2023-2-BG01-KA210-SCH-000180168

Educational CONTENT

FEMALE STEAM MINDSET
GIRLS IN MEN'S WORLD

Co-funded by the European Union

TABLE OF CONTENT

FEMALE STEAM MINDSET
GIRLS IN MEN'S WORLD

Co-funded by the European Union

ICONS MAP

Duration

School subject

Description

Lesson plan

Key Concepts

Preliminary preparation and needed materials

Learning objectives

Expected difficulties

Expected results

Evaluation

Practical application

FEMALE STEAM MINDSET
GIRLS IN MEN'S WORLD

Co-funded by the European Union

Back to Top

WELCOME MESSAGE

The gender gap in STEM fields persists globally, with women's representation below 30% of researchers according to UNESCO. UNESCO Fact Sheet (2019). Women in Science.(2022) Studies reveal lower interest among females in STEM compared to males, with social inclusion factors impacting this trend. Inclusive STEM schools show promise in cultivating interest and talent among underrepresented students. Europe faces a shortage of ICT workers due to fewer women in computer science, and early decline in STEM interest is evident. https://news.microsoft.com/wp-content/uploads/2017/02/Microsoft_girls_in_STEM_final-Whitepaper.pdf This issue threatens future job markets and economic competitiveness. It is a pressing societal concern, hindering EU's educational goals and economic resilience. Underachievement rates in basic skills remain high, undermining progress and equality. Addressing these challenges is crucial for balanced STEM engagement and sustained growth.

WELCOME MESSAGE

In line with the selected priorities of promoting both inclusion and diversity, and nurturing interest and excellence in STEM through the STEAM approach, we delineate the following objectives:

- Stimulate Curiosity: Utilise artistic elements and sports to kindle interest in STEM.
- Foster Comprehension: Create an understanding of STEM concepts through creative expression and physical challenges.
- Build Confidence: Empower girls with diverse learning styles to explore STEM fields confidently.
- Promote Equality: Work towards reducing the gender gap and encouraging inclusivity in STEM education.

In light of the prevailing gender gap in STEM globally, our project aims to engage girls more actively in STEM sciences. The innovative program, which brings together art, sport and STEM, promises an engaging learning environment tailored to increase curiosity, build confidence and foster understanding in girls. We believe that this will not only pave the way for closing the gender gap, but also strengthen the EU's steps towards inclusion, diversity and excellence in STEM and STEAM.

EDUCATIONAL CONTENT FOR STUDENTS

Analysing Sports Through Multimedia Arts

5 Lessons of 45 minutes each

This topic explores the critical intersection of biology, physical education, and health sciences by focusing on how breathing influences energy transformation in the human body, particularly in sports and physical activities. Breathing is a fundamental physiological process essential for life, playing a vital role in delivering oxygen to our cells and removing carbon dioxide. Understanding this process is crucial for athletes and anyone engaged in physical activities, as it directly impacts performance, endurance, and overall health. Students will experiment with this topic through several activities and the creative development of digital posters in Canva.

- Respiratory system
- Breathing as power support
- Box breathing
- Diaphragmatic breathing
- Intensity of physical activities
- Meditations
- Educational Posters

- Understanding of the Biological Mechanisms of Breathing
- Exploration of the Physiological Impact of Physical Activities
- Learning about the Benefits of Breathing Techniques
- Developing Communication and Presentation Skills
- Encouragement in Artistic Expression
- Application of Knowledge to Real-Life Situations
- Promotion of Collaborative Learning

FEMALE STEAM MINDSET
GIRLS IN MEN'S WORLD

Co-funded by the European Union

Back to Top

Analysing Sports Through Multimedia Arts

- Students will clearly understand the respiratory system's structure and function, including how oxygen is transported and utilised in the body.
- Students will recognize how different activities (physical exercise, meditation, and breathing exercises) affect breathing patterns and energy levels.
- Students will develop the ability to conduct simple experiments and observations related to their breathing and physical activities, enhancing their scientific inquiry skills
- Students will improve their ability to communicate complex scientific ideas clearly and effectively by creating and presenting posters.
- They will enhance their public speaking skills and confidence in presenting information to their peers.
- Students will strengthen their ability to work collaboratively in groups, sharing responsibilities and contributing to a common goal.
- They will practise cooperative problem-solving and decision-making skills.

Analysing Sports Through Multimedia Arts

The interdisciplinary approach in the subject includes the following practical applications:

- Respiratory System—Understanding the respiratory system helps students appreciate how their body supplies oxygen during physical activities and how this impacts overall performance.
- Gas Exchange - Learning about gas exchange enables students to understand the importance of efficient oxygen delivery to cells and carbon dioxide removal.
- Cellular Respiration—Grasping the steps of cellular respiration allows students to see how energy (ATP) is produced and why oxygen is vital for athletic performance
- Efficient Breathing - Understanding efficient breathing helps athletes (and can be applied to every person) optimise their oxygen use, enhancing endurance and performance.
- Physical Activity - Students will understand that intense physical activity demonstrates how exercise increases breathing rate and oxygen demand.
- Meditation - Practising meditation shows how deep, controlled breathing can relax the body and conserve energy.
- Breathing Exercises - Practising specific breathing exercises helps students improve their breathing efficiency and energy levels.

Analysing Sports Through Multimedia Arts

- Biology
- Sports
- Arts
- Technology
- Communication

Introduction

Before the class, watch this video on how humans and animals use respiration to power their cells with energy that can be transformed into movement (video link). If the student's knowledge of English is sufficient, the video can be played in class as well.
Explain to students that they need oxygen to use the energy they store. Humans need this energy for their functions but can also use it for sports and physical activities.
One way to acquire oxygen is through breathing. Humans breathe around 12 times per minute. Ask students to count the number of times they breathe during one minute.
Share the results among students.

Work on the topic

Lesson 1&2: Introduction to Breathing and Energy Transformation

Biological Explanation:

- Respiratory System: Explain the structure and function of the respiratory system, including the nose, trachea, lungs, and diaphragm. You can use this video as an example: video
- Gas Exchange: Describe how oxygen is inhaled into the lungs, diffuses into the blood, and transported to cells. Explain how carbon dioxide, a byproduct of cellular respiration, is exhaled.
- Cellular Respiration: Discuss how cells use oxygen to produce energy (ATP) through cellular respiration, highlighting the steps of glycolysis, the Krebs cycle, and the electron transport chain.

Importance in Sports:

- Explain how efficient breathing is crucial for athletes to maintain high energy levels and performance.
- Different intensities of physical activity require varying amounts of oxygen; every person should do physical activity, especially high-intensity ones. You can check this video to understand the importance of physical activity (video).

Work on the topic

Experiments:

- Physical activity:
  - Activity: Engage students in a short, intense physical activity (e.g., running in place, jumping jacks, or a quick game of tag).
  - Observation: Have students notice and record changes in their breathing rate and depth during and after the activity.
- Meditation:
  - Activity: Guide students through a brief meditation session focused on deep, controlled breathing. You can play this meditation in the class.
  - Observation: Ask students to pay attention to how their body feels during deep breathing compared to when they are active.Share with students that meditation as a breathing exercise has mental benefits, helping them in both their daily lives and during exams. Regular meditation reduces stress and anxiety by lowering cortisol levels. It boosts focus and concentration, productivity and learning and improves memory and cognitive function, which is crucial for retaining and recalling study material.

Work on the topic

3.Breathing Exercises:

- Activity: Teach students specific breathing exercises such as diaphragmatic breathing (breathing deeply into the belly) and box breathing (inhaling, holding, exhaling, and holding for equal counts). Choose one style and practise it with students.
- Observation: Have students practise these exercises and observe how controlled breathing affects their energy levels and sense of calm.

Lesson 3 & 4: Group Work - Creating Posters on Breathing and Energy Transformation

Introduction:

- Recap the activities from the previous lesson.
- Explain the task: Each group will create a poster that explains how their assigned activity affects breathing and energy transformation. Students will work with the Canva platform to create digital posters. To explain how to create a poster in Canva, you can play this guide. Students can either use a free Canva account or, if the school has a pro-Canva version available, for more possibilities within the software. Set up a Canva account before the lesson and share log-in information with the class after explaining how to edit the poster in Canva.

Work on the topic

Group Division:

- Divide the class into three groups, each focusing on one type of activity:
  a. Physical Activity Group
  b. Meditation Group
  c. Breathing Exercise Group

Group Work:

Physical Activity Group:

- Ask the group to create a poster explaining the impact of physical activity on breathing rate, and oxygen intake. Encourage students to include diagrams showing how oxygen is used during exercise and how increased physical activity demands more oxygen and energy.

Meditation Group:

- Students should create a poster explaining how meditation affects breathing patterns, relaxation, and energy conservation.
- The group can use illustrations to show deep breathing techniques and their benefits on the body and mind.

Breathing Exercise Group:

- This group should create a poster explaining how specific breathing exercises can enhance breathing efficiency and energy levels. For example, they can provide step-by-step instructions for performing these exercises.

Work on the topic

Lesson 5: Group Presentations and Discussions

Introduction:

- Briefly remind students of the objective of the lesson: to share their findings on how different activities affect breathing and energy transformation.

Group Presentations:

- Each group presents their poster to the class (approx. 8 minutes per group).
- Groups explain their posters in detail, discussing the scientific principles behind their findings.

Discussion and Reflection:

- Class Discussion: Facilitate a discussion on the presentations by asking following questions:
  - What did you learn about the relationship between breathing and energy transformation?
  - How can this knowledge be applied to improve performance in sports and daily life?

Work on the topic

Wrap-Up:

- Summarise the key points discussed during the presentations.
- Explain that during those 3 lessons, students had a chance to study
- not one but 3 subjects simultaneously.
- Multimedia arts (Canva poster)
- Sports (exercises)
- Biology (respiratory system)

Preliminary Preparation:

- Review Content: Familiarise with the respiratory system, gas exchange, and cellular respiration.
- Prepare Videos: Select and queue up educational videos on the respiratory system and the importance of physical activity. (videos are linked in the lesson plan)

Materials:

- Computer and projector for showing videos
- Internet access or pre-downloaded videos
- Space for physical activities
- Yoga mats or comfortable seating for meditation
- Observation worksheets and writing utensils
- Access to Canva (provide login details if using a class account)

Analysing Sports Through Multimedia Arts

Materials

- Stopwatch or timer for timing physical activities and meditation sessions
- Comfortable seating or space for physical activities and meditation

- Students may need help understanding complex biological concepts like cellular respiration and gas exchange.
- Some students may find physical activities too strenuous or have health issues limiting their participation.
- Students may need help creating posters using Canva or other digital tools, especially if they lack prior experience.
- Group dynamics can vary, with some students possibly dominating the group work while others may not participate fully.
- Completing the poster within the given time frame might be difficult, particularly for more detailed and artistic presentations.
- Some students may experience anxiety or discomfort when presenting their work to the class.

- Students' dedication, involvement in group projects, and individual contributions are valued when actively participating in all project-related activities.
- Tasks aimed at students' understanding of respiratory function through the creation of posters.
- Visual creativity with the explanation of creating exercises when creating posters.
- Presentation skills when sharing final digital posters.
- Feedback during the class wrap-up session.

Geometry in Motion: Robotics Meets Fine Art

4 Lessons (45 minutes each) or 2 lessons (90 minutes each)

At this interdisciplinary topic, students will discover how geometric shapes have been used throughout art history, learn to describe them in English, and then program LEGO robots to create and showcase these shapes through movement. They'll also engage in mathematical calculations related to the shapes and create their own artwork incorporating geometric elements.
Recommendation: if possible make two block lessons of 90 minutes.

- Geometry: shapes, angles, perimeter, area, symmetry.
- Robotics: programming, movement, sensors.
- Art History: influence of geometric shapes in different artistic movements.
- English Language: vocabulary for shapes and descriptions, communication skills.
- Mathematics: calculations of perimeter, area, angle measurements.

Geometry in Motion: Robotics Meets Fine Art

- Identify and name basic geometric shapes (circle, triangle, square, rectangle, pentagon, hexagon, octagon) in English.
- Describe the properties of these shapes using appropriate geometric terminology in English.
- Understand the relationship between code instructions and the resulting robot movements.
- Recognize and discuss the use of geometric shapes in works of art throughout history, citing specific examples.
- To foster innovative thinking by combining technical skills with artistic design.

- Gain a deeper understanding of the interplay between geometry, art, and technology.
- Improve English language skills related to STEAM vocabulary and communication.

Geometry in Motion: Robotics Meets Fine Art

- Develop proficiency in identifying and describing geometric shapes using appropriate vocabulary.
- Enhance their programming skills and understanding of robotic movement.
- Strengthen their mathematical abilities through practical applications of geometric concepts.
- Express their creativity through the creation of geometrically inspired artwork.
- Improve communication and collaboration skills through teamwork and presentations.
- Be more engaged in learning through hands-on, collaborative activities.

- Maths
- Robotics
- English language
- Fine art
- History

Introduction

Lesson 1

Introduce the role of the geometric figures in fine arts throughout history. Show paintings of famous artists that used geometrical figures in their paintings like Piet Mondrian, Bridget Riley, Frank Stella, Sonia Delaunay, ect.

Geometry in Motion: Robotics Meets Fine Art

Introduction

*(Geometric figures have played a significant role in fine arts across various cultures and time periods. In Ancient Greece, the Geometric period (circa 900-700 BCE) is renowned for its dominance of geometric motifs in vase painting, reflecting a clear and ordered aesthetic in Greek art (The Metropolitan Museum of Art). Similarly, the Bauhaus movement in early 20th century Germany integrated geometry into modern design and architecture, focusing on abstract forms and functionalism, which were expressed in furniture, textile patterns, and other artworks.)

