STEPAM Handbook

The Teacher's Guide to Physical Activity & Embodied Learning in STEAM Education



The outcome of the Erasmus+ KA220
STEPAM project

Co-funded by the European Union

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The STEPAM Practice Handbook is a unique, forward-thinking contribution to modern, student-centered pedagogy. It equips educators with the concrete tools, games, and instructional guidelines needed to turn classrooms into dynamic laboratories of active learning, play, and discovery. I wholeheartedly endorse this guide to teachers and school leaders seeking to enhance physical activity volume within school settings to support health, well-being, and academic improvement in primary school-aged children.

What makes this guide exceptionally strong is its commitment to holistic education, inclusion, and hands-on engagement:

- **Timely Support for Emerging "Active School" Systems:**

While the "Active School" framework has recently gained strong international backing, numerous countries are still at the beginning of this transition. This handbook provides invaluable, ready-to-use material that simplifies implementation.

- **Rich Thematic Activities:**

The handbook contains dozens of dynamic, practical activities where movement is never an afterthought; rather, bodily actions, measurements, and spatial awareness directly reinforce abstract conceptual understanding.

- **Commitment to Inclusion and Accessibility:**

The guide explicitly emphasizes non-competitive, formative assessment strategies alongside inclusive adaptations for mixed-ability classes.

- **Teacher Autonomy and Flexibility:**

Rather than forcing a rigid syllabus, the handbook functions as an adaptable framework. It offers practical advice for co-designing lessons with local communities, leveraging low-tech tools, and adapting learning spaces across both urban schoolyards and rural environments.



- **Policy Alignment:**

By anchoring its goals in international standards set by UNESCO, WHO, and the EU Council, the handbook offers valuable insights derived from comparative educational policies across Austria, Serbia, and Finland.

The STEPAM Practice Handbook is a unique, forward-thinking contribution to modern, student-centered pedagogy. It equips educators with the concrete tools, games, and instructional guidelines needed to turn classrooms into dynamic laboratories of active learning, play, and discovery. I wholeheartedly endorse this guide to teachers and school leaders seeking to enhance physical activity volume within school settings to support health, well-being, and academic improvement in primary school-aged children.

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The STEPAM Practical Handbook is a comprehensive and well-structured resource that successfully bridges physical education, STEAM education, and embodied learning into a coherent pedagogical framework. The handbook provides a logical progression from the conceptual foundations of the STEPAM approach, including its core values of inclusion, equity, sustainability, and play, to practical guidance for classroom implementation.

Particularly valuable are the chapters addressing curriculum design, assessment strategies, safety and accessibility, as well as the wide range of thematic units that demonstrate how interdisciplinary learning can be effectively achieved through movement-based activities. The inclusion of implementation guidelines and comparative policy perspectives further enhances the handbook's practical relevance for educators working in diverse educational settings.

From a scientific and educational perspective, the handbook is grounded in contemporary pedagogical principles and reflects current evidence on holistic education, physical literacy, and interdisciplinary teaching. The emphasis on teacher autonomy, inclusive practices, professional development, and adaptation to different educational contexts makes the publication suitable for diverse school environments across Europe and beyond. The practical orientation, clarity of presentation, and methodological consistency ensure that the handbook will be a valuable resource for teachers, teacher educators, researchers, and policymakers.

I highly recommend its publication, as it represents an important contribution to innovative and evidence-informed teacher education and has considerable potential to support the implementation of high-quality interdisciplinary learning in primary education.

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STEPAM

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Introduction to STEPAM



Purpose of the STEPAM Project

The **STEPAM** (Teacher Training in Physical Activities and Embodied Learning through STEAM Education) project is an initiative which examines how cultural, economic, and social factors influence PE policy and its interdisciplinary potential.

STEPAM aims to improve teacher training programs, equiping educators with skills and pedagogical approaches to integrate physical activity effectively and embodied learning strategies with STEAM subjects.

Overview of STEPAM Approach

- **Theoretical foundations** — This framework links theoretically grounded mechanisms — such as *embodied learning* and *experiential learning* — with PA–cognition relations and integrated STEM principles.
- **Pedagogical approach** — Through collaborative, hands-on professional development, educators learn to design inclusive, interdisciplinary lessons connecting physical activity with STEAM subjects.
- **Integration model** — STEPAM unites PA with STEAM through purposeful, embodied experiences where movement supports conceptual understanding. Students explore science, math, technology, and art through bodily action, data collection, and creative design.
- **Learning outcomes** — STEPAM builds creativity, collaboration, and bodily awareness while enhancing cognition and digital skills. It unites physical and academic growth.
- **Implementation strategy** — Through Erasmus+ collaboration, STEPAM combines teacher training, workshops, and classroom pilots across partner countries. Its network promotes shared resources, peer learning, and sustainable innovation in embodied STEAM education.

Importance of Interdisciplinary Learning

Interdisciplinary learning connects knowledge across subjects, helping students apply concepts in real-world contexts through collaboration and creativity. By linking Physical Education with STEAM, STEPAM promotes holistic development —enhancing cognition, engagement, and problem-solving through embodied, hands-on experiences that unite mind and body in learning.

Getting Involved with STEPAM

Educators, ministries, and NGOs interested in adopting or adapting the STEPAM approach can:

1. Dive into our Geogebra MOOC & Handbook.
2. Join us for training or explore partnership opportunities.
3. Share your ideas to adapt it for your local curriculum!



Open Resources and Licensing

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01

Welcome & Orientation



1.1 Purpose of the Handbook

The STEPAM Practice Handbook is designed to help educators, trainers, and policymakers understand and apply the STEPAM framework within their own contexts. It provides theoretical foundations, pedagogical models, and ready-to-use strategies for integrating physical activity and embodied learning into STEAM education.

The handbook serves both as a reference and a practical guide: it connects research with classroom practice, supports professional development, and promotes collaboration across disciplines and regions. Ultimately, its purpose is to inspire inclusive, movement-based learning that nurtures creativity, wellbeing, and innovation in schools.

1.2 About STEPAM: What It Is and Why It Matters

STEPAM (Science, Technology, Engineering, Physical Education, Arts, and Mathematics) is an interdisciplinary educational initiative that aims to integrate Physical Education (PE) with the broader STEAM fields, fostering holistic development in students aged 7 to 14 years. It promotes active learning environments where physical movement is not an isolated subject but a catalyst for cognitive, emotional, and social growth. STEPAM encourages schools and educators to reimagine PE as a bridge to academic achievement, health, creativity, and community engagement.

By aligning physical activities with conceptual learning and real-world problem-solving, STEPAM transforms school spaces into dynamic laboratories of movement, play, discovery, and inclusion.



1.3 Core Values: Inclusion, Play, Equity, Sustainability

STEPAM is grounded in four core values that shape its design and practice across all contexts:

- **Inclusion:** Every child, regardless of ability, background, gender, or learning profile, must have access to meaningful physical education and STEAM opportunities.
- **Play:** Movement and play are central to how children explore, understand, and interact with the world. We honor play as a legitimate and powerful learning strategy.
- **Equity:** STEPAM strives to reduce educational disparities by promoting access to quality instruction, safe environments, and diverse role models in all regions.
- **Sustainability:** Activities and learning processes consider awareness, lifelong health, and social responsibility

These values are present not only in pedagogical choices but also in how we design learning spaces, develop partnerships, and assess outcomes.

1.4 Age Group Focus: 7 to 14 Years Old

STEPAM is designed specifically for students in the 7–14 age range, corresponding roughly to Grades 1 through 8/9 in many educational systems. This period is critical for developing:

Motor skills and physical literacy

Cognitive flexibility and conceptual understanding

Social-emotional competencies and empathy

⟷ **Curiosity and exploratory learning behaviors**

By targeting this developmental window, STEPAM ensures that physical education is not limited to exercise or competition, but becomes a transformative force in shaping how children think, collaborate, and grow.



1.5 Framework: PE + STEAM + Local Culture

The STEPAM model is not a fixed curriculum — it is a framework. It is based on the strategic combination of:

1. **Physical Education:** Focused on movement, coordination, health, safety, and self-expression
2. **STEAM Disciplines:** Integrating scientific inquiry, technological fluency, creative expression, mathematical reasoning, and engineering practices
3. **Local Cultural Contexts:** Recognizing and embedding traditions, games, dances, community practices, and languages into the learning experience

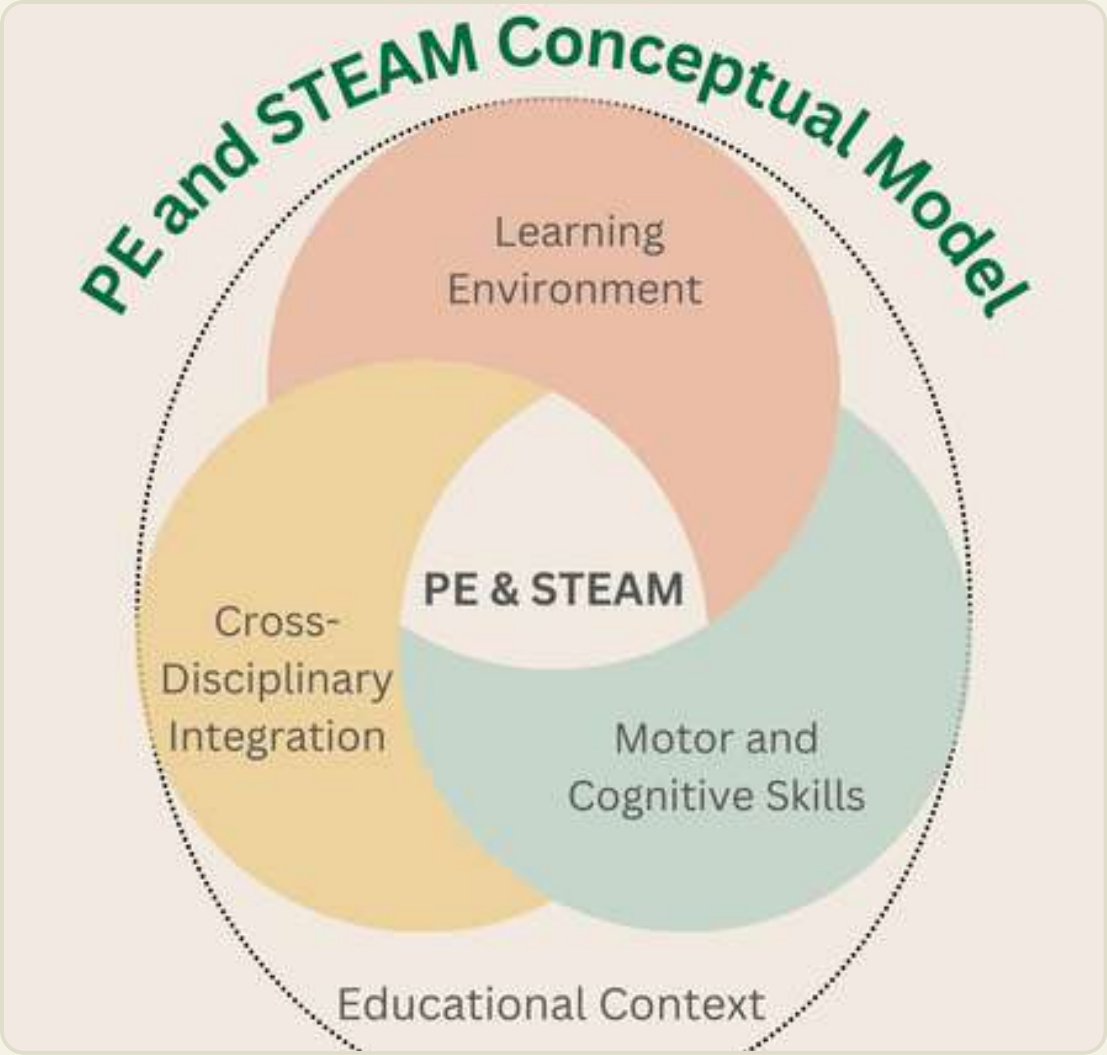
This triad fosters relevant, joyful, and meaningful learning that reflects students' realities and opens new intellectual and physical pathways.

1.6 Alignment with WHO, UNESCO, EU Benchmarks

STEPAM aligns its principles and practices with key international guidelines and goals:

- WHO Global Recommendations on Physical Activity for Health (2010): Advocating at least 60 minutes of moderate to vigorous physical activity daily for school-aged children
- UNESCO Quality Physical Education Guidelines for Policymakers (2015): Promoting inclusive, safe, and rights-based PE for all
- Council of the European Union (2013): Emphasizing the integration of health-enhancing physical activity into school policies
- European Commission STEAM Initiatives: Encouraging interdisciplinary approaches and gender-inclusive STEM participation

By grounding its strategies in these global references, STEPAM supports national ministries, schools, and teachers in building robust, evidence-informed, and internationally recognized programs.



1.7 Phenomenon-Based Learning and the STEPAM Circle

One of the guiding methodological pillars of STEPAM is Phenomenon-Based Learning (PBL), a Finnish-origin model that integrates subjects through real-world phenomena rather than isolated topics. Within STEPAM, this approach is expressed through the STEPAM Circle — a conceptual model that includes:

- Motor and Cognitive Skills
- Cross-Disciplinary Integration
- Learning Environment
- Inclusive & Equitable Participation
- Assessment & Adaptation

Each unit or activity is designed to touch multiple domains simultaneously, allowing students to explore movement, science, art, and community in ways that are interconnected, reflective, and embodied. The STEPAM Circle ensures that learning is not fragmented, but holistic — connecting the body, mind, and world.

02

Evidence-Based Foundations of STEPAM





2.1 STEPAM: An Evidence Based Framework

The STEPAM approach presented in this handbook is grounded in current educational research. To better understand how Physical Activity (PA), Physical Education (PE), and STEAM education have been integrated across educational settings, a systematic review of 45 empirical studies was conducted. The findings provide an evidence-based foundation for the PA-STEAM Framework, which supports educators in designing meaningful interdisciplinary learning experiences.

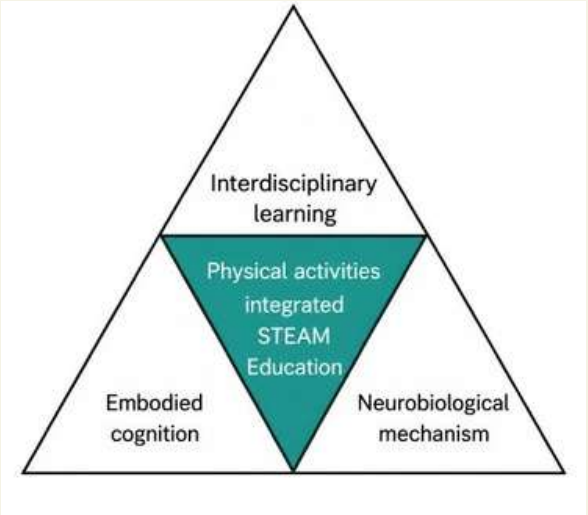
Rather than prescribing a single method, the framework illustrates the different ways movement and STEAM disciplines can be integrated.

The framework helps teachers to:

- understand different approaches to PA–STEAM integration;
- design balanced interdisciplinary learning experiences;
- select appropriate roles for physical activity and technology;
- reflect on the educational purpose of movement within STEAM learning.

2.2 Theoretical Foundations for Movement-Based Learning

The integration of movement within STEPAM is supported by three complementary perspectives: **Embodied Cognition Theory**, which links movement with learning; **Interdisciplinary Learning Theory**, which promotes meaningful connections across curriculum areas; and **Neurobiological Research**, which shows that physical activity enhances cognitive function and academic performance. Together, these perspectives provide the theoretical foundation for the PA-STEAM Framework.





2.3 The PA-STEAM Framework

The PA-STEAM Framework organises STEPAM learning experiences using two complementary dimensions.

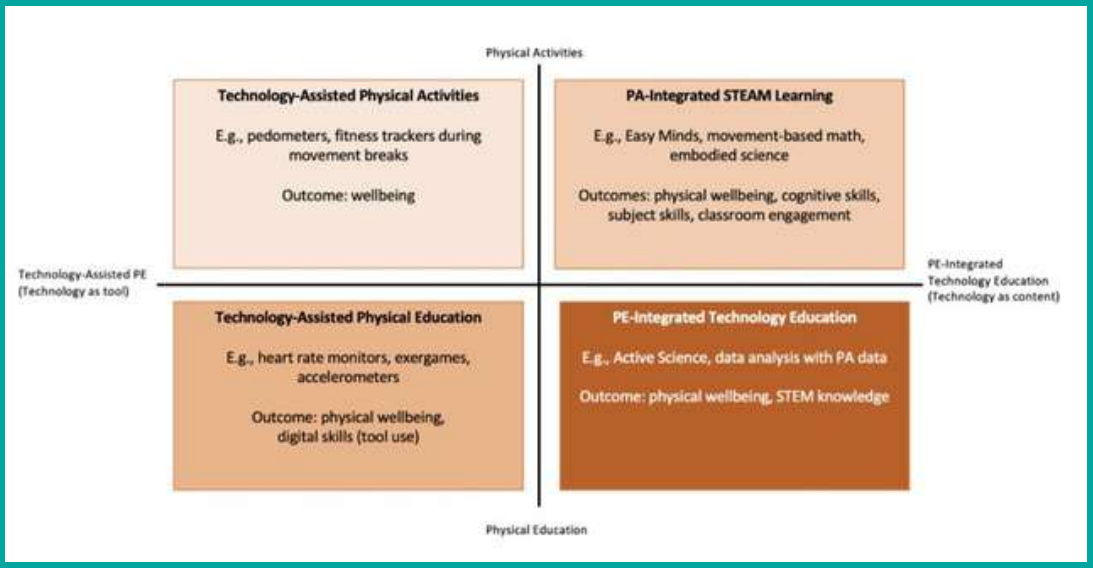
The horizontal axis represents the role of movement, ranging from Physical Activity (PA) to Physical Education (PE).

- **Physical Activity** focuses on movement as a strategy to support learning, increase engagement, and promote active participation across different curriculum areas.
- **Physical Education** positions movement as an educational discipline where students develop physical literacy, motor competence, teamwork, and health-related knowledge while simultaneously engaging with STEAM concepts.

The vertical axis represents the role of technology.

- **Technology as Assistance** refers to digital tools that support learning, such as tablets, sensors, videos, heart-rate monitors, or augmented reality.
- **Technology as Content** involves learning technological knowledge and skills directly, including robotics, coding, computational thinking, engineering design, digital modelling, and programming.

Together, these two dimensions generate four complementary approaches to STEPAM integration.





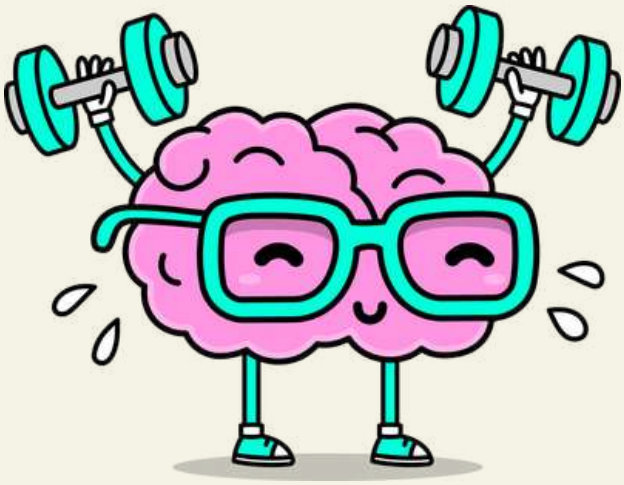
2.4 What Does Evidence Tells Us?

The systematic review identified several important trends that can inform educational practice.

Key findings

✓ Most STEPAM experiences are implemented in primary education.
✓ Mathematics and Science are the most frequently integrated disciplines.
✓ Technology is commonly used as a learning tool, while explicit technological learning is less frequent.
✓ Engineering remains one of the least represented STEAM disciplines, highlighting opportunities for future curriculum development.
✓ Evidence consistently reports positive outcomes in student motivation, engagement, academic learning, collaboration, creativity, and physical wellbeing.

These findings demonstrate that integrating movement with STEAM learning can support both academic achievement and holistic student development.







2.5 Implications for Teachers

The evidence suggests several principles that can guide effective STEPAM implementation.

Design movement with purpose
Movement should support meaningful learning rather than simply providing classroom activity breaks. Physical experiences should reinforce disciplinary understanding and promote active engagement with concepts.

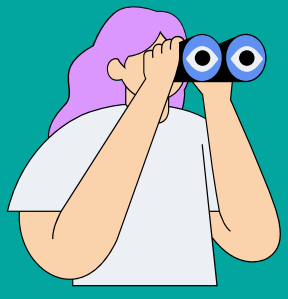
Balance physical and cognitive learning
Successful STEPAM experiences integrate physical participation with inquiry, problem-solving, creativity, and reflection.

Integrate technology intentionally
Technology can function both as a learning resource and as an educational content area. Teachers should consider whether technology is supporting learning, becoming part of the learning objectives, or both.

Strengthen engineering learning
Although engineering appears less frequently than other STEAM disciplines, authentic design challenges provide valuable opportunities for students to investigate, create, test, and improve solutions collaboratively.

Encourage interdisciplinary collaboration
Effective STEPAM implementation benefits from collaboration between Physical Education teachers, classroom teachers, and STEAM specialists to design authentic learning experiences.

2.6 Looking Ahead!!



The PA-STEPAM Framework provides an evidence-informed perspective for understanding and designing integrated learning experiences. Throughout this handbook, the framework serves as a reference for the lesson sequences, assessment strategies, and interdisciplinary activities presented in the following chapters. By combining research evidence with practical classroom applications, STEPAM aims to support educators in creating engaging, inclusive, and meaningful learning experiences for all students.

03

The STEPAM Commitments







3.1 Commitment to Holistic Education

The STEPAM project embraces a holistic approach to education that recognizes the interconnected development of students' physical, cognitive, social, and emotional dimensions. Grounded in interdisciplinary and embodied learning principles, holistic education within STEPAM integrates physical activity with STEAM subjects to foster meaningful, real-world learning experiences.

Research highlights that physical activity not only enhances health and well-being but also supports cognitive functions such as attention, memory, and problem-solving, which are essential for academic success. By embedding movement into learning processes, students engage more deeply with abstract concepts, transforming them into tangible and experiential knowledge.

Furthermore, the STEPAM framework emphasizes inclusive and equitable participation, ensuring that all learners benefit from integrated educational practices. Through the alignment of motor and cognitive skills, cross-disciplinary connections, and supportive learning environments, holistic education becomes a foundation for developing adaptable, creative, and resilient individuals prepared for the complexities of the modern world.



3.2 Cross-Cultural Learning Commitments

Our organization draws inspiration from comparative insights across Austria, Serbia, and Finland, embracing diverse cultural approaches to PE. We acknowledge that educational policies must reflect national values while also aligning with international benchmarks from UNESCO, WHO, and the European Commission. We aim to synthesize these into a common framework that supports:

- Inclusive and equitable PE practices
- Consistent weekly instructional time
- Cross-disciplinary connections with Science, Technology, Engineering, Art, and Mathematics (STEAM)



3.3 Commitment to Equal Opportunity through PE

We believe PE should be inclusive and adaptive, ensuring access for all students regardless of physical ability, background, or gender identity. This includes:

- Providing inclusive equipment and space
- Offering adaptive PE strategies aligned with students' needs
- Training educators in inclusive pedagogies



3.4 Non-Discrimination in Physical Education

Physical Education programs under STEPAM must be free from any form of discrimination. Schools and partner institutions must ensure that:

- No student is excluded from PE based on disability, ethnicity, gender, or socio-economic status
- PE classes promote mutual respect, fair play, and diversity appreciation



3.5 Commitment to Evidence-Based Practice

STEPAM policies are shaped by international evidence and comparative research from national curricula in Europe. We commit to:

- Reviewing and aligning curricula with current educational research
- Supporting continuous improvement based on data from implementation
- Encouraging experimentation with models like Active Science that merge technology, PE, and data literacy



3.6 Open Dialogue and Feedback

Educators and administrators are encouraged to share insights, challenges, and suggestions for improving the integration of PE into broader academic frameworks. The STEPAM network supports:

- Cross-border teacher collaboration (e.g., Erasmus+, bilateral partnerships)
- Peer observation and professional learning communities
- Annual policy reviews and reflective practice



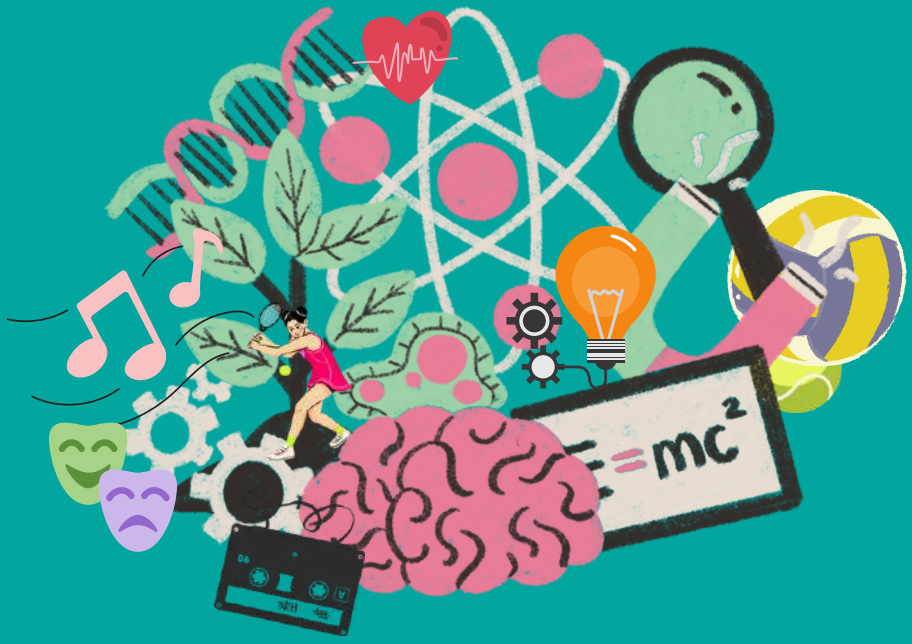
3.7 Integrating PE with STEAM

A central workplace commitment within STEPAM is to intentionally integrate PE with STEAM principles, using a model grounded in:

- Motor and Cognitive Skills Development
- Cross-Disciplinary Integration (e.g., applying math in movement-based tasks)
- Learning Environments that support creativity and inquiry

This interdisciplinary approach enhances both academic and health outcomes, reinforcing physical activity as a bridge to deeper understanding in core subjects.

