowledge transforms into practical wisdom that impacts everyday life.

By exploring geometric shapes, calculating shadows, experiencing ancient printing presses, and studying the natural and historical values of Ohrid, students develop important problem-solving skills and learned concepts. The practical application of theory strengthens their curiosity and creativity, encourages them to exchange ideas and collaborate, and prepares them for a future where science and nature are inseparably linked.

In this game, students not only learn but also experience how knowledge can be used to preserve cultural and natural heritage, making the learning process meaningful and inspiring. "City Game" affirms the importance of practical learning as a way to inspire and sustain a love for science and the environment.

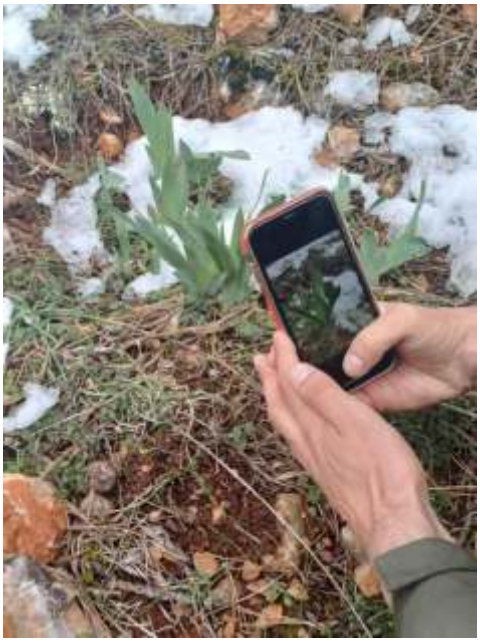













EDUCATIONAL GAMES

5.

5.1. Board game "Business Laboratory"

Welcome to the world of science and business where chemistry meets economics! In "Business Laboratory" players take on the role of chemists and entrepreneurs, competing to become the best chemical compound developer or the most efficient supplier of raw materials. You are about to enter the game. You have to make a division between chemists and entrepreneurs. It is up to your cooperation, cleverness and strategy to determine who will be the most successful.

Role division rules

Players can divide themselves into chemists and traders in several ways:

1. Draw — each player draws his role before the game begins.

2. Selection at the beginning of the game — players decide which role they want to assume.

3. Alternate division — if there is an equal number of players, every other person becomes a chemist and the others become entrepreneurs.

Role division rules

Chemists — buy elements from traders and combine them into chemical compounds. Their goal is to create the most valuable and stable compounds possible.

Traders — trade elements, setting prices and negotiating with chemists. Their task is to maximize profits by selling raw materials at the right time.

The game combines strategy, logical thinking and elements of negotiation, allowing players to immerse themselves in the fascinating world of chemistry and business. Will you succeed in creating the most valuable compounds, or will you dominate the market of elements? It's time to find out!

Link to the game

https://www.canva.com/design/DAGhCQOA9gU/ZVqrY4IrAoxj734twjMkuA/edit

Chemist

Main goal
Your task is to create as many chemical compounds as possible.

NOTE!
Each compound is scored differently. After creating a chemical compound, report to the instructor who will exchange the compound for points (tokens). The game consists of five sessions. After each of them, the player has a choice of using the risk card or paying 20 euros. The chemist who scores the most points wins.

Game rules
1. The game consists of 5 sessions.
2. You receive 200 euros to start and a card with the elements written out along with their value.
3. You can spend any amount of money in each round.
4. You approach the entrepreneurs. You choose the stall that interests you. You start the game by choosing the element you want to buy and negotiate the price.
5. After each round, you decide whether you pay 20 euros or take a risk card.
6. After the second and fourth sessions you take part in an exchange which lasts 5 minutes. During it you have the opportunity to exchange or buy elements with the money you saved in earlier rounds. You negotiate prices with both chemists and traders.
7. Various types of events are possible during the game.

Trader

Main goal
Your task is to collect as much money as possible. You sell the elements to chemists.

NOTE!
Each compound is scored differently. The minimum price of each is 5 euros, max 50 euros. It is you who decides for what price you will ultimately sell a given element. The game consists of five sessions. After each round, the player has the choice of using the risk card or paying 20 euros. The entrepreneur who has the most money wins.

Game rules
1. The game consists of 5 sessions.
2. You receive a package of elements to start.
3. You can exhibit up to five elements in each session.
4. You own your booth. During the round you negotiate the price with the chemists, try to encourage purchase and get as much money as possible.
5. After each round, you decide whether you pay 20 euros or charge a risk card.
6. After the second and fourth sessions you take part in an exchange which lasts 5 minutes. During it you have the opportunity to exchange or buy elements with the money you earned in earlier rounds. You negotiate with both chemists and entrepreneurs.
7. Various types of events are possible during the game.