Work on the topic

Introduce basic geometrical figures with description in the English language. (Circle: A perfectly round shape where all points on the edge are the same distance from the centre;

Triangle:A closed shape with three sides and three angles;
Square:A shape with four equal sides and four right angles;
Rectangle:A shape with four sides, where opposite sides are equal and all angles are right angles;
Pentagon:A closed shape with five sides and five angles;
Hexagon:A closed shape with six sides and six angles;
Octagon:A closed shape with eight sides and eight angles.)

Work on the topic

Give the students flash cards/notes with written figures and a sentence with description and a drawing of them. Students should connect them.

Lesson 2

Divide the class in small groups. Instruct them that they will receive secret notes with different geometrical figures that they need to program a lego robot to show through motion. The other teams should guess the shape and call the names in English.

*You may use Scratch, Python or Java or different programming languages.

Support teams during the process. Give them suggestions for the robot to use light signals at every angle/corner, to make it easier for guessing.

Provide the necessary time and support for finishing the task.

Lesson 3

Every group shows the programmed robot, the rest of the class is guessing the figures.

Once the figure is recognised, it should be measured, and a certain mathematical calculation or operation should be performed.

*It could be to draw them in their notebooks and measure the angles, or to calculate the perimeter and the face of the geometric figure.

Do this for the figures of all the groups.

Then let every student make a drawing in which to include one geometric figure by their own choice.

Lesson 4

Students are showing their drawings in front of the class and the class is finding the hidden/used geometric figure and shouting it in English. Then they have a discussion.

Conclusion

Lead a class discussion where students share their experiences, challenges, and triumphs throughout the project.

Ask questions that reflect on the connections between geometry, art, and robotics.

Discuss the potential for further exploration and real-world applications of these concepts.

- Projector for presentations.
- Flashcards or visuals of geometric shapes.
- Notes with written sentences with description of the geometric figures.
- LEGO robotics kits with programming software.
- Computers or tablets with programming software installed (e.g., LEGO Mindstorms, Scratch, or any suitable programming environment that works with LEGO robotics).
- Art supplies (paper, markers, paint, etc.).
- Measuring tools (rulers, protractors).
- Notebooks and pencils for sketching and calculations.

Geometry in Motion: Robotics Meets Fine Art

- Some students may struggle with programming or abstract mathematical concepts. Provide differentiated instruction and additional support as needed.
- Time management can be a challenge. Ensure that each lesson has a clear structure and pace.
- Group dynamics may require attention to ensure equitable participation and collaboration.

- Use a kahoot or another tool to assess the geometric understanding and mathematical application.
- Observe student engagement and participation in discussions and presentations.
- Collect student reflections on their learning experiences and challenges.

The Harmony of Nature Through the Lens

4 Lessons of 40 minutes each

The theme focuses on the research and study of the ecosystem close to the school through an interdisciplinary approach. The intersection of the included disciplines - biology, fine arts, music and physical culture - is a focus on biodiversity, physical activity and knowledge about environmental protection.
Through outdoor observations in nature, students study the interaction between plants and animals, ecological factors, and the impact of human activity on the ecosystem. Photographs aid the research process and are a way to document the diverse life in the ecosystem.
Recognizing sounds from nature and creating musical works reflect the connection between natural phenomena and art, while promoting students' creativity and perception.
Outdoor physical activity supports the healthy lifestyle of students. The process of creating photographic collages involves the use of image processing technologies. All these activities demonstrate students' knowledge and skills in different areas by engaging them in active inquiry learning.

The Harmony of Nature Through the Lens

- Ecosystem
- Biodiversity
- Photographic images
- Photo collage
- Recycled materials
- Musical instruments
- Ecopath
- Protection of the environment
- Interdisciplinary approach
- Active learning
- Cooperation
- Creativity

- To learn about different biological species and their habitats through photographic research;
- To reveal the interrelationship between biological principles and different elements of photography - composition, lighting and choice of object;
- Exploring the relationship between music and nature;
- Acquiring practical skills for taking photos that show the beauty in nature;
- Developing skills for visual presentation of stories and creativity through photographic material;

The Harmony of Nature Through the Lens

- To acquire practical skills for sketching the photographed biological objects;
- To build connections between different scientific disciplines and the arts;
- To make a photo collage or collection of photos based on specific biological criteria: plants, fungi, animals; plant organ diversity; natural phenomena;
- To develop observation, cooperation and communication skills.

- Acquired knowledge about different biological species and demonstrated a deeper understanding of biological diversity;
- Acquired skills for taking photographic pictures and telling stories through images;
- Acquired practical skills for drawing the captured biological objects;
- Created musical works inspired by the sounds and movements in nature;
- Improved teamwork and communication among students;
- Aware of the interrelationship between different scientific disciplines and the arts;
- Developed skills for critical thinking, creative expression and collaboration;
- Acquired skills for preserving ecosystems and nature conservation.

The Harmony of Nature Through the Lens

- Biology
- Music
- Fine Arts
- Physical culture
- Photography

Introduction

- Presentation of the topic and objectives of the lesson.
- Introducing students to the basic principles of photography.
- Lecture on species diversity of organisms in nature and their habitat.

Work on the topic

Followed by hands-on activities related to observing nature and taking pictures.

1. Outdoor observation in nature:

Students go out into the school yard, park or other nearby natural environment. They are pre-divided into groups of 2-3 people each, and each of them has the task of observing different types of plants, animals, insects. Students use all their senses to observe organisms, sounds, and movements in nature. The groups also look at individual elements of the ecosystem, such as the interaction between plants and animals or the impact of the environment on biodiversity, pollutants. Each group keeps notes (worksheet) to explain the complex interactions in the ecosystem.

Work on the topic

2. Nature photography:

Students use cameras or smartphones to capture what they observe. They focus on details, such as the different types of leaves of deciduous and coniferous plants, the patterns on the wings of butterflies, the bark of trees or interesting natural forms and phenomena. Each group worked together to create a collection of photographs representing the diversity of life in the ecosystem.

3. Exploring sounds from nature:

Students explore the different sounds that can be heard in the environment - of birds, insects, wind or other natural phenomena.

4. Outdoor physical activity:

A walk along the eco-path in the observed ecosystem; running, yoga, gymnastics.

5. Photo Analysis:

Students return to the classroom and analyse the photos taken by uploading them to a computer or laptop. They use their notes to help themselves with information about what they saw in each picture - the type of plant or animal, its features and its lifestyle.

6. Choosing the most suitable photos for a photo collage:

The photos should complement each other and tell about the biological diversity in the observed ecosystem.

Work on the topic

7. Create photo collages and/or photo albums:
Arrange photos, add short text, use image processing software.

8. Creating musical instruments from recycled materials:
Students use their imaginations and using recycled materials (plastic bottles, drink cans, wooden sticks and others) make musical instruments;

9. Improvisation and Composition:
Students use their voices, their bodies and the instruments they have created to improvise and compose musical pieces. They should include sounds that resemble observed natural phenomena - the singing of birds, the sound of the wind or the babbling of the river. They can imitate the movements of animals in nature - flapping their arms like a bird, jumping like a frog or crawling like a snake.
Students work together in groups to develop choreography for their short performance. Through their movements, they will have to tell about the harmony in the relationship between man and nature. Time is set aside for rehearsal and performance.

10. Filming the choreographic performances:
Videos;

11. Presentation:
Each group presents their photographic collages, musical works and choreographic performances to the rest of the class and invited guests - parents, teachers, school management.

Work on the topic

Conclusion:

A short closing talk about the achievement of the set goals of the topic and an assessment of the students' progress.

Reflection and feedback from students.

We thank the students for their participation and activity.

- Computers or laptops;
- Cameras or mobile phones with a camera;
- White sheets of paper, A4;
- Colored pencils or markers;
- Sound recording device or computer with sound recording software;
- Software for processing photos and creating a photo collage;
- Materials for recycling - tin cans, wooden sticks, plastic and glass bottles.

- Adverse weather conditions that may make outdoor observations difficult or impossible;
- Noise from vehicular traffic or other human activities can prevent students from hearing the sounds of nature;
- Depending on the location, there may be a limited number of plant and animal species to observe;
- Low light, which will make it difficult to focus and take clear photos;

The Harmony of Nature Through the Lens

- Technical problems, such as exhausted batteries, lack of memory in the phone, malfunctioning camera;
- Difficult-to-focus objects, such as small insects or fast-moving animals;
- Lack of patience and loss of interest among students if they fail to capture the desired photos quickly;
- Difficulties in recognizing types of plants and animals and sounds in nature;
- Lack of computer skills for image processing;
- Inability to find appropriate photos and make a photo collage of the observed ecosystem.

- Students will be assessed through their involvement during fieldwork in the ecosystem, their participation in discussions and group activities.
- Their camera skills, composition of the captured moment, ability to analyse photographs, identify plant and animal species, draw conclusions and interpret data will be assessed.
- The quality of the created photo album will be evaluated - content, selected photos, organisational skills.
- The accuracy, clarity and persuasiveness of the information presented in the student-created poster/brochure, as well as the students' skills in presenting their projects, will be assessed

From Nature to Neighbourhood: Designing Sustainable Living Spaces

4 Lessons of 45 minutes each

This lesson plan explores the relationship between architecture and engineering, emphasising the design and construction of sustainable structures. Through four lessons, students are introduced to the architectural ingenuity found in nature, the evolution of human construction, and the practical application of these concepts in creating eco-friendly buildings. The goal is to inspire students to integrate natural elements into creative, functional designs for energy-efficient buildings.

- Sustainable buildings
- Use of natural materials in construction
- Energy and water efficiency in architecture
- Evolution of construction techniques
- Natural structures
- Design
- Creativity
- Drawing sketches
- Teamwork

- To recognise and draw inspiration from the natural structures and traditional methods in designing sustainable buildings.
- To understand the shift from natural to engineered materials in construction and explore the reintegration of natural elements in modern architecture.
- To design and construct a model of a sustainable building incorporating natural materials and energy-efficient designs.

FEMALE STEAM MINDSET
GIRLS IN MEN'S WORLD

Co-funded by the European Union

Back to Top

From Nature to Neighbourhood: Designing Sustainable Living Spaces

- Deeper understanding of sustainable architecture principles and their application in modern contexts;
- Created original construction of architectural models;
- Hands-on experience in designing and building architectural models.
- Improved teamwork and communication skills.
- Awareness of the environmental impact of building materials and design choices.
- Creating a sustainable building model.
- Developing teamwork and communication skills

- Science
- Mathematics
- Art
- Environmental studies
- Technology

Introduction

Lesson 1:

Begin with an interactive polling tool or app to gather students' opinions on various statements about architecture and sustainability, such as: "All new buildings should have solar panels" or "It's important for buildings to have green spaces." , "Do you think using natural materials like wood and stone in construction is better for the environment than using metal elements and plastic, considering all aspects of extraction, production, and recycling of these materials?"

Display the results live and use them as a starting point for a discussion about their preconceptions and societal views on sustainable architecture.

Work on the topic

Use a presentation to start a discussion about how animals like birds, termites, and beavers build their homes using materials found in their environment.
Information that can include:
Honeycombs exemplify geometric efficiency with their hexagonal cells, maximising storage space and minimising construction material, making them a model of material efficiency relevant to human designs in packaging and construction.
Bird Nests demonstrate diversity and adaptability, varying significantly across species to meet environmental challenges. Weaver birds, for instance, construct elaborate nests that provide protection from predators, inspiring lightweight and sustainable architectural designs.
Termite Mounds feature advanced architectural designs with internal networks that regulate temperature and humidity, some even maintaining constant internal conditions through natural ventilation.
You can show examples through a slideshow or video clips.
Let the students sketch or model an animal's home using clay or craft materials.

Lesson 2

Briefly overview of how humans have historically used natural materials like wood, stone, and clay in construction. Point out the similarities and differences with the animals' homes and the fact that with time our homes changed a lot and became very different from theirs.

Work on the topic

Encourage students to discuss what modern architecture can learn from these natural and historical examples.
Introduce the concept of sustainability in building practices.

Introduce green technologies in construction (solar panels, green roofs, rainwater harvesting).
Show how these technologies are integrated into modern buildings through videos or presentations. Show examples of modern engineering technologies and techniques that can improve the sustainability and energy efficiency of buildings.

**If you have more time you can extend by including:*

- *study of different cultural and geographical contexts in which architecture and engineering play an important role in the sustainable development of societies;*
- *an examination of the possible ethical dilemmas and social issues related to sustainable construction and its application in various societal settings.*

Work on the topic

In groups, let students brainstorm ideas for a sustainable building incorporating features discussed.
Begin sketching their designs. You can give them tasks like: “Integrate a pyramid with a volume of approximately 1 cubic unit into your design. Determine the dimensions of a square base and the height that will achieve this volume. Consider using this pyramid as an eye-catching rooftop or a central decorative element to enhance visual interest in your model.” or “Design part of your model to include a circle with a diameter of about 0.32 units, giving a circumference close to 1 unit. This could be used in designing elements like windows or decorative patterns on the building's exterior.”

Lesson 3:
Give time to the students to finalise their sketches.
Using materials such as recycled items, fabric, and natural elements like wood (if they went on observation they could pick it and other natural materials), students begin to construct a model of their sustainable building.

Lesson 4:
Let the students work and finalise their models.
Support the groups during the process.

*If you have more time you could include working with 3D modelling software such as SketchUp or Tinkercad to allow students to create digital prototypes of their designs prior to their physical construction.

Work on the topic

Conclusion:

Each group presents their model and discusses how their design contributes to sustainability.

Discussing potential real-world implementation to enhance urban sustainability and livability.

- drawing supplies: pencils, rulers, paper.
- building materials: recyclable plastics, wood scraps, fabric, wool.
- research tools: access to computers and libraries.
- visual aids: images, videos and presentations.
- clay or craft materials.

- Grasping the technical aspects of sustainable design.
- Balancing creative and practical aspects of architectural design.
- Collaboration and working together in groups to design and build structures could be challenging.