04 Curriculum Framework &Educational Approach







4.1 Curriculum Anchors (PE, STEAM, Interdisciplinary Goals)

The STEPAM curriculum is anchored in three interconnected pillars:

Physical Education (PE)
Emphasizing motor development, coordination, health literacy, and teamwork. PE activities are not separate from cognitive goals, but integral to them.

STEAM Fields
Science, Technology, Engineering, Arts, and Mathematics provide conceptual foundations for inquiry, experimentation, and problem-solving. These are woven into physical tasks in creative and relevant ways.

Interdisciplinary Goals
STEPAM promotes thematic learning, where activities develop multiple competencies at once—for example, combining movement with calculation or creative design.

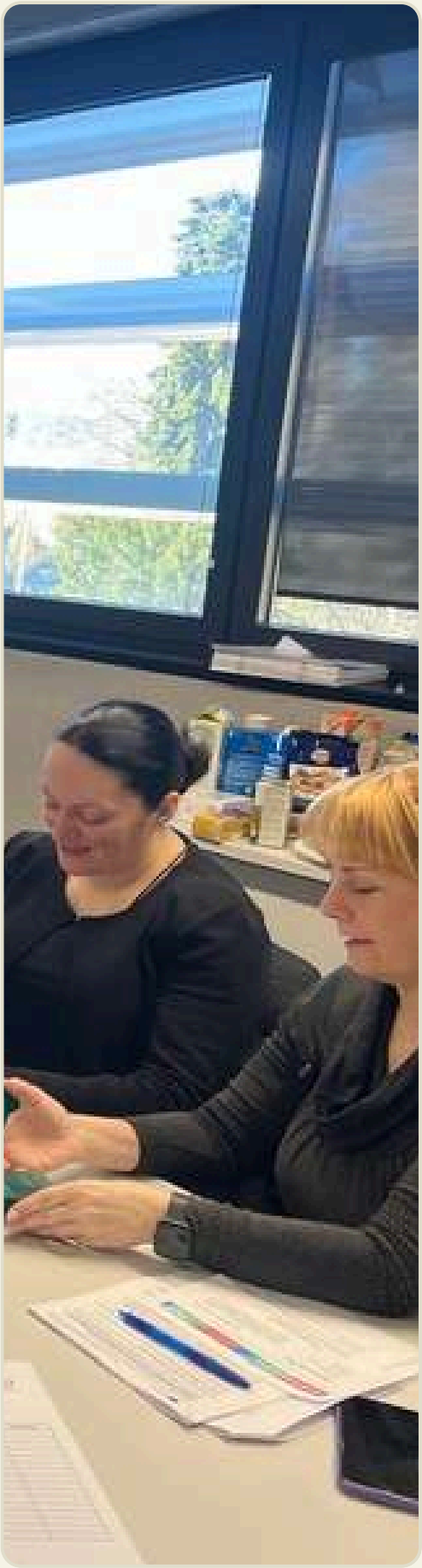
By rooting each unit in these anchors, STEPAM provides students with a dynamic, embodied, and integrated learning experience that prepares them for the complex challenges of the future.

4.2 Organization by Learning Dimensions

STEPAM organizes learning around flexible, cross-cutting dimensions rather than rigid subjects, such as:

- **Movement & Space** (e.g., obstacle courses, spatial orientation, symmetry)
- **Measurement & Data** (e.g., measuring time, length, mass, recording results)
- **Scientific Inquiry** (e.g., forces, electricity, water cycle, magnetism)
- **Creative Expression** (e.g., dance, visual art, body design, tessellation)
- **Health & Sustainability** (e.g., healthy habits, recycling, food systems)
- **Community & Culture** (e.g., traditional games, social roles, collaboration)

This approach allows teachers to adapt activities to local contexts, resources, and student needs while staying aligned with the overall STEPAM vision.



4.3 Core Competencies and Soft Skills

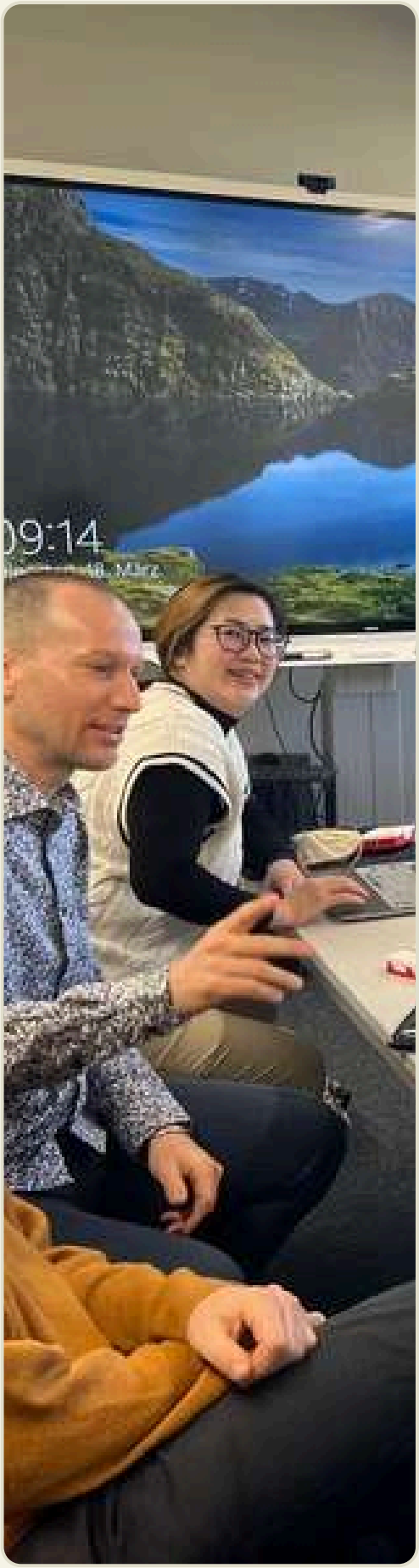
Each STEPAM activity is designed to promote both academic competencies and socio-emotional development. Core competencies include:

- Physical literacy: control of movement, coordination, body awareness
- Mathematical reasoning: estimation, comparison, measurement, number sense
- Scientific thinking: cause-and-effect relationships, observation, experimentation
- Artistic creativity: pattern recognition, visual design, movement expression
- Technological fluency: using simple tools (apps, devices) to explore content

Additionally, STEPAM explicitly fosters soft skills such as:

- Teamwork and cooperation
- Empathy and inclusive behavior
- Resilience and perseverance
- Critical thinking and reflection
- Leadership and communication

These are essential for the development of students as whole learners and active citizens.

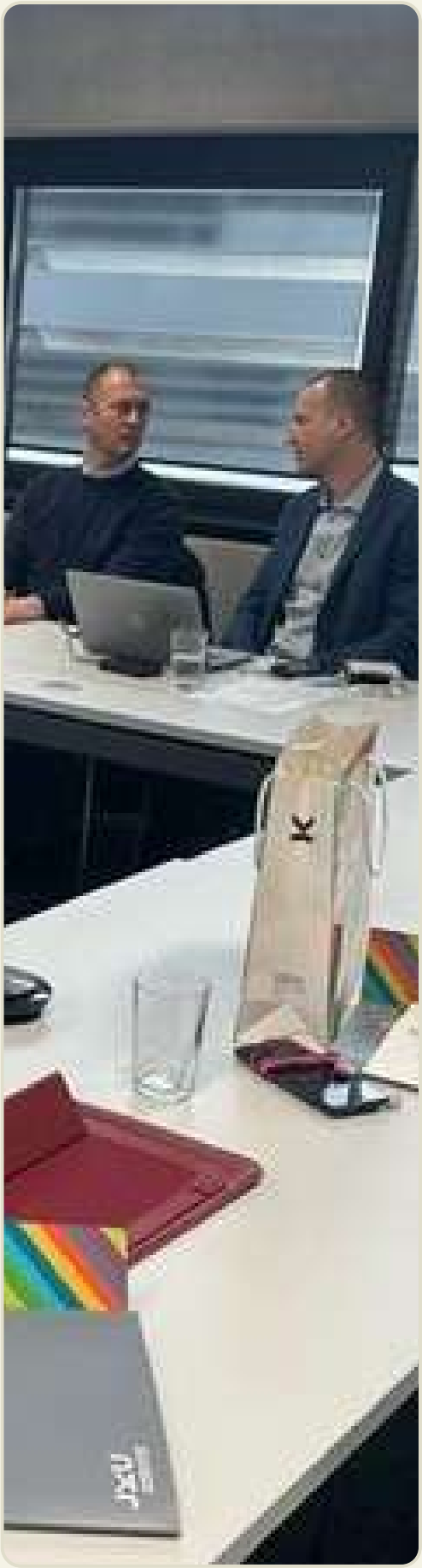


4.4 Assessment Strategies

Assessment in STEPAM is non-competitive, formative, and multi-modal. Its primary goal is to support learning and inclusion—not to rank or exclude.

- **Formative assessment:** Continuous observation and feedback during activities
- **Observational tools:** Checklists, journals, teacher notes to track progress
- **Creative output:** Students may create drawings, models, choreographies, or write reflections to demonstrate their understanding
- **Peer and self-assessment:** Encouraged to build responsibility and metacognition

Each unit includes sample evaluation criteria adapted for students with different levels of physical or cognitive development. Teachers are encouraged to focus on progress, participation, and effort, rather than standardized benchmarks.



4.5 Safety, Accessibility & Inclusion

A core component of the STEPAM curriculum is its commitment to safe, accessible, and inclusive participation. Every unit and activity includes guidance to ensure:

- **Physical safety:** appropriate materials, risk assessment, emergency protocols
- **Accessibility:** modifications for students with disabilities or mobility needs
- **Gender inclusion:** language, teams, and roles are designed to promote equity
- **Cultural sensitivity:** activities reflect or adapt to local customs and traditions
- **Psychological safety:** environments promote respect, cooperation, and trust

Inclusive PE does not mean creating separate activities, but designing environments where everyone can participate together, with meaningful adaptations.

05

Thematic Units and Cross-Curricular Activities



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Materials Box Challenge

Exploring Geometry & Materials Properties through Play & Games

This lesson introduces students to the relationship between geometric form, material properties, and function through observation, movement, and construction. By working with everyday objects and physical models, students explore how geometry operates in real-life and scientific contexts.



Key Takeaway

The shape and material of an object determine how it behaves and how it can be used. Geometry is embedded in everyday objects, movement, and design.

Practical Considerations

- **Student level:** Upper primary / lower secondary (adaptable)
- **Prerequisites:** Basic familiarity with simple geometric shapes
- **Time needed:** 90 minutes
- **Learning space:** Classroom with open space for movement
- **Equipment:** Materials box, construction materials (clay, plastiline, plastic, wood, paper, rubber, textiles, etc), sports balls, modeling toolkit, digital devices, visual slides (optional)

Teacher's Role

The teacher introduces the activity through guided observation of everyday objects, encouraging students to notice shape, material, and function. Throughout the challenge, the teacher facilitates movement, supports group collaboration, prompts comparison between materials, and guides reflection through targeted questioning.

Students' Role

Students actively observe, discuss, move, and construct. In small groups, they retrieve materials, analyze their properties, and collaboratively build assigned geometric shapes. Students adapt their models and explain their design choices using geometric and material-based reasoning.

Activity!!

1

Introduction



Students observe everyday objects — particularly sports balls — to identify geometric shapes such as spheres, cubes, cylinders, and pyramids. Discussion focuses on why certain shapes and materials are chosen for specific functions.

2

Materials Box Challenge

- Students work in small groups to construct an assigned geometric shape using the available materials.
- Through the Box Challenge, students move (running, skipping, hopping, crawling) to collect materials, analyze their properties, and compare them within the group.



3

Model Construction and Adaptation

Groups build geometric models using selected materials and refine them according to criteria such as stability, aesthetics, or scientific relevance. Short presentations support communication and peer learning.

Student Reflection (Teacher-Guided)

To support deeper understanding, the teacher may guide reflection using questions such as:

- How did the properties of your material influence your design?
- Which materials worked best for your shape, and why?
- What challenges did you encounter, and how did your group solve them?
- Where can you find similar shapes or materials in everyday life or science?
- How did teamwork and communication affect your final result?

Reflection and Consolidation

The lesson concludes with a whole-class reflection connecting physical models to real-world and scientific structures. Students consolidate learning by creating a short concept map linking geometry, materials, and **STEAM** applications.

STEPAM Integration

- **Science:** Material properties and structural models
- **Technology:** Research and concept mapping
- **Engineering:** Design and construction
- **Physical Education:** Movement and coordination
- **Art:** Creative form and texture
- **Mathematics:** Geometric shapes and spatial reasoning

Step by Step

Motion and Static Positions

This lesson helps students explore and understand motion and static positions through observation, movement, visual representation, and measurement. By combining physical activity with artistic, digital, and mathematical tools, students experience motion as a measurable and representable phenomenon.

Key Takeaway

Motion describes change in position, while static objects remain still — both can be observed, represented, and measured in different ways.

Practical Considerations

- **Student level:** Upper primary / lower secondary (adaptable)
- **Prerequisites:** Basic observation and teamwork skills
- **Time needed:** 90-160 minutes
- **Learning space:** Classroom, outdoor area, and play space
- **Equipment:** Art materials (paper, paints, crayons, markers), digital devices, measuring tools (measuring tape, rulers, graph paper or graphing tools)

Advance preparation

- Prepare observation areas and play zones
- Check digital tools and materials
- Mark lines or paths for movement games

Teacher's Role

The teacher introduces the concepts of motion and stillness through examples and guided observation. Throughout the lesson, the teacher facilitates activities, ensures safe movement, supports digital and artistic representations, and guides students in collecting and interpreting motion data.

Students' Role

Students observe, move, create, measure, and collaborate. They explore motion in nature, represent it visually and digitally, engage in movement-based games, and analyze simple motion data using mathematical tools.

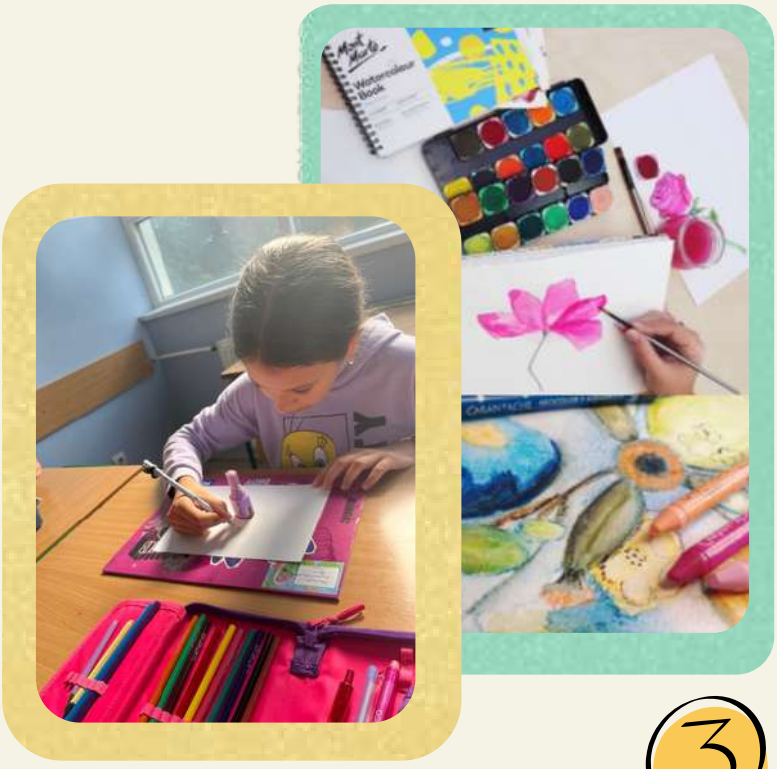
Activity!!

1 Introduction: Exploring Motion and Stillness (10-20 min)

Students watch the video Movement Around Us(⚠) showing examples of motion and stillness. Through guided questions, they identify moving and static elements in everyday life.
The activity continues with a brief outdoor observation, where students notice motion in nature and discuss simple factors that influence movement, such as gravity and wind.

2 Representing Motion Paths

Using art materials, students draw motion paths (straight, curved, zigzag) based on their observations and share their interpretations.



3 Movement Games

Through structured games, students experience motion and stillness physically, following rules that limit or guide movement and encourage teamwork and strategy.

a **Polar Bear and Line Tag**
Objective: Reinforce motion concepts through teamwork and physical activity.

b **White Bear Tag**
Objective: Reinforce motion concepts, physical activity and it's ideal for snowy conditions.

Activity !!



4 **Digital Path Creation** (20 min)

Students recreate observed motion paths using digital tools, labeling and explaining different types of movement.

Measuring and Graphing Motion (25 min) 5

Students measure distances and time during simple motion activities, record data, and represent it using basic graphs to identify patterns.

Check the **Geogebra** **STEPAM MOOC** to play the videos and learn more about the activities! Scan the **QR code** to get to the site.

Student Reflection (Teacher-Guided)

The teacher may guide reflection with questions such as:

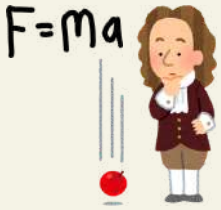
- What examples of motion and stillness did you observe?
- How did movement feel different during games and observations?
- Why do some motion paths look straight while others curve?
- How did measurement help you understand motion better?
- How did working as a team support learning?

Reflection and Consolidation

The lesson concludes with a class discussion linking observation, movement, art, technology, and mathematics. Students consolidate learning by summarizing motion concepts through drawings, digital paths, and simple graphs.

STEPAM Integration

- **Science:** Exploration of motion and static positions through observation and experiments.
- **Technology:** Digital representation of motion paths
- **Engineering:** Design of physical and digital movement paths
- **Physical Education:** Movement, coordination, and teamwork
- **Art:** Creative visual representation of motion using various techniques
- **Mathematics:** Measurement and graphing of motion data



Forces Game!

Push, Pull, Flour and No Shoes!

This lesson introduces the concept of force through physical interaction and experimentation. By pushing and pulling in different conditions, students experience how force depends on magnitude, direction, mass, and surface friction.

Key Takeaway

A force is a push or a pull that can change movement. Its effect depends on strength, direction, mass, and the surface involved.

Practical Considerations

- **Student level:** Upper primary / lower secondary (adaptable)
- **Prerequisites:** Ability to follow safety rules and work in pairs
- **Time needed:** 60-90 minutes
- **Learning space:** Large open indoor or outdoor area
- **Equipment:** Chalk, arrows, flour, ropes

Teacher's Role

The teacher introduces the idea of force as a push or pull and explains safety rules. During the activities, the teacher observes interactions, manages pairings, introduces variations, and guides students to notice how force, mass, and surface conditions affect movement.

Advance preparation

- Prepare force arrows in different sizes and colors
- Mark starting and finishing lines on the ground
- Review safety rules for physical contact

Students' Role

Students work in pairs to apply forces through pushing and pulling. They compare experiences with different partners and conditions, observe outcomes, and reflect on how force changes depending on body mass and surface friction.

Activity!!

Push ... (20 min)

Students are divided in two teams (A & B), they form 3 or 4 pairs between opposite teams (A1B1, A2B2,A3B3, etc) facing each other on the contrary side of the starting line. At the teacher's cue, students push their pair towards the finishing line using their hands. Repeat it, two, or three times, allow the students to pair with someone else with a different body constitution to theirs. Help students notice how differences in body **mass** affect who wins the challenge.

Pulling ...(20 min)

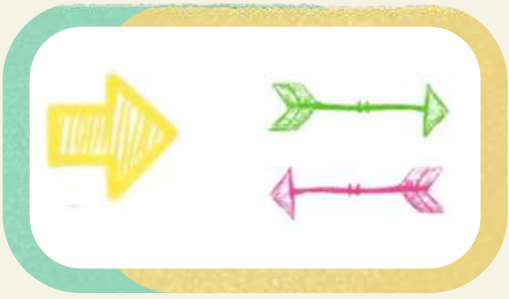
Students stand in pairs on opposite sides of a starting line and try to push their partner toward a finishing line using their hands.



Surface and Friction Variation (30 min)

Students repeat the standing activity under different conditions: barefoot, with flour on both feet, and with flour on one participant only. Guide students to compare the results of Activities 1 and 2 with the variations introduced in Activity 3.

Graphic Representation of Forces: Arrows (10 min)



Using the colored arrows that the students previously made, the teacher helps students visualize forces by representing their direction and magnitude.

5 **Rope Pull** (10 min)

In this game, team's members pull a rope to move a board across a marked distance. The activity helps students recognize how force magnitude, direction, and coordination affect movement. Teachers can guide students to observe how synchronized effort and body positioning influence speed and control.



Student Reflection (Teacher-Guided)

The teacher may guide reflection with questions such as:

- When was it easier to push or pull your partner?
- How did body size and mass affect the result?
- How did the surface under your feet change the outcome?
- What role did friction play in each situation?
- In which direction was the force applied?

Reflection and Consolidation

The lesson concludes by linking push and pull to friction, explaining how rougher surfaces increase resistance and support stability, while smoother surfaces reduce friction and make movement easier.

STEPAM Integration

- **Science:** Types and characteristics of forces
- **Technology:** —
- **Engineering:** —
- **Physical Education:** Push and pull movement activities
- **Art:** Designing visual force arrows
- **Mathematics:** Understanding force magnitude and direction

Check the **Geogebra** **STEPAM MOOC** to play the videos and learn more about the activities! Scan the **QR code** to get to the site.



Robots

Exploring Motion Through Forces, Measurement, and Making

This lesson introduces action and reaction forces and how they influence the movement and stopping of objects. Through experiments, physical activities, and creative construction, students observe how forces act, react, and can be measured, modified, and used to create simple machines.

Key Takeaway

For every action, there is an equal and opposite reaction. Forces affect how objects move, stop, and interact with their environment.

Practical Considerations

- **Student level:** Upper primary / lower secondary (adaptable)
- **Prerequisites:** Basic understanding of motion and simple measurements
- **Time needed:** 90-120 minutes
- **Learning space:** Classroom, gym, and open work areas
- **Equipment:** Ramps, toy cars, balls, measuring tools, stopwatch, objects of different weights, worksheets, craft materials (toothbrush heads, motors, batteries, tape, markers)

Advance preparation

- Prepare ramps and data sheets
- Test motors and batteries
- Organize materials for building stations

Teacher's Role

The teacher introduces the concept of action and reaction using relatable examples and ensures students understand safety and measurement procedures. Throughout the lesson, the teacher supports experimentation, guides observation and data analysis, and encourages reflection across physical, scientific, and creative tasks.

Students' Role

Students observe, measure, move, build, and create. They experiment with motion, record data, engage in physical challenges, and construct simple machines that demonstrate action and reaction forces.

Activity!!

1 Action Reaction Experiment!

Students explore how objects move and stop by releasing toy cars or balls down a ramp. They observe acceleration, impact, and stopping, discussing gravity, friction, and reaction forces.

2 Measuring Motion

Students measure the time it takes for a car to travel down ramps of different heights. They compare results, identify patterns, and optionally represent data using simple graphs.





3 Push That Ball!

Through a relay-style physical activity, students push balls of different sizes and weights, experiencing how force, mass, and surface affect movement.

4 Building Bristle Bots

Students construct simple bristle bots using motors and toothbrush heads. By adjusting weight and bristle direction, they observe how action and reaction forces produce motion.

5 Building Artbots

Students create artbots that move and draw patterns. This activity highlights how mechanical forces can be used creatively to produce visual outcomes.

Activity!!



Rope Pull! 6

This game challenges teams to work together to pull a board across a marked distance using a rope. As students engage, the teacher can help them recognize how force, direction, and effort combine: the stronger and better-aligned the pull, the faster the board moves.

Encourage students to notice how body positioning, coordination, and teamwork influence their success, and how pulling harder at the right angle changes movement compared to uneven or uncoordinated force.



Land Mines 7

In this paired movement game, students navigate a circular arena while holding a stick and avoiding “mines.” Through pushing, pulling, and adjusting their posture, they experience how forces affect motion and balance. The activity helps students recognize action–reaction forces and the small body adjustments needed to stay stable.

Check the **Geogebra** **STEPAM MOOC** to play the videos and learn more about the activities! Scan the **QR code** to get to the site.

Student Reflection (Teacher-Guided)

The teacher may guide reflection with questions such as:

- What happens when an object pushes against another object?
- How did ramp height affect speed and time?
- Why did some balls move farther or stop sooner?
- How did changing weight or direction affect your bot?
- How can forces be used intentionally in design?

Reflection and Consolidation

The lesson concludes with a discussion connecting experiments, physical activities, and creative constructions. Students summarize how action and reaction forces explain movement, stopping, and design in both scientific and artistic contexts.

STEPAM Integration

- **Science:** Action and reaction forces; motion and stopping
- **Technology:** Exploring motors and energy transfer
- **Engineering:** Building simple machines (bristle bots, artbots)
- **Physical Education:** Push-based movement activities
- **Art:** Creating force-driven visual patterns
- **Mathematics:** Measuring time, height, and representing data graphically



Non-Newtonian Fluids?

Exploring Liquids, Viscosity, and Matter through Movement and Experimentation

This lesson introduces students to liquids as a state of matter, focusing on viscosity and the distinction between Newtonian and non-Newtonian fluids. Through hands-on experimentation with Oobleck, mathematical planning, and physical challenges, students explore how materials behave under applied force.

Key Takeaway

Not all liquids behave the same way. While Newtonian fluids maintain a constant viscosity, non-Newtonian fluids change their behavior when force is applied—sometimes acting like solids and sometimes like liquids.

Practical Considerations

- **Student level:** Upper primary / lower secondary
- **Prerequisites:** Basic understanding of states of matter. Basic arithmetic (volume, proportions, multiplication). Ability to follow safety instructions and work in teams
- **Time needed:** 60–90 minutes
- **Learning space:** Classroom and/or open area for Oobleck activity.
- **Equipment:**
- Buckets or large containers
- Cornstarch
- Water
- Measuring cups/scales
- Optional: food coloring, glitter
- Towels, floor covers
- Recording devices (tablet or phone)
- Images or slides of fluids and viscosity examples

Advance preparation

- Prepare 15 cm deep buckets or containers
- Gather cornstarch and water
- Cover the floor to prevent spills
- Prepare tablets or phones for recording

Teacher's Role

The teacher introduces fluid properties, guides investigations and calculations, ensures safety, and facilitates discussion and reflection.