Jedna szkoła.....wiele smaków.
One school, many flavours.
Business Laboratory
EDUCATIONAL GAME
Chemist
Trader

5.2. Interdisciplinary online Educational Game "Summary Evaluation Quiz" (Quizizz Platform)

Objectives

Cognitive (knowledge) objectives

- To summarize the acquired knowledge from all activities during their mobility in the City of Ioannina.

Affective (attitude) objectives

- To collaborate in international team groups and use their communication, social and language skills.

Psychomotor (physical movement & coordination) objectives

- To evaluate the acquired knowledge from all activities by using ICT technologies playing an online Quiz game created in Quizizz platform.

Expected learning outcomes

- To summarize the acquired knowledge from all activities.
- To evaluate the acquired knowledge for the purposes of the project.
- To improve their communication, collaboration, social and use of digital technology skills.

Educational game description

Four (4) international teams (A, B, C and D), comprising six (6) students per team, with two students from each country, took part in an online educational Quiz game created in the Quizizz platform:

https://quizizz.com/admin/quiz/675b04920dc858972e65e7ce?searchLocale=

The teams competed in a summary Quiz game, comprising 25 questions from all activities performed during the student mobility in Greece. Each team was connected online with the Quizizz Platform and recorded their answers, collaboratively and in real-time, using a tablet provided by the school.

As shown in Figure 6, the scores of all teams were great indicating the project's purpose that "practical ways of teaching make lessons more logical and easy to understand in order to acquire new knowledge and skills".

Figure 1: Representative photos from the online Educational Game "Summary Evaluation Quiz" (Quizizz Platform)


QUIZIZZ
Practical is more Logical Summary Quiz
Total questions: 25
Worksheet time: 28mins
Is the map depicted in the image properly oriented to the "Real North" ?
a) NO
b) YES
Summary Evaluation with QUIZIZZ
GO!
Practical is more Logical Summary Quiz
QUIZIZZ

5.3. Educational Game – Quiz: "It's Up to You Whether Life Continues"

Theoretical Reflection

This educational quiz-experiment aims to increase students' knowledge of reproduction and the biological cycle through a symbolic game with an egg as a simulation of an egg cell. The game is designed to involve competition, logic, teamwork, experimentation, and creative thinking. Students gain an understanding of the vulnerability and importance of life, as well as the need for protection, care, and strategies for its survival.

1. The symbolic use of an egg as an egg cell allows students to connect to the biology topic in a practical and funny way.
2. The game is structured to develop logic, strategic thinking, and motor skills.
3. Through the quiz, students earn resources that allow them to "protect life" on both a practical and symbolic level.
4. The development of a sense of responsibility and the importance of collective effort.

Goal of the Quiz-Experiment

The primary goal of this activity is for students to develop the following competencies through knowledge and practical tasks:

- Application of biology knowledge in simulated situations.
- Teamwork and division of responsibilities.
- Practical planning and problem-solving.
- Motor and fine skills in handling sensitive materials.
- Development of empathy and awareness of life as a value.

Goals – Attitudes

Cognitive:

- Understanding the concept of life's fragility and the process of reproduction.
- Active participation in solving tasks through a quiz format.
- The ability to connect theoretical knowledge with practical reality.

Pedagogical:

- Encouraging teamwork, trust, and responsibility within the group.
- Acquiring motor skills through egg protection creation.
- Applying strategies and analyzing results.

Attitudes:

- Development of empathy, ethical stance toward life, and preservation of living beings.
- Encouraging innovation and finding practical solutions with limited resources.
- Understanding the significance of collective intelligence in complex tasks.

Methods

- Interdisciplinary approach (biology, physics, logic, social sciences)
- Presentation
- Practical activity – experiment
- Group discussion
- Quiz competition

Required Materials

- Classroom
- Whiteboard
- Numbered cards (1, 2, 3)
- Markers
- 3 fresh eggs
- Cotton
- Toilet paper
- Bandages
- Adhesive tape
- Toothpicks

Procedure for Practical Exercise

Step 1: Introduction and Grouping
- Students draw numbered cards (1, 2, or 3) and are divided into three mixed groups from different countries.
- The moderator explains the rules and presents the purpose of the activity.

Step 2: Quiz Questions
- Each group receives questions from three categories (hard – 20 points, medium – 10 points, easy – 5 points).
- For each correct answer, they earn points and corresponding amounts of materials. (Example: 20 points = cotton + bandage; 10 points = toilet paper; 5 points = toothpicks)

Step 3: Egg Protection Creation
- Each group receives 1 egg and uses the materials they have won to protect it.
- They have 10 minutes for preparation.

Step 4: Egg Drop from Height
- Each group drops their egg.
- The egg that remains intact symbolically "continues life" – that group wins.