- Students will be assessed based on their engagement with the material, creativity in their designs, understanding of sustainable practices, and collaborative efforts in the project.

Dance school

6 Lessons of 40 minutes each

This interdisciplinary topic covers different skills such as design, business, creativity, dance, engaging students in a realistic project to create a dance school. Its goal is to develop problem-solving, critical thinking, collaboration, and communication skills by applying basic principles of budget planning and project management. Students are creative in visualising ideas for a dance school and creating a sketch plan, incorporating elements of fine art. As part of the process, they study different types of dance – folk, sports and classical – and develop choreographies that match their projects. The result is the creation of original and realistic projects for a specific hall in a dance school, which combine business ideas, creativity and choreography. The theme addresses practical skills in maths, art, music and physical activity through dance.

- Business and finance: Budgeting, cost planning, resource management to create a three-room dance school;
- Design: Space planning, aesthetic layout.
- Creativity: Concept development, sketch plan, visualisation.
- Dances: Knowledge of different types of dances, the needs of dancers.
- Entrepreneurship: Creating and managing your own business.
- Collaboration: Teamwork, communication, problem solving.
- Planning: Setting goals, developing strategies, allocating tasks.
- Creative thinking: Generating ideas, innovative problem solving.

Dance School

- To develop a design project for a dance school with three halls;
- To apply creative skills in the field of visual arts when visualising the idea of a dance school;
- To develop problem solving and critical thinking skills by designing a dance school concept;
- To apply basic principles of budget creation and project management;
- To develop cooperation and communication in a group by creating dance choreography;
- To stimulate creativity and innovative thinking.

- Created original and realistic projects for a hall in a dance school, according to the budget and planned activities;
- Acquired problem solving and critical thinking skills in designing a dance school concept;
- Improved creative skills in the field of visual arts by creating a plan-sketch, presenting a vision for a dance school;
- Acquired practical skills for applications of mathematics, proportions, symmetry, spatial thinking, physical activity and creativity in dance;
- Created choreographies of different types of dances - folk, sports, classical;
- Developed teamwork, cooperation and communication skills.

- Mathematics
- Music
- Physical education
- Arts
- Information technology
- Technology

FEMALE STEAM MINDSET
GIRLS IN MEN'S WORLD

Co-funded by the European Union

Back to Top

Dance School

Introduction

The topic begins with a talk about students' interests in dance and how to determine if a dance school is good.
Following is an introduction to the topic of the lesson: "Dance School" and a brief explanation of the connection between mathematics and dance.
A discussion of the different types of dance and their impact on culture and physical health.
The different types of dances that will be included in the project are presented: folk dances, sports dances and classical dances.
The main problem is posed: How can a room be divided into three parts, so that different dances can take place in each of them, taking into account the principles of mathematics, geometry and proportions?

Work on the topic

Preparation for participation in project activities:
Students are divided into three working groups of 5-6 people.
Each group is given the task of dividing a room into three parts dedicated to folk dances, sports dances and classical dances.
Students must measure the dimensions of the room, calculate its area, draw a plan, determine the optimal placement of the three dance halls, taking into account natural light, ventilation and other factors.

Project development:
After the room is divided into three, each team randomly selects one of the future rooms.

Dance School

Work on the topic

The team develops a creative project for the design of its part of the room: a sketch of the hall, taking into account the chosen type of dance, size, natural light, availability of dressing rooms and others.
Students use elements of fine art: colours, layout to make their venue attractive and inspiring to dancers.

• Determining a budget for renovations, equipment, costumes, choreography and music;
• One student on each team takes on the role of "CFO", calculating costs for equipment, rent, instructor salaries, and more. The rest of the team can help with the research part by finding average prices for the various costs;
• Costume ideas are developed, combining traditional elements with modern trends and geometric shapes;
• Create a choreography involving basic movements of the chosen type of dance, using mathematical figures and proportions in the movements;
• Selection of appropriate music for the dances;
• Students use different resources - internet, videos, interviews and others of their choice;
• Create a sketch with appropriate materials or through a design software product that shows the team's concept of the dance school hall. Photographs of dancers, clothing, props and other items deemed appropriate may be included. The sketch should reflect the overall atmosphere and feel of their place in a dance school.

Work on the topic

Rehearsals:

• Each team rehearses their project, focusing on the dance moves, choreography and music.

Music and physical education teachers help teams perfect their movements and timing.

To energise and prepare for the dance activities, students do a short warm-up that includes coordination, flexibility, and balance exercises, as well as exercises related to mathematical figures, proportions, and geometric shapes.

Presentation:

Each team presents its project to the other students of the class and the teachers, highlighting the most important features: floor plan, information about the chosen type of dance, its music and costumes, budget and a short demonstration of the developed choreography.

Work on the topic

Conclusion:

The topic ends with a group reflection in which the students discuss the following questions:

- What did you learn from the topic?
- What was most interesting to you?
- How was the process of designing a hall at the dance school?
- What challenges did you face creating your project?
- How would you improve your project if you had more time?

Students' collaborative, creative and mathematical application skills are assessed.

- Paper, pencils, markers for sketching ideas, making plans, budgeting;
- Materials for a sketch of the hall project (clippings from magazines, newspapers, coloured paper).
- a drawing of the room that will be used for a dance school;
- Calculator or application for drawing up a budget;
- A computer with Internet access for searching information.

Dance School

- Combining knowledge from different fields and integrating them into a realistic project;
- Budget planning of student projects, costs, management;
- Good visualisation of student ideas and presentation in an attractive way;
- The creation of a choreography that corresponds to the project for a hall in the dance school, details, planned activities;
- Lack of good communication and coordination of team members, leading to disagreements and delay in progress;
- Limited time to complete the project, because the students have other learning tasks;
- Maintaining the motivation and commitment of all students in the project;
- The definition of fair criteria for evaluating projects and constructive feedback to students.

- Students will be assessed on the performance of project tasks: their ability to develop and present a detailed plan for the dance school, mathematical skills for budgeting, scheduling, allocation of tasks and responsibilities. Skills to create visualisations, sketches to represent the ideas of the dance school will be assessed.
- Students' dance performances will be judged on creativity, technique, synchronicity and artistry.
- The evaluation of the students will also include their contribution to the cooperation in the team, distribution of roles in it, communication, coordination of actions.

Integrating Technology and Science into Physical Education

2 Lessons of 45 minutes each

During this lesson, students will understand how integrating technology and science into physical education provides a comprehensive approach to supporting physical fitness through the intersection of multiple disciplines. This lesson connects modern technology, such as fitness apps and virtual reality (VR), to create engaging and personalised workout experiences while deepening students' understanding of physiological and biomechanical principles. By combining physical education with insights from biology, students learn how the cardiovascular system responds to exercise, using technology to monitor heart rate and analyse performance.

- Cardiovascular System
- Physiological Responses
- Virtual Reality (VR)
- Health Monitoring

FEMALE STEAM MINDSET
GIRLS IN MEN'S WORLD

Co-funded by the European Union

Back to Top

Integrating Technology and Science into Physical Education

- Students will learn about the structure and function of the cardiovascular system, including how the heart, blood vessels, and blood work together to deliver oxygen and nutrients during physical activity.
- Students will develop the ability to monitor and interpret physiological data, such as heart rate and calories burned, using fitness apps.
- Students will gain proficiency in using VR technology and fitness apps to enhance their workout experiences and track performance.
- Students will improve the technical skills needed to effectively use fitness apps, VR headsets, and motion sensors, preparing them for future technological advancements in fitness and health.
- Students will better understand the cardiovascular system and how physical activity impacts heart rate, oxygen delivery, and overall cardiovascular health.
- Students will learn how to effectively use fitness apps and VR technology to monitor and improve physical fitness.
- By recording and analysing physiological data such as heart rate and calories burned, students will enhance their ability to interpret and use data to inform their fitness routines.
- Students will develop proficiency in modern fitness technology, including fitness apps and VR equipment.

- Participation in physical activities will help improve students' physical fitness levels, promoting healthier lifestyle habits.
- Students will learn to identify and solve problems related to integrating technology into fitness, such as troubleshooting technical issues and optimising workout plans based on data analysis.
- Integrating subjects like biology, technology, and health education will likely spark interest across multiple disciplines, encouraging students to explore further learning opportunities in these areas.

- Biology
- Technology
- Sports
- Health Education
- Science

Introduction

You can watch this video about how technology is backed by science to help people with their fitness routines. Ask students to download a fitness app on their mobile phones and give them a few minutes to explore what such an app covers. Share with students that in this class, students will understand the importance of cardiovascular systems and together you will explore how technology and science can support physical education and improve fitness outcomes.

Work on the topic

Lesson 1: Integrating Technology and Science into Physical Education

Biological Explanation
Cardiovascular System
Structure and Function

Explain the structure and function of the cardiovascular system, including the heart, blood vessels, and blood. Discuss how the heart pumps blood through the circulatory system to deliver oxygen and nutrients to tissues. If students have sufficient English, you can play this explanatory video.
Explain how the heart rate increases during physical activity to supply more oxygen to muscles. You can show students that they can feel their pulse on the back of their arms or neck. Here is a video on how to measure your pulse. Ask students to measure their pulse while they are sitting.
Importance in Physical Education:
Explain that students can improve their workout efficiency, optimise performance, and support overall cardiovascular health by understanding the cardiovascular system and using this knowledge in the training.

Technology (fitness apps, VR, motion sensors) can monitor physiological data, analyse movement, and provide personalised feedback for better performance.

Work on the topic

Peer-to-Peer Learning:
Assign students to small groups and have them research different aspects of technology in physical education.
Topics can include fitness apps, VR workouts, motion sensors, and other technological advancements related to fitness and health.
Explain to students that they will summarise their findings in the following class. The summary should be around 5 minutes long. There is no need for a presentation.

Lesson 2: Experiments

Start the lesson by listening to each group of students present their findings. After that, explain that in this class, students will experiment with different workout fitness apps/ virtual reality.

Experiments:
Note: for your lesson, you can choose one activity.
Physical Activity with Fitness Apps:
Have participants engage in a short, intense physical activity (e.g., this 5-minute workout, or prepare workout in advance) while using a fitness app to track heart rate and calories burned.
Participants will notice and record changes in their heart and breathing rates during and after the activity. Discuss the data collected by the fitness app and how it relates to cardiovascular and muscular function.

Work on the topic

VR Workout Experience

Activity Explanation:

Explain that participants will use VR headsets for virtual workout sessions.
Explain that VR simulates different environments and activities.
VRs offer various fitness experiences; choose one that interests the students. By using VR for workouts, students can observe the scientific principles behind VR workouts, such as the cardiovascular system.
After you perform a VR workout with students, follow the Cool Down Routine and guide participants through a 5-minute cool-down routine to help their bodies recover.

Conclusion

Wrap-up:

Ask students to think back to the fitness app they downloaded earlier.
Ask a question to prompt student participation: "So, how does this app connect to what we learned about the cardiovascular system today?"
Encourage student responses and explain how the app tracks heart rate, a vital part of the cardiovascular system. Point out how the app monitors changes in heart rate during exercise, providing insights into workout efficiency.

Work on the topic

Briefly mention that fitness apps are one of many ways technology is used in PE. If you did the VR experiment, mention it here and explain how VR technology allows for diverse workout experiences in different environments.
At the end of the lesson, summarise the key takeaways:

- Importance of the cardiovascular system in delivering oxygen during exercise.
- How technology (apps & VR) helps monitor workouts, analyse movements, and improve fitness outcomes.
- The combined benefit of understanding our bodies and using technology tools for a more effective and fun PE experience.

Technology and Equipment:

- **VR Headsets:** Oculus Quest, PlayStation VR, or HTC Vive.
- **Fitness Apps:** Installed on smartphones or tablets (e.g., MyFitnessPal, Strava, Nike Training Club).
- **Monitoring Tools:**
- **Heart Rate Monitors**: To track heart rate during activities.
- **Pedometers or Accelerometers:** To measure steps and movement (optional).

Physical Exercise Equipment:

- **Exercise Mats:** For warm-up and cool-down exercises.
- **Audio-Visual Resources:**
- **Projector or Computer:** For displaying instructional videos and explanations.
- **Speakers:** To ensure that all participants can hear instructions and explanations clearly.

Technical Issues: Participants may need help with VR headsets, fitness apps, or motion sensors, which can disrupt the lesson flow. Comfort and Safety: Some participants might experience motion sickness or discomfort while using VR headsets.
Varying Fitness Levels: Participants may have different fitness levels, making it challenging to find activities suitable for everyone.
Space Constraints: Limited space can restrict movement, especially for VR activities that require more room.

Dixit Cards for Evaluation
Materials Needed:

- A set of Dixit cards.
- A comfortable and quiet environment for discussion.

Dixit Cards for Evaluation

Steps:

Introduction:

- Explain the purpose of the activity: to use the images on Dixit cards as a tool for reflecting on and evaluating their learning experiences.

Card Selection:

- Spread the Dixit cards face up on a table or floor where everyone can see them.
- Ask each participant to choose one card that they feel represents their experience, learning, or feelings about the topic or activity you are evaluating.

Reflection:

- Once everyone has selected a card, ask participants to take a few minutes to reflect silently on why they chose that particular card and how it connects to their experience.

Sharing:

- Invite each participant to share their chosen card with the group and explain why they selected it and what it represents to them.

Conclusion:

- Summarise the key points from the discussion and highlight any common themes or important insights.
- Thank participants for their honesty and participation.

The Sound of Science

2 or 3 Lessons of 45 minutes each

This lesson introduces students to the interdisciplinary field of sound engineering and acoustics, combining elements of physics, engineering, and music. Through experiments, students will learn about sound waves, how different materials affect sound, and the basics of sound insulation. With the newly acquired knowledge they will have the opportunity to use their imagination and create a concept for a sound machine.