Students' Role

Students calculate material quantities, prepare and test the Oobleck mixture, take part in relay challenges, observe fluid behavior under stress, and record and reflect on their learning.

Activity!!

1 Planning the Experiment: Math Meets Matter

One day before the experiment, students calculate the volume of a container large enough to fit both feet, with a minimum height of 15 cm. This volume determines the amount of water needed for the mixture. Based on this calculation, students then determine the mass of cornstarch required, using twice the amount of water. This planning stage establishes the mathematical foundation for the experiment.





2 Making Oobleck: Hands-On Science

On the day of the experiment, students prepare the cornstarch–water mixture using their calculated quantities. They may add food coloring or glitter to personalize their Oobleck. While mixing, students observe changes in texture, resistance, and flow, experiencing viscosity directly through touch and movement.

Activity !!

Oobleck Relay Challenge: Move to Stay on Top

3

Students are divided into two or three teams and take turns stepping onto the Oobleck. The challenge is to run in place continuously without sinking; when movement stops, the material behaves more like a liquid, and the student sinks. Teammates may switch places, ensuring that all students participate at least once. The team that remains on the surface for the longest time wins. During the activity, students record short videos describing their sensations, observations, and explanations of the phenomenon.



4

Compare & Predict: Could This Work with Water?

After the relay, students discuss whether the same activity could be performed using water or salted water. They make predictions and justify their reasoning by comparing these liquids with the behavior observed in the Oobleck experiment.

Check the **Geogebra** **STEPAM MOOC** to play the videos and learn more about the activities! Scan the **QR code** to get to the site.

Student Reflection (Teacher-Guided)

The teacher may guide reflection with questions such as:

- Why were you able to run on Oobleck but not stand still?
- How did force and movement change the behavior of the material?
- How does Oobleck compare to water, milk, or shampoo?
- What role did math play in making the experiment work?
- How did movement help you understand the science concept better?

Reflection and Consolidation

The teacher consolidates learning by connecting students' experiences to key concepts, reviewing the states of matter (solid, liquid, and gas), the properties of liquids (defined volume and variable shape), and viscosity as resistance to flow. Newtonian fluids are presented as having constant viscosity, while non-Newtonian fluids change their behavior under applied stress. Examples such as water turning into ice or steam are used to distinguish between changes of state and changes in fluid behavior.

STEPAM Integration

- **Science:** Understanding viscosity and its relation to the non-Newtonian fluid behavior
- **Technology:** Recording experiments and explaining observations digitally
- **Engineering:** Designing the container solution and managing material constraints
- **Physical Education:** Balance, endurance, and coordination through relay challenges
- **Art:** Designing and customizing the Oobleck mixture
- **Mathematics:** Calculating volume, proportions, and material quantities



Rolling & Gravitation-Rollercoasters

Exploring Gravity, Motion, and Engineering through Design and Play

This lesson introduces students to gravity, rolling motion, and fundamental principles of physics through experimentation, engineering design, mathematical analysis, and physical activity. Students investigate how slope, inertia, friction, and action–reaction forces influence motion while designing and testing their own roller coaster models.

Key Takeaway

Gravity drives rolling motion, but slope, friction, and inertia determine how objects move. By designing and testing roller coasters, students connect physics principles with engineering, mathematics, and real-world applications.

Practical Considerations

- **Student level:** Upper primary / lower secondary
- **Prerequisites:** Basic understanding of force & motion. Familiarity with units (meters, seconds). Arithmetic skills (division, fractions, multiplication).
- **Time needed:** 2–3 class periods
- **Learning space:** Classroom or open area for rolling games.
- **Equipment:**
- Pre-made roller coaster templates
- Cardboard, paper, pool noodles/ foam pipe insulation
- Scissors, glue, duct tape
- Marbles, balls of various sizes & weights, bean bags
- Stopwatch or timer, measuring tape, rulers, protractors
- Graphing tools or digital apps
- Worksheets

Advance preparation

- Print and prepare roller coaster templates
- Set up inclined planes with adjustable angles
- Prepare measuring tools and stopwatches
- Ensure a safe open space for rolling activities

Teacher's Role

The teacher introduces key concepts of gravity and motion, guides experiments and construction, ensures safety, and supports data analysis and reflection.

Students' Role

Students explore rolling motion through experiments, design and test roller coaster models, solve motion-related problems, participate in rolling games, and reflect on their findings.

Activity!!

1 Exploring Gravity and Rolling Motion



Students begin by observing a ball rolling down an inclined plane. Through guided experimentation with different slope angles, they observe changes in rolling speed and measure the displaced distance, discovering how gravity accelerates motion and how friction slows it.

2 Engineering – Building Roller Coaster Models



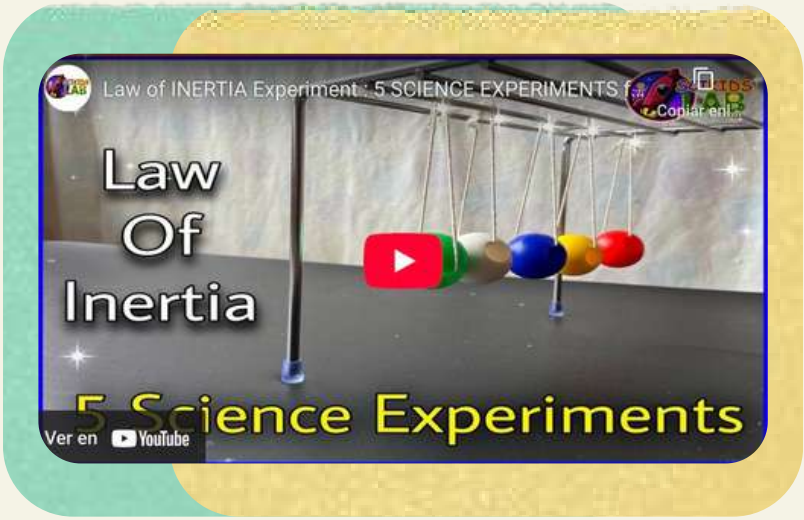
Working in groups, students build roller coaster tracks using prepared templates, test them with marbles, and refine their designs by adjusting slopes or structures. They reflect on how gravity, inertia, and friction affected performance.

3 Mathematics – Rolling Motion and Slopes

Students measure the length of the slopes and time how long it takes a ball to roll down. Using the collected data, they calculate speed (distance ÷ time), solve proportional reasoning problems, and determine fractions of the distance covered. They create simple graphs comparing speeds on different slopes and analyze how angle affects motion.

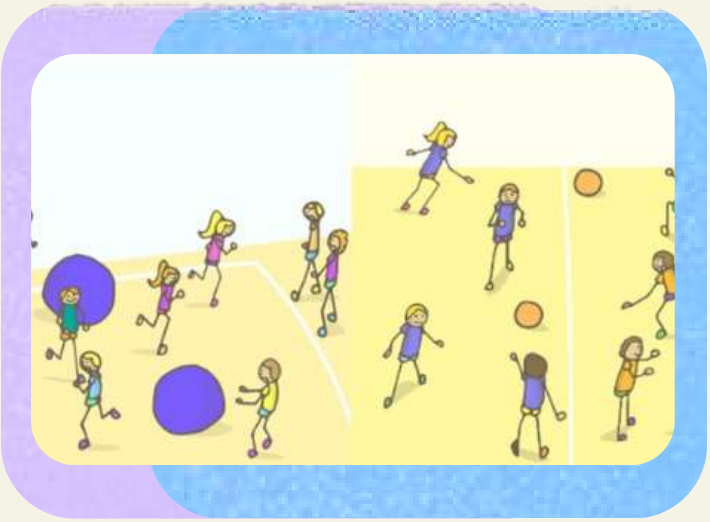
Activity!!

4 Action–Reaction and Inertia Experiments



Students explore Newton's laws of motion through demonstrations and hands-on activities. Using a Newton's cradle, they observe energy transfer and action–reaction forces. They test inertia by pushing a ball across a flat surface and observing how friction slows it. Rolling a ball against a wall demonstrates reaction forces. Optional digital tools can be used to measure acceleration and speed.

5 Physical Education – Rolling Games



Students participate in cooperative and competitive rolling games. In Big Ball Rolling Tag, teams roll large balls to tag others. In Rolling Circle, students roll balls across a circle with varying rules. In Bean Bag Slide, players slide bean bags toward a target, adjusting the distance to adjust the difficulty of the challenge. These games reinforce coordination, teamwork, and understanding of motion.

Student Reflection (Teacher-Guided)

The teacher may guide reflection with questions such as:

- How does gravity influence rolling motion?
- Why do steeper slopes increase speed?
- How did friction affect your roller coaster design?
- How do Newton's laws explain what you observed?

Reflection and Consolidation

The teacher links students' observations to key physics concepts, explaining gravity as the force that pulls objects downward, inertia as resistance to changes in motion, friction as the force that slows movement, and action–reaction forces as described by Newton's laws. Students then apply these ideas to real roller coasters and everyday rolling objects.

STEPAM Integration

- **Science:** Investigating gravity, inertia, friction, and motion
- **Technology:** Using measurement and graphing tools to analyze motion
- **Engineering:** Designing, constructing, and improving roller coaster models
- **Physical Education:** Rolling games that reinforce coordination and applied motion
- **Art:** Decorating and creatively designing roller coaster structures
- **Mathematics:** Calculating speed, distance, time, fractions, and analyzing graphs

Crack the Code

Secret Message

This lesson introduces students to the concept of ciphering, its historical and modern significance, and its application in mathematics and digital safety. Through hands-on activities, students encode and decode messages, solve math problems, and participate in physical and creative challenges.

Key Takeaway

Ciphers are methods of hiding information. Understanding them strengthens logical reasoning, arithmetic skills, teamwork, and awareness of digital safety in real-life contexts.

Practical Considerations

- **Student level:** Upper primary / lower secondary (adaptable)
- **Prerequisites:** Basic understanding of the alphabet, addition, subtraction, and division; ability to follow instructions & work in teams
- **Time needed:** 90-120 minutes
- **Learning space:** Classroom or open area for relay races & maze games
- **Equipment:**
- Pictures/slides of Caesar & substitution ciphers
- Worksheets with math problems and Caesar cipher key (shift of 3)
- Pre-written encrypted messages
- Math problem cards
- Cones or markers for relay paths or maze
- Cardboard, thick paper, scissors, brass fasteners, markers, ruler, compass, alphabet templates
- Balloons, adhesive tape, small notes, balls

Advance preparation

- Prepare worksheets w/encoded messages and math problems
- Set up relay courses & maze grids
- Cut and assemble materials for cipher wheels
- Inflate & tape balloons for “Punch the Exercise Balloon”

Teacher’s Role

The teacher introduces ciphers & their history. They guide the students in solving math problems & encoding/decoding messages. They also facilitate reflection and discussion.

Students’ Role

Students work to encode & decode messages, solve math problems, participate in relay races, maze games, & construct cipher wheels. They reflect on strategies, teamwork, & how ciphering applies to real-life situations.

Activity!!

1 Introduction to Ciphering and Its History

Students learn why people hide messages and explore ciphers like Caesar's shift, substitution ciphers, and the Enigma Machine. They practice encoding a simple message, such as "THIS IS FUN."

Encode and Decode Messages 2

Students work in pairs to decode messages using Caesar and substitution ciphers. They then create their own messages to swap with classmates.
Examples:

- Caesar Cipher (shift 3): FRZHUW WRPDB → CRYPTO TODAY
- Substitution Cipher: 4PP13 → APPLE

3 Ciphered Math Problems

Students solve division problems; each answer acts as a shift key to decode letters using the Caesar cipher. Completing all problems reveals a hidden message (e.g., "Math is cool").

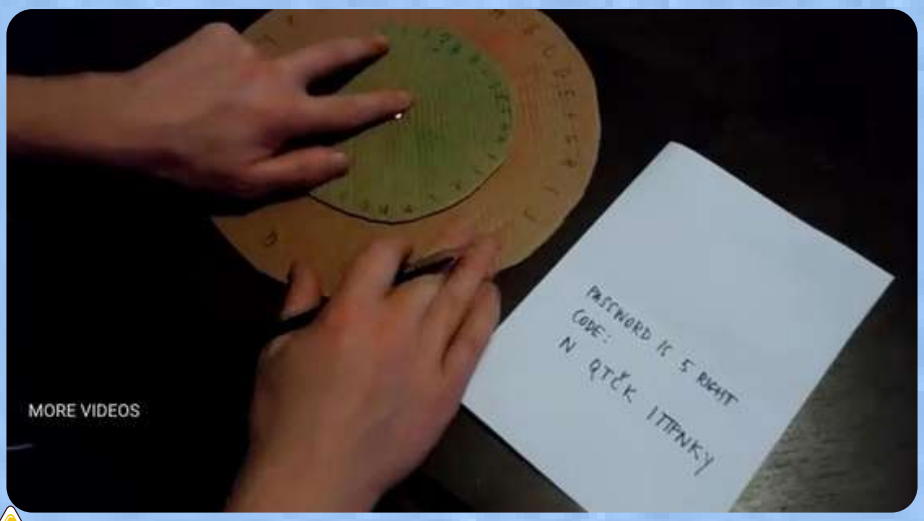
Cipher Relay Race 4

Teams solve math problems along a relay path, using the results as shift keys to decode letters in an encrypted message. The first team to decode the full message wins.

5 Build a Cipher Wheel

Students design and construct a Caesar cipher wheel from cardboard and fasteners. They use the wheel to encode and decode messages, including science-related terms.

Activity !!





Punch the Exercise Balloon

Balloons taped to a wall contain small tasks or coded messages. Teams throw balls to burst balloons and complete the tasks or decode the messages.

Trap Maze – Decode the Safe Path

Students navigate a maze of Poly spots, stepping on safe spots or completing challenges. They use logic, memory, and simple
ciphers to find the correct path.



Check the **Geogebra** **STEPAM MOOC** to play the videos and learn more about the activities! Scan the **QR code** to get to the site.

Student Reflection (Teacher-Guided)

The teacher may guide reflection with questions such as:

- How does ciphering relate to keeping information safe online?
- How did building a cipher wheel help you understand letter shifts?
- What helped you remember safe versus unsafe spots (in the trap maze activity)?
- Which strategies helped in decoding messages or navigating the maze?
- How did teamwork influence problem-solving?
- How did decision-making change as you learned the maze?

Reflection and Consolidation

The lesson concludes with a discussion where the teachers guide the students to link the activities to real-life applications like digital safety, problem-solving, and teamwork.

STEPAM Integration

- **Science:** Digital safety, hazard awareness in information sharing
- **Technology:** Understanding encryption in online environments
- **Engineering:** Designing and constructing cipher wheels
- **Physical Education:** Relay races, maze navigation, balloon challenges
- **Art:** Crafting cipher wheels and designing coded messages
- **Mathematics:** Arithmetic problem-solving and applying number shifts in ciphers



Coding in Action

Introduction to Algorithms Through Movement, Games, and Creative Design

This lesson introduces students to the basics of algorithms and computational thinking through physical activities, coding tools, and creative tasks. Students explore sequencing, repetition, and conditional logic while applying problem-solving skills in both digital and unplugged environments.

Key Takeaway

An algorithm is a clear sequence of steps used to complete a task or solve a problem. Algorithms guide both technology and everyday activities, and they require logical thinking, precision, and debugging.

Practical Considerations

- **Student level:** Upper primary / lower secondary (adaptable)
- **Prerequisites:** Spatial comprehension abilities.
- **Time needed:** 90 minutes
- **Learning space:** Gym or open classroom.
- **Equipment:**
- Bee Bots or coding apps
- Arrow cards for sequencing
- Picture cards for algorithm creation
- Grid worksheets for drawing tasks
- Sports equipment (mattresses, ropes, soft objects)
- Balls for Pac-Man activity
- PowerPoint slides
- Mobile devices or tablets
- Mazes and drawing grids

Advance preparation

- Prepare maze layouts and safe pathways
- Set up Bee Bots or coding apps
- Print arrow cards and grid worksheets
- Organize sports equipment for movement games

Teacher's Role

The teacher introduces algorithmic thinking, facilitates coding and movement activities, ensures safety, and guides reflection on key concepts.

Students' Role

Students create and test algorithms, debug challenges, participate in movement games, collaborate on creative tasks, and reflect on their problem-solving process.

Activity!!

1 Introduction to Algorithms

Students explore the concept of algorithms through daily-life examples such as tying their shoes or following a recipe. The teacher introduces sequencing, repetition, and conditional logic, helping students recognize how structured steps guide actions and decisions.



Algorithm Exploration (Digital and Unplugged) 2

Using Bee Bots or coding apps, students create simple directional algorithms to move a robot from start to finish while avoiding obstacles. In the Minefield Maze activity, one student acts as the "programmer" and gives precise verbal instructions to guide a blindfolded "robot" through a safe path. If errors occur, students debug by correcting the sequence of steps.

3 Fast Decision Making – Real World Pac-Man

Students participate in a live-action maze game inspired by Pac-Man. One student plays Pac-Man while others are Ghosts. Pac-Man must collect balls placed throughout the maze while avoiding being tagged. If tagged, the player restarts and replaces collected balls. The activity reinforces quick decision-making, strategy, and spatial awareness.

Activity!!



Art Coding – Grid Algorithms

4

Working in groups, students create algorithms to draw images on a grid using step-by-step instructions. They exchange algorithms with another group to test clarity and accuracy. Students then design their own images and write detailed instructions, reinforcing precision and logical sequencing.

Trap Maze

5

In the Maze Trap Game, students use pre-created algorithms to navigate a floor maze by stepping only on predetermined safe spots. Mistakes require restarting, reinforcing precision and perseverance.



Check the **Geogebra** **STEPAM MOOC** for an overview of the Real World PacMan, The Minefield & the Trap Maze games! Scan the **QR code** to get to the site.

Student Reflection (Teacher-Guided)

The teacher may prompt reflection with questions such as:

- What makes an algorithm clear and effective?
- What happened when the steps/instructions were not in the right order?
- How did debugging (fixing mistakes) improve your results?
- How did following steps in the right order help you during the games?
- Where do you use algorithms (follow steps/instructions) in everyday life?
- How did teamwork help solve challenges?

Reflection and Consolidation

Students reflect on how algorithms guided both the digital and physical activities. The class discusses how sequencing, repetition, and conditional logic appear in everyday life and technology. Emphasis is placed on debugging as an essential part of problem-solving.

A final group reflection highlights teamwork, clarity of instructions, and the practical value of computational thinking.

STEPAM Integration

- **Science:** Understanding structured processes in daily routines and natural systems
- **Technology:** Introduce Bee bots or coding apps to practice basic coding and algorithm creation
- **Engineering:** Designing and navigating mazes using step-by-step logic
- **Physical Education:** Enhance coordination and spatial awareness through movement-based coding games
- **Art:** Creating grid-based drawings using algorithm instructions
- **Mathematics:** Practicing spatial reasoning, directionality, and logical sequencing



Breaking the Code

Developing Strategy, Logic, and Teamwork Through Active Play

This lesson combines logical reasoning and physical activity through a movement-based version of the Mastermind game. Students apply pattern recognition, deduction, and teamwork while engaging in cardiovascular exercise.



Key Takeaway

Problem-solving improves when we observe feedback, adjust strategies, and work together. Logical thinking and physical movement can reinforce each other in active learning environments.

Practical Considerations

- **Student level:** Upper primary / lower secondary (adaptable)
- **Prerequisites:** Ability to recognize colors and patterns. Basic logical reasoning. Ability to follow game rules and collaborate in teams
- **Time needed:** 60-75 minutes
- **Learning space:** Gym or open classroom with space for running.
- **Equipment:**
- 4 different colored small balls
- Black cone (to cover the secret code)
- Red cones (for feedback signals)
- Open playing space
- Mats, hoops, or floor markers (for ball placement)
- Stopwatch (optional)

Advance preparation

- Prepare 4-color secret code
- Mark four placement spots at the end of the hall
- Organize balls at the starting line
- Review safety rules for running activities

Teacher's Role

The teacher sets the secret code, explains rules, provides feedback after each round, ensures safety during movement, and guides reflection on strategy and teamwork.

Students' Role

Students run (or crabwalk) to select and place colored balls, analyze feedback, adjust their strategy, collaborate with teammates, and apply logical reasoning to break the code.

Activity!!

1 Warm-Up and Introduction

Students begin with short running drills to prepare physically. The teacher introduces the objective: to break a hidden four-color code by placing balls in the correct sequence. Teams are formed, and rules are explained clearly.



2 Breaking the Code Relay

Teams take turns running to collect one colored ball and placing it in one of four marked positions. After four balls are placed, the teacher checks the sequence. For each correctly positioned color, a red cone is placed atop the black cone as feedback. Teams must interpret the feedback and adjust their next attempt. The game continues until one team correctly identifies the full sequence.



3 Variation: Crabwalk Challenge

To increase difficulty, students transport the balls using a crabwalk position instead of running. If the ball drops, the student returns to the start and tries again. This variation adds coordination, balance, and endurance to the activity.

Student Reflection (Teacher-Guided)

The teacher may prompt reflection with questions such as:

- How did your team decide which colors to try next?
- How did the red cones help you think about your next guess?
- How did working together help you succeed?

Reflection and Consolidation

The teacher connects the activity to logical reasoning and deduction, highlighting how feedback supports improvement. Students reflect on how patterns, trial-and-error, and teamwork helped them solve the challenge.

STEPAM Integration

- **Science:** Cause-and-effect reasoning through feedback and deduction
- **Technology:** Applying computational thinking and testing solutions
- **Engineering:** Planning and refining team strategies
- **Physical Education:** Building endurance, coordination, and agility
- **Art:** Working with color recognition and visual patterns
- **Mathematics:** Recognizing patterns and logical sequencing

Check the **Geogebra** **STEPAM MOOC** for an overview of the Crab Ball Relay! Scan the **QR code** to get to the site.



Time in Motion

Learning to Measure, Read, and Use It

This lesson integrates mathematics, physical activity, engineering, and creative design to help students understand how time is measured and used in everyday life. Students explore different types of clocks, learn to read analog time, engage in time-based physical challenges, and design their own functional clock models.



Key Takeaway

Time helps us organize our lives. By learning how clocks work, practicing time calculations, and experiencing time through movement and design, students develop practical mathematical skills and real-world awareness.

Practical Considerations

- **Student level:** Upper primary / lower secondary (adaptable)
- **Prerequisites:** Ability to count to 60. Basic addition and subtraction.
- **Time needed:** 90–120 minutes
- **Learning space:** Gym or open classroom with space for PA.
- **Equipment:**
- Pictures of different types of clocks (analog, digital, hourglass, sundial)
- Memory game cards
- Presentation slides
- Worksheets with time word problems
- Toy clocks or printable clock faces
- Cardboard or thick paper
- Brass pins
- Markers
- Ruler and compass
- Plastic bottles (for water clock)
- Ball
- Hoops
- Beanbags

Advance preparation

- Prepare memory cards with different types of clocks
- Prepare presentation or visual materials
- Print worksheets with time word problems
- Organize materials for clock construction
- Prepare equipment for Ball Pass Timer activity

Teacher's Role

The teacher introduces key concepts about time, demonstrates how to read an analog clock, facilitates mathematical problem-solving, supports students during clock construction, & guides reflection on learning.

Students' Role

Students participate in discussions, practice reading time, solve time-related problems, engage in physical activities that involve time measurement, collaborate in teams, & design & build their own clock models.

Activity!!

1 Introductory Activity: Exploring How We Measure Time



Students begin by engaging in a memory game that introduces different types of clocks. Through discussion, they examine why people measure time and how methods of timekeeping have evolved. This activity acti--vates prior knowledge while positioning time as both a historical and practical concept. Students begin to see that time can be represented in multiple ways, each designed to solve the same fundamental problem: measuring duration.

Understanding the Structure of a Clock 2

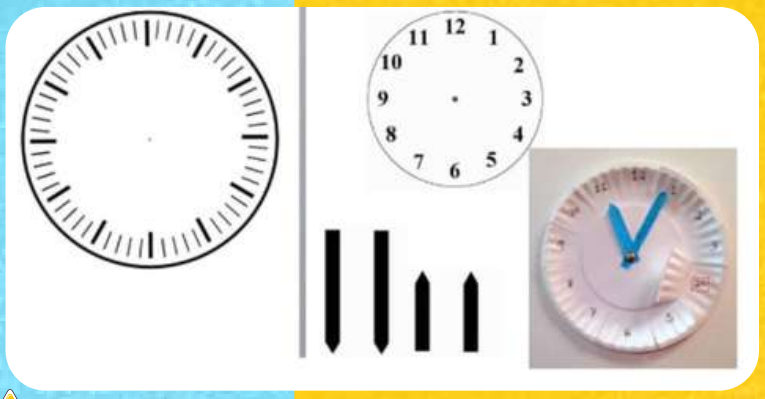
Students investigate the components of an analog clock, identifying the hour hand, minute hand, and dial. Through guided modeling and practice, they explore how the movement of each hand represents measurable units of time. By observing patterns and relationships between hours and minutes, students develop foundational skills in reading time and interpreting numerical positions spatially.

3 Experiencing Duration Through Movement: Ball Pass Timer

In a team-based physical challenge, students experience time as duration rather than simply numbers on a clock. One group completes repeated ball passes while another collects objects within that same time frame. As roles rotate, students begin to perceive how time feels different depending on activity level and coordination. The experience reinforces the idea that time can be measured, compared, and experienced physically, strengthening both teamwork and temporal awareness.

Activity!!





Building a Clock!

4

Students apply their understanding by designing and building a functional analog clock using cardboard and movable hands. Precision in spacing, numbering, and alignment reinforces mathematical accuracy. Additionally, students explore the concept of a water clock, observing how steady movement can mark the passage of time. This engineering-focused activity transforms abstract measurement into a tangible model, deepening conceptual understanding through creation.

Check the **Geogebra** **STEPAM MOOC** for an overview of the Ball Pass Timer Game! Scan the **QR code** to get to the site.

Student Reflection (Teacher-Guided)

The teacher may prompt reflection with questions such as:

- What did you learn about how clocks measure time?
- How do the hour and minute hands work together?
- How did the movement activity help you have a better sense of time?
- Why is it important to measure time accurately?
- Where do you use time-reading skills in your daily life?

Reflection and Consolidation

The teacher connects movement, construction, and mathematical reasoning to emphasize that time is a measurable system that organizes human activity. Students reflect on how observing patterns, practicing calculation, and experiencing duration strengthened their understanding.