Practical Work in Class – Focus

During the activity, students are fully engaged through:
- Team task distribution (one plans, one packs, one analyzes, etc.).
- Testing and adjusting their tactics (e.g., test drop with a plastic egg).
- Using previous knowledge of mechanics and protection on impact.
- Post-activity analysis: Why did some eggs break? What could have been done better? Which material was most useful and why?
- Discussion of the symbolism of the task – how life requires care, support, and knowledge to survive.

Discussion – Conclusions

After the quiz and experiment, a reflective discussion is organized with the following guiding questions:
- Which teams succeeded and why?
- What role did collaboration play?
- How did the quiz affect the practical part?
- How do you interpret the message "It's up to you whether life continues"? Students are encouraged to reflect on the real-life context – the importance of knowledge, skill, and an ethical approach to the environment and human values.

Time Implementation of the Quiz-Experiment/Educational Game Theme

Total time: 45 minutes (1 lesson period)

	Phase	Activities	Duration
1.	Introduction and Explanation	Greeting, short introductory video / question about life, explanation of the rules	5 minutes
2.	Team Formation	Division of students into 3 international groups (8 students per group)	3 minutes
3.	Quiz Competition	Choice questions – knowledge from biology, ecology, general knowledge	10 minutes
4.	Presentation of Points	Summing up the points and distributing materials based on the results	2 minutes
5.	Practical Preparation	Egg protection creation using available materials	10 minutes
6.	Protection Test	Egg dropping – simulating life risk and checking the result	5 minutes
7.	Analysis and Discussion	Discussion about the results, selection of the winning team, symbolism of the task	7 minutes
8.	Conclusion and Message	Final thoughts, reflection, and connection to the topic: the value of life	3 minutes

CONCLUSIONS

CONCLUSIONS

The Erasmus+ project "Practical is More Logical" stands as a testament to the effectiveness of innovative, interdisciplinary, and practice-based education. With the active involvement of students and teachers from partner schools across three countries, this project provided a holistic educational experience that bridged theory and practice in meaningful and impactful ways.

From the very first day, the atmosphere was marked by enthusiasm, cooperation, and a shared commitment to learning. The project unfolded through a rich variety of activities—team-based games, scientific workshops, creative sessions, cultural excursions, and eco-educational visits—all designed to engage students not only intellectually but also emotionally and socially. These carefully planned activities served as powerful catalysts for student growth, pushing them to apply theoretical knowledge in real-world contexts and to explore learning from multiple perspectives.

Central to the success of the project was its strong focus on interdisciplinary STEAM education (Science, Technology, Engineering, Arts, and Mathematics). Through hands-on experimentation, laboratory work, environmental analysis, digital tool engagement, and artistic creation, students were encouraged to explore the practical applications of their classroom knowledge. Whether creating soap with natural oils, analyzing water quality in a lake, building insect houses, or working with drones and coding programs, the project illustrated that practical experience enhances retention, motivation, and creativity.

The project also highlighted the importance of environmental sustainability and social responsibility. Workshops focused on ecological awareness and real-life problem-solving—such as recycling lithium batteries, understanding biodiversity, and studying ecosystems—contributed to building a generation of learners who are not only knowledgeable, but also conscious of their role in shaping a sustainable future.

Moreover, the intercultural component of the project played a crucial role in enriching the participants' educational journey. Through shared experiences and group collaboration, students were exposed to different traditions, languages, and worldviews. This fostered tolerance, empathy, and respect for diversity—values that are essential in today's interconnected world. Many new friendships were formed, and the bonds created during the mobility continue to inspire ongoing communication and cooperation among participants and partner schools.

The pedagogical methods applied throughout the project supported active learning, self-directed exploration, and problem-based education. By combining structured workshops with open-ended inquiry and reflection, students gained both academic knowledge and essential life skills such as critical thinking, teamwork, adaptability, and resilience. Teachers, too, benefited from the exchange of ideas and best practices, enriching their teaching strategies and reinforcing their roles as facilitators of learning rather than transmitters of information.

All planned objectives of the project were fully achieved. Students not only acquired new knowledge but also developed a deeper understanding of how learning can be dynamic, interdisciplinary, and personally relevant. The activities were thoughtfully designed to be inclusive, engaging, and adaptable, allowing all participants to contribute meaningfully and feel valued.

One of the most notable impacts of the project was the shift in mindset among students. Many expressed that the most memorable learning happened outside the traditional classroom—when they could touch, observe, experiment, and actively participate in the learning process. This confirms that experiential education is not just an alternative approach, but a necessary evolution in modern pedagogy.