- sound waves;
- wave vibration;
- acoustics;
- sound dampening;
- acoustical engineering;

- Explore the relationship between sound waves and vibrations.
- Understand the concepts of frequency, amplitude, and pitch.
- Investigate how the size and shape of objects affect the sound they produce.
- Demonstrate how sound waves travel through various mediums.
- Observe and understand how different materials affect, block or absorb sound.

The Sound of Science

- Students will understand fundamental acoustic principles and how they apply to sound engineering.
- They will gain hands-on experience in how different materials and shapes affect sound within an enclosed space.
- They will explore how sound travels through solids.
- Demonstrate how sound waves travel through various mediums and understand how different materials can block or absorb sound.
- Students will make connections between physics, engineering, and music. This will help them see the value of interdisciplinary learning and understand how different subjects can be integrated to solve real-world problems.
- Designing the sound machine will encourage students to think creatively and apply their knowledge of sound in an innovative way. They will learn to brainstorm ideas, select appropriate materials, and consider the practical implications of their design choices.

- Physics,
- Engineering,
- Music.

Introduction

Lesson 1

Introduce the topic by asking students questions to raise their interest.
Do they know what acoustical engineering is, what they think that acoustical engineers do, what school subjects are giving them the knowledge they need if they want to practise this profession?

The Sound of Science

Introduction

Invite them to become acoustical engineers for the lesson. Tell them that they will create a design for a sound machine. It could be anything they want. Tell the students that in order to design a sound machine they need to have some knowledge about sounds and you are going to guide them during the process.

Work on the topic

Start with a brief presentation on the physics of sound waves.

The experiments will help to clarify concepts like vibrations, frequency, amplitude, and how sound travels through different mediums (air, water, solids).
The concept of sound insulation, how materials can block or absorb sound, impacting noise levels.

1. Sound wave vibration visualisation:

- Stretch an empty balloon over a bowl and sprinkle it with rice or salt. When students speak or make noises into the balloon, the vibrations will cause the rice to move, visually demonstrating sound waves.

Work on the topic

- Divide students in groups. Distribute tuning forks to each student or group.

Demonstrate how to strike a tuning fork and then place it near the surface of the water in a bowl to visualise vibrations creating ripples.

- Next use a ruler, a metal strip or a tuning fork over the edge of the table.

Strike the object, and let students pull the object closer onto the table, effectively shorting the vibrational area (length) of said object.
The pitch (frequency) should increase by the shortening.

After the activities, lead a discussion about what the students observed and felt. Ask questions like:

- How did the rice/salt move on the balloon when you made different sounds?
- Which materials felt the strongest vibrations from the tuning fork? Was there a difference in how various materials reacted to the tuning fork?
- Can you think of other ways to see or feel sound vibrations? (e.g., feeling the vibrations of a drum).
- How will students explain the change in pitch when the vibrating object is shortened, will this effect also work on the other materials? Will the length of any random hard material affect how it will vibrate? What does this mean for the size of any given object, room or instrument?

Work on the topic

1. Sound Travel Experiment:

- Set up stations with different materials (a container of water, and solid blocks of material).

Divide students in pairs or small groups. One student works with the tuning fork, and the rest of the group listen to the material by using a cup. When the tuning fork is applied, the listening students will hear the sound not through the air, but through the material.

Students touch the vibrating tuning fork to various materials (wood, metal, stone) and feel the vibrations transferring through these solids.

Then students strike the material directly, making a lower pitch knock sound. When students strike the tuning fork against different materials, have them compare the resulting sound to different musical instruments. Does a metal sound remind them of a bell? Does a wooden sound remind them of a drum? Invite them to play a simple melody with the items provided.

DIY Stethoscope:
Create a simple stethoscope using a funnel attached to a tube (like a garden hose). Students can use it to listen to heartbeats and other sounds. Invite the students to explore the room.
Maybe there is a door, a wall clock, the heating system, the floor etc.

Work on the topic

Discussion: Ask them to explain how the stethoscope works? Ask students if they discovered new sounds in unexpected locations, how does the stethoscope help them hear the sounds,

Lesson 2

Start the lesson by revisiting the previous experiment. Start a discussion to connect how the concepts you explored also apply to the world of music.
ASk questions like:
How might the vibrations you saw on the balloon relate to the vibrations of a drumhead or a guitar string when they produce music?
When you sang or spoke into the balloon, did the rice move differently for high and low pitches? Why do you think that is?
Can you imagine how a composer might use different sound waves to create a piece of music with varying pitches and volumes?
About the Sound Travel Experiment: explain that the speed of sound varies in different materials. This is why instruments made of different materials (wood, metal, etc.) produce different sounds.
Discussion Questions:
Did the tuning fork sound different when you touched it with different materials? How might this relate to the sound of different musical instruments?
Why do you think the sound travels differently through water and solids compared to air? How might this affect the way music sounds in different environments?

Work on the topic

Can you think of any musical instruments that rely on the vibration of solids to produce sound (e.g., xylophone, piano)?

About DIY Stethoscope: Discuss how our bodies create their own rhythms and sounds, like heartbeats and breathing. These rhythms can be incorporated into music (e.g., heartbeat-like drum patterns).

Discussion Questions:

What did you notice about the rhythm of your heartbeat? Could you tap out a beat to match it?

How might a composer use the sounds of the human body (heartbeats, breathing) to create music?

Have you ever heard music that uses sounds from nature or everyday life? What effect did it have on you?

Continue with the next experiment:

3.Sound Insulation Testing:

Provide various materials (foam, fabric, cardboard) for students to test their sound insulating properties.

Work on the topic

Using a decibel(A) metre, students measure the effectiveness of each material in reducing noise as they strike the tuning fork and cover it with different insulators.
Record and compare the decibel levels with and without the insulation materials.
Ensure that the sound metre is used correctly and consistently to get accurate readings.

Encourage students to think about real-world applications of these concepts, like soundproofing rooms or designing concert halls.

Discussion:
What materials allowed the sound to travel through them easily? Was the sound affected by the material?
Is there a difference between the high sound and low pitch sound?
What properties of some materials make it dampen sounds?
Is there difference between dampening sounds with a high pitch and a low pitch?
If you're a sound engineer that needs to change a room's acoustics. What would you do to increase reflection and echo? What would you do to soften the effect of the room?
Explain that recording studios and concert halls use specific materials to control how sound travels and bounces around. Discuss how different types of music might require different acoustic environments.

Work on the topic

*You might challenge students to create a miniature "recording studio" using the insulation materials provided. They can use the decibel metre to measure how well their studio blocks out external noise.

Lesson 3

Give the students time to work on the project of the sound machine, it can be a drawing on paper etc.

* You may encourage them to apply some of the experiments in order to help them to assimilate the information and successfully use it in creating their own sound machine.
* If you prefer, after each lesson, you may guide the students to start fulfilling the main practical task, by following certain steps.

After the experiments, the students are able to use the recently acquired knowledge to select materials or music instruments to make sounds.
Design materials and shapes (tube) to redirect and reflect sounds, modify sounds, dampen sounds.
Consider the sizing of objects depending on the pitch of the sound.

When they are ready, students present their ideas and drawings of sound machines. They explain what knowledge they used.

Work on the topic

*Teacher background information:
Air: Sound may be heard clearly, but it dissipates over a larger distance.
Water: Sound travels faster and farther in water than in air due to the closer proximity of molecules.
Solid material: Denser materials transmit sound faster than less dense materials (like foam or fabric).
Solid materials can partly accept sounds and start vibrating with it, another part of the sound is reflected from the surface.
Sound always requires a medium to travel through, in space in a perfect vacuum there is no sound.
A sound transmission from a light carrier (air) into a solid (wood or metal) is less efficient because of the weight difference.
Dampening materials use this property by entrapment of air into separated area's making the sound traverse this transmission very often, therefore weakening the amplitude every step of the way.

Group discussion and analysis:

At the end of the lessons engage students in a discussion about their observations. Use the following questions:

- Ask them to theorise why certain materials were more effective at conducting sound.
- Why other materials dampened them, what material properties influenced their performance?

Work on the topic

- How are those principles used in our everyday life and modern technologies?
- How the sizes of things affect sound, why is a Cello larger than a violin?
- How can they use what they observed in the experiments?
- We've learned how sound engineers use science to make music sound great in a recording studio or concert hall. Can you think of other jobs or situations where understanding sound science might be important?" (Possible answers: designing quieter aeroplanes, creating sound effects for movies, developing hearing aids).

- Tuning forks
- Bowls of water, balloons, rice.
- Various solid materials (wood, metal, stone)
- Insulation materials (foam, fabric, cardboard)
- Decibel metre or smartphone/tablet with a decibel metre app

Some students may struggle to grasp the abstract concepts of sound waves, frequency, and amplitude.
Group work can be challenging due to differences in learning styles, abilities, and personalities.

Observe students during experiments and discussions. When students present their sound machine designs to the class, evaluate their understanding of sound principles, and ability to explain their design choices.

A Fusion of Science and Art in Chromatography and Cyanotype Printing

3 Lessons of 45 minutes each

This lesson plan goes beyond traditional boundaries, exploring the intersection of science and art. It consists of two fascinating topics: chromatography and cyanotype printing, offering students a unique opportunity to bridge the gap between these seemingly disparate disciplines.

Chromatography is a powerful technique for separating mixtures into their components. By employing chromatography, scientists can gain valuable insights into the composition of complex mixtures, a process with wide-ranging applications in various scientific fields.

Cyanotype printing, on the other hand, resides in the artistic domain. It utilises light-sensitive chemicals and the magic of sunlight to create stunning blueprints. Think of capturing the sun's essence on paper! Cyanotype printing offers a unique artistic process, allowing individuals to express their creativity through light and chemical reactions.

The overarching theme that ties these seemingly distinct disciplines together is the concept of analysis and creation. Chromatography analyses mixtures, revealing their hidden parts. Conversely, cyanotype printing utilises light exposure results to bring forth unique works of art.

This lesson plan actively engages students in a dynamic exploration of both science and art.

A Fusion of Science and Art in Chromatography and Cyanotype Printing

- Students will explore the concept of mixtures (substances combined physically) and how chromatography separates them into their components.
- They will understand the roles of the mobile phase (liquid or gas that carries the mixture) and the stationary phase (material that interacts with the mixture) in the separation process.
- Students will learn that different mixture components interact with the stationary phase at varying rates, leading to their separation during chromatography.
- Students will discover how certain chemicals react to light exposure, forming the basis of the cyanotype printing process.
- They will be introduced to the basic idea of chemical reactions, where the light interacts with the cyanotype solution to create a permanent blue print.
- The lesson plan allows students to explore creative expression through object placement and design choices in their cyanotype artwork.

- Students will be able to explain chromatography and describe its basic principles(mobile phase, stationary phase, separation of mixtures).
- Students can create a cyanotype print using light-sensitive chemicals and sunlight, demonstrating proper technique for solution application and object placement.

A Fusion of Science and Art in Chromatography and Cyanotype Printing

- Students will successfully identify the mobile and stationary phases involved in a chromatography experiment.
- Students will create a cyanotype print that clearly separates the exposed and unexposed areas, demonstrating successful light interaction with the solution.
- Understanding chromatography is a fundamental concept in various scientific fields, and this lesson provides a foundation for future learning.

- **Improved Understanding:** Students will gain a solid foundation in the scientific concepts of chromatography and cyanotype and their applications. They will learn how light interacts with chemicals to create cyanotype prints, connecting science with art.
- **Skill Development:** Students will develop hands-on laboratory skills through the chromatography experiment, and the cyanotype printing activity will foster their creative expression and fine motor skills.
- **Innovation:** By combining science and art, students are encouraged to think outside the box and approach problems creatively.
- **Engagement:** Combining science and art offers a more engaging and stimulating learning experience for students with diverse interests.

- Science
- Chemistry
- Arts
- Maths
- Technology

FEMALE STEAM MINDSET
GIRLS IN MEN'S WORLD

Co-funded by the European Union

Back to Top

A Fusion of Science and Art in Chromatography and Cyanotype Printing

Introduction

This lesson plan explores two interconnected concepts: chromatography and cyanotype. Designed for students, it fosters scientific inquiry, experimentation, and artistic expression.

Chromatography introduces students to a fundamental scientific technique used to separate mixtures. Through a hands-on experiment, they will observe how different components travel at varying rates, gaining a practical understanding of this crucial analytical tool.

Cyanotype provides a unique opportunity to bridge science and art. Students will utilise light-sensitive chemicals to create beautiful blueprints, effectively harnessing the power of sunlight for artistic expression. They will connect this process to chromatography principles, solidifying their understanding.

Work on the topic

Lesson 1

Introduction:

- **Warm-up:** Ask students if they've ever seen a box of crayons with mixed colours. How would they separate the colours?
- **Introduce Chromatography:** Explain that chromatography is a technique scientists use to separate mixtures into their parts. Show pictures or diagrams (optional) to illustrate the concept.

Work on the topic

Lesson 1

Introduction:

- **Mobile and Stationary Phases:** Briefly introduce the two main components of chromatography: the mobile phase (which carries the mixture) and the stationary phase (which acts like a filter). You can follow this video as an example:

Demonstration:

- (This step can be skipped if time is limited)
- Set up a simple chromatography demonstration with a marker and a coffee filter. Draw a line with a marker across the bottom of the filter paper.
- Pour a small amount of water into a cup.
- Carefully dip the bottom edge of the filter paper (with the marker line) into the water without submerging the marker line.
- Observe how the water travels up the filter paper, separating the colours in the marker line.

Student Experiment:

- Divide students into groups of 2-3.
- Instruct each group to use a marker to draw a circle (about 1 inch in diameter) on the centre of a coffee filter. Encourage them to use several colours within the circle.
- Help students label the cups – one for water and one for waste.
- If using rulers, students can mark a starting line (lightly) about 1 inch above the bottom edge of the coffee filter.