STEPAM Integration

- **Science:** Understanding time measurement and the historical development of clocks.
- **Technology:** Using visual tools to explore clock mechanisms.
- **Engineering:** Designing and constructing functional clock models.
- **Physical Education:** Experiencing duration and coordination in timed challenges.
- **Art:** Creative clock design and visual representation.
- **Mathematics:** Reading time, calculating elapsed time, and converting units.



A Journey Through Time: Transformers

Exploring Time Measurement, Historical Innovation, and Future Design

This lesson integrates history, mathematics, physical activity, engineering, and creativity to help students understand time measurement and technological evolution. Through timelines, movement-based challenges, and design tasks, students explore how inventions change across centuries and imagine innovations of the future.



Key Takeaway

Understanding time helps us see patterns in history and innovation. By organizing events chronologically, measuring time intervals, and designing future inventions, students connect past developments to present realities and future possibilities.

Practical Considerations

- **Student level:** Upper primary
- **Prerequisites:** Ability to read dates
- Basic understanding of number sequences, addition, and subtraction. Ability to collaborate in groups
- **Time needed:** 90–120 minutes
- **Learning space:** Gym or open classroom with space for PA.
- **Equipment:**
- Long paper strips for a timeline
- Timeline cards with historical inventions and dates
- Cones and floor markers
- Recyclable materials (cardboard, bottles, foil, caps)
- Scissors, glue, markers, colored paper
- Large poster papers
- Computers or smartphones for research

Advance preparation

- Prepare timeline strips & invention cards
- Organize century, decade, & millennium markers.
- Set up cones or markers for relay activities.
- Prepare recyclable materials
- Ensure access to digital devices for research.

Teacher's Role

The teacher introduces time concepts, facilitates research & movement-based activities, supports mathematical reasoning, guides construction tasks, & leads reflection linking past innovations to future ideas.

Students' Role

Students organize events on timelines, calculate time intervals, participate in relays, research inventions, collaborate in teams, & design & present models of future technologies.

Activity!!

1 Discussion: What is Time Measurement?



The lesson begins with a guided discussion about how life, toys, and transportation have changed over time. Students are introduced to the concept of a timeline and explore the meaning of decade, century, and millennium using clear examples. By visually mapping “long ago” to “today,” students begin to understand time as a measurable and structured progression.

Exploring Inventions Over Time

2

Students explore toys and cars from different historical periods, identifying changes in materials, design, and technology. Through comparison and research, they connect inventions to specific centuries and recognize patterns of innovation over time.

3 Timeline Relay Challenge



Students work in teams to place invention cards in chronological order along a large classroom timeline. In a movement-based variation, teams carry invention cards across a relay path and position them under the correct century markers. After placement, students calculate time differences between events, strengthening mathematical reasoning while physically engaging with historical sequencing.

Activity!!

4



Laser Maze Timeline Challenge

Students navigate a rope "laser maze" symbolizing movement through time, strengthening coordination and teamwork. As part of the challenge, they align pathways to connect historical events in chronological order. For older students, a mini laser maze using small lasers and mirrors can increase precision and problem-solving. In Competition Mode, teams earn points for creativity and successful navigation. In Cooperative Mode, teams work together to build the longest or most intricate maze.

Future Inventions: Designing the Next Century

5

Building on historical understanding, students imagine futuristic inventions. In small groups, they sketch and design futuristic toys or cars, labeling special features and predicting when their invention might exist (next decade, century, or millennium). Using recyclable materials, they construct simple models and present their ideas, explaining how their designs improve upon current technology. Their projected inventions are then placed on a future section of the classroom timeline, reinforcing large-scale time concepts.

Check the **Geogebra** **STEPAM MOOC** for an overview of the Time Relay Challenge & the Lazer Maze Game! Scan the **QR code** to get to the site.

Student Reflection (Teacher-Guided)

The teacher may prompt reflection with questions such as:

- What is the difference between a decade, a century, and a millennium?
- How did the timeline help you understand history better?
- What changes did you notice in toys or cars over time?
- How did you decide when your future invention might exist?
- Why is it useful to organize events in chronological order?

Reflection and Consolidation

The teacher reviews key concepts: measuring time in decades, centuries, and millennia; organizing events chronologically; observing technological evolution; and imagining future innovation. Students reflect on how mathematics, movement, research, and design helped them understand time as both historical structure and future possibility.

STEPAM Integration

- **Science:** Understanding technological progress and innovation.
- **Technology:** Researching historical inventions using digital tools.
- **Engineering:** Designing and constructing future invention prototypes.
- **Physical Education:** Engaging in relay and movement-based sequencing challenges.
- **Art:** Designing and modeling creative future concepts.
- **Mathematics:** Measuring time intervals and organizing chronological sequences.



Symmetry Around Us

Exploring Symmetry through Nature, Movement, and Design

This lesson introduces the concept of symmetry through observation, movement, and design. Students explore symmetry in nature, geometry, and the human body, while applying it through physical activities, digital tools, and creative tasks.

Key Takeaway

Symmetry is a balance of shapes and movements across a line. It appears in nature, the human body, art, and design, and helps us understand patterns, structure, and coordination.

Practical Considerations

- **Student level:** Upper primary / lower secondary
- **Prerequisites:** Basic understanding of materials & simple measurements
- **Time needed:** 60-90 minutes
- **Learning space:** Gym or open areas.
- **Equipment:** Pictures of symmetrical objects (e.g., butterflies, flowers, faces)
- Mirrors, paper, markers, rulers, scissors
- Geometry worksheets
- Devices for Mathigon Polypad
- Art materials for T-shirt design

Advance preparation

- Prepare images of symmetrical objects
- Print worksheets
- Set up access to Mathigon Polypad
- Prepare materials for art activity
- Organize space for movement games

Teacher's Role

The teacher introduces symmetry through examples and guides students in observation, movement, and design activities. They ensure safe participation and support reflection throughout the lesson.

Students' Role

Students explore symmetry through observation, movement, and creative tasks. They identify patterns, participate in activities, and reflect on symmetry in everyday life.

Activity!!

Exploring Symmetry

1

Students observe images from nature and everyday life to identify symmetry. Using mirrors, they explore symmetry in letters, shapes, and pictures, and complete worksheets by drawing lines of symmetry.



Creating Symmetrical Designs

2

Students use the Mathigon Polypad tool to create symmetrical patterns by reflecting shapes across different lines.

Activity!!

Symmetry Dance and Games

3

Students explore symmetry through movement by mirroring actions, forming symmetrical body shapes, and playing games such as mirror movement, group symmetry poses, and rope pull.





Art – Symmetrical Pattern Design

4

Students design a symmetrical T-shirt pattern using shapes and colors, applying their understanding creatively.



Symmetry in the Human Body

5

Students explore how the human body shows symmetry and how it supports balance and movement, identifying symmetrical and asymmetrical actions.

Student Reflection (Teacher-Guided)

The teacher may guide reflection with questions such as:

- Where did you notice symmetry in nature, objects, or your body?
- Which activities helped you understand symmetry best?
- How did movement or teamwork support your learning?
- Where can you see symmetry in everyday life?

Reflection and Consolidation

Students consolidate learning by sharing their designs and experiences.

- **Design Sharing:** Students present their symmetrical patterns or T-shirt designs.
- **Movement Recall:** Students demonstrate a symmetrical movement or pose.
- **Summary Task:** Students give one example of symmetry from daily life or create a simple drawing showing a line of symmetry.

STEPAM Integration

- **Science:** Symmetry in nature and the human body
- **Technology:** Digital pattern creation using Polypad
- **Engineering:** Designing balanced and structured patterns
- **Physical Education:** Symmetrical movement and coordination
- **Art:** Creative symmetrical designs
- **Mathematics:** Lines of symmetry and geometric figures

Human Mandala

Exploring Symmetry through Movement, Rhythm, and Collaboration

This lesson introduces students to symmetry, patterns, and coordination through movement and music. Students work collaboratively to create synchronized human mandalas, exploring how rhythm, balance, and spatial awareness contribute to symmetrical designs.

Key Takeaway

Symmetry can be expressed through movement as well as shapes. By working together to create human mandalas, students experience how coordination, rhythm, and cooperation help create balanced and visually appealing patterns.

Practical Considerations

- **Student level:** Upper primary / lower secondary
- **Prerequisites:** Ability to follow movement instructions and work cooperatively in groups
- **Time needed:** 50-60 minutes
- **Learning space:** Gym or open areas.
- **Equipment:**
- Music player and selected music
- Open space for movement
- Images of mandalas
- Camera or tablet (optional)
- Floor mats (optional)

Advance preparation

- Select calm, rhythmic music suitable for synchronized movement.
- Prepare an open and safe movement space.
- Prepare images or short videos of mandalas.
- Place floor mats in the sitting area.

Teacher's Role

The teacher introduces symmetry and mandalas, guides movement activities, and supports students in creating synchronized group formations. They encourage cooperation, participation, and reflection throughout the lesson.

Students' Role

Students participate in movement activities, collaborate to create human mandalas, and explore symmetry through rhythm and body positioning. They work with peers, follow instructions, and reflect on their learning.

Activity!!

Circle Movements 1

Students form a large circle and mirror simple movements led by the teacher, such as raising arms, lifting legs, and leaning in different directions. They explore coordination, balance, and synchronization while maintaining the circle formation.



Introduction to Human Mandalas 2

Students learn about mandalas and examine examples of symmetrical circular patterns. The teacher highlights how symmetry and repetition create visually balanced designs.

Activity !!

3

Human Mandala Formation and Dance

Students perform synchronized movements to music, gradually increasing complexity. They then work in smaller groups to create embedded circles and symmetrical body formations. Finally, each group develops a short human mandala dance sequence that combines rhythm, balance, and coordinated movement.



4

Performance and Sharing

Groups present their human mandala performances to the class. Students observe the different formations and discuss how symmetry, rhythm, and teamwork contributed to each presentation.

Student Reflection (Teacher-Guided)

Guide students to reflect on their experiences:

- How did symmetry appear in your group formations?
- What helped your group stay synchronized?
- How did music influence your movements?
- What challenges did you face when creating symmetrical patterns?
- Why is cooperation important when building a human mandala?

Reflection and Consolidation

Students consolidate learning by sharing their performances and discussing how movement, rhythm, and symmetry worked together.

- **Design Sharing:** Students present their human mandala dance to the class.
- **Movement Recall:** Students repeat one symmetrical movement or pose from their group sequence.
- **Summary Task:** Students describe or draw one example of symmetry they created with their bodies.

STEPAM Integration

- **Science:** Body movement, coordination, and natural symmetry.
- **Technology:** Recording performances to observe synchronization and patterns.
- **Engineering:** Building stable and structured circular formations.
- **Physical Education:** Rhythm, balance, coordination, and teamwork.
- **Art:** Creating expressive symmetrical movement patterns.
- **Mathematics:** Symmetry, repetition, circles, and spatial relationships.



Step on a Magnet:

Mapping, Magnets & Movement

This lesson introduces students to magnetism through storytelling, experimentation, movement, mapping, and creative construction. Students explore magnetic forces, collect and analyse data, use technology for measurement and navigation, and develop physical skills through cooperative games and challenges.



Key Takeaway

Magnets create forces that can attract or repel objects. Understanding magnetism helps us explore science, technology, movement, and design.

Practical Considerations

- **Student level:** Upper primary / lower secondary
- **Prerequisites:** Basic understanding of forces, ability to follow instructions, & team-work.
- **Time needed:** 90-120 minutes
- **Learning space:** Classroom or gym
- **Equipment:** Costumes & props
- Presentation slides (PDF)
- Magnetic boards or smooth surfaces
- Magnets
- Small iron objects (screws, clips, etc.)
- Salt & tempera colours
- Mobile phones & magnetometer apps
- Google Maps or mapping tools
- Kinder eggs with metal objects & printed tasks
- Sticks, string, & duct tape
- Tables &charts for recording findings
- Cones or markers for PE activities

Advance preparation

- **S**tudents bring in advance the costumes for the dramatization
- Set up magnetic exploration stations.
- Prepare magnets, metal objects, and construction materials.
- Install magnetometer apps on mobile devices.
- Prepare Google Maps
- Assemble Kinder eggs with metal objects & challenge cards.
- Mark boundaries for movement activities.

Teacher's Role

Introducing magnetism through storytelling & hands-on investigation, guides experiments, movement activities, & supports students in recording, analysing, & presenting their findings.

Students' Role

Students explore magnetic properties through experiments, participate in movement games, use technology to collect data, build simple structures, & collaborate to solve challenges.

Activity!!

The Story of Magnes

1

Students perform a short dramatization about the shepherd Magnes and the discovery of magnetite. The activity introduces magnetism through storytelling and encourages discussion about scientific discoveries and cultural perspectives.



Exploring Magnetism

2

Students investigate the properties of magnets, including attraction, repulsion, magnetic poles, and magnetic force. Through demonstrations and discussion, they learn how magnets interact with different materials.



Magnetic Art and Sculpture Design



Students use magnets beneath a surface to move metal objects and create drawings, shapes, letters, and patterns. They then design and build simple magnetic sculptures such as robots, vehicles, or people using magnets and metal components.

Movement Challenges



Students participate in cooperative movement games that develop speed, agility, balance, coordination, and teamwork. Activities may include:

- Two Is Company, Three Is a Crowd
- Find a Pair
- Double Leg Stick
- Musketeers

Activity !!









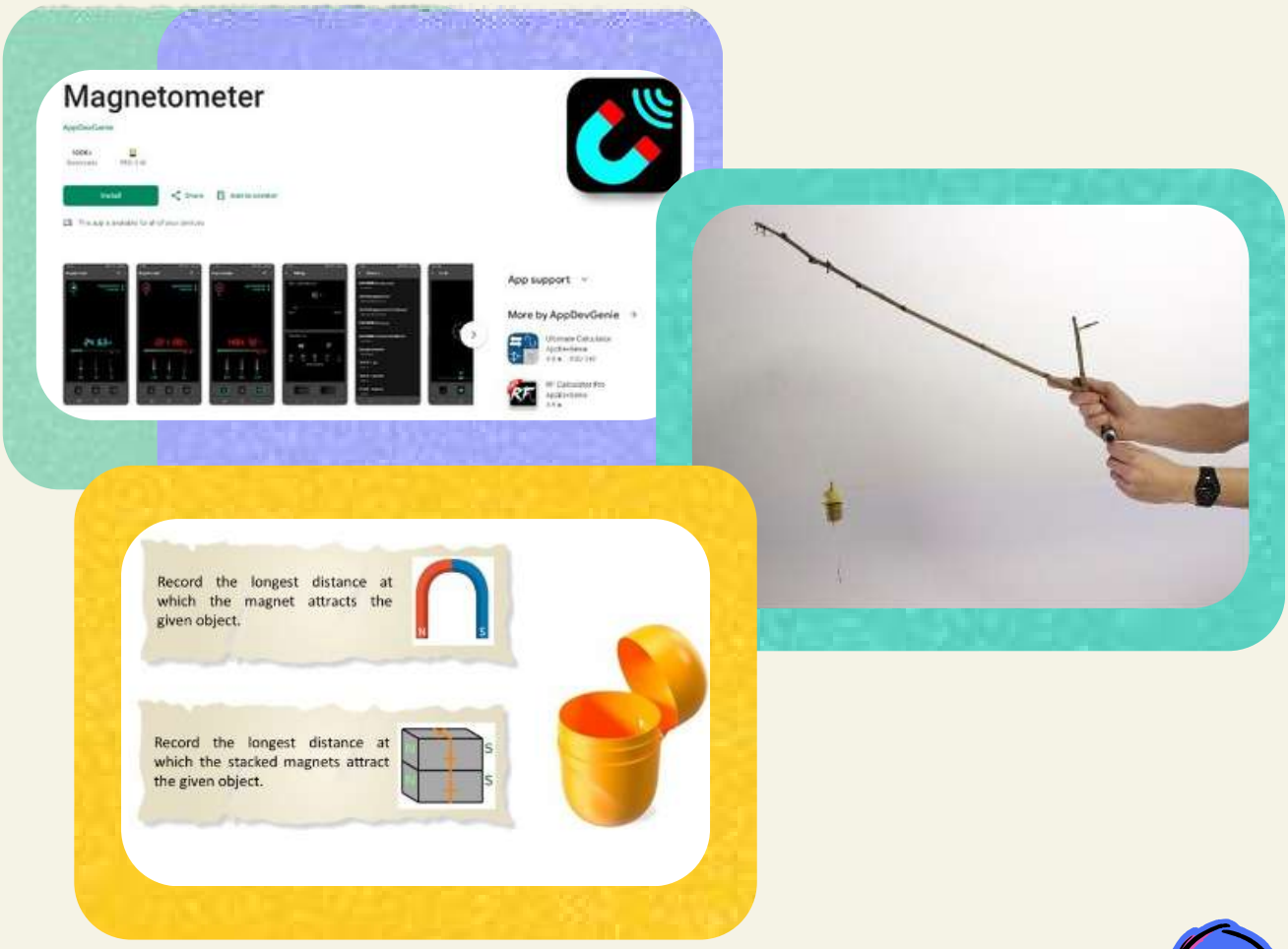
Check the **Geogebra** **STEPAM MOOC** to watch the videos of the activities! Scan the **QR code** to get to the site.

Activity !!

Measuring Magnetic Force with Technology

5

Using magnetometer applications, students measure and compare the strength of different magnets. They record data, analyse results, and discuss the accuracy and reliability of measurements.



Magnetic Fishing Challenge

6

Students design and build a simple fishing rod using a stick, string, and magnet. They use it to retrieve challenge capsules containing tasks related to measurement, mathematics, observation, and problem-solving.

Student Reflection (Teacher-Guided)

Guide students to reflect on their experiences:

- What did you discover about how magnets work?
- Which activity helped you understand magnetic force best?
- How did technology help you investigate magnetism?
- What challenges did you face when building or testing your designs?
- How did teamwork contribute to your success?

Reflection and Consolidation

Students consolidate learning by discussing their findings and demonstrating what they learned about magnetism.

- **Experiment Sharing:** Students present one observation or discovery from their investigations.
- **Technology Review:** Students compare magnetometer measurements and discuss results.
- **Challenge Reflection:** Students explain how they solved a task during the Magnetic Fishing Challenge.
- **Summary Task:** Students identify one real-world use of magnets and explain how magnetic force is involved.

STEPAM Integration

- **Science:** Properties of magnets and forces of attraction and repulsion
- **Technology:** Use of magnetometer apps and digital mapping tools
- **Engineering:** Construction of magnetic sculptures and fishing rods
- **Physical Education:** Development of speed, agility, balance, and coordination through movement games
- **Art:** Magnetic drawing and creative sculpture design
- **Mathematics:** Data collection, measurement, equation solving, and spatial reasoning



Static Electricity:

Exploring Electric Charges Through Experiments, Movement, and Design

This lesson introduces students to the concept of static electricity through storytelling, experimentation, mathematical investigations, physical activities, and engineering design. Students explore how electric charges are created, how they interact, and how static electricity appears in everyday life.

Key Takeaway

Static electricity is created when electric charges build up on objects. Different materials can become positively or negatively charged, causing them to attract or repel one another.

Practical Considerations

- **Student level:** Upper primary / lower secondary
- **Prerequisites:** Basic understanding of materials and observation skills.
- **Time needed:** 90-120 minutes
- **Learning space:** Classroom, science workspace, or open areas.
- **Equipment:** Pictures showing examples of static electricity
- Presentation slides
- Worksheets
- Cardboard or thick paper
- Styrofoam
- Pepper, salt, and iron filings
- Amber, Wool, Silk, Glass, Balloons
- Paper, Scissors, Markers, Glue
- Brass fasteners
- Plastic pipes
- Plastic bottles/containers
- Plastic film
- Devices for viewing videos

Advance preparation

- Prepare presentation slides and worksheets.
- Gather materials for experiments and apparatus construction.
- Set up the movement activity area.
- Test videos and ICT resources before the lesson.

Teacher's Role

The teacher introduces key concepts, guides investigations and activities, and supports discussion and reflection throughout the lesson.

Students' Role

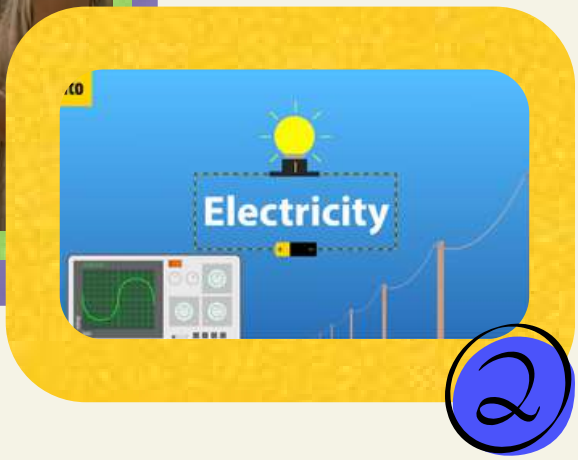
Students investigate static electricity through experiments, mathematical challenges, movement activities, and engineering tasks. They collaborate with peers, collect and analyse data, and reflect on how electric charges behave.

Activity !!

The Discovery of Electricity 1

Students listen to the legend of Thales' daughter and discuss how electricity was first observed using amber and wool. Through questioning and discussion, they begin exploring how materials can become electrically charged.





Exploring Static Electricity 2

Students work in groups to investigate how static electricity is produced by rubbing different materials, such as wool, silk, amber, glass, and plastic. They test which materials attract small objects (e.g., paper, pepper, salt, or iron filings), compare their observations, and discuss how electric charges interact. A short educational video from **"Into The Ordinary"** (ito) reinforces the concepts explored.

Check the **Geogebra** **STEPAM MOOC** to watch the video **What is Electricity** by **Into The Ordinary**! Scan the **QR code** to get to the site.



3 Mathematics – Counting and Comparing Static Electricity

Students test different charged materials and count how many small objects each one attracts. They record their results in tables, compare the effectiveness of the materials, and answer mathematical questions using their experimental data, linking arithmetic with the study of static electricity.

Mathematics Problems with Static Electricity

4

Students solve mathematical problems involving addition, multiplication, division, and comparison using data related to static electricity experiments.

Problem 1: Three groups tested different materials for their static electricity properties. Group A's wool attracted 126 pieces, Group B's silk attracted 4 times as many pieces as Group A, and Group C's plastic attracted 3 times as few pieces as Group A. How many paper pieces were attracted in total by the three groups?

Problem 2: Four groups attracted a total of 312 pieces of paper using different materials. If each group attracted the same number of pieces, how many pieces did each group attract?

Problem 3: During an experiment with static electricity, Group A attracted 150 pieces of paper using various materials. If 4/10 of these pieces were attracted by plastic, how many pieces did plastic attract?



5 Physical Activity – Static Electricity Chase

Students participate in the game Two Is Company, Three Is a Crowd, simulating the interaction of charged particles through movement. The activity develops agility, coordination, cooperation, and strategic thinking while reinforcing scientific concepts.

Engineering Challenge – Build a Static Electricity Apparatus 6

Students design and construct a simple apparatus that demonstrates static electricity. Using everyday materials, they test how different objects become charged and evaluate the effectiveness of their designs.



Check the **Geogebra** **STEPAM MOOC** to play the videos and learn more about the activities! Scan the **QR code** to get to the site.

Student Reflection (Teacher-Guided)

Guide students to reflect on their experiences:

- What materials became charged most easily?
- How did positive and negative charges interact during the experiments?
- What did your data reveal about static electricity?
- How did the movement game help you understand electric charges?
- What challenges did you face when building your apparatus?

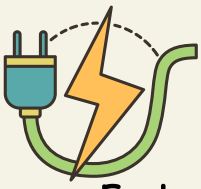
Reflection and Consolidation

Students consolidate learning by sharing their observations, experimental results, and engineering designs.

- **Experiment Sharing:** Students present one important discovery from their investigations.
- **Design Demonstration:** Students demonstrate their static electricity apparatus and explain how it works.
- **Summary Task:** Students identify one example of static electricity from everyday life and explain the science behind it.

STEPAM Integration

- **Science:** Investigating electric charges, attraction, repulsion, and static electricity phenomena
- **Technology:** Using videos and digital resources to explore electrical concepts
- **Engineering:** Designing and constructing a simple apparatus to demonstrate static electricity
- **Physical Education:** Developing coordination, agility, and teamwork through movement games
- **Art:** Designing and decorating static electricity models and apparatus
- **Mathematics:** Recording data, interpreting tables, and solving arithmetic problems using experimental results



Electric Current

Exploring Circuits Through Science, Movement, Engineering, and Design

This lesson introduces students to electric current and simple electrical circuits through hands-on experiments, movement activities, engineering challenges, mathematics, and creative design. Students investigate how electricity flows, identify conductors and insulators, and build working circuits using everyday materials.



Key Takeaway

Electric current flows through a closed circuit. Understanding how circuits work helps us explain and create many of the electrical devices used in everyday life.

Practical Considerations

- **Student level:** Upper primary / lower secondary
- **Prerequisites:** Basic understanding of electricity and simple observation skills
- **Time needed:** 90-120 minutes
- **Learning space:** Classroom or open areas.
- **Equipment:** Pictures showing examples of electric current
- Presentation slides
- Worksheets
- Cardboard or thick paper
- Copper wire, Plastic pipes
- Batteries, Small light bulbs or LEDs, Mini switches
- Scissors, Markers
- Conductive & insulating objects
- Hula hoops, Balls or beanbags
- Makey Makey kits
- Lemons and bananas (optional)

Advance preparation

- Prepare presentation slides and worksheets.
- Gather materials for building electrical circuits.
- Set up the movement activity area.
- Test Makey Makey kits and digital resources.

Teacher's Role

The teacher introduces electric current through demonstrations and experiments, guides students in building circuits, and supports discussion, problem-solving, and reflection.

Students' Role

Students investigate electrical circuits through experiments, games, engineering challenges, and mathematical activities. They collaborate with peers, record observations, and apply their understanding to build working circuits.

Activity!!

Electric Current in Everyday Life

1



Students discuss how electricity is used in everyday life and compare electric current with static electricity. They identify common electrical devices and explore the importance of electricity in modern society.

Exploring Electrical Circuits

2

Students build simple electrical circuits using batteries, wires, and bulbs to investigate how electricity flows. They test different materials to identify conductors and insulators, observe the difference between open and closed circuits, and record their findings through tables and drawings.

3



Electricity Puzzle Challenges

Students use digital puzzle activities to explore how electrical circuits function. By rotating wires, batteries, resistors, and other electrical components, they discover that a complete closed circuit is required for electric current to flow.