CONCLUSIONS

In conclusion, the Erasmus+ project "Practical is More Logical" has successfully demonstrated that practical learning is not only logical—it is essential. It nurtures inquisitiveness, inspires innovation, and empowers students to connect education with the real world. This project has left a profound imprint on all participants, equipping them with knowledge, values, and skills that extend far beyond the classroom.

We strongly believe that the spirit of this project will continue to live on in future collaborations, classroom practices, and international partnerships. It is a model of how education can evolve to meet the challenges of the 21st century—by being inclusive, practical, engaging, and, above all, meaningful.

Irena Bachikj, Biljana Stevoska, Vera Gushevska - Vojneska, Violeta Nikovska, Slavica Kicheec

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The implementation of the project is deemed successful, with all initial objectives achieved. The execution of the different student mobility phases in the three countries was exemplary, effectively connecting the teaching of Natural Sciences with everyday life in an experiential and multimodal manner. This approach engaged students in the learning process and cultivated skills in communication, collaboration, metacognition, technology, career development, and life. The interaction between students and teachers outside the school environment proved particularly beneficial, significantly strengthening their relationships and mutual respect.

The outcomes of the project include photographic and video material that was produced and published on the school's website and blog, enhancing the school's outreach and promoting the dissemination of good practices within the broader educational community.

The five interdisciplinary lesson plans, along with all the accompanying educational material that was created, aim to spark students' interest in the Natural Sciences—Biology, Chemistry, Physics, Geography—and in Mathematics. These resources will be utilized by fellow educators in the coming school years to connect the curriculum content of these subjects with everyday life, improve the quality of teaching, engage students more actively in the learning process, and help them acquire new skills.

The outcomes and experience gained from this project can be used by colleagues both within and beyond the school, and can be applied to other subject areas as well, through the dissemination of these educational practices via the school's website and social media platforms.

The factors that facilitated the achievement of the project's goals were the effective organization and planning of the different phases of student mobility in the various countries, as well as the excellent collaboration and communication among the participating educators—both with each other and with the students.

Any difficulties that arose were successfully overcome thanks to the exemplary cooperation and proper planning by the Coordinating Teachers from all parties involved.

Dimitra Katsouli, Michail Mantzaris

CONCLUSIONS

Uneven inclusion of practical education in school curricula
In all three partner countries (Poland, Greece, North Macedonia), practical education in the field of natural sciences has so far been treated incidentally – without a permanent, systemic rooting in the curriculum. Practical classes are not an integral part of the programme and rarely serve to help students acquire specific skills.

The effectiveness of interactive scenarios and increased student engagement
The development of interactive lesson scenarios and games (city games, board games) engages students and teachers emotionally and stimulates their activity, especially in the teaching of natural sciences. We have noticed that practical activities, such as chemical and biological experiments and solving mathematical problems in real-life contexts, have significantly increased student engagement in the learning process. Students showed greater interest in topics that they could test empirically or apply in practice. **Systematic integration of learning through action is needed – project-based methods, field research and activating teaching strategies are rarely part of everyday teaching, but they are very much needed.**

The need for permanent integration of practice and development of practical skills
Lack of a systematic philosophy for implementing practical classes. Our project has shown that such activities should be part of the curriculum, not just an addition. Teachers often use traditional methods focused on preparing for exams rather than developing scientific competences and attitudes. This is also due to overloaded curricula and pressure to achieve results. Practical experiments are extremely time-consuming, expensive and require a lot of commitment from teachers, but they are very worthwhile because they lead to a better understanding of theory. Combining theory with practice made it easier for students to understand difficult topics. Thanks to the experiments, students were able to observe chemical and biological processes live which allowed them to better assimilate the material and understand the connections between different fields of science.

Classes should be held outside of school which increases their appeal and practicality
Educational trips and field classes conducted in parks, forests, lakes or rivers encourage observation, experimentation and building bonds with the local environment, but also learning about the natural environment that surrounds us. Therefore, local resources could be used more often in lessons – e.g. to study air/water quality, create herbariums, bird feeders, monitor biodiversity, which will develop students' practical skills (as shown by Polish city game scenarios and lesson scenarios).

Building connections between subjects
The project showed that science subjects are interconnected and that skills acquired in one area (e.g. mathematics) can be successfully applied in another (e.g. chemistry or biology). This helped students to better understand the interdisciplinary nature of knowledge.

Teacher training and support
Programmes containing educational games should be supported by, for example, Teacher Education Centres and trainings organised by the Ministry of Education. It is crucial for increasing staff competences.

Practical conclusions
Conducting experiments and solving problems in a practical way allows knowledge to be consolidated in a more lasting and user - friendly manner. Students are more willing to learn through action than through lectures or talks. The project method, and above all the method of practical classes and exercises promote cooperation in groups and develops creativity and independence.

Jarosław Budnik, Edyta Ołdziejewska-Budnik, Urszula Lipska

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