Work on the topic

- Instruct students to carefully roll the coffee filter (marker side facing inwards) to create a loose cylinder. Secure the roll with tape (optional) if needed.
- Guide students to place the rolled coffee filter (with the marker circle at the bottom) into the empty cup.
- Carefully pour water into the other cup until it reaches a depth of about ½ inch.
- Instruct students to carefully dip the bottom edge of the rolled coffee filter (with the marker circle) into the water-filled cup, ensuring the coloured circle doesn't touch the water directly.
- Observe and discuss what happens as the water travels up the coffee filter.

Discussion and Wrap-up:

- Once the water reaches the top of the coffee filter, have students carefully remove the rolled filter and lay it flat on a paper towel to dry.
- Discuss the observations. How did the colours in the marker circle separate?
- Explain how the water acted as the mobile phase, carrying the coloured components (mixture) up the filter paper (stationary phase).

Work on the topic

Introduction to cyanotype:

- Explain to students that they will now prepare Canvas for the following class about cyanotype and graphic design in chemistry.
- Briefly discuss the history of photography and introduce cyanotype as an early photographic technique.
- Show students examples of cyanotype prints and explain how sunlight creates the blue colour. Explain that cyanotype is a photographic method that utilises UV (sunlight) to create prints. It is quite inexpensive and creates a cyan blueprint.

Mixing the Solution:

- **Adults prepare the solution:** Following the kit instructions, mix the pre-made cyanotype solution in a well-ventilated area.

Coating the Canvas:

- In a low-light area (use shades in the classroom), students will use foam brushes to apply a thin, even coat of the cyanotype solution onto their canvas panels.
- Remind students to cover all areas and the sides of the canvas.
- Lay the coated canvas flat to dry completely in a dark space.

Lesson 2

Creating the Design:

- Start the class by reminding students about the previous lesson and how photography uses cyanotype. Explain that variations in the technique can allow many creative solutions, and today, you will be working on graphic design on Canvas,

Work on the topic

Lesson 2

Creating the Design:

- Start the class by reminding students about the previous lesson and how photography uses cyanotype. Explain that variations in the technique can allow many creative solutions, and today, you will be working on graphic design on Canvas,
- As the canvas with cyanotype from the previous class is dry, students can lightly mist the surface of the canvas with water using a spray bottle. This creates a mottled effect on the final print.
- While the canvas is still damp, students creatively arrange their chosen objects (leaves, flowers, etc.) on the surface.

Sun Exposure:

- Carefully place the glass sheet on the canvas, ensuring the objects are pressed flat.
- **Adult supervision:** Bring the covered canvas outside on a sunny day.
- Explain that sunlight activates the cyanotype solution. The exposed areas will turn a dark blue/green, while the areas covered by objects will remain light-sensitive.
- Monitor the colour change. Depending on sunlight intensity, exposure can take 15-30 minutes. The canvas will turn a darker shade of blue/green as it's exposed.

Rinsing and Revealing the Print:

- **Adult supervision:** Bring the canvas back into the low-light area. Carefully remove the objects and glass sheet.

Work on the topic

- Rinse the canvas thoroughly under running water in a large container (sink or tub) for several minutes. The brown areas will wash away, revealing the beautiful blue Prussian blueprint.
- Lay the rinsed canvas flat on paper towels to dry completely. The print may continue to darken slightly as it dries.

Lesson 3 - Finalising the artwork

This lesson can be used to finalise students' artwork.
The teacher with students can also organise a showcase or exhibition of students' cyanotype prints within the school or community, promoting awareness of science and art and student creativity.

Conclusion

Reflection and Display:

- Once dry, students can observe their cyanotype creations! Discuss the results and how sunlight exposure affected the final print.
- Please encourage students to explain their design choices and the unique features of their cyanotypes.
- Display the finished prints in a well-lit area (not direct sunlight to preserve the prints).

Preparation:

- Safety: If working with young students, prepare safety information and procedures for handling chemicals (cyanotype solution) in advance. You may want gloves and eye protection available for adult supervision during solution mixing (optional for students).

Preparation:

- Workspace Setup: Designate a well-ventilated area for mixing the cyanotype solution (adult only) and another low-light area for students to apply the solution and lay out their cyanotype designs. Ideally, this would be a room with controllable light conditions.
- Prepare Cyanotype Solution (Adults Only): If using a pre-mixed cyanotype kit, follow the instructions to prepare the solution in a well-ventilated area before students arrive.
- Gather Materials: Ensure you have all the necessary supplies listed below readily available.
- Optional: Prepare examples of cyanotype prints to show students during the introduction.
- Needed Materials:
- Cyanotype Printing:
- Safety Gear (Optional for Students): Gloves and eye protection (for adults handling chemicals)
- Cyanotype Kit: A pre-mixed solution is recommended for safety (available online or at art stores)
- Canvas Panels: One per student (alternative: watercolour paper)
- Foam brushes
- Spray bottle with water
- Selection of flat, opaque objects: Leaves, flowers, stencils, lace doilies etc.
- Glass sheet: Large enough to cover the canvas (alternative: a picture frame with glass)
- Large container for rinsing: Sink or tub

A Fusion of Science and Art in Chromatography and Cyanotype Printing

- Paper towels
- Chromatography Experiment:
- Markers (various colours)
- Coffee filters (or filter paper)
- Cups or beakers (2 per group)
- Water
- Tape (optional)
- Pencils
- Rulers
- Pictures or diagrams showing chromatography (optional)

Cyanotype:

- **Safety:** Working with chemicals requires adult supervision and clear safety instructions for students (especially younger ones).
- **Light Sensitivity:** Creating cyanotypes requires a low-light environment to prevent accidental exposure.
- **Exposure Time:** Exposure time to sunlight can vary depending on weather conditions and might require some experimentation to achieve optimal results.
- **Material Variations:** Different materials used for printing (canvas vs. watercolour paper) may yield slightly different results.

Chromatography:

- **Mess Potential:** The water can drip or spill during the experiment, so be prepared for some mess.
- **Limited Separation:** The colours may not separate dramatically depending on the marker types.
- **Student Confusion:** Mobile and stationary phases might be challenging for younger students.

A Fusion of Science and Art in Chromatography and Cyanotype Printing

Time Constraints: Both activities, especially cyanotype

Wrap-up Discussion (2 minutes):

- Briefly summarise the key concepts covered in the past two classes:
  - Chromatography: Separating mixtures using a mobile and stationary phase.
  - Cyanotype: Using light-sensitive chemicals to create blueprints.
- Ask students a few questions to spark discussion:
  - How do chromatography and cyanotype connect to each other? (Both involve separating components based on their interaction with a medium)
  - What surprised you the most about these topics?
  - What real-world applications can you think of for chromatography?

Circle of Feelings (5 minutes):

- Instruct students to form a circle in the open space.
- Explain that each person will get to share one word describing their feelings about the last two classes on cyanotype and chromatography.
- Encourage them to consider words related to:
  - Learning (confused, curious, informed)
  - Experimentation (frustrated, excited, surprised)
  - Creativity (limited, inspired, free)
- Start the circle by sharing your word and a brief explanation.
- Gently guide the circle so that everyone has a chance to participate. If a student hesitates, offer some prompts or positive reinforcement.

Reinvention Through Art and Sport

6 Lessons of 40 minutes each

The subject unites the academic disciplines of mathematics, biology, music, physical education and sports through a STEAM approach. Students explore the relationship between the two and create practical solutions that combine the arts and physical activity.
The intersection of academic disciplines is about experiential learning, developing critical thinking, problem solving and creativity, and how to interact with the world around us.
Applied sports activities develop physical fitness, coordination and discipline. Art directs creative abilities and creativity.
Mathematical skills to build a stadium, a sports hall and the game concepts used develop logical thinking.
Awareness of environmental issues when organising a sports event develops a responsible attitude towards the environment.
Project activities implemented in the subject give students the opportunity to express themselves through music and develop musical skills. STEAM skills help generate new ideas.
The interdisciplinary approach contributes to the development of students as individuals and their readiness to accept the challenges of the 21st century.

- In the field of art: dance, music, painting, sculpture, design, theatre performance, choreography, composing, designing
- In the field of sports: individual sports (athletics, shooting); team sports (football, basketball)

Reinvention Through Art and Sport

- To explore the relationship between the expressive arts and sports;
- To discover the mathematical principles used in different sports;
- To study the environmental aspects of a chosen type of sport;
- To develop creative theatrical performances combining sports, music and movement;
- To explore the relationship between music and emotions in sports - rhythm, tempo and dynamics;
- To promote physical activity and a healthy lifestyle through sports activities and creative expression;
- To develop skills for creative thinking, teamwork, coordination, spatial thinking, communication and problem solving.

- Acquired knowledge for researching and interpreting sports experiences through the expressive arts, such as dance, theatre, music;
- Recognition of mathematical principles used in different sports;
- Acquired skills to apply mathematical knowledge to analyse sports performances and predict results;
- Acquired skills for understanding the environmental impact of a given sport and developing proposals for its ecologically sustainable practice;
- Created original creative works that integrate sports themes and expressive arts;
- Support for the career guidance of students by developing skills for creating scenarios, directing, acting, scenography;
- Developed habits for physical activity and a healthy lifestyle;
- Developed skills for teamwork, cooperation and coordination of actions;

- Improved verbal and non-verbal communication skills.
- Develop skills to generate solutions and deal with challenges.

- Physical Education and Sport
- Music
- Mathematics
- Biology
- Technology
- Art

Introduction

Lesson topic discussion about the different sports that will be covered: soccer, basketball, track and field, and shooting.
Discuss the relationship between expressive arts, sports, mathematics, ecology, music, physical culture and STEAM.

Work on the topic

1. Study of the four sports through

• Playing technical elements of four sports with the whole class: football, basketball, athletics and shooting.
• Playing the four sports to musical accompaniment, with the music determining the dynamics of the game;
• Selection of music to perform the exercises in the chosen sports and their playing;
- Football – classical music, hip hop;
- Athletics – opera, rock;
- Basketball- "Tango", "Rap";
- Sports shooting - heavy metal, pop music.

Work on the topic

2. Student activities

• Dividing students into four teams, one for each sport according to their preferences and physical capabilities. Each team researches its sport and solves theoretical and practical tasks.

Theoretical part: Explore your sport and discover:

- The mathematical principles used in it (field size; angles and trajectories, speed);
- The environmental aspects of sports (construction and maintenance of stadiums, sports halls, travel of athletes and fans to matches; generation of waste - plastic bottles, food packaging and paper);
- Musical works that suit the sport.

• Practical part:

Represent your sport by:

- dance moves inspired by sports;
- music combined with the theme of sports.
- a prop symbolising the sport.
- costumes depicting the athletes.
- presentation time up to 5 minutes.

Draw the sport on the background of relaxing music.

Students have time to develop assignments and rehearse.

PE and music teachers help students improve their movement, timing and expression.

3. Presentation

Each team presents the chosen sport to the class.
Each presentation is followed by a short discussion about
the relationship between the respective sport and the expressive arts.

Work on the topic

Conclusion

Conversation on questions:
What did you learn?
What did you like the most?
What could you improve on the topic?
Reflection and feedback

- Preliminary preparation - determination of goals; the activities that will be performed by the students; necessary materials; allocating work time
- Materials: Soccer balls, basketball hoops, shooting targets, sports clothes and shoes; musical instruments, paints, pencils, paper, clay, theatre props; line, protractor, calculators, recycled materials, posters, brochures, audio recordings

Reinvention Through Art and Sport

Coordination of the activities between the different subjects and the teachers;
• Difficulties in procuring the necessary materials and resources for all activities;
• Careful planning of each activity and determination of the execution time;
• Integration of the activities in the curriculum for the various subjects;
• Some students may not be motivated to participate in activities that are not related to their interests. Ways must be found to include all students without neglecting their individual interests and skills.
• Difficulties in assessing students' assimilation of knowledge and skills on the interdisciplinary topic.
• Develop clear evaluation criteria.

- Students' ability to correctly perform technical elements of the four sports (football, basketball, athletics, shooting) will be assessed; the coordination and synchrony of the students while playing to musical accompaniment; the ability of students to choose appropriate music for each sport, according to its dynamics and character.
- Students' creativity, artistry and synchronicity during the performance of their chosen sport will be assessed, as well as their ability to convey the emotion and dynamics of the sport through drawing.

Sustainable Development Through Sport

6 Lessons of 40 minutes each

The subject aims to teach students how to plan sporting events in an environmentally friendly way. The study of ecosystems, biodiversity and the impact of human activity on the environment will guide them towards more sustainable planning of sporting events. They will realise how sporting events can pollute the environment and learn about the different types of pollutants generated by humans.
Students will analyse soil, work to reduce carbon footprint, recycle waste and support environmental initiatives. By creating a project for an environmentally conscious sporting event, they will focus on ways to reduce the negative impact on the environment. They will motivate themselves and others to engage in sports activities that improve health, they will support the participation of athletes, fans and organisers of sports events in environmental initiatives. Participation in a project activity will contribute to the development of students' teamwork, communication and critical thinking skills. The interdisciplinary approach to the topic leads to innovative solutions and improving the sustainability of sporting events, inspiring participants to act for clean nature and environmental impact assessment.

- sustainability
- ecology
- sport events
- planning
- sustainability
- recycling
- carbon footprint
- environmental initiatives
- planting trees
- ecological transport solutions.

FEMALE STEAM MINDSET
GIRLS IN MEN'S WORLD

Co-funded by the European Union

Back to Top

Sustainable Development Through Sport

- To understand the impact of sporting events on the environment;
- To explore practices for sustainable planning of sports events;
- To create a project for an environmentally conscious sporting event, including reducing the carbon footprint, recycling waste and supporting environmental initiatives.
- To help promote a healthy lifestyle through sports, motivating students to engage in sports activities that improve their health.
- To assist in the participation of athletes, fans and organisers of sports events in environmental initiatives, causes related to the protection of nature;
- To improve teamwork, communication and critical thinking skills.