Activity !!



4 Physical Education – Circuit-Themed Games

Students participate in movement games that model the behaviour of electrical circuits. Through activities such as **Hot Potato, Hula Hoop Circuit, Circle Ball Delight, and Human Circuit with Makey Makey**, they develop teamwork, coordination, and agility while experiencing how energy flows through a complete circuit.







Check the **Geogebra** **STEPAM MOOC** to play the videos and learn more about the activities! Scan the **QR code** to get to the site.

Activity!!



5 Engineering Challenge – Build an Electrical Circuit

Students design and construct their own working electrical circuit using batteries, wires, switches, and bulbs. They test their designs, identify any faults, and improve their circuits to create a functioning electrical system.

6 Mathematics – Circuits and Measurement

Students calculate the perimeter of rectangular and square circuit boards to determine the length of wire needed to build simple electrical circuits. They then construct the circuits using the calculated wire lengths, reinforcing the connection between geometry and engineering design.



Check the **Geogebra** **STEPAM MOOC** to play the videos and learn more about the activities! Scan the **QR code** to get to the site.

Activity!!

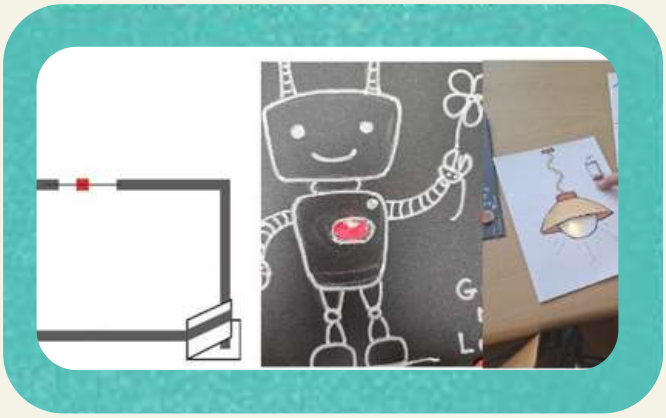


7 Mathematics – Fractional Battery Power Problems

Students solve word problems involving battery power expressed as fractions. Using addition and subtraction of fractions, they determine whether batteries provide enough energy to operate different devices, applying mathematical reasoning in real-life electrical scenarios.

8 Art & Engineering – Light-Up Robot Card

Students design a greeting card featuring a robot or another creative character with a working paper circuit. Using LEDs, copper tape, and a coin-cell battery, they build a simple circuit that lights up part of their design while combining artistic creativity with engineering principles.



Check the **Geogebra** **STEPAM MOOC** to play the videos and learn more about the activities! Scan the **QR code** to get to the site.

Student Reflection (Teacher-Guided)

Guide students to reflect on their experiences:

- What is the difference between static electricity and electric current?
- Which materials conducted electricity best?
- Why is a closed circuit necessary for electricity to flow?
- What challenges did you face when building your circuit?
- How did teamwork help you complete the activities?

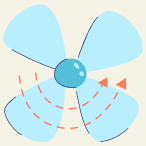
Reflection and Consolidation

Students consolidate learning by sharing their investigations and demonstrating their electrical circuits.

- **Circuit Demonstration:** Students present their working circuits and explain how they function.
- **Experiment Review:** Students compare conductors and insulators identified during the investigation.
- **Summary Task:** Students draw and label a simple electrical circuit, identifying its main components.

STEPAM Integration

- **Science:** Investigating electric current, conductors, insulators, and electrical circuits
- **Technology:** Using Makey Makey kits and digital puzzle applications to explore electrical systems
- **Engineering:** Designing, building, and improving simple electrical circuits
- **Physical Education:** Developing teamwork, coordination, and movement through circuit-themed games
- **Art:** Designing creative paper circuits and light-up greeting cards
- **Mathematics:** Calculating perimeter, measuring wire length, and solving fraction problems related to electrical circuits



Force & Power

Exploring Energy Sources Through Engineering, Movement, and Measurement

This lesson introduces students to different energy sources and the concepts of force and power through scientific investigations, engineering challenges, physical activities, and mathematical analysis. Students explore how energy powers movement while considering sustainability and environmental responsibility.



Key Takeaway

Different energy sources produce movement in different ways. Measuring force, distance, and time helps us understand efficiency, power, and sustainable energy use.

Practical Considerations

- **Student level:** Upper primary / lower secondary
- **Prerequisites:** Basic understanding of movement, measurement, and simple energy concepts
- **Time needed:** 90-120 minutes
- **Learning space:** Classroom or open areas.
- **Equipment:** Images or models of renewable and non-renewable energy sources
- Examples or pictures of electronic waste
- Model car kits (solar, water, air/balloon, battery, elastic-powered)
- Stopwatches, Measuring tapes & rulers
- Mobile devices with the Phyphox app
- Hula hoops, rope
- Poly spots or activity cards
- Art materials for posters

Advance preparation

- Prepare images and examples of renewable and non-renewable energy sources.
- Gather materials for building and testing model cars.
- Install the Phyphox app on mobile devices.
- Set up the movement activity area.

Teacher's Role

The teacher introduces energy concepts, guides investigations and engineering activities, supports data collection, and facilitates discussion and reflection throughout the lesson.

Students' Role

Students investigate energy sources through experiments, build and test model cars, participate in movement activities, collect data, and reflect on sustainable energy solutions.

Activity !!

1 Exploring Energy Sources



Students explore renewable and non-renewable energy sources by observing images or models such as coal, solar panels, wind turbines, and hydropower systems. Working in groups, they classify each energy source, discuss how it produces energy, and compare its advantages and disadvantages. The activity concludes with a class discussion about the energy sources used at home or in the local community and their impact on the environment.



2 Engineering Challenge – Build and Test Model Cars

Students work in teams to design and construct model cars powered by different energy sources, such as solar, water, air, battery, or elastic energy. They test their vehicles by measuring the distance travelled, comparing performance across several trials, and discussing how each energy source affects movement and efficiency.

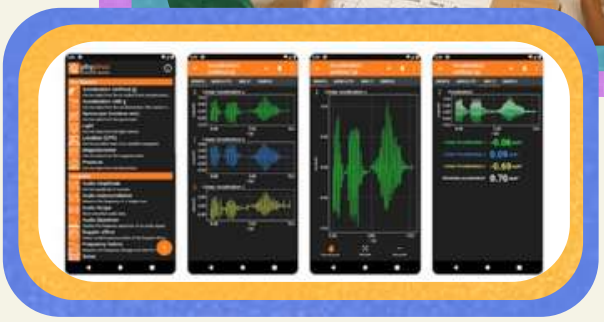
Activity !!

Technology Investigation – Car Experiment Stations

3

Students rotate through experiment stations to test different model cars while using the **Phyphox app** to measure distance, time, and, where appropriate, acceleration. They record their results in tables, analyse the data, compare the efficiency of each energy source, and reflect on real-world applications of sustainable energy.





4

Physical Education – Human-Powered Energy Games



Students explore force and power through movement activities, including an F1 Human-Powered Car Race using hula hoops, Tug of War, and a Memory Challenge with physical exercises. These games develop teamwork, coordination, strength, & endurance while illustrating how force and energy produce movement.

Check the **Geogebra** **STEPAM MOOC** to play the videos and learn more about the activities! Scan the **QR code** to get to the site.

Activity!!





Students are divided into two teams and compete in a tug-of-war challenge, working together to pull the rope across the centre line. After the activity, they reflect on how greater force requires more energy and how teamwork, coordination, and strategy influence performance.

Check the **Geogebra** **STEPAM MOOC** to play the videos and learn more about the activities! Scan the **QR code** to get to the site.

Activity !!

Mathematics – Measuring Force and Movement

5

Students analyse the data collected during the car experiments by measuring distance, time, and speed. They compare results, calculate averages, interpret tables, and investigate how different energy sources influence movement and performance.



Art – Promoting Sustainable Energy

6

Students design posters encouraging energy conservation, recycling, and the responsible use of renewable energy sources. They communicate scientific concepts through creative visual designs.

Check the **Geogebra** **STEPAM MOOC** to play the videos and learn more about the activities! Scan the **QR code** to get to the site.

Student Reflection (Teacher-Guided)

Guide students to reflect on their experiences:

- Which energy source was the most efficient? Why?
- How did force affect the movement of the cars?
- What did the measurements tell you about speed and power?
- How can renewable energy help protect the environment?
- How did teamwork contribute to your success?

Reflection and Consolidation

Students consolidate learning by sharing their investigations, engineering designs, and experimental results.

Engineering Showcase: Students present their model cars & explain how they work.
Data Review: Students compare measurements & discuss the efficiency of different energy sources.
Summary Task: Students explain one way renewable energy can contribute to a more sustainable future.

STEPAM Integration

- **Science:** Investigating renewable and non-renewable energy sources, force, and power
- **Technology:** Using the Phyphox app to measure distance, time, and movement
- **Engineering:** Designing, building, and testing model cars powered by different energy sources
- **Physical Education:** Developing strength, coordination, teamwork, and endurance through energy-themed games
- **Art:** Creating posters promoting renewable energy and environmental sustainability
- **Mathematics:** Measuring distance and time, calculating averages, and analysing experimental data

Shadow in Motion

Understanding Shadows, Light, and Geometry Through Hands-On STEAM Activities

This lesson introduces students to the science of light and shadow through hands-on investigations, creative design, movement, and mathematical exploration. Students discover how shadows are formed, how light interacts with different objects, and how these concepts can be applied through creative STEAM activities.

Key Takeaway

Shadows are created when light is blocked by an object. The size, shape, and clarity of a shadow depend on the light source, the object's properties, and the distance and angle between the light & the object.

Practical Considerations

- **Student level:** Upper primary / lower secondary
- **Prerequisites:** Basic understanding of light, simple geometric shapes, and measurement
- **Time needed:** 90-120 minutes
- **Learning space:** Classroom or darkened room.
- **Equipment:** Mobile phones, torches, or projectors
- Transparent and opaque objects
- Transparent foil
- Black and white paper
- Cardboard, scissors, glue, wooden sticks
- Large box or screen for the shadow theatre
- Mobile devices for recording
- Pre-prepared shadow theatre scripts
- PDF slides or presentation

Advance preparation

- Prepare light sources
- Gather transparent and opaque materials
- Prepare shadow theatre materials
- Print shadow theatre scripts
- Set up the shadow theatre screen
- Prepare mobile devices for recording

Teacher's Role

The teacher introduces the concepts, guides investigations and activities, ensures safety, and facilitates discussion and reflection.

Students' Role

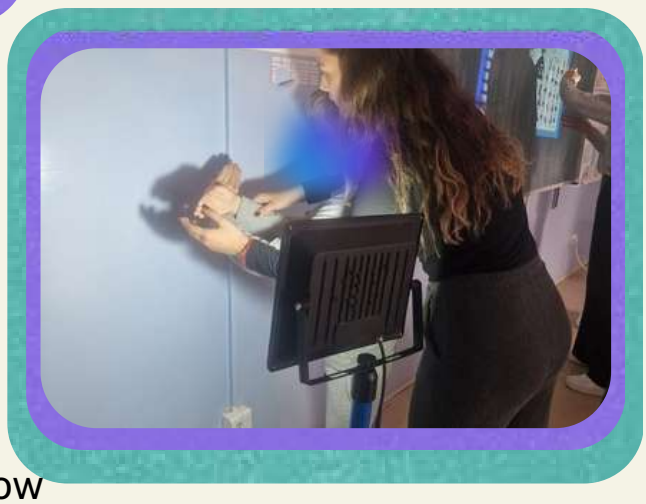
Students investigate shadows, create shadow theatre models, participate in movement activities, and reflect on their findings through collaboration and creativity.

Activity!!



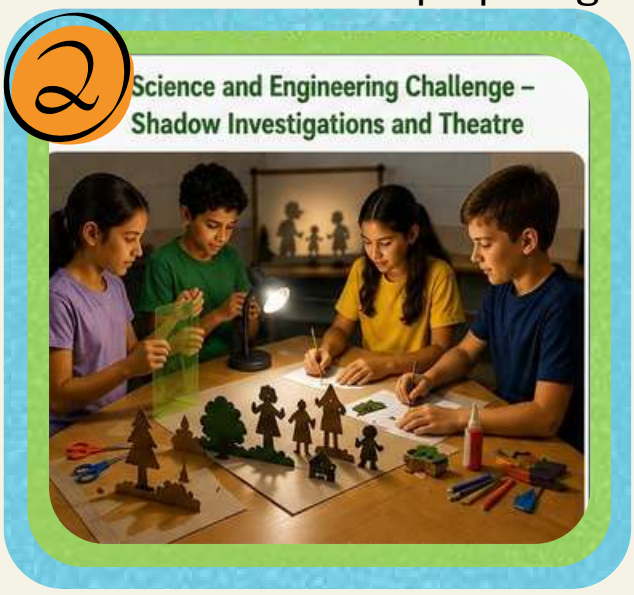
Exploring Shadows

Students investigate how shadows are formed using their hands, everyday objects, and different light sources. Working in groups, they explore how changing the position of the light, the object, and the viewing angle affects the size, shape, and clarity of shadows.



Science and Engineering Challenge – Shadow Investigations and Theatre

Students rotate through investigation tasks exploring transparent & opaque materials, different light intensities, & geometric shapes.
They then design & construct shadow theatre characters, scenery, & props using cardboard, paper, & wooden sticks before preparing a short shadow theatre performance.





Activity !!



Technology Investigation – Recording Shadow Theatre

Students use mobile devices to record their shadow theatre performances, experimenting with lighting, camera position, and projection to improve shadow quality. They review their recordings and discuss how technology can be used to analyse and communicate scientific observations.

Physical Education – Shadow Movement Games

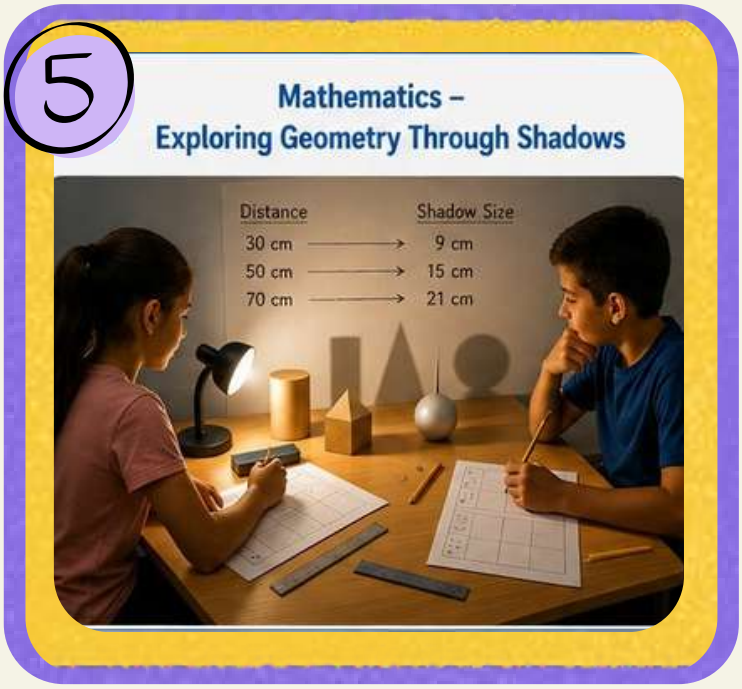
Students participate in movement activities such as **Copy Paste** and **Shadow Chasing**, where they imitate body positions, movements, & shadow patterns. These activities develop coordination, observation skills, teamwork, & body awareness while reinforcing the relationship between movement and shadow formation.





Copy Paste-
This fun game includes a relatively small number of players, up to ten. If played outdoors on a concrete court, the players should draw a board on the ground, similar to a chess board or a half of a chess board. All the players are lined up in front of the board. The first player chooses a path through the board and the rest of the players follow their path one by one.

Activity!!



Mathematics – Exploring Geometry Through Shadows

Students investigate how the distance between the light source and an object changes shadow size. They compare shadows produced by different geometric shapes, measure distances, identify patterns, and discuss how angles influence shadow projection.

Art – Creating Shadow Theatre

Students design and decorate characters, scenery, and props for a shadow theatre performance. They combine artistic creativity with scientific understanding to communicate stories through light, shadow, and movement.



Student Reflection (Teacher-Guided)

Guide students to reflect on their experiences:

- What conditions are necessary for a shadow to form?
- How did distance affect the size of the shadow?
- How did transparent and opaque materials behave differently?
- How did geometric shapes influence the shadows?
- How did teamwork contribute to your shadow theatre performance?

Reflection and Consolidation

Students consolidate their learning by sharing their investigations, creative designs, and performances.

Shadow Theatre Showcase: Students perform their shadow theatre stories and explain how they created their effects.
Science Discussion: Students compare how light, materials, and distance influenced shadow formation.
Summary Task: Students explain one factor that changes the size or shape of a shadow and describe a real-life example.

STEPAM Integration

- **Science:** Investigating light, shadows, transparency, opacity, and penumbra
- **Technology:** Using mobile devices and light sources to create, record, and analyse shadow theatre
- **Engineering:** Designing and constructing shadow theatre characters, props, and scenery
- **Physical Education:** Developing coordination, spatial awareness, teamwork, and observation through shadow movement games.
- **Art:** Designing creative shadow-theatre performances that use light and visual storytelling
- **Mathematics:** Investigating geometric shapes, measuring distances, and analysing how angles and position affect shadow size and shape.



Liquids

Exploring the Properties of Liquids Through STEAM Subjects & Movement

This lesson introduces students to the properties of liquids through hands-on investigations, engineering challenges, creative activities, movement, and mathematical exploration. Students discover how liquids behave, why objects float or sink, and how density and buoyancy are applied in everyday life.

Key Takeaway

Liquids have different physical properties, such as density and solubility, which influence how they behave. Understanding these properties helps explain floating, sinking, buoyancy, and many real-world applications.

Practical Considerations

- **Student level:** Upper primary / lower secondary
- **Prerequisites:** Basic Knowledge of measurements, observations, & quantity comparison.
- **Time needed:** 90-120 min
- **Learning space:** Classroom, lab, gymnasium, & optionally swimming pool.
- **Equipment:**
- Transparent containers and glasses
- Water, oil, honey, vinegar, food colouring
- Salt, sugar, and other solutes
- Plastic, wooden, and metal objects
- Balloons, syringes, small plastic bottles
- Smartphones or tablets with a photo editing app
- Worksheets
- Towels and plastic sheets
- Water activity equipment (pool noodles, floating objects, wet T-shirts, etc.)

Advance preparation

- Prepare transparent containers and liquids
- Gather floating and sinking objects
- Prepare submarine experiment materials
- Set up mobile devices with a photo editing app
- Prepare maths worksheets & water game-equipment

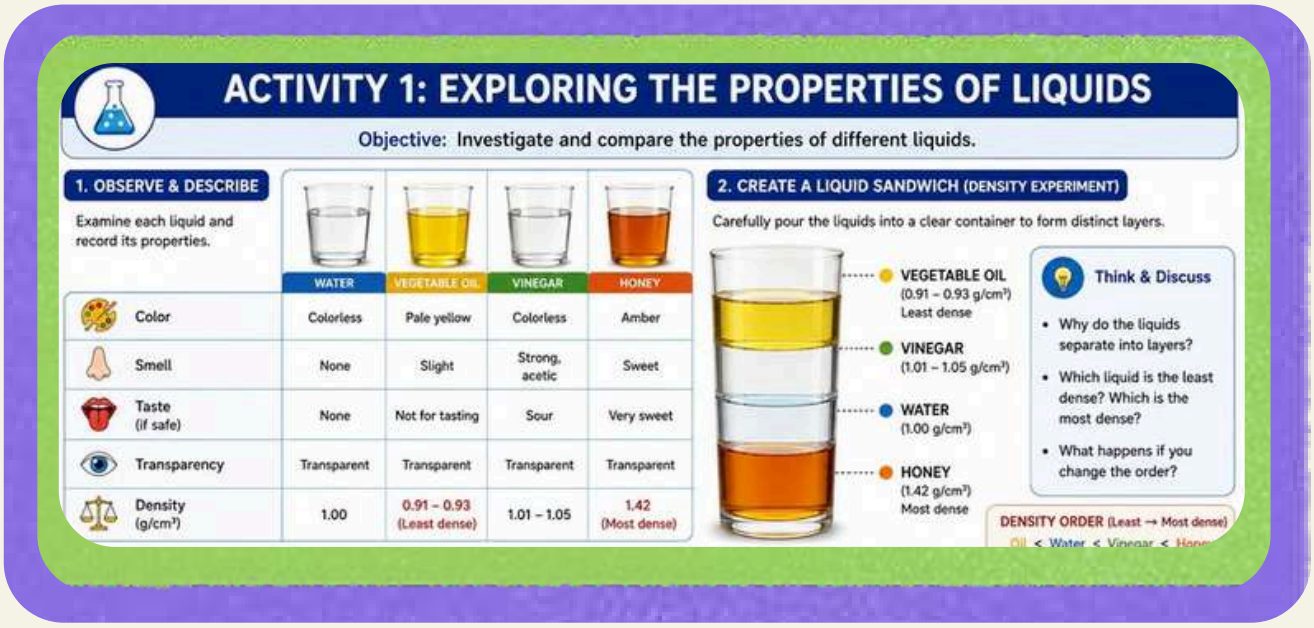
Teacher's Role

The teacher introduces the concepts, guides investigations and activities, ensures safety, and facilitates discussion and reflection.

Students' Role

Investigate liquid properties, conduct experiments, build engineering models, participate in movement activities, create digital artwork, and analyse mathematical concepts collaboratively.

Activity !!



Exploring the Properties of Liquids

1

Students investigate different liquids by observing and comparing their colour, smell, transparency, density, and solubility. They create a layered **liquid sandwich** using liquids of different densities and explore how common substances, such as salt and sugar, dissolve in different liquids.

Floating and Sinking Investigation

2

Students predict whether different objects will float or sink before testing them in water. They compare their results and discover how density determines whether an object floats or sinks.



Activity !!



Technology and Art – Liquid Photography

Students create artistic arrangements using transparent glasses filled with coloured liquids. They photograph their designs using mobile devices, enhance the images with a photo editing app, and present their original and edited photographs while explaining their creative choices.

Engineering Challenge – Build a Model Submarine

Students investigate how submarines control buoyancy by constructing a simple model submarine using balloons, syringes, or small plastic bottles. They test how changing the amount of air or water inside the model affects floating and sinking, and compare different designs.



Activity !!



5

Physical Education – Water-Themed Games

Students participate in cooperative water-themed activities, including the Swimming Duet, Extra-Long Swimmer, Wet T-Shirt Relay, Carry the Baby, and Octopus Race. These games develop teamwork, coordination, communication, and body awareness while reinforcing water-related concepts.

6

Mathematics – Comparing Liquid Properties

Students investigate liquid properties using greater than (>), less than (<), and fractions. They compare liquid densities, solve practical problems involving liquid quantities and dissolved substances, and interpret their results using mathematical relationships.

Student Reflection (Teacher-Guided)

Guide students to reflect on their experiences:

- Which liquid had the greatest density? Why?
- Why did some objects float while others sank?
- How does a submarine control its movement underwater?
- How did technology help improve your artistic creations?
- How did teamwork contribute to your success?

Reflection and Consolidation

Students consolidate their learning by sharing their investigations, engineering designs, artwork, and mathematical solutions.

Science Review: Students compare the properties of different liquids and explain floating, sinking, and density.
Engineering Showcase: Students demonstrate how their model submarines control buoyancy.
Art Gallery: Students present their original and digitally enhanced liquid photographs.
Summary Task: Students explain one real-life application of density or buoyancy.

STEPAM Integration

- **Science:** Investigating liquid properties, density, solubility, floating, sinking, and buoyancy
- **Technology:** Using mobile devices and photo editing apps to create and enhance liquid photography
- **Engineering:** Designing and testing a model submarine to investigate buoyancy control
- **Physical Education:** Developing teamwork and coordination through water-themed cooperative games.
- **Art:** Creating colourful liquid arrangements and digital photographic compositions
- **Mathematics:** Comparing quantities using greater than (>), less than (<), fractions, and density relationships



Re-Cycle Balance

Exploring Balance, Mass Measurement, and Recycling

This lesson explores the concept of balance from both a physical and environmental perspective. Through movement, games, and model building, students investigate how balance, mass, and recycling are interconnected in everyday life, engineering, and nature.



Key Takeaway

Balance depends on mass, distribution, and cooperation—both in physical systems and in how humans manage resources in nature.

Practical Considerations

- **Student level:** Upper primary / lower secondary
- **Prerequisites:** Basic shape recognition & ability to follow instructions
- **Time needed:** 90-120 min
- **Learning space:** Classroom & open space for movement activities
- **Equipment:** Balance equipment (BOSU balls, balance beams, unstable surfaces)
- Recyclable materials (metal, plastic, paper, glass)
- Digital devices w/ mass measurement apps
- Color-coded recycling bins, visual slides.

Teacher's Role

Introduce balance through real-life examples, guide learning activities, support teamwork and safe participation, and help students connect balance to environmental and engineering concepts.

Students' Role

Participate in hands-on activities, measure, sort, and build, collaborate with peers, and reflect on how balance applies to nature, recycling, and everyday life.

Activity!!

Introduction (5-10 min)

Students discuss balance in everyday tools (seesaws, levers, cranes) and in nature (food chains, biodiversity). Basic ideas of mass measurement and recycling categories are reviewed.

Educational Game (5-10 min)

Students measure the mass of different objects and sort them into the correct recycling bins, linking weight, material type, and balance.



Balancing and Building (60-70 min)

- Students practice balance on unstable surfaces.
- While being on unstable surfaces, the teacher throws a ball to the students, and they must catch and return it.
- Students design and build functional balance scales using recyclable materials and test them by measuring object mass.

Team Balance Games (5-10 min)

Short cooperative games (**three-legged race**, **caterpillar collector & the big foot race**) reinforce balance, coordination, communication, and shared responsibility, using balance as an analogy for environmental sustainability.



Student Reflection (Teacher-Guided)

The teacher may prompt reflection with questions such as:

- What helped you maintain balance during the activities?
- How did mass and distribution affect your scale design?
- Why is balance important in nature and recycling systems?
- How did teamwork influence your success?
- Where do you see balance applied in real life?

Reflection and Consolidation

Students consolidate learning through a simple balance assessment activity and short group presentations of their recycled scales.