- Acquired skills to recognize the different types of pollution generated by sports events and their impact on climate and biodiversity;
- Researched good practices for sustainable planning of sports events;
- Creation of a project for an ecologically conscious sports event;
- Promotion of a healthy lifestyle through sports:
- Engaged athletes, fans and organisers of sports events in environmental initiatives;
- Informed participants and spectators in the controversial events about the importance of environmental protection and the ways in which they can contribute to it;

Sustainable Development Through Sport

- Informed participants and spectators in the controversial events about the importance of environmental protection and the ways in which they can contribute to it;
- Supporting environmental initiatives, such as planting trees, recycling waste;
- Improved teamwork, communication and critical thinking skills;

- Biology
- Geography
- Physics
- Chemistry
- Physical Education and Sport
- Technology
- Civic Education
- Information

Introduction

Discussion on the topic: How can the environment be affected by sporting events?
Discuss the importance of sustainability and environmental protection.
Presentation of different types of sporting events and their environmental impact.

Work on the topic

Activity 1: Research
Watching an outdoor soccer match.
During the meeting, the students carefully monitor the actions of the fans. After the end of the meeting, the environmental pollution left by the fans was found - waste, plastic cups, paper and other materials. What has been seen is discussed, the main pollutants, the causes that led to the pollution are determined. Measures that would be effective in dealing with pollution at subsequent sporting events are indicated, such as placing recycling containers and encouraging fans to use them; organising clean-up after the events.
1. The effects of the football match on the soil can be analysed by measuring its moisture, pH value and, as well as the biodiversity of the site: by observing the animals and plants in the area. What species do they encounter? How does biodiversity change depending on the intensity of the soccer match?
Bicycle tour for environmental observation
Students ride bicycles in the school area. They pay attention to dirty lawns, garbage and waste.

Work on the topic

They observe the gases emitted by cars when moving, they also observe the planes in the sky and the tracks they leave. Students compare the impact of cars, planes, buses and trams on the climate. They become familiar with the institutions to which they can signal for cleaning up the contaminated sites. They plant flowers at the site of any litter spotted on the lawns around the school.

Activity 2: Project activity

Students are divided into groups of 3-4 people. Each group chooses: a sporting event (soccer match, school sports festival, marathon) or a study of transport emissions during sporting events at random.

Sustainable Sports Event Planning Project:

- Defining the goals of the event: What do we want to achieve with the sports event - popularising sports, supporting a healthy lifestyle or collecting funds for charity?
- Determination of playgrounds and included sports - parks, green areas, sites with solar panels;
- Placement of recycling containers in different locations to facilitate disposal of waste in the correct place;
- Encouraging participants to recycle plastic cups, bottles and other materials;
- If the event requires transportation, to focus on using public transportation, bicycles or car sharing, which will reduce the carbon footprint;
- Use of environmentally friendly materials for brochures, tickets, banners, prize cups and medals for winners are made from recycled paper or from rapidly degradable materials;

Work on the topic

- Organising information stands or presentations to draw attention to environmental issues. Donations may also be collected for environmental organisations.
- Tree planting and maintenance of green areas
- within the sporting event;
- Preparing a program for the sports event;
- Project for the study of transport emissions during sports events:
- Students choose a sporting event to research - football match, athletics, cycling, etc.
- Collect information about the event:
- Location (stadium, track, etc.).
- Number of participants (athletes, spectators, staff).
- Types of transport used to reach the event (cars, buses, bicycles, etc.).
- Measuring carbon emissions by counting cars parked around the event.
- analysis of the collected information:
- How many cars were at the event?
- What types of fuels were used?
- What are the CO2 emissions?

presenting the results through a presentation, including graphs, charts and comparisons of emissions from different types of transport.

Activity 3: Discussion

Each group presents their projects to the rest of the class.

A discussion follows on environmental issues related to sporting events.

Work on the topic

Conclusion

This is followed by a short interview, reflection and evaluation on the topic through guiding questions:

How can sporting events affect the environment? What are the positives and negatives?

How can we make sporting events more sustainable and environmentally responsible?

What measures can we take to reduce pollution during sporting events?

What are the advantages of using public transport or bicycles to get to sporting events?

Which specific proposals to reduce the environmental impact of sporting events impressed you the most and why?

How can we encourage fans and participants to recycle and be environmentally aware during sporting events?

What role can your school play in promoting sustainable practices in sporting events and how can you contribute to this initiative?

- Information resources on the impact of sporting events on the environment;
- Information brochures relating to recycling and waste management;
- Whiteboard or cardboard for project activity planning.
- Markers or markers.
- Camera or smartphone to capture ideas and plans;
- Bicycles;
- Suitable flowers for planting on lawns in the school area.

Reinvention Through Art and Sport

- Students may not be old enough to understand ecology and environmental protection to make sample projects on the topic.
- Students may not understand exactly what the environmental problems associated with sporting events are and how they would contribute to reducing them.
- Working in a team, especially if there are different views on the topic or communication between students is difficult.
- Students may face difficulties in obtaining additional support from teachers and parents for the realisation of their project.
- Limited time to work on the project due to other academic obligations.

Student assessment will be done through:

- study of their skills to observe and make an ecological analysis of a sports event;
- participation in a cycling tour to observe the environment and plant plants;
- their participation in a project activity for planning a sustainable sports event and researching emissions from transport during sports events - what role do they have in the team, the skills of data collection and analysis, communication, sharing of ideas, creativity;
- participation in presenting project activities to the class;

From Page to Stage: Building "The Little Prince"

5 Lessons of 45 minutes each

In this interdisciplinary lesson, students reimagine the classic tale of "The Little Prince" by creating a unique theatrical adaptation that includes their own creative storytelling and extends the story to journeys to different planets, using their knowledge of astronomy. Students will work in groups and each student group will take on roles in scriptwriting, costume design using recyclable or reused materials, engineering a rocket, and acting. The construction of costumes and a rocket from recyclable or reused materials teaches sustainability.

This approach mirrors real-world theatrical productions where various skills and knowledge areas mix to create an engaging performance.

This lesson project enhances their understanding of literature, science, and drama and also develops practical skills in design, teamwork, and public presentation.

- Performance skills
- Costume design
- Problem-solving
- Recycling and reusability
- Construction and basic engineering
- Astronomy and planetary science
- Creative writing

From Page to Stage: Building "The Little Prince"

- Improve understanding and critical thinking by rewriting the story.
- Practise creative writing.
- Revisit and apply knowledge about the solar system and different planets.
- Understand and discuss the importance of sustainable living through the selection and use/reuse of recycled materials and for costumes and sets.
- Develop acting skills through rehearsal and performance.
- Foster a sense of responsibility and improve teamwork skills.

- Students will demonstrate a deeper understanding of "The Little Prince," specifically its themes, character motivations, and moral lessons, which will be evident in their discussions and creative outputs.
- Students will practise creative writing.
- Students will include astronomical facts in their play, demonstrating their ability to creatively apply scientific knowledge.
- Students will gather and choose recycled materials to create costumes and a rocket model for the play.
- Through rehearsals and the final performance, students will improve their acting skills and demonstrate their ability to design and execute artistic projects.

From Page to Stage: Building "The Little Prince"

- They will gain confidence in public speaking, artistic design, and teamwork.
- Students will be able to recognize and discuss how science, art, and literature are used in real life.
- Students will develop stronger teamwork abilities and a sense of responsibility.
- Students will be able to recognize and discuss how science, art, and literature are used in real life.
- Students will develop stronger teamwork abilities and a sense of responsibility.

- Literature
- Maths (Geometry)
- Science (Astronomy)
- Art
- Drama (Theater Arts)
- Environmental Studies

Introduction

Begin with discussing theatrical productions and the students' experiences, then transition into a focused discussion on "The Little Prince" to spark creativity for their adaptation.

Lead the discussion on what components are essential for a play, such as actors, scripts, costumes, and decor. This will help students understand the various elements involved in staging a theatrical production.

Summarise "The Little Prince," focusing on themes of adventure and exploration. Ask students to share their favourite parts, especially scenes that captivated their imagination.

From Page to Stage: Building "The Little Prince"

Introduction

Discuss the travels of the Little Prince and how he explores various planets, meeting different characters along the way.
Suggest to the students that they will be creating their own version of "The Little Prince" play. Encourage them to think about how they could extend the story, with the visit of the solar system planets.
Explain that the costume creators can use recyclable materials, integrating their knowledge of environmental science.
Emphasise that every role, from scriptwriting to acting and set design, is crucial for the play's success.
Remind that the Little Prince travelled to many different planets, each with its own unique environment. To design his rocket and costumes, students use their maths skills to measure and calculate the dimensions of the materials and how much we need. They'll also think like scientists, considering how we can reuse and recycle materials to create amazing props without harming the environment.

You may form groups based on interest: scriptwriting, costume design, rocket construction.

*Keep in mind that letting the students choose their group may lead to uneven group sizes. Instead you can give an opportunity to the students to rotate their roles. Consider switching roles or allowing students to contribute to multiple aspects of the production to broaden their experience.

Work on the topic

Lesson 2

Help the students to make an action plan and give them time to work in their groups. Guide them through the process.
Scriptwriting group works on adapting the story. They can research different planets in our solar system, learning about their unique characteristics and environments, and then incorporate those details into the play's script and set design.
Costume design group sketches ideas and gathers materials. Students measure the dimensions of their bodies for costumes, calculate the amount of material needed
Rocket builders draft a blueprint. They calculate the amount of material needed for the rocket and use geometric shapes to design the set (e.g., triangular mountains, circular planets).
Students can apply their knowledge of recycling and sustainability by selecting and repurposing materials for costumes and props, demonstrating how creativity can be combined with eco-consciousness.

Lesson 3

Continue script finalization and begin rehearsals.
Costume group starts creating the outfits.
The construction group builds the rocket, using engineering skills to ensure stability and functionality.
When they are ready (next lesson) make a full rehearsal of the play with all elements in place.

From Page to Stage: Building "The Little Prince"

Work on the topic

Lesson 4

Perform the play for a selected audience, showcasing their comprehensive project.

Conclusion

Reflect and summarise this experience.

- A whiteboard to write down ideas and components discussed.
- Copies or excerpts of "The Little Prince" for reference during discussion.
- Note-taking materials for students.
- Recyclable materials for costumes and set construction.
- Basic tools for building (scissors, tape, glue).
- Art supplies for designing (paper, pencils, paints).

Balancing different skill sets and interests. If students choose activities based on their preferences, it might lead to uneven group sizes.
Managing group dynamics and ensuring productive collaboration.

Assessment will be based on individual and group contributions to the final performance, creativity in script adaptation and costume/rocket design, and the ability to incorporate scientific principles effectively. Feedback will focus on how well students integrate narrative and scientific elements, as well as their teamwork and problem-solving skills during the project.

The Food Pyramid - A Colourful Symphony of Health

4 Lessons of 40 minutes each

Through the theme, students embark on a musical and creative approach to learning about eating habits and food groups. To present a comprehensive understanding of the importance of healthy eating, biology, music, fine arts, mathematics and physical culture are combined. The intersection between the relevant disciplines is the combination of creativity and scientific research of food groups. The main idea that connects them is the achievement of balance and variety in nutrition, with students getting to know food groups as part of the food pyramid and their functions in the human body.

Each part of the theme has its own specific approach and purpose. Through a variety of activities, students learn about the principles of healthy eating, develop creativity, team skills, communication skills, mathematical and logical skills, as well as skills for working with STEAM technologies.

- food pyramid
- types of nutrients
- food groups
- balanced nutrition
- healthy life style
- food metabolism
- culinary innovations

The Food Pyramid - A Colourful Symphony of Health

- Students to understand the importance of a balanced diet for a healthy lifestyle;
- To become familiar with the food pyramid and the different food groups;
- To learn how to make healthy food choices;
- To investigate the influence of music on nutrition and food preferences;
- To create a song or melody that promotes healthy eating and an active lifestyle;
- To apply mathematical knowledge to calculate nutritional values and recipes;
- To learn about the importance of physical activity and sports for health and metabolism;
- To consider technological innovations in the field of nutrition and cooking;
- To make a project, in the form of a poster or brochure, that visually presents the benefits of a balanced diet;
- To create an interactive game or application that teaches others about the importance of healthy eating;
- To develop creativity and team skills.

- Students recognize the main groups of nutrients and their importance for the human body;
- Students define what a balanced diet is;
- Explaining the relationship between food and health;

The Food Pyramid - A Colourful Symphony of Health

- Acquired skills for healthy food choices;
- Applied mathematical skills for calculating and analysing nutritional values;
- Acquired knowledge about the importance of movement for good health;
- Created an original song or tune that promotes healthy eating and an active lifestyle;
- Designed a visually appealing poster or brochure that highlights the benefits of a balanced diet;
- Developed an interactive game or application that teaches about the importance of healthy eating;
- Demonstrated creativity in relation to the creation and presentation of food;
- Developed team skills and communication abilities.

- Biology
- Music
- Mathematics
- Physical Education and Sport
- Art
- Technology

Introduction

• Introducing the students to the topic and the included STEAM idea;
• explanation of the goals and tasks of the lesson on an image of the food pyramid;
• talk on the main nutrients and their importance for the human body;
• a conversation about the importance of healthy eating and its relationship with various aspects of life.

Work on the topic

Creative sessions follow:

1. Mission "Nutrients"

- students are divided into teams of 3-4 people;
- each team has a sheet with a description of the different nutrients (fruits, vegetables, cereals, dairy products, meat, fish, eggs and legumes);
- pictures of different foods are scattered on a table;
- each team collects all the pictures with foods rich in one of the nutrients;
- after the teams collect the pictures, they stick them on a piece of paper and explain why they chose each food by determining the nutrient content (proteins, carbohydrates, fats, vitamins and minerals).