- **Flamingo Test:** Conclude with the Flamingo test, a standardized test for balance assessment. Each student performs the test three times, and the results are recorded.
- **Group Presentations:** Students present the scales they built from recycled materials, sharing their experiences and insights about balance, recycling, and mass measurement.
- **Concept Map:** Have students create concept maps to summarize what they have learned about balance, mass measurement, and recycling.

STEPAM Integration

- **Science:** Balance in nature and ecosystems
- **Technology:** Digital mass measurement tools
- **Engineering:** Design of functional balance scales
- **Physical Education:** Coordination and balance activities
- **Art:** Creative model design
- **Mathematics:** Mass, units, and balance calculations



Natural Ecosystems & Habitats

Investigating Terrestrial and Aquatic Habitats Through Science, Movement, & Creativity

This lesson introduces students to the characteristics of natural terrestrial and aquatic habitats, to investigating how plants and animals adapt to different environments, and to understanding the importance of protecting ecosystems through collaborative, creative, physical, and digital learning activities.



Key Takeaway

Natural habitats support unique communities of plants and animals that depend on their environment. Understanding these ecosystems helps students recognize the importance of conserving biodiversity and protecting nature.

Practical Considerations

- **Student level:** Upper primary / Lower secondary
- **Prerequisites:** Differentiation between living and non-living things & familiarity w/ simple geometric shapes
- **Time needed:** 90–120 min
- **Learning space:** Classroom, outdoor school area
- **Equipment:**
- Animal outline templates,
- graph paper, rulers, & colored pencils
- Poster paper, magazines, glue, & scissors
- Laptops with Tinkercad

Advance preparation

- Prepare habitat images and examples
- Print animal outline templates; set up tablets or laptops with Tinkercad (or similar software)
- Organize materials for collage and physical activity.

Teacher's Role

The teacher introduces habitats and ecosystems, facilitates collaborative learning, guides investigations and activities, and supports connections between scientific concepts, physical experiences, and digital design.

Students' Role

Students collaborate to investigate habitats, create mathematical & artistic representations, participate in movement activities, design digital habitat models, and reflect on ecosystem conservation.

Activity!!

1

Exploring Natural Habitats

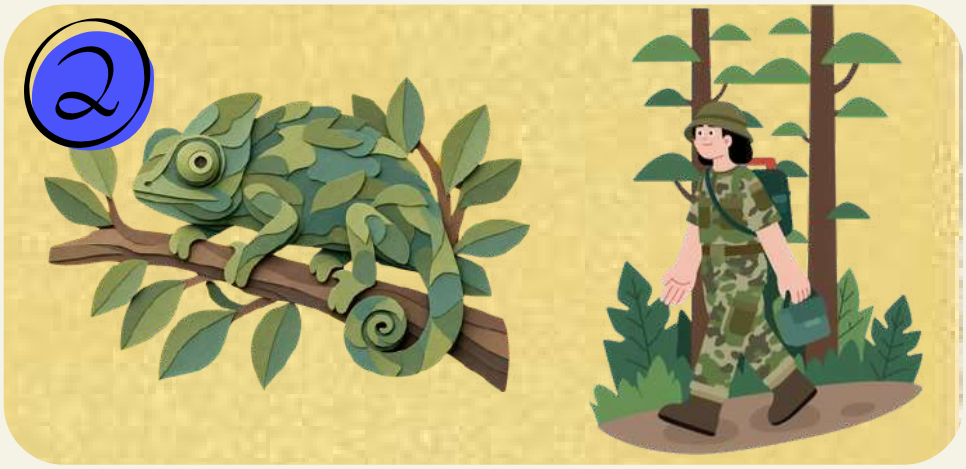
Students work in groups to investigate an assigned terrestrial or aquatic habitat. They create a poster illustrating environmental characteristics, typical plants and animals, and the relationships within the ecosystem.



2

Camouflage Patterns in Nature

Students create camouflage patterns inside an animal outline using geometric shapes and colours.



3

Hide and Seek in Nature

Students participate in a movement game that simulates predator–prey interactions. By matching clothing or coloured cloth to different habitats, they experience how camouflage increases the chances of survival.



Activity !!

Digital Habitat Creation 4

Students use a simple 3D design application such as Tinkercad to create a digital model of their assigned habitat, including natural features, animals, and environmental elements that provide food, shelter, and protection.



Ecosystem Collage 5

Students create a collage representing their habitat using drawings and magazine images. They present their work to the class, explaining interactions among plants, animals, and environmental conditions, as well as the importance of conservation.



Student Reflection (Teacher-Guided)

The teacher may guide reflection with questions such as:

- How do different habitats provide suitable living conditions for plants and animals?
- Why is camouflage important for many animals?
- How did mathematics help you create your camouflage design?
- What challenges did you encounter while designing your digital habitat?
- What actions can people take to protect natural ecosystems?

Reflection and Consolidation

Sharing Activity: Groups present their habitat poster, digital habitat model, and ecosystem collage, explaining the key features of each.
Review Task: Students compare terrestrial and aquatic habitats, identifying similarities, differences, and the environmental factors they share.
Summary Task: Students explain one characteristic of their assigned habitat and describe one way humans can help protect ecosystems.

STEPAM Integration

- **Science:** Investigate terrestrial and aquatic ecosystems, habitats, biodiversity, and adaptations
- **Technology:** Use digital tools to design 3D habitat models
- **Engineering:** Design camouflage patterns that help animals adapt to their environment
- **Physical Education:** Participate in movement-based predator–prey camouflage activities
- **Art:** Create habitat posters, camouflage designs, and ecosystem collages
- **Mathematics:** Apply geometry by using shapes and measuring perimeter and area in camouflage designs



Don't Eat Me

Relationships Between Living Beings

This lesson introduces students to ecological relationships through food chains, habitats, and the interdependence of living organisms. Through hands-on STEAM activities, students explore ecosystem balance and the importance of environmental conservation.

Key Takeaway

All living organisms are connected through ecological relationships. Protecting habitats and maintaining ecosystem balance are essential for the survival of plants, animals, and humans.

Practical Considerations

- **Student level:** Upper primary, lower secondary
- **Prerequisites:** Basic knowledge of living and non-living things, basic graph reading, & teamwork skills.
- **Time needed:** 90–120 min
- **Learning space:** Classroom, outdoor area
- **Equipment:**
- Poster paper, drawing paper, markers, coloured pencils or crayons
- Organism cards, habitat pictures, string or yarn
- LEGO® or building blocks, popsicle sticks, rubber bands
- Scissors, glue, playdough
- Natural materials (leaves, twigs, stones)
- Graph paper
- Large open space
- Animal masks (optional)

Advance preparation

Prepare organism cards and habitat images, organize building materials, prepare graph paper and relay stations, gather art materials & natural objects.

Teacher's Role

Introduce ecological relationships and food chains, guide collaborative investigations and learning activities, support students during creative and mathematical tasks, and facilitate reflection on ecosystem balance and conservation.

Students' Role

Collaborate to investigate ecosystem relationships, construct habitats, create artistic representations, analyse food chains, participate in movement activities, and reflect on the importance of protecting natural environments.

Activity !!

Building a Food Chain

1

Students work in groups to arrange organism cards into a food chain and connect them using string to demonstrate energy flow within an ecosystem.



Building Habitats

2

Students design and build a simple habitat for an assigned animal using construction materials and explain how it supports survival.



Nature Art

3

Students create artwork representing an organism and describe its role and interactions within the ecosystem.



Activity !!

Food Chain Graphing 4

Students calculate food requirements within a food chain and create a bar graph to illustrate energy flow between organisms.



Eco Relay 5

Students participate in a relay game that simulates the roles of different organisms within an ecosystem through movement.



Student Reflection (Teacher-Guided)

The teacher may guide reflection with questions such as:

- How are plants and animals connected within an ecosystem?,
- Why are food chains important?
- How did mathematics help you understand energy flow?
- What did you learn about building suitable habitats for animals?
- How can humans help protect ecosystems?

Reflection and Consolidation

Students identify the role of producers, consumers, and predators within a food chain and discuss how they depend on one another. Students explain one ecological relationship and describe one action people can take to protect ecosystems.

STEPAM Integration

- **Science:** Investigate ecological relationships, food chains, ecosystems, and the interdependence of living organisms.
- **Technology:** Explore how technology can be used to study ecosystems and support habitat conservation.
- **Engineering:** Design and build model habitats that meet the survival needs of different animals.
- **Physical Education:** Participate in the Eco Relay to experience ecosystem interactions through movement.
- **Art:** Create artwork representing organisms and their ecological roles within an ecosystem.
- **Mathematics:** Calculate food requirements within a food chain and represent the data using bar graphs.



Aggregate Condition

Exploring the States of Matter Through Science and Discovery

This lesson introduces students to investigate the three states of matter by observing their properties, exploring density & phase changes, & representing scientific concepts through mathematical, creative, physical, & hands-on activities.

Key Takeaway

Matter exists as solids, liquids, and gases, each with unique properties. Temperature and particle arrangement influence how matter changes from one state to another.

Practical Considerations

- **Student level:** Upper primary, lower secondary.
- **Prerequisites:** Observation & measurement skills, & with fractions
- **Time needed:** 120–150 min
- **Learning space:** Classroom, science lab, outdoor area
- **Equipment:**
- Rock, rubber ball, book
- Water, vegetable oil, honey, corn syrup, washing-up liquid, coloured rubbing alcohol
- Balloons, ice cubes
- Hot plate or kettle, heat-safe container, thermometer
- Tall clear jar or graduated cylinder
- Construction paper, clay or play-dough
- Scissors, markers, glue
- Recyclable craft materials
- Graph paper, rulers
- Mobile device w/ thermometer app or digital sensor

Advance preparation

Prepare matter discovery stations, organize materials for the Rainbow Jar experiment, set up the heating demonstration, & prepare modelling materials & P.E equipment.

Teacher's Role

The teacher introduces the properties of matter, facilitates scientific investigations, guides mathematical analysis and creative activities, and encourages students to connect observations with scientific explanations.

Students' Role

Students observe, investigate, measure, create models, participate in movement activities, collaborate with peers, and reflect on how matter behaves in different states.

Activity !!

1 Matter Discovery Stations



Students rotate through stations to investigate the properties of solids, liquids, and gases by observing and comparing real objects and materials.

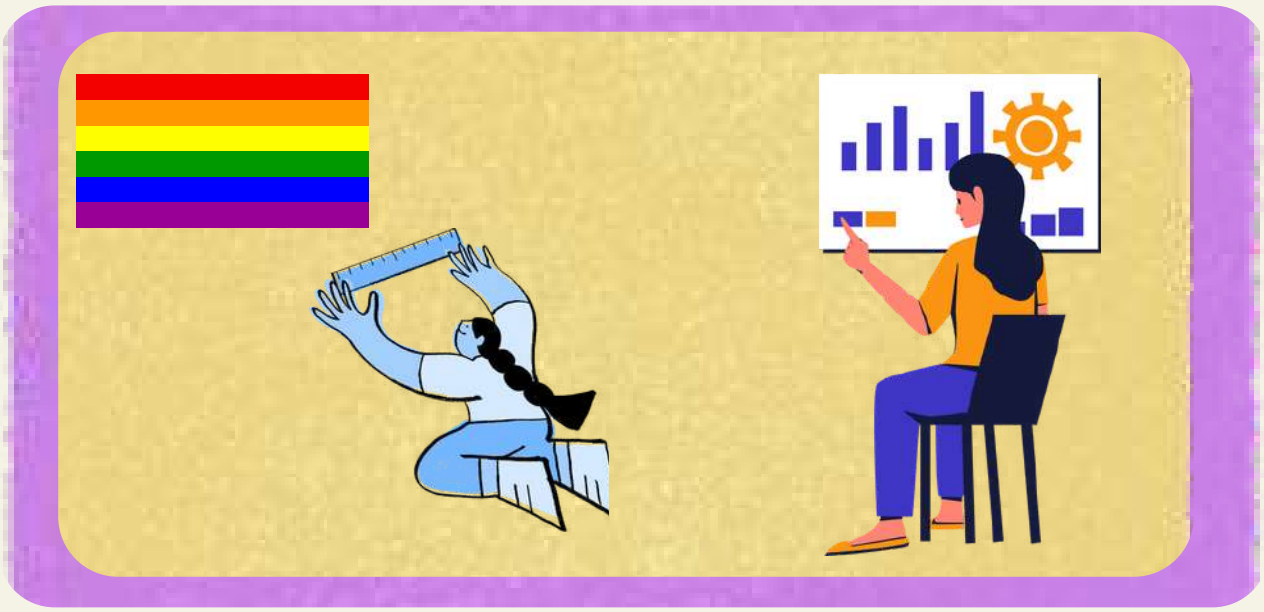
2 Rainbow Jar Density Challenge



Students predict and observe how liquids of different densities form distinct layers in a Rainbow Jar and discuss the concept of density.

3 Mathematics with the Rainbow Jar

Students measure liquid layers, compare their heights, represent the data using fractions, graphs, or scale drawings, and interpret the results.



Activity !!

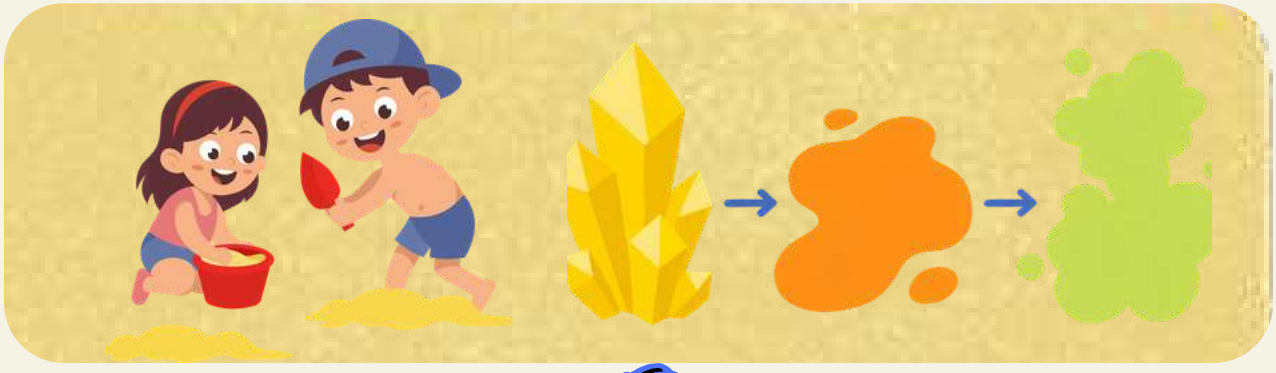
Watch It Change – Ice to Steam 4

Students observe ice melting and water boiling while relating temperature changes to phase transitions between solid, liquid, and gas.



State of Matter Model-Making 5

Students create a three-dimensional model representing a solid, liquid, or gas and explain its properties using labels and examples.



Balloon Movement Challenge 6

Students participate in cooperative or team games using balloons to explore movement, teamwork, and the behaviour of gases through physical activity.



Student Reflection (Teacher-Guided)

The teacher may guide reflection with questions such as:

- How are solids, liquids, and gases different?
- Why do some liquids form separate layers in the Rainbow Jar?
- How did mathematics help you analyze the experiment?
- What did you observe during the phase-change demonstration?
- Which activity helped you understand states of matter the most, and why?

Reflection and Consolidation

Students compare the properties of solids, liquids, and gases, including density and phase changes. Students describe one characteristic of each state of matter and explain one example of a phase change from everyday life.

STEPAM Integration

- **Science:** Investigate the properties of solids, liquids, gases, density, and phase changes.
- **Technology:** Use thermometers or digital sensors to measure and record temperature changes
- **Engineering:** Design models of states of matter and investigate liquid layering
- **Physical Education:** Participate in cooperative movement activities demonstrating the behaviour of gases
- **Art:** Create labelled 3D models representing solids, liquids, or gases
- **Mathematics:** Measure, compare, graph, and interpret data from investigations



All Parts Make A Whole

Exploring Fractions Through Food, Nature, Engineering, Movement, and Creative Design

This lesson introduces students to develop an understanding of fractions as parts of a whole through hands-on activities involving food, nature, movement, digital tools, and creative design.



Key Takeaway

Fractions describe parts of a whole and can be applied in everyday situations such as sharing food, creating designs, and representing objects. Mathematics helps us understand the world around us.

Practical Considerations

- **Student level:** Upper primary
- **Prerequisites: U**nderstanding of simple fractions, counting & comparing quantities, teamwork & communication skills.
- **Time needed:** 120–150 min
- **Learning space:** Classroom, outdoor area
- **Equipment:**
- Pre-cut fruit/safe chopping tools
- Fruit salad recipes
- Presentation slides
- My Health Pyramid/Start Simple with MyPlate apps
- Large circular paper templates
- A3 carpet worksheets
- Grid worksheets
- Microsoft Paint/drawing software

Equipment:

- Recyclable materials
- Cardboard
- Plastic caps, Pipe cleaners, Fabric scraps
- Scissors, Glue, Tape, Markers
- Fraction Creature planning sheet

Advance preparation

Prepare all lesson materials, including fruit, templates, digital tools, and recyclable craft resources.

Teacher's Role

The teacher guides students in learning fractions through practical activities, collaboration, and connections to science, art, technology, and movement.

Students' Role

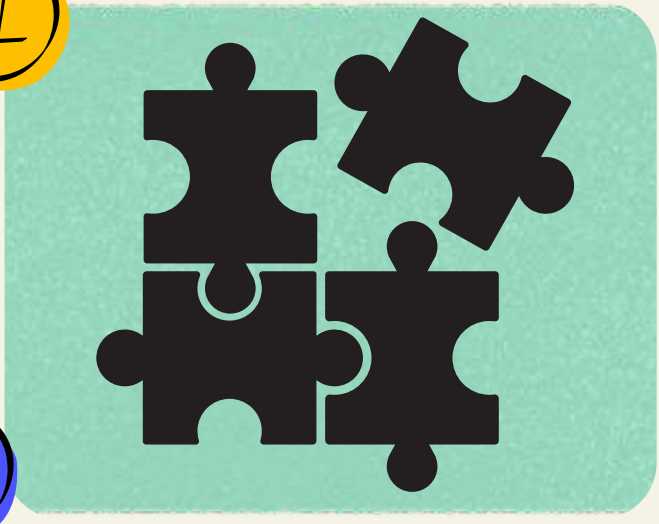
Students work collaboratively to solve fraction challenges, participate in movement activities, create artistic and engineering projects, use digital tools, and reflect on how fractions apply to everyday life.

Activity !!

Fractions Through Fruit Salad

1

Students prepare a fruit salad using recipes with fractional quantities (e.g., ½ banana, ¼ apple, ⅓ orange) and discuss how fractions represent parts of a whole.





2

Technology and Science – Food Pyramids and Cultural Foods

Students use a digital food pyramid app to explore healthy eating, classify foods and animals, and discuss food traditions from different cultures.

Physical Education – Caterpillar Challenge

3

Students participate in cooperative **Caterpillar games** where teamwork, coordination, and communication are essential. Variations include relay races, balloon caterpillars, and educational matching challenges that reinforce fractions and animal classification through movement.



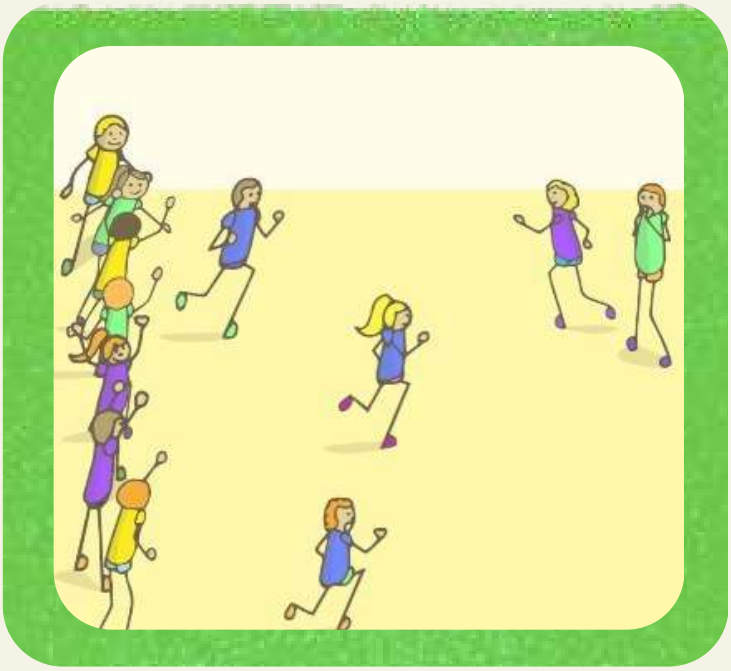


Activity !!

Zoo Hunters

4

Students take part in an active role-playing game where they identify animals and habitats while developing agility, spatial awareness, teamwork, and quick decision-making through cooperative movement challenges.





Mathematics and Art – Fraction Pizza Challenge

5

Students create colourful "Fraction Pizzas" by following topping instructions expressed as fractions. They label each section, compare fractional parts, and present their pizzas while explaining how the fractions combine to form one whole.

Activity !!

Engineering Challenge – Build a Fraction Creature

6

Students design and construct a creature whose body parts represent different fractions of the whole using recyclable materials. Students create a carpet pattern by applying fraction-based colour rules and recreate their designs using digital drawing software.





Technology and Art – Fraction Carpet Design

7

Students design colourful carpet patterns using fractional colour rules on paper before recreating their designs using digital drawing software. They compare fractional areas, discuss design choices, and reflect on how mathematics can be represented visually.

Student Reflection (Teacher-Guided)

The teacher may guide reflection with questions such as:

- How did fractions help you solve everyday problems?
- Which activity helped you understand fractions the most?
- How did your group work together to complete the challenges
- How can fractions be used in art and design?
- Where do you use fractions in everyday life?

Reflection and Consolidation

Students compare unit fractions and explain how different fractional parts combine to make one whole. Students describe one real-life situation where fractions are useful and explain what they learned about parts and wholes.

STEPAM Integration

- **Science:** Explore healthy eating, classify animals, and investigate the relationship between food sources and habitats..
- **Technology:** Use digital food pyramid applications and drawing software to visualise healthy meals and fraction-based designs. experiments.
- **Engineering:** Design and construct Fraction Creatures by combining fractional parts into a complete model.
- **Physical Education:** Participate in Caterpillar and Zoo Hunters games that promote teamwork, coordination, and active learning.
- **Art:** Create Fraction Pizzas, Fraction Creatures, and Fraction Art Carpets using colour, shape, and creative design.
- **Mathematics:** Apply, compare, and represent fractions through food preparation, visual models, design activities, and problem-solving.



Safeguarding Exercise

Understanding Settlements, Spatial Awareness, and Disaster Preparedness Through STEAM Activities

This lesson introduces students to settlements and disaster preparedness through map investigations, engineering challenges, and collaborative activities. Students explore safe navigation, emergency response, and environmental hazards while developing teamwork and problem-solving skills.



Key Takeaway

Maps, hazard symbols, and teamwork help people prepare for and respond to emergencies. Understanding spatial relationships and safety practices supports safer communities and disaster preparedness.

Practical Considerations

- **Student level:** Upper primary, lower secondary.
- **Prerequisites:** Basic understanding of maps & directions, simple grids, teamwork, & communication skills.
- **Time needed:** 90–120 min
- **Learning space:** Classroom, computer room, or outdoor area
- **Equipment:**
- Google Maps or printed maps
- Grid paper and navigation worksheets
- Mobile devices
- Hazard symbol cards or worksheets
- Hazard symbol learning apps
- Disaster preparedness videos
- Coloured paper, markers, paint
- Scissors and glue
- Ropes
- Art materials

Teacher's Role

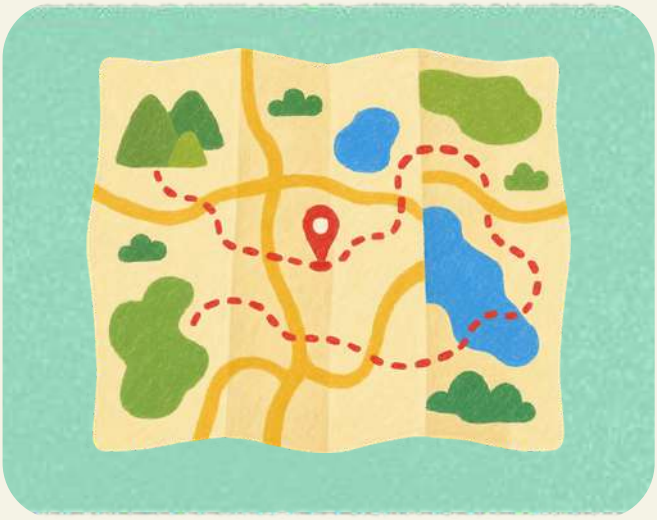
The teacher introduces disaster preparedness and spatial awareness, facilitates collaborative learning activities, guides discussions about safety and environmental responsibility, and supports students in applying mapping and problem-solving skills.

Students' Role

Students investigate maps & hazard symbols, complete engineering & movement challenges, design safety solutions, and reflect on disaster preparedness through teamwork.

Activity !!

Map Navigation Challenge 1



Students use printed maps or Google Maps together with square grids to locate places, practise navigation, and develop spatial reasoning skills.

Hazard Symbols and Safety Awareness 2



Students identify hazard symbols, match them with their meanings, and discuss workplace safety, environmental hazards, and waste decomposition.

Radioactive Ball Challenge 3

Students work in teams to move a ball using ropes without touching it directly, developing teamwork, coordination, and creative problem-solving.



Activity !!

Design a Safety Symbol Preparedness Discussion

4

Students create their own hazard symbols and explain how visual communication helps improve safety and disaster awareness.



Disaster Preparedness Discussion

5

Students analyse disaster scenarios through videos and class discussion, reflecting on preparedness, emergency response, and community safety.



Student Reflection (Teacher-Guided)

The teacher may guide reflection with questions such as:

- How do maps help people prepare for emergencies?
- Why are hazard symbols important in everyday life?
- How did teamwork help during the Radioactive Ball Challenge?
- What did you learn about disaster preparedness?
- How can we help create safer communities?

Reflection and Consolidation

Sharing Activity: Students present their safety symbols and explain how they communicate important safety information.
Review Task: Students identify different hazard symbols, describe map navigation strategies, and explain how teamwork supported the engineering challenge.
Summary Task: Students describe one action they can take to improve disaster preparedness at school or in their community.