2. Maths games with food labels:

- Students work in groups of 2-3 people;
- Each group receives one nutrition label from a random food;
- The task is to calculate the calories, fats, carbohydrates and proteins in the product;
- Groups compare their results and discuss the meaning of the information on the labels.

3. A musical walk through the food pyramid:

- Students are divided into groups of 4-5 people.
- The groups distribute the food groups among themselves, and each group is given the task of describing one of them in the food pyramid (fruits, vegetables, cereals, dairy products, meat, fish, eggs and legumes).
- Each group of students creates a short verse or description of foods.
- Groups combine their poems/descriptions into a song or rap performance and present them to the class.

Work on the topic

4. Visual creativity with the food groups:

- The task is to create a drawing, collage or sculpture depicting the foods in one of the groups in the pyramid, using materials of your choice (paints, pencils, pastels, plasticine, natural materials);
- Students work independently or in pairs, choosing a food group that is interesting to them;
- Students present their artwork to the class and talk about their food choices.

5. Movement in the rhythm of food groups:

- The teacher plays music at different speeds;
- Students listen carefully to the music and move to its rhythm;
- When the music is slow, they walk slowly as if carrying a heavy basket of fruits and vegetables.
- When the music is fast, they run in place as if chasing a butterfly;
- The exercise is repeated several times, with different tempos of the music.

6. Technologies: Creating a balanced menu:

- Students work in pairs;
- Couples are given a blank menu sheet and their task is to create a balanced menu for breakfast, lunch and dinner using the information from the food pyramid;
- Students choose 2-3 foods from each group for each meal, writing down the selected foods in the menu and calculating their approximate caloric value;
- They design their menu beautifully and present it to the class

Conclusion

Summary of the topic, answers to the questions:

What did you learn about different nutrients?

Do you think you eat healthy?

What were your experiences making music or raps related to the food pyramid?

How did you feel during the movement in the rhythm of the food groups?

How did the music help you express the movement and energy of these foods?

Is the information on food labels important?

What inspired you for your artwork with the food groups?

How did you go about creating a balanced menu? What challenges did you encounter and how did you solve them?

What did you learn about balanced nutrition and how can it be applied to your daily life?

Reflecting on learning and linking to future research projects or activities, such as presenting culinary technological innovations and being able to test virtual recipes.

- Photo of a food pyramid, paints, plasticine, brushes, felt-tip pens, coloured pencils, natural materials, white A4 paper, music recordings (fast and slow instrumental);
- Sheets with a description of the various nutrients (carbohydrates, fats, proteins, vitamins, minerals);
- Pictures of different foods;
- Board or cardboard.

- Good coordination and planning between different academic disciplines and teachers;
- Differentiated tasks, tailored to the capabilities of each student, due to the different levels of knowledge;

The Food Pyramid - A Colourful Symphony of Health

- Lack of resources and materials for all activities planned in the lesson;
- Time may be too short to complete all planned tasks. You can decide which of them are the most important and do them during the lesson, and give the rest for homework;
- Occurrence of technical problems when working with technologies (for example, computers, projectors). Have a backup plan of action in case of such problems.
- Many students do not realise the importance of a healthy diet for their health, the benefits of a balanced diet and the negative consequences of an unhealthy diet;
- How will communication between students take place; the distribution by teams and the work in them;
- Lack of good mathematical skills, creativity among students.

- The active participation of students in all activities related to the project, theirs, is appreciated commitment and participation in group work and their individual contribution.
- The various tasks are aimed at assessing students' mathematical skills, creative, musical and artistic abilities when creating songs or rap performances.
- Coordination, motor activity and students' understanding of the relationship between food and movement are assessed; assessing students' computer skills, searching for information, planning and calculating calories.
- Feedback is focused through students' ability to apply acquired knowledge in practice by analysing food labels and creating a balanced menu.

Music and the Science of Stress Relief

2 Lessons of 45 minutes each

Students will understand the concept of sound waves and their properties, such as frequency and amplitude. They will also see how these properties influence the way we perceive sound.
The lesson explores the impact of music on our emotions and well-being. Students will discover how different musical styles can evoke various moods and potentially reduce stress.
The overarching theme is the connection between science, music, and stress management.
Students will learn how the physics of sound waves translates into music's calming or energising effects, empowering them to use music to manage stress.

- Students will explore the fundamental properties of sound waves:
- The concept of frequency (pitch) will be introduced, explaining how the number of vibrations per second determines the perceived pitch of a sound (high frequency = high pitch, low frequency = low pitch).
- Students will be introduced to the concept of amplitude (volume) and will understand how the intensity of vibrations affects the perceived loudness of a sound (high amplitude = loud sound, low amplitude = soft sound).
- Students will be exposed to different musical genres (e.g., classical, rock, pop) and their potential effects on mood and emotions.

Music and the Science of Stress Relief

- The lesson will explore the link between music and emotions. Students will learn how music's tempo, rhythm, and melody can influence their feelings (e.g., fast-paced music can be energising, while slower tempos with calming melodies can promote relaxation).
- Students will gain a basic understanding of stress and its adverse effects on their health and well-being.
- The lesson will highlight the potential of music to help manage stress. Students will learn how calming music can lower heart rate, reduce anxiety, and promote relaxation.
- Students will see the connection between the scientific properties of sound waves (frequency and amplitude) and how they perceive music (pitch and volume).
- This understanding will connect to exploring how different musical styles, with their varying tempos, rhythms, and melodies (influenced by sound wave properties), can evoke different emotions and potentially promote relaxation for stress management.

- Students will be able to define the terms "frequency" and "amplitude" about sound waves and explain how they affect the way we perceive sound (pitch and volume).
- Students can identify different musical genres (e.g., classical, rock, pop) and describe the potential emotions associated with each genre.
- Students will be able to explain how music can influence stress levels and create a personalised stress-management playlist using calming music or natural sounds.

Music and the Science of Stress Relief

- Students will correctly label diagrams of sound waves indicating frequency and amplitude.
- Students will participate in a class discussion, identifying emotions associated with different musical genres (e.g., classical - calm, rock - energetic).
- Students will create a playlist on a designated platform (or write down the chosen songs) with a brief explanation of how the chosen music can help them manage stress.
- Understanding sound waves is a foundational concept in physics. This lesson provides a starting point for future scientific exploration.
- Exploring the connection between music and emotions fosters self-awareness and emotional literacy.
- Learning to manage stress through music is a valuable life skill.

- Engaging with this interdisciplinary lesson plan on music and stress management can lead to a variety of positive outcomes for students:
- Students will gain a basic foundation in the science of sound waves, understanding their properties and how they affect sound perception.
- They will develop a deeper appreciation for music and its influence on emotions and well-being.
- Students will learn about music's potential as a stress management tool.
- Students will develop critical thinking skills by analysing the connection between sound waves and music.

Music and the Science of Stress Relief

- They will practise communication skills through class discussions and potentially create presentations on calming music.
- Creating personalised playlists fosters creativity and self-awareness when choosing music for stress reduction.
- Combining science, music, and a practical application for stress management creates a more engaging learning experience for students with diverse interests.
- Hands-on activities, discussions, and creating personalised playlists cater to different learning styles and promote active participation.

- Science
- Music
- Technology
- Psychology

Introduction

Warm-up: Ask students to share what stress feels like for them (physical sensations, emotions). Briefly discuss the negative effects of stress on health.
Introducing the Topic: Explain that music can powerfully impact our emotions (you can watch this video about how music is influencing our emotions). Ask students if they listen to music when they are stressed and why (open discussion).

Music and the Science of Stress Relief

Introduction

Science Connection: Introduce the concept of sound waves and their properties: frequency (pitch) and amplitude (volume). You can use a projector or a video to visually demonstrate sound waves (optional). Briefly explain how sound waves travel and interact with our ears - you can play this explanatory video.

Work on the topic

Activity 1: Sound Waves in Action

Demonstration: Demonstrate sound waves using a tuning fork. Strike the tuning fork and ask students to describe the sound they hear (high/low pitch). Explain that the frequency of the vibrations determines the pitch.

Exploring Sound Waves: (Optional) Use a slinky or rope to simulate sound waves. Stretch the slinky and move your hand to create waves. Relate this to the movement of air particles during sound propagation.

Sound and the Body: Explain how sound waves travel through the eardrum and stimulate the inner ear. Briefly mention how this can influence our brain activity and emotions.

Work on the topic

Activity 2: Music and Mood

Brainstorming: Ask students to list different types of music (e.g., classical, rock, pop). Divide the board/chart paper into sections for different genres.

Music and Emotions: Discuss how different music genres can make us feel (e.g., classical - calm, upbeat music - energetic). Encourage students to share their experiences.

Stress-Busting Beats: Discuss how certain types of music can help reduce stress. Use examples like calming classical music or nature sounds.
Creating a Playlist: Instruct students to consider their preferred music for relaxation. They can explore online music resources or use pre-selected samples to create a personalised stress-management playlist. Advice students to explore different music genres outside of the class and create playlists on them. (Optional: Students can use tablets/laptops to access music streaming services and create playlists).
You can give students examples of binaural beats to improve their studying abilities.

Work on the topic

Activity 2: Music and Mood

Conclusion

Wrap-up:
Briefly review the key points: sound waves, their properties, and how music can influence emotions and stress levels.
Encourage students to use their playlists when feeling stressed and observe the effects.
(Optional) Discuss the importance of a healthy lifestyle for managing stress (exercise, sleep, etc.) in addition to music.

Materials:

Visual Aids (Optional):

- Projector and screen (to display images or videos of sound waves)
- Pictures or diagrams of sound waves (demonstrating frequency and amplitude)

Demonstration Tools:

- Tuning forks (at least two with different frequencies)
- Slinky or rope (to simulate sound waves)

Music and the Science of Stress Relief

Classroom Materials:

- Whiteboard or chart paper
- Markers

Technology Integration (Optional):

- Tablets or laptops with internet access (for researching music or creating playlists)
- Music streaming service or pre-selected music samples (for creating playlists)

Teacher Preparation:

- **Review the lesson plan:** Familiarise yourself with the flow of activities and learning objectives.
- **Gather materials:** Ensure you have all the necessary materials for demonstrations, visuals, and activities.
- **Prepare visual aids (Optional):** If using a projector, find or create images/videos of sound waves to display.
- **Prepare pre-selected music samples (Optional):** If technology access is limited, curate a selection of calming music or natural sounds to introduce students to stress-reducing music options.
- **Consider student needs:** Adapt the lesson plan based on your students' age, interests, and learning styles.

Music and the Science of Stress Relief

Additional Considerations:

- **Classroom Setup:** Arrange the classroom seating to facilitate discussion and activities.
- **Background Knowledge:** Gauge students' prior knowledge of music and sound. Briefly review basic concepts if needed.
- **Differentiation Strategies:** Prepare activities that cater to different learning styles (visual, auditory, kinesthetic).

Attention Span: Keeping students engaged with a physics introduction and then transitioning to music and stress management might require creative transitions and engaging activities.

Limited Resources: Access to technology like tablets or laptops for playlist creation may vary across schools. Having pre-selected music samples can be a backup.

Subjectivity of Music: What one student finds calming, another might find boring. The lesson can emphasise creating personalised playlists based on individual preferences.

Formative Assessment (During the Lesson):

- **Observations:** Observe student participation in discussions and activities. Their level of engagement and interest can indicate their understanding of the material.
- **Questioning:** Ask open-ended questions throughout the lesson to assess student comprehension of scientific concepts (sound waves), their grasp of music and emotions, and their thought process while creating playlists.

Summative Assessment (After the Lesson):

Quiz (Optional): For students, a short quiz with multiple-choice or fill-in-the-blank questions can assess their grasp of scientific terms (frequency, amplitude) and the connection between music and emotions. You can share this quiz with students.

The answer key is listed here:

Science of Sound

What property of a sound wave determines its pitch (high or low)?

a) Amplitude

b) Frequency

c) Wavelength

d) Volume

A loud sound wave has a higher _____ compared to a soft sound wave.

a) Frequency

b) Amplitude

c) Wavelength

d) Pitch

Music & Emotions

Which of the following musical styles is typically associated with feelings of calmness and relaxation?

a) Heavy Metal

b) Classical

c) Hip-Hop

d) Rock

How can music influence our emotions?

a) By affecting the colour we see

b) By changing our sense of taste

c) By stimulating different parts of the brain

d) By making us smell different things

Design Your Dream Sportswear: Art Meets Science and Technology

3 Lessons of 45 minutes each

This lesson focuses on sportswear design, exploring the intersection of science, technology, and visual arts. Students will design their sportswear, considering the following aspects:

- **Science:** They'll understand the **scientific properties** of materials used in sportswear, such as breathability and moisture-wicking, and how these properties impact an athlete's performance in different sports.
- **Technology:** Students will explore the **technological advancements** improving sportswear design, such as 3D printing for custom features or wearable tech for monitoring performance.
- **Visual Arts:** Students will create visually appealing and functional sportswear designs by applying fundamental **visual arts principles** like colour theory and composition.
- **Maths:** Students may also consider basic mathematical concepts like **proportion** to ensure the garment fits and functions properly.

The overarching theme of this lesson is interdisciplinary design. Students will see how these seemingly separate subjects - science, technology, visual arts, and maths - come together to create practical and stylish sportswear.

Design Your Dream Sportswear: Art Meets Science and Technology

- Students will research and understand how clothing materials' properties impact athletes' performance in different sports.
- Students will explore how 3D printing, wearable tech (e.g., heart rate monitors) could be integrated into their sportswear designs.
- Students will apply principles like colour theory, balance and composition to create visually appealing sportswear designs.
- Students will be able to **identify two scientific properties** of materials used in sportswear (e.g., breathability,moisture-wicking) and explain how they benefit athletes in a chosen sport.
- Students will **research and describe one technological advancement** in sportswear design (e.g., 3D printing,wearable tech) and its potential application in their design.
- Students will create a **sketch or digital prototype** of their dream sportswear, incorporating at least two visual arts principles (e.g., colour theory, balance).
- Students will explain how they considered **proportion and symmetry** (optional) in their design to ensure a well-fitting and functional garment (optional).
- Students' understanding of scientific properties can be assessed through **questioning** during research and presentations.