STEPAM Integration

- **Science:** Investigate settlements, environmental hazards, and disaster preparedness.
- **Technology:** Use Google Maps, digital hazard symbol resources, and educational videos to support learning.
- **Engineering:** Solve practical challenges through map navigation and the Radioactive Ball engineering activity.
- **Physical Education:** Participate in the Radioactive Ball Challenge to develop coordination, communication, and teamwork.
- **Art:** Design hazard symbols that communicate important safety messages.
- **Mathematics:** Apply grid-based navigation, spatial reasoning, and map-reading skills to solve real-world problems.

O_2

Oxygen & Gases

Exploring Air, Oxygen, and Fire Safety Through Hands-On STEAM Activities

This lesson introduces students to the composition of air, the water cycle, and the importance of oxygen through scientific investigations, engineering challenges, movement activities, and mathematical exploration. Students discover how oxygen supports life and combustion while learning about fire safety and environmental processes.

Key Takeaway

Oxygen is an essential component of air that supports life and combustion. Understanding the composition of air, the water cycle, and fire safety helps students appreciate the importance of gases in the natural world.

Practical Considerations

- **Student level:** Upper primary / lower secondary.
- **Prerequisites:** Basic understanding of air, water, & simple fractions & percentages
- **Time needed:** 120–150 min
- **Learning space:** Classroom, laboratory, or outdoor area
- **Equipment:**
- Water cycle diagrams or videos
- Clear containers, water, sponges
- Candles, matches, glass jars
- Flammable material labels
- Worksheets, graph paper, rulers
- Markers
- Stopwatch or timer
- Mobile devices with the Phyphox app
- Gym mats

Advance Preparation

- Prepare water cycle visuals
- Set up the candle experiment
- Print air composition worksheets
- Install the Phyphox app
- Prepare the movement area

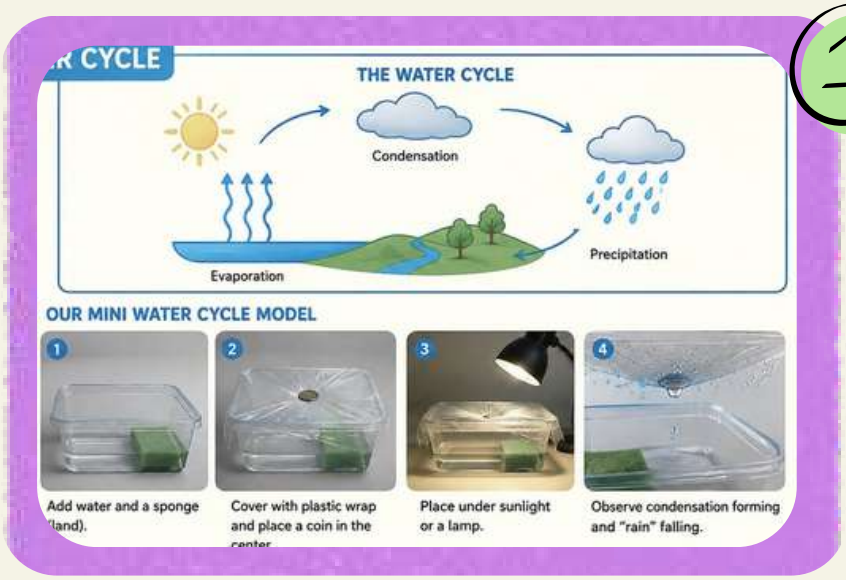
Teacher's Role

The teacher introduces the concepts, guides investigations and activities, ensures safety, and facilitates discussion & reflection

Students' Role

Students investigate oxygen through experiments, collect data, participate in movement activities, and reflect on their findings through collaboration.

Activity !!



1 Exploring the Water Cycle

Students investigate the stages of the water cycle by building a simple model that demonstrates evaporation, condensation, and precipitation. They discuss how water vapour and atmospheric gases contribute to this natural process.

Mathematics & Science – Composition of Air

2

Students investigate the composition of air using fractions, percentages, graphs, and charts. They create visual representations that show the proportions of nitrogen, oxygen, and other gases and interpret mathematical relationships.



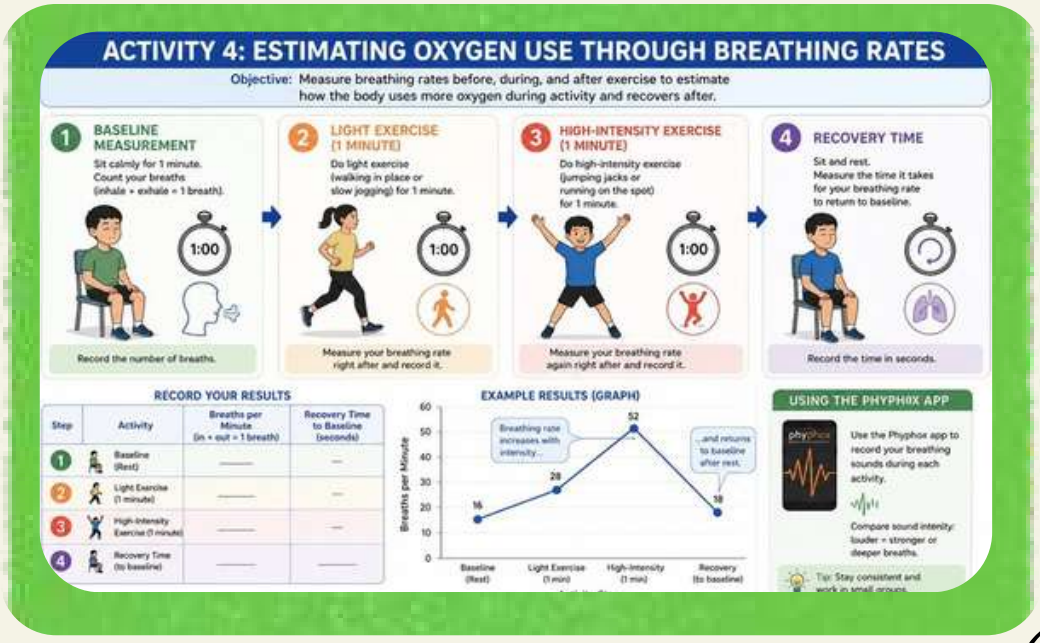
Activity !!

Science Investigation – Oxygen and Combustion

3

Students perform a supervised candle experiment to investigate how oxygen supports combustion. They observe what happens when the oxygen supply is removed and discuss the relationship between oxygen, fire, and combustion.





4

Technology Investigation – Measuring Breathing Rate

Students measure their breathing rate before, during, and after physical activity using stopwatches and the Phyphox app. They compare breathing patterns, recovery times, and discuss how oxygen demand increases during exercise.

Activity !!



5

Physical Education – Changing the Side of the Mat

Students participate in a cooperative or competitive mat-flipping challenge where they work together or compete to turn mats onto a designated side within a set time. The activity develops teamwork, coordination and illustrates how increased physical activity raises oxygen demand.

Fire Safety – Flammable Materials

6

Students investigate flammable material labels, discuss fire safety rules, and explore how oxygen influences the spread and extinguishing of fire through real-world examples.



Mathematics – Fractions and Percentages

7

Students solve mathematical problems involving fractions, percentages, and comparisons related to air composition, oxygen, and combustion using real-life scenarios.

Check the **Geogebra** **STEPAM MOOC** to play the videos and learn more about the activities! Scan the **QR code** to get to the site.

Student Reflection (Teacher-Guided)

Guide students to reflect on their experiences:

- Why is oxygen essential for living organisms?
- What happened when oxygen was removed from the candle?
- Why does breathing rate increase during exercise?
- How can understanding oxygen improve fire safety?
- How did teamwork contribute to the movement activity?

Reflection and Consolidation

Students consolidate their learning by sharing their investigations, experimental results, and mathematical solutions.

Science Review: Students explain the role of oxygen in the water cycle, respiration, and combustion.
Technology Review: Students compare breathing-rate measurements and discuss how physical activity affects oxygen demand.
Summary Task: Students explain one way oxygen supports life and one way it influences fire safety.

STEPAM Integration

- **Science:** Investigating the water cycle, air composition, oxygen, combustion, and fire safety.
- **Technology:** Using the Phyphox app and digital tools to measure breathing rate and analyse physical activity.
- **Engineering:** Designing simple models to demonstrate the water cycle or oxygen's role in combustion.
- **Physical Education:** Developing teamwork and coordination through the "Changing the Side of the Mat" activity while exploring oxygen demand during exercise.
- **Art:** Creating graphical representations of air composition.
- **Mathematics:** Solving problems involving fractions, percentages, graphs, and comparisons related to air composition and oxygen.



Human Body Relay: Anatomy in Action

Exploring Human Body Systems Through Movement, Engineering, and Teamwork

This lesson introduces students to the major human body systems through movement, scientific investigation, engineering, and collaborative activities. Students discover how body systems work together to support movement, health, and everyday life.

Key Takeaway

The human body is made up of interconnected systems that work together to enable movement, breathing, circulation, communication, and support.

Practical Considerations

- **Student level:** Upper primary / lower secondary
- **Prerequisites:** Basic understanding of the human body and teamwork skills
- **Time needed:** 90-120 min
- **Learning space:** Classroom, gymnasium, & outdoor area
- **Equipment:**
- Large wrapping paper or poster board
- Markers, crayons, paints
- Body system templates (bones, muscles, organs)
- Balloons, straws, yarn, string
- Cones, balls, cotton balls
- Stopwatch or timer
- Mobile device or tablet (optional)

Advance preparation

- Prepare relay stations for each body system
- Gather materials for life-sized body models
- Set up relay equipment and movement space
- Prepare body system templates or visual aids

Teacher's Role

The teacher introduces the major body systems, demonstrates movement activities, guides relay challenges & engineering tasks, supports teamwork, & facilitates discussion & reflection throughout the lesson.

Students' Role

Students investigate body systems through movement, collaborate in relay challenges, build life-sized body models, collect simple measurements, and explain how the body's systems work together.

Activity!!



Warm-Up – Exploring the Human Body Systems

1

Students explore the five major body systems through movement. They imitate skeletons, stretch muscles, jog to represent blood circulation, practise controlled breathing, and respond quickly to movement signals, discovering the function of each system through physical activity.

Physical Education – Human Body Relay

2



Students rotate through relay stations representing the skeletal, muscular, circulatory, respiratory, and nervous systems. Each challenge demonstrates the function of one body system while developing teamwork, coordination, agility, and communication.

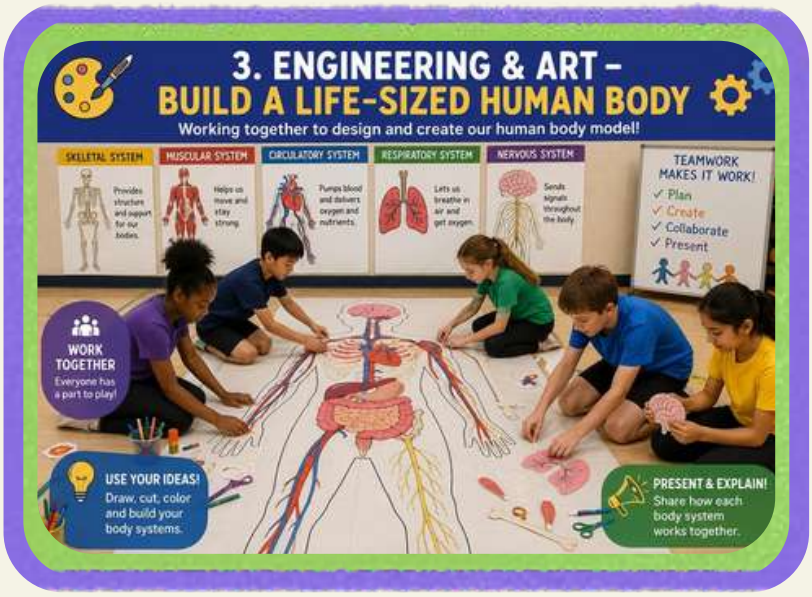
Activity!!

Mathematical Extension: Students can measure & compare heart rate or relay times before & after physical activity. They record & interpret their results, discuss how exercise affects the body, & use digital resources or anatomy models to reinforce their understanding.

Engineering and Art – Build a Life-Sized Human Body

3

Working in teams, students trace a classmate's body outline and construct a life-sized human body model. They add the skeletal, muscular, circulatory, respiratory, and nervous systems using drawings, templates, & craft materials before presenting how the systems work together.



4

Reflection and Body System Review

Students participate in a guided cool-down with stretching while reviewing the role of each body system. They reflect on how the systems worked together during the activities and discuss the importance of maintaining a healthy body.



Student Reflection (Teacher-Guided)

Guide students to reflect on their experiences:

- Was there a body system that was the most important during the relay? Why?
- How do the different body systems work together?
- What happened to your heart rate after exercise?
- Why is it important to keep our body systems healthy?

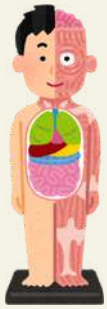
Reflection and Consolidation

Students consolidate their learning by sharing their life-sized body models and discussing the function of each body system.

Engineering Showcase: Students present and explain their body models.
Data Review: Students compare heart rates or relay times and discuss how physical activity affects the body.
Summary Task: Students explain how two or more body systems work together during everyday activities such as running, jumping, or breathing.

STEPAM Integration

- **Science:** Investigating the skeletal, muscular, circulatory, respiratory, and nervous systems.
- **Technology:** Using digital anatomy resources and simple measurement tools
- **Engineering:** Designing and constructing a life-sized human body model
- **Physical Education:** Developing fitness, coordination, teamwork, and body awareness through relay activities
- **Art:** Creating labelled life-sized body system models
- **Mathematics:** Measuring and comparing heart rate, relay times, and physical performance



Human Body

Exploring the Human Body Through Nutrition, Engineering, Movement, and Mathematics

This lesson introduces students to the structure and function of the human body by exploring body systems, digestion, nutrition, and healthy lifestyles through scientific investigations, engineering challenges, movement activities, and mathematical problem-solving.

Key Takeaway

The human body is made up of interconnected systems that work together to keep us healthy. Understanding digestion, nutrition, and body functions helps us make healthy lifestyle choices.

Practical Considerations

- **Student level:** Upper primary / lower secondary
- **Prerequisites:** Basic understanding of body parts and healthy habits
- **Time needed:** 90-120 min
- **Learning space:** Classroom, gymnasium, and outdoor area
- **Equipment:**
- Cardboard, scissors, glue, markers
- Printable body system diagrams
- Small objects or paper cut-outs representing food
- Stopwatch or timer
- Measuring tape
- Tablets or smartphones with anatomy apps

Advance preparation

- Prepare body system diagrams or anatomy apps
- Gather materials for the cardboard stomach model
- Set up relay activity area
- Prepare mathematics worksheets

Teacher's Role

The teacher introduces the major body systems & nutrition concepts, guides scientific investigations & engineering activities, supports movement challenges & mathematical tasks, & facilitates discussion & reflection throughout the lesson.

Students' Role

Students explore body systems, investigate digestion, build models, participate in movement activities, solve mathematical problems, and reflect on healthy lifestyle choices.

Activity !!



Science – Exploring the Human Body Systems

1

Students investigate the digestive system using diagrams, videos, and a 3D model to identify the organs involved and the stages of digestion. Working in small groups, they arrange organ and function cards to reconstruct the digestive pathway before modelling the digestive process with simple everyday materials, such as crackers to represent food, a plastic bag with water as the stomach, and a strainer as the small intestine. The activity concludes with a guided discussion on how food is transformed into nutrients and why balanced nutrition is essential for a healthy digestive system.

Technology – Exploring Human Body Systems

2

Students use anatomy and health apps to explore the major body systems and their functions through interactive digital models. They identify organs, investigate how different systems work together, and compare scientific information presented through animations and virtual anatomy resources.

Activity!!



3 Engineering – Cardboard Stomach Model

Students design and construct a cardboard stomach model with an opening for inserting "food" and another representing digestion output. Using coloured paper or small objects to represent proteins, carbohydrates, and fats, they simulate the digestive process and discuss how different nutrients are processed by the stomach and digestive system.

4 Physical Education – Body Part Touch Relay

Students are divided into two or more teams and line up behind a starting line. At the teacher's signal, the first player from each team runs to a cone positioned several metres away, touches it using the assigned body part (e.g., shoulder, elbow, knee, or foot), and returns to tag the next teammate. Each round introduces a different body part or movement variation, such as hopping, crawling, or skipping, to reinforce body awareness, coordination, teamwork, and quick decision-making while reviewing the names and functions of different body parts.





Check the **Geogebra** **STEPAM MOOC** to play the videos and learn more about the activities! Scan the **QR code** to get to the site.

Activity !!



Alternative Classroom Activity – Heads, Shoulders, Knees & Cone

Students work in pairs, standing opposite each other with a cone placed between them. As the teacher calls out body parts such as "head," "shoulders," or "knees," both students quickly touch the corresponding body part. When the teacher calls "cone," the first player to grab it wins the round and moves on to compete against another winner. This fast-paced reaction game develops concentration, listening skills, body awareness, and response time while reinforcing the identification of body parts.

Mathematics – Human Body Problems

5

Students apply mathematics to everyday health by solving word problems involving heart rate, calorie intake, stomach capacity, hydration, and body measurements. They calculate quantities, compare results, and discuss how mathematics helps explain body functions and healthy lifestyle choices.



Student Reflection (Teacher-Guided)

Guide students to reflect on their experiences:

- Which digestive organ surprised you the most? Why?
- How does the digestive system transform food into nutrients?
- Why is balanced nutrition important for a healthy body?
- How did movement activities reinforce your understanding of body parts?
- How can healthy habits help keep the body's systems working effectively?

Reflection and Consolidation

Students consolidate their learning by presenting their cardboard stomach models and explaining the digestive process.

Engineering Showcase: Students demonstrate how their stomach models simulate digestion and nutrient processing.
Technology Review: Students share interesting facts discovered using anatomy apps and interactive models.
Summary Task: Students explain how the digestive system and healthy nutrition contribute to maintaining a healthy body.

STEPAM Integration

- **Science:** Investigating body systems, digestion, nutrition, and healthy lifestyles
- **Technology:** Using anatomy apps and interactive digital resources to explore the human body
- **Engineering:** Designing and constructing a cardboard stomach model to simulate digestion
- **Physical Education:** Developing coordination, teamwork, and body awareness through relay activities
- **Art:** Creating body system diagrams and engineering models
- **Mathematics:** Solving word problems involving heart rate, calories, stomach capacity, and body measurements



Be Fit!

Understanding Health & Physical Activity Through STEAM

This lesson introduces students to the foundations of a healthy lifestyle by exploring hygiene, nutrition, physical activity, and rest through scientific investigations, fitness challenges, technology, data analysis, and creative design.

Key Takeaway

Healthy habits such as regular exercise, balanced nutrition, adequate sleep, and rest work together to improve physical and mental well-being. Monitoring the body's responses to exercise helps students make informed health choices.

Practical Considerations

- **Student level:** Upper primary / lower secondary
- **Prerequisites:** Basic knowledge of healthy habits & physical activity
- **Time needed:** 90-120 min
- **Learning space:** Classroom, gymnasium, and outdoor area
- **Equipment:**
- Tablets or smartphones with pulse meter apps
- Stopwatch or timer
- Bean bags and hula hoops
- Cones and markers
- Paper, coloured pencils, and comic templates
- Computers or tablets with drawing/chart software
- Worksheets and graph paper

Advance preparation

- Install pulse-monitoring apps on tablets or smartphones.
- Prepare recording sheets and graph templates.
- Set up fitness stations and endurance games.
- Prepare comic strip templates.

Teacher's Role

The teacher introduces healthy lifestyle concepts, guides fitness and technology activities, supports data analysis, and facilitates discussion and reflection.

Students' Role

Students investigate healthy habits, measure and analyse their pulse during exercise, participate in fitness challenges, interpret health data, and communicate their learning through creative visual storytelling.

Activity!!



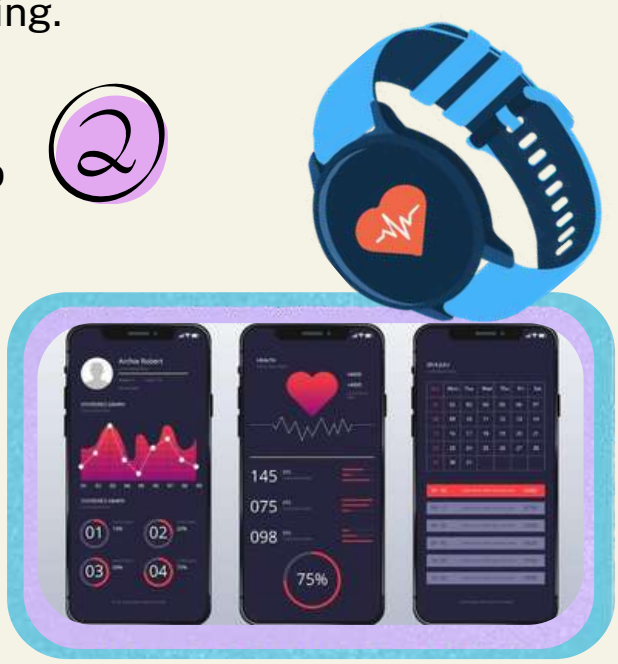
Science – Healthy Habits Discussion

1

Students explore the foundations of a healthy lifestyle through an interactive class discussion about sleep, exercise, nutrition, and rest. Working in small groups, they identify examples of healthy and unhealthy daily habits and create a Healthy Life Poster using drawings and keywords. The activity concludes with a whole-class summary that highlights how healthy habits work together to improve physical and mental well-being.

Technology – Measuring Heart Rate

2



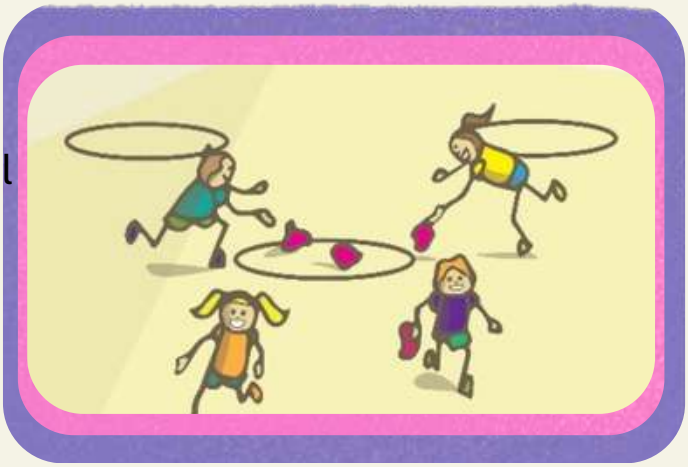
Students use a pulse-monitoring app on a smartphone or tablet to measure their resting heart rate before completing a short physical activity, such as jogging or star jumps. They immediately measure their pulse again, record the results, and compare the changes. The collected data is used later to investigate how exercise affects the cardiovascular system through mathematical analysis.

Activity !!

Engineering & Physical Education – Fitness Circuit Stations 3

Students work in groups to design their own fitness stations by selecting exercises, materials, and simple instructions. After completing each station, they measure and compare their pulse before and after exercise to investigate how different activities affect the body. The students use the same stations for the games **Give and Take** & **Tag with Safe Base** to measure their pulse afterwards.

Give and Take:



Four players begin in separate hoops positioned around a central hoop that contains beanbags. Players collect one bean bag at a time from the centre before attempting to steal from other players' hoops until someone collects three bean bags. Different movement variations, such as hopping, skipping, crawling, or jumping, can increase the challenge while heart rate is measured after

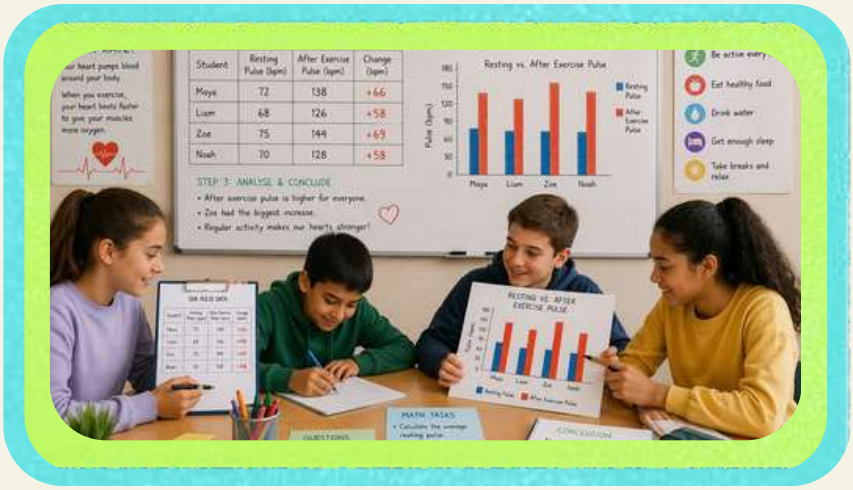
Tag with Safe Base



Students play a tag game using hula hoops as temporary safe bases. Only one player may occupy each hoop, and students must leave after a few seconds to continue moving. Tagged players become the new tagger, while pulse measurements taken during recovery encourage students to observe how quickly their heart rate returns to normal after exercise.

Check the **Geogebra** **STEPAM MOOC** to play the videos and learn more about the activities! Scan the **QR code** to get to the site.

Activity !!



Mathematics – Health Data Analysis

4

Students organise the pulse data collected during the fitness activities into tables before calculating differences, averages, and changes in heart rate. Using graph paper or digital tools, they create bar graphs or line charts to compare resting and active pulse values, identify patterns, and draw conclusions about the relationship between exercise intensity and heart rate.

Art & Technology – Create Your Fitness Comic

5



Students create a comic strip that teaches healthy exercise habits through storytelling. They plan a sequence showing a character completing a safe warm-up, main activity, & cool-down using speech bubbles, illustrations, & diagrams to communicate key health messages.

Student Reflection (Teacher-Guided)

Guide students to reflect on their experiences:

- Which healthy habit do you think has the greatest impact on your health? Why?
- Why did your pulse change during exercise?
- How did the fitness stations challenge different parts of your body?
- What did your graphs reveal about physical activity?
- How can technology help people monitor and improve their health?

Reflection and Consolidation

Students present their fitness comics and discuss how healthy habits contribute to lifelong well-being.

Health Review: Students compare pulse measurements and explain how exercise affects the body.
Data Showcase: Groups present and interpret their graphs, identifying patterns in heart rate before and after activity.
Summary Task: Students design a simple daily fitness routine that includes warm-up, activity, cool-down, healthy nutrition, and adequate rest.