Design Your Dream Sportswear: Art Meets Science and Technology

- Students will gain a basic understanding of the scientific properties of materials used in sportswear (breathability,moisture-wicking, etc.) and how these properties impact an athlete's performance.
- They will be introduced to technological advancements in sportswear design (3D printing, wearable tech) and explore their potential benefits.
- Students will demonstrate an understanding of visual arts principles (colour theory, balance, composition) and how these principles can be applied to create an aesthetically pleasing design.
- They will be able to identify the role of mathematics (proportion, symmetry) in ensuring a functional and well-fitting sportswear design (optional).
- They will practise brainstorming and design thinking to come up with innovative and functional designs for their dream sportswear.
- Students will improve their communication and presentation skills by explaining their design choices and the reasoning behind them.
- The lesson encourages collaboration and teamwork as students work in teams to create their designs

Design Your Dream Sportswear: Art Meets Science and Technology

- Visual Arts
- Sportswear Design
- Science
- Technology
- Maths

Introduction

Warm-up Activity: Begin with a short, interactive activity to get student attention.

Ask students to raise their hands if participating in sports or physical activities. Then, follow up by asking how they choose specific clothing for these activities.

After a quick poll, project images showing athletes in different sports wearing various types of sportswear. Encourage students to discuss the visual elements (colour, design) and their assumptions about the clothing's functionality.

Work on the topic

Lesson 1

Review of Visual Arts Principles

Ask students to share their thoughts on what makes good sportswear. Encourage them to consider factors like comfort, fit, and how the clothing helps them perform their chosen sport.

Explain that the materials used in sportswear play a crucial role in its effectiveness. Introduce terms like breathability and moisture-wicking, and explain how different fabrics (cotton, synthetics) possess varying properties that impact performance.

Design Your Dream Sportswear: Art Meets Science and Technology

Work on the topic

Lesson 1

Highlight the increasing role of technology in sportswear design. Briefly showcase examples like 3D-printed clothing for customised fit or wearable tech integrated into garments (e.g., heart rate monitors). Explain how these advancements can enhance athlete performance and comfort.

Review of Visual Arts Principles

Ask students to share their thoughts on what makes good sportswear. Encourage them to consider factors like comfort, fit, and how the clothing helps them perform their chosen sport.

Explain that the materials used in sportswear play a crucial role in its effectiveness. Introduce terms like breathability and moisture-wicking, and explain how different fabrics (cotton, synthetics) possess varying properties that impact performance.

Highlight the increasing role of technology in sportswear design. Briefly showcase examples like 3D-printed clothing for customised fit or wearable tech integrated into garments (e.g., heart rate monitors). Explain how these advancements can enhance athlete performance and comfort.

Team Formation & Sport Assignment:

Divide the class into small teams (2-3 students) and assign each team a specific sport. Consider a mix of popular sports (basketball, soccer) and more niche activities (rock climbing, swimming) to cater to diverse interests.

Design Your Dream Sportswear: Art Meets Science and Technology

Work on the topic

Research and Brainstorming:

Provide students with access to resources (internet access, textbooks, pre-selected materials) to research their assigned sport. Encourage them to brainstorm ideas for their sportswear design, focusing on the following aspects:

- **Athlete Needs:** Consider the specific needs of athletes in the assigned sport. For example, basketball players may require good ankle support and breathable fabric, while swimmers need chlorine-resistant materials that allow freedom of movement.
- **Scientific Considerations:** Students should research the scientific properties of different materials (breathability, moisture-wicking, insulation) and how they can benefit athletes in their chosen sport.
- **Technological Inspiration (Optional):** Encourage students to explore technological advancements in sportswear and brainstorm how to integrate these innovations into their designs (e.g., 3D-printed padding for runners, heart rate monitoring sensors for cyclists).
-

Lesson 2

Activity: Design Your Dream Sportswear

Guiding the Design:

Repeat the task from the previous lesson, where students brainstormed their design ideas for sportswear. Remind them that they will start working on their prototype today. Encourage students to challenge themselves and collaborate effectively within the team. Students can divide their tasks according to each team member's abilities.

Design Your Dream Sportswear: Art Meets Science and Technology

Work on the topic

Sketching and Ideation:

Provide each team with design templates or drawing paper, pencils, markers, and rulers (optional). Students should begin sketching their initial design ideas, considering functionality and aesthetics.

You can circulate the classroom, providing guidance and feedback to teams as they brainstorm and sketch. Encourage students to discuss their design choices and their relevance to scientific and technological considerations.

Remind students to apply visual arts principles (colour theory, balance, composition) to create visually appealing designs. Discuss how colour choices can evoke emotions and impact performance (e.g., bright colours for high-visibility sports, and calming colours for yoga wear).

Developing the Prototype:

Based on the initial sketches and teacher feedback, teams can refine their designs, focusing on details like pockets, closures, and overall proportions.

For younger students, a simple paper prototype with labelled features may suffice. More advanced students could use design software (if available) to create a digital representation of their sportswear.

If materials are available, students can choose fabric swatches that represent their ideal materials based on their scientific research (e.g., breathable mesh for a basketball jersey). These swatches can be attached to their sketches or digital prototypes.

Work on the topic

Lesson 3

Wrap-up

Team Presentations: Each team presents their dream sportswear design to the class. Encourage them to showcase their sketches/prototypes and explain their design choices, highlighting:

- **Scientific considerations:** How the chosen materials address the specific needs of athletes in their assigned sport.
- **Technological inspiration (if applicable):** How technological advancements were incorporated into the design.
- **Visual arts principles:** The colour scheme and design elements used and how they contribute to the overall look and functionality of the sportswear.

Conclusion

Class Discussion: Facilitate a discussion encouraging students to provide constructive feedback to their peers and appreciate the diverse design approaches taken by each team. Remind them of the importance of combining science, technology, visual arts, and maths in creating functional and stylish sportswear.

Design Your Dream Sportswear: Art Meets Science and Technology

Materials:

- **Drawing Materials:**
  - Pencils
  - Markers
  - Crayons (optional)
- **Design Tools:**
  - Rulers (optional)
  - Design templates (optional, can be created by the teacher)
- **Presentation Tools:**
  - Whiteboard or projector for presentations
- **Technology (Optional):**
  - Computers with design software (if available)
  - Internet access for research (if available)
- **Optional Materials:**
  - Fabric swatches representing different materials (breathable mesh, moisture-wicking fabric)
  - Pre-selected articles or websites on scientific properties of materials and technological advancements in sportswear

Design Your Dream Sportswear: Art Meets Science and Technology

Student Interest: Not all students may be equally interested in sports or fashion design.

Differentiation: Adapting the lesson to accommodate students with varying prior knowledge of science, technology, or visual arts might be required.

Resource Availability: Access to technology (internet, design software) and materials (fabric swatches) may vary across schools. Complexity of Prototypes: Creating detailed prototypes could be time-consuming for younger students.

Scientific Understanding: Depending on the age group, balancing a basic understanding of scientific concepts (breathability, moisture-wicking) with the creative design process might require adjustments.

Formative Assessment (During the Lesson):

- **Observation:** Observe student participation during discussions, research, and design stages. Their level of engagement and collaboration provide insights into their understanding of the material.
- **Questioning:** Ask open-ended questions throughout the activity to assess students' grasp of scientific concepts (breathability), their ability to connect technology to sportswear design, and how they apply visual arts principles to their creations.

Summative Assessment (After the Lesson):

- **Presentations:** Evaluate student presentations based on their ability to:
  - Clearly explain their design choices.
  - Demonstrate an understanding of the scientific properties of materials and their relevance to their chosen sport. (e.g., breathable fabric for a running jersey)

- Incorporate technological advancements (if applicable) and explain their potential benefits.
- Apply visual arts principles effectively to create an aesthetically pleasing design.

Sports As a Social Bridge

3 Lessons of 45 minutes each

This interdisciplinary project focuses on the power of sports to unite people and bridge cultural differences. Students will explore how sports foster teamwork, friendships, and understanding. Through hands-on activities like creating surveys, collecting data, and presenting findings, students will gain insights into the social impact of sports in their school and community. This project combines social studies, physical education, mathematics, and computer science to provide a comprehensive learning experience.

- Survey;
- Question types;
- Data collection;
- Target group;
- Interpreting results, identifying trends, drawing conclusions;
- Analysing information;
- Communication skills;
- Presentation skills;

- To understand the role of sports in societal integration and cultural exchange.
- Design and conduct digital surveys to gather data on sports participation, preferences and sport influence in their life.
- Analyse survey results to identify trends and draw conclusions about the social impact of sports.
- To improve speaking and presentation skills.
- Demonstrate effective teamwork and collaboration skills.

Sports As a Social Bridge

- Gain a deeper understanding of how sports can break down barriers and connect people from diverse backgrounds.
- Develop practical skills in survey design, data collection, analysis, and presentation.
- Grow a greater appreciation for the cultural significance of sports and their role in promoting understanding and unity.
- Enhance their ability to collaborate effectively, respect diverse opinions, and work towards a common goal.
- To create and present a poster or presentation about the social side of sports.

- Social Studies,
- Physical Education,
- Mathematics (Statistics),
- Computer Science.

Introduction

Lesson 1

Engage students in a brief discussion about their favourite sports and why they enjoy them.
Introduce the concept of sports as a social bridge, highlight their role in connecting people from different backgrounds, promoting teamwork, and fostering friendships.
Facilitate a discussion about how sports can help break down cultural barriers and build understanding.
Share examples of sports teams or events that have brought people together from different cultures or communities.

Work on the topic

Present the basics of survey methodology, providing examples to show how gathering opinions can reveal shared interests and values among diverse groups.

*What is a Survey?
Definition: A survey is a method of collecting information from people to learn about their opinions, behaviours, or experiences.
Purpose: Surveys help us understand what different people think, feel, and do.
How to Create a Survey
Choose a Topic: Decide what you want to learn about (e.g., favourite hobbies, opinions on school lunches).
Write Questions:
Open-ended Questions: Let people answer in their own words (e.g., "What is your favourite hobby?").
Closed-ended Questions: Give people specific choices (e.g., "Do you like sports? Yes/No").
Collecting Responses
Methods: Surveys can be done on paper, online, or by talking to people.
Sample Size: The number of people you ask should be large enough to get a good variety of answers.

Work on the topic

Divide students into small groups and guide them through the process of creating a digital survey using Google Forms or a similar platform.

- Help students brainstorm relevant questions about sports preferences, participation, and social impact.
- Ensure questions are clear, concise, and appropriate for the target audience (schoolmates and community members).

- Choose mostly closed-ended questions with only one possible answer. This will make analysing the date, later, much easier.

Instruct students on how to share their surveys with classmates, family, and community members (through social media, email, etc.).

- Set a deadline for data collection and monitor progress.

Lesson 2

Guide students in analysing the survey results.

- Teach them how to calculate percentages, averages, and identify trends in the data.
- Encourage them to draw conclusions about the social impact of sports based on their findings.

Work on the topic

* Analysing Survey Results:

Step 1: Calculating Percentages

Find the total number of responses for the survey.

Divide the number of responses for a specific answer by the total number of responses.

Multiply the result by 100 to get the percentage.

Example:

Total responses: 100

Number of students who play sports: 60

Percentage: (60/100) * 100 = 60%

Step 2: Finding Averages

Add up all the numerical responses for a particular question.

Divide the sum by the total number of responses to find the average.

Example:

Responses to hours spent on sports per week: 4, 5, 6, 7, 8

Total sum: 4 + 5 + 6 + 7 + 8 = 30

Number of responses: 5

Average: 30 / 5 = 6 hours

Step 3: Identifying Trends

Examine the data for recurring patterns or notable changes over time.

Compare responses between different groups (e.g., age, gender) to spot differences or similarities.

Work on the topic

Example:
If a higher percentage of younger students play sports compared to older students, this indicates a trend.
Step 4: Drawing Conclusions
Based on your calculations, think about what the numbers are showing you. Consider how the data reflects the role of sports in students' lives.

Discuss how participation in sports might affect social skills, teamwork, and overall well-being. Example: If most students report positive social interactions through sports, conclude that sports have a beneficial social impact. Provide time to the students to prepare their presentations or posters. Encourage the use of visuals, graphs, and charts to make the data easy to understand.

Sports As a Social Bridge

- Access to computers or tablets with internet access.
- Google Forms (or similar survey platform).
- Presentation software (e.g., Google Slides, Canva, PowerPoint).
- Whiteboard or projector for class discussions.
- Markers, chart paper, or poster board for presentations (if not digital).
- Articles and videos about sports in different cultures.
- Notebooks and writing tools for note-taking and sketching ideas.

Some students may struggle with survey design or data analysis. Provide additional support as needed.
Keeping younger students engaged and focused during discussions and presentations.
Group dynamics may require attention to ensure everyone participates equally.

- Observe and assess student participation, collaboration, and critical thinking throughout the project.
- Evaluate survey design, data analysis, and presentation quality.
- Teamwork and ability to share and discuss ideas within groups.

PROJECT PARTNERS

Nikola Obretenov Elementary School

Little smiles

Youthfully Yours SK

FEMALE STEAM MINDSET
GIRLS IN MEN'S WORLD

Co-funded by the European Union

Back to Top

Funded by the European Union. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union or the European Education and Culture Executive Agency (EACEA). Neither the European Union nor EACEA can be held responsible for them.

This document is for electronic use only. Please do not print.

FEMALE STEAM MINDSET
GIRLS IN MEN'S WORLD

Co-funded by the European Union

Back to Top