STEPAM Integration

- **Science:** Understanding healthy lifestyles, body responses to exercise, and pulse changes
- **Technology:** Using mobile apps to measure heart rate and digital tools to display data
- **Engineering:** Designing fitness stations and planning exercise routines
- **Physical Education:** Participating in fitness circuits and endurance games while monitoring physical effort
- **Art:** Creating comics that promote healthy habits through visual storytelling
- **Mathematics:** Organising, analysing, and representing pulse data using tables, averages, and graphs

Ethno Active: Discovering Culture Through Movement



This lesson explores cultural diversity through traditional clothing, dances, games, and patterns from Serbia, Austria, and Finland. Students engage in movement, pattern-making, creative design, and collaborative activities to develop intercultural understanding while connecting culture with STEPAM concepts.

Key Takeaway

Cultural traditions can be expressed through movement, clothing, games, patterns, and art. Exploring different traditions helps students recognise cultural diversity and discover connections between culture, mathematics, creativity, and movement.

Practical Considerations

- **Student level:** Upper primary, lower secondary.
- **Prerequisites:** Basic knowledge of patterns, movement, measurement, teamwork, and communication.
- **Time needed:** 120–150 min
- **Learning space:** Classroom, gymnasium, or schoolyard
- **Equipment:** Images or videos of traditional clothing and dances,
- Dance pattern cards, music, paper, markers, coloured pencils, rulers or measuring tape.
- Craft materials (felt, fabric, yarn, glue, scissors, tape, string, optional buttons/beads)
- Laptops or tablets
- PE equipment (cones, soft balls, sponge noodles, sticks or blocks).

Advance Preparation

- Prepare visual resources.
- Print activity materials.
- Organise craft supplies.
- Set up games, music, and digital devices.

Teacher's Role

Introduce cultural diversity, facilitate exploration of traditional dances, clothing, games, & patterns, & guide students to make connections with STEPAM concepts.

Students' Role

Observe, discuss, & investigate materials, collaborate to construct geometric models, & explain their design choices using geometric reasoning.

Activity!!



1 Discovering Cultures Through Dance

Students explore traditional dances and clothing from Serbia, Austria, and Finland through videos, images, and discussion, comparing movements, patterns, clothing, and cultural features..

2 Spot the Patterns

Students identify repeating patterns in traditional dances and create an eight-beat movement sequence using steps, claps, turns, and jumps.

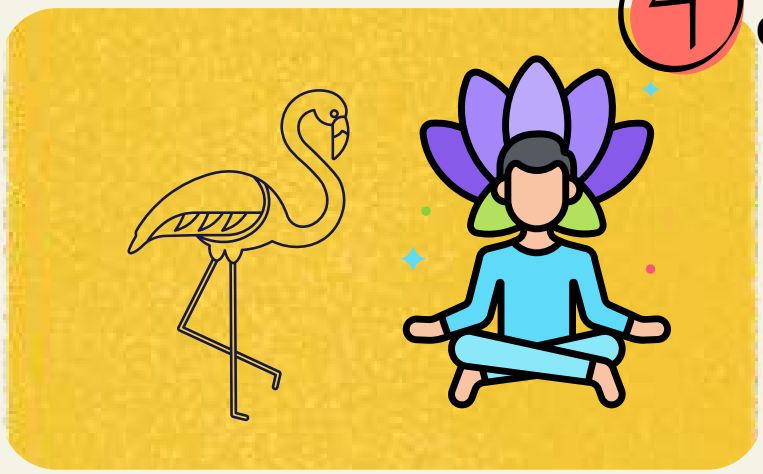




3 Culture Through Costume

Students explore traditional costume designs and create a small accessory inspired by a selected culture using simple materials and geometric patterns.

Activity !!



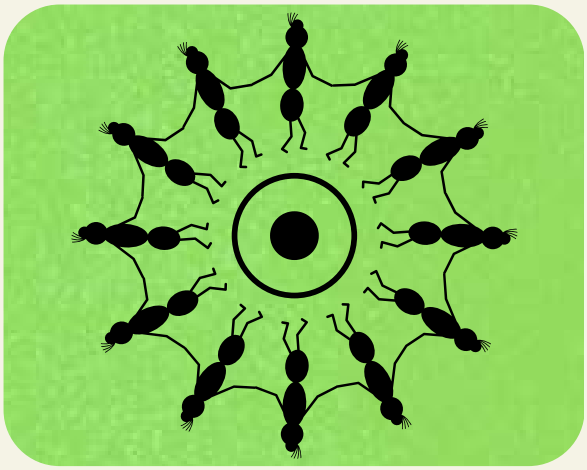
4 Create Your Dance Symbols

Students represent their dance movements visually using symbols, shapes, lines, and patterns inspired by traditional costumes or nature.

Traditional Games Around the World 5

Students rotate through traditional game stations from Serbia, Austria, and Finland, developing coordination, teamwork, and intercultural awareness through active play.





Circle Dance and Reflection 6

Students finish with a simple circle dance and discuss what they learned about cultural diversity, patterns, movement, and traditional practices.

Student Reflection (Teacher-Guided)

Guide students to reflect on their experiences:

- What did you learn about the cultures explored today?
- What patterns did you notice in the dances or costumes
- How can mathematics help us understand dance movements?
- How are art and culture connected?
- What did you enjoy most and why?

Reflection and Consolidation

Sharing Activity: Groups present their costume accessories and dance symbols, explaining the cultural inspiration and patterns they used.
Review Task: Students compare the dances, clothing, games, and movement patterns explored from the three countries.
Summary Task: Students describe one cultural tradition they learned about and explain how it connects with mathematics, art, or physical movement.

STEPAM Integration

- **Science/ Social Science:** Exploring population, national minorities, cultural diversity, & how traditions reflect communities and environments.
- **Technology:** Using videos, digital devices, & online resources to explore traditional clothing, dances, & cultural practices.
- **Engineering:** Planning & constructing wearable cultural accessories using materials, measurements, & design principles.
- **Physical Education:** Participating in traditional games and dances to develop coordination, agility, teamwork, and movement skills.
- **Art:** Creating costume accessories & visual symbols representing cultural patterns, movement, and traditions.
- **Mathematics:** Identifying, counting, comparing, & creating repeating movement patterns using beats, sequences, shapes, & symmetry.



Professions

Exploring Careers and the Skills That Shape Our Communities

This lesson helps students explore occupations and their contributions to society through job classification, workplace mathematics, simple tool design, digital career exploration, and occupation-based physical activities.

Key Takeaway

Different occupations contribute to communities in different ways and require a range of knowledge and skills. Mathematics, technology, engineering, creativity, and teamwork are important in many jobs.

Practical Considerations

- **Student level:** Upper primary, lower secondary.
- **Prerequisites:** Basic understanding of common occupations, basic measurement skills, simple classification, teamwork and communication skills.
- **Time needed:** Approximately 120–150 minutes
- **Learning space:** Classroom, computer room, gymnasium, or outdoor area.
- **Equipment:** Whiteboard or smartboard, markers, large paper or chart paper, occupation cards or pictures, scissors, glue, circular objects, measuring cups, water, small weights or objects, rulers, stopwatch, worksheets, string, tape, straws, small objects to lift or move, mobile devices, QR codes, stuffed animals or other props.

Advance preparation

- Prepare occupation cards & measurement stations.
- Gather engineering materials & create QR codes for occupation videos.
- Set up occupational relay stations.

Students' Role

Students explore careers through classification, measurement, tool design, digital resources, & physical activities while developing teamwork & career skills.

Teacher's Role

The teacher introduces different occupations and guides students in exploring how mathematics, technology, engineering, and teamwork are used in different jobs. The teacher facilitates hands-on activities and encourages students to connect classroom learning with real-world occupations.

Activity !!

1 Exploring and Classifying Occupations



Students explore different occupation cards and classify jobs according to whether they primarily produce goods or provide services, discussing how each contributes to the community.

2 Measurement in Different Jobs



Using art materials, students draw motion paths (straight, curved, zigzag) based on their observations and share their interpretations.

3 Build a Tool

Through structured games, students experience motion and stillness physically, following rules that limit or guide movement and encourage teamwork and strategy.



Activity!!

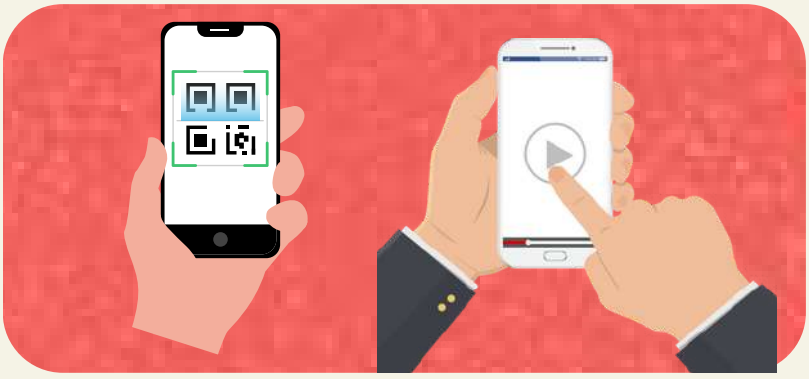


4 Occupational Relay

Students participate in a team relay with stations representing different occupations, completing simple physical tasks while developing coordination and teamwork.

Career Exploration with QR Codes 5

Students scan QR codes to explore short videos about different occupations and share interesting facts about the jobs and skills they discover.



Student Reflection (Teacher-Guided)

The teacher may guide reflection with questions such as:

- What makes an occupation important to a community?
- How is mathematics used in different occupations?
- How can an engineered tool make a job easier?
- Why is teamwork important in many occupations?
- Which occupation would you like to learn more about and why?

Reflection and Consolidation

Sharing Activity: Students present an occupation and describe the skills and tools required for it.
Review Task: Pupils identify occupations that use measurement, technology, engineering, physical skills, or teamwork.
Summary Task: They reflect on how occupations contribute to the community and the skills needed for future careers.

STEPAM Integration

- **Science:** Explore occupations and the skills used in work and community life
- **Technology:** Use QR codes and digital devices to access information about occupations
- **Engineering:** Design and build simple tools for workplace tasks
- **Physical Education:** Participate in occupation-themed relay activities to develop coordination and teamwork
- **Art:** Sketch and design tools or visuals related to occupations
- **Mathematics:** Measure and interpret length, mass, volume, and time in occupation-based tasks



Balloons

Up, Pop, and Float! Discovering the Science of Bubbles and Balloons



This lesson introduces students to the science of soap bubbles and balloons by exploring air, surface tension, pressure, movement, and stability through scientific investigations, engineering design, creative art, mathematical analysis, and active games.

Key Takeaway

Soap bubbles and balloons demonstrate how air, pressure, and surface tension influence movement and stability. Through experimentation and play, students discover how scientific principles can be investigated using observation, measurement, creativity, and teamwork.

Practical Considerations

- **Student level:** Upper primary / lower secondary
- **Prerequisites:** Basic understanding of measurements.
- **Time needed:** 90-120 min
- **Learning space:** Classroom, gymnasium, and outdoor area
- **Equipment:**
- Balloons (different sizes and shapes)
- Soap bubble solution
- Water, dish soap, glycerin, corn syrup
- Straws, pipe cleaners, wire, plastic bottles
- Rubber bands, fabric or mesh
- Transparent containers
- Measuring cups and spoons
- Markers
- Art paper
- Non-toxic paint or food colouring
- Tablets or smartphones
- Stopwatch or timer

Advance preparation

- Prepare bubble solutions and activity materials.
- Organise the game area.
- Ensure mobile apps are ready for use.

Teacher's Role

The teacher introduces the scientific concepts of air, pressure, and surface tension, guides experiments and engineering activities, facilitates movement games, and supports students in analysing and reflecting on their results.

Students' Role

Students investigate bubbles and balloons through experiments, design simple engineering tools, collect and analyse data, participate in movement games, and express creativity through bubble art.

Activity !!



Science – Exploring the Science of Soap Bubbles

Students investigate how soap bubbles form and explore the role of air and surface tension through demonstrations and hands-on experiments. Working in groups, they compare different bubble solutions by testing recipes made with soap, water, glycerin, or corn syrup to determine which produces the largest and longest-lasting bubbles. They measure how long bubbles remain intact, calculate average lifespans, and discuss how factors such as wind, temperature, and solution composition influence bubble stability.



Engineering – Building Bubble Tools

Students design and build a variety of bubble-making tools using everyday materials such as pipe cleaners, straws, bottles, fabric, and string. They create bubble wands, bottle bubble blowers, and giant bubble makers before testing the effectiveness of each design. Students compare the size and quality of the bubbles produced, measure their diameters, calculate average bubble sizes, and discuss how engineering design influences bubble formation.

Activity !!

3 Science, Technology & Mathematics – Balloon Physics



Students investigate how balloon size, shape, and air pressure affect movement and stability by inflating balloons to different sizes and releasing them under controlled conditions. Using measuring apps like **Measure by Google** and simple recording tools, they calculate the distance travelled by each balloon and organise their results into tables and bar graphs. Students analyse how balloon characteristics influence performance and discuss the relationship between air pressure, shape, and movement.

4 Art & Technology – Bubble Art Creation



Students create colourful abstract artwork by blowing bubbles made from soap solution mixed with non-toxic paint or food colouring onto paper. As the bubbles burst, they produce unique patterns and textures that combine science with artistic expression.

Students photograph their artwork using tablets or smartphones, enhance the images with simple editing apps, and present their final creations while discussing the techniques and colour effects they achieved.

Check the **Geogebra** **STEPAM MOOC** to play the videos and learn more about the activities! Scan the **QR code** to get to the site.

Activity !!

5

Physical Education – Balloon Games

Students participate in cooperative and competitive balloon games that develop coordination, teamwork, and motor skills while reinforcing the properties of air-filled objects.

Balloons in the Circle



Students work in teams, standing in a circle with a balloon in the centre. Using only one hand, they cooperate to keep the balloon in the air for as long as possible without letting it touch the ground.



Pop the Balloon – Last Balloon Alive

Each student begins with one balloon while attempting to protect their own and pop other players' balloons. The last player with an unpopped balloon wins, encouraging agility, spatial awareness, and strategic movement.

Check the **Geogebra** **STEPAM MOOC** to play the videos and learn more about the activities! Scan the **QR code** to get to the site.

Student Reflection (Teacher-Guided)

Guide students to reflect on their experiences:

- Why do you think some bubble solutions create stronger bubbles?
- How did the design of your bubble tool affect the bubbles you produced?
- Which balloon travelled the furthest, and why?
- What patterns did you observe in your bubble artwork?

Reflection and Consolidation

Students present their engineering designs, compare scientific results, and display their bubble artwork.

Science Review: Students explain how air, pressure, and surface tension influence bubbles and balloons.
Engineering Showcase: Groups demonstrate their bubble-making tools and discuss which designs were most effective.
Summary Task: Students identify how science, engineering, mathematics, technology, art, and physical activity worked together throughout the lesson.

STEPAM Integration

- **Science:** Investigating air, surface tension, pressure, and bubble stability
- **Technology:** Using measurement, graphing, photography, and image-editing apps
- **Engineering:** Designing and testing bubble-making tools
- **Physical Education:** Developing coordination, teamwork, and movement through balloon games
- **Art:** Creating abstract bubble paintings using coloured bubble solutions
- **Mathematics:** Measuring time, distance, proportions, averages, and bubble size while analysing experimental data



Hop to Grid

Exploring Settlements and Spatial Relations through STEAM

This lesson introduces students to exploring differences between rural and urban settlements while developing spatial awareness through coordinate grids, maps, navigation, and movement. They apply mathematical and creative thinking to design settlements and connect spatial concepts with real-world environments.



Key Takeaway

Settlements are organised according to the needs of the people who live there. Maps, grids, directions, and spatial relationships help us understand, design, and navigate different environments.

Practical Considerations

- **Student level:** Upper primary, lower secondary.
- **Prerequisites:** Basic understanding of directions, familiarity with grids & coordinates. Basic measuring & drawing skills. Teamwork & communication skills.
- **Time needed:** 120–150 minutes
- **Learning space:** Classroom, computer room, gymnasium, schoolyard, or other open space
- **Equipment:** Costumes or props, 10×10 square grid paper, cardboard building shapes, markers, glue, scissors, rulers, tablets or mobile phones with Google Maps, large outdoor chalk or masking-tape grid, coordinate and direction task cards, drawing paper, coloured pencils, cardboard boxes and recycled building materials (optional), whistle or signal sound.

Teacher's Role

Introduce rural and urban settlements, guide learning activities, support students in exploring spatial relationships, and facilitate connections between spatial concepts, navigation, and settlement design.

Students' Role

Investigate settlement types, use maps and grids to navigate, design and construct settlements, collaborate with peers, and explain how settlements meet community needs.

Activity!!

Rural and Urban Settlement Drama

1

Students act out rural and urban community roles and discuss differences in population, buildings, transportation, environment, and daily life.



Build a Settlement on the Grid

2

Students place buildings and natural features on a 10×10 grid using coordinates and task cards, then describe routes using directions and number of steps.



Activity !!

Human Grid Challenge 3

Students navigate a large floor grid by hopping, skipping, or jumping between specified coordinates while following directional instructions.



Design a Settlement 4

Students design a settlement on a grid and include homes, public buildings, green areas, and services. They explain the reasons for their spatial arrangements.



Activity !!

Navigate Like a Pro 5

Students use Google Maps to explore routes between familiar places, identify turns and directions, and sketch their routes using spatial language.



Streets and Alleys 6

Students participate in a chasing game using a human grid, changing between streets and alleys to develop agility, spatial awareness, and quick decision-making.



Student Reflection (Teacher-Guided)

The teacher may guide reflection with questions such as:

- What are the main differences between rural and urban settlements?
- How do grids help us describe where things are?
- How did you use directions to navigate the grid?
- When might we use maps or navigation apps in real life?
- Why do people organise buildings and roads in particular ways?

Reflection and Consolidation

Sharing Activity: Present their settlement designs and explain the location of key features using spatial language
Review Task: Students practise describing locations & routes using coordinates, directions, and spatial language.
Summary Task: They reflect on how maps, grids, & spatial awareness support settlement design & navigation.

STEPAM Integration

- **Science:** Explore how people and the environment shape settlements
- **Technology:** Use Google Maps to investigate locations and routes
- **Engineering:** Design and build model settlements
- **Physical Education:** Play grid-based games to develop movement and spatial awareness
- **Art:** Create maps and model settlements
- **Mathematics:** Use coordinate grids, directions, and spatial patterns



Human Landscape

Bringing Maps to Life

This lesson explores geographical features such as mountains, hills, rivers, lakes, valleys, and plains through mapping, model-making, movement, and collaborative activities. Students develop spatial awareness while connecting geography with STEPAM concepts.

Key Takeaway

Maps represent physical features of landscapes that can be interpreted and represented in different ways. Working with our bodies can help us visualise spatial relationships and understand geographical features.

Practical Considerations

- **Student level:** Upper primary, lower secondary.
- **Prerequisites:** Basic knowledge of common geographical features, teamwork & communication skills
- **Time needed:** 60–75 min
- **Learning space:** Gymnasium, schoolyard, classroom w/ sufficient open space.
- **Equipment:** Physical or digital maps showing different landscapes
- Projector or screen, raffle box, map cards
- Drawing paper, coloured pencils or markers (optional)
- Modelling materials for extension activities (optional)
- Digital or augmented reality tools (optional).

Advance preparation

- Prepare simplified physical or digital maps.
- Organise materials for group work.
- Set up the presentation area and movement space.

Teacher's Role

The teacher introduces geographical features, guides map interpretation, supports group planning, and facilitates reflection on spatial awareness.

Students' Role

Students collaboratively interpret maps, create physical landscapes, and develop spatial awareness through observation, discussion, and movement.

Activity!!

1 Geographic Movement Warm Up

Students use simple movements to represent geographical features such as mountains, hills, and rivers, preparing to connect physical movement with landscape concepts.



2 Map Selection and Exploration

Groups randomly select a landscape map and examine its geographical features before planning how to represent it physically.



3 Creating Human Landscapes

Students collaboratively transform their selected map into a human landscape, using body positions and movements to represent elevations, water features, valleys, and plains.



Activity !!

4 Landscape Presentation and Guessing Game

Groups present their human landscapes while classmates observe and identify the corresponding map, explaining which geographical features helped them make their choice.



5 Landscape Art & Mapping

Students draw or model the landscape they represented and compare their physical representation with the original map.



6 Geographic Cool Down & Reflection

Students perform gentle movements inspired by geographical features and reflect on how movement helped them understand landscapes and spatial relationships.



Student Reflection (Teacher-Guided)

The teacher may guide reflection with questions such as:

- Which geographical feature was most difficult to represent?
- How did your group work together to create the landscape?
- Which features helped you identify another group's map?
- What did you learn about landscapes through movement?
- How can maps help us understand real places?

Reflection and Consolidation

Sharing Activity: Groups present their human landscapes & explain their representations.
Review Task: Students identify and compare geographical features on different maps.
Summary Task: Students explain how maps can be transformed into physical or artistic landscape representations.

STEPAM Integration

- **Science:** Explore landforms and geographical landscapes
- **Technology:** Use digital maps and visual tools to explore landscapes
- **Engineering:** Transform map information into physical representations.
- **Physical Education:** Develop movement, balance, and spatial awareness through human landscapes
- **Art:** Represent geographical features through movement and creative expression
- **Mathematics:** Explore spatial relationships, scale, direction, and map features



Circumference & Pi

Discovering the Relationship Between Circles, Measurement, and π

This lesson introduces students to the measurement of circles by investigating the relationship between circumference and diameter. Through hands-on measurement of circular objects, students discover the constant ratio known as π and use their findings to develop and apply the circumference formulas.

Key Takeaway

The ratio between the circumference and diameter of any circle is approximately 3.14, known as π (pi). This relationship allows the circumference of any circle to be calculated using $C = \pi \times d$ or $C = 2 \times \pi \times r$.

Practical Considerations

- **Student level:** Upper primary / lower secondary
- **Prerequisites:**
- **Time needed:** 45-60 min
- **Learning space:** Classroom and outdoor area
- **Equipment:**
- Cans of different sizes
- Hula hoops of different sizes
- Measuring tapes
- Rulers and metre sticks
- Ropes or string
- Tablets or smartphones with measurement apps

Advance preparation

- Collect circular objects of different sizes.
- Prepare measuring tools and recording sheets.
- Ensure measurement apps are available if used.

Teacher's Role

The teacher introduces circumference and diameter, guides students through measurement strategies, and helps them identify the constant relationship between the two measurements.

Students' Role

Students measure circular objects, record and compare their measurements, calculate circumference-to-diameter ratios, and use their findings to understand and apply π.

Activity !!

1



Mathematics & Science- Measuring Circumference and Discovering π

The teacher begins by reviewing the terms circumference and diameter, emphasising that circumference can refer to the distance around a circle. Students work with circular objects of different size beginning with cans and progressing to larger objects such as hula hoops.

Students measure both the circumference and diameter using measuring tapes, rulers, ropes, metre sticks, or digital measurement apps, and record their results in a table. For large or difficult-to-measure objects, students can wrap a rope around the circumference or roll the object along the ground to transform the curved distance into a straight line.

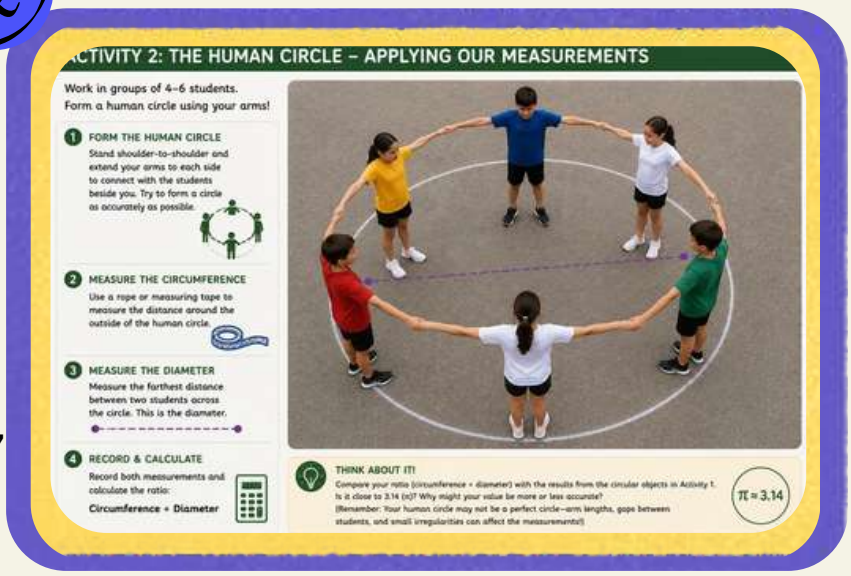
Students then compare their measurements and calculate:

Circumference ÷ Diameter

By examining several circles, they discover that the ratio is consistently close to **3.14**. The teacher introduces this constant as **π (pi)** and explains that it applies to circles regardless of their size.

Activity !!

The Human Circle – Applying Our Measurements



Students work in groups of 4–6 and form a human circle by standing shoulder-to-shoulder and extending their arms outward to connect with the students beside them, creating the circumference as accurately as possible. They then measure the distance around the human circle using a rope or measuring tape. Next, they measure the farthest distance between two students across the circle, representing the diameter. Students record both measurements and calculate the ratio circumference ÷ diameter.

Students compare their results with those obtained from the circular objects in Activity 1. They may notice that the ratio for the human circle is less accurate or further from 3.14, because the students cannot form a perfectly circular shape and the distances between them may vary. Use this observation to reinforce that π is a constant for perfect circles, while real-world measurements can vary because of the lack of accuracy of the shape and the measuring process.

Student Reflection (Teacher-Guided)

Guide students to reflect:

- Which measurement strategies were most accurate?
- How did rolling or using a rope help with larger circles?
- What pattern did they find when dividing circumference by diameter?
- Was the ratio approximately the same for all circles?
- What differences did you notice between your calculated values of π in Activity 1 and the Human Circle activity?
- Why do you think your results were different? What factors may have affected the accuracy of your measurements?

Reflection and Consolidation

Emphasize that **for a circle of any size, the ratio of its circumference to its diameter is equal to Pi**, which is about 3.14. This means that **the circumference (C) of a circle is the product of Pi times the length of its diameter (d)**. That is, **$C = \pi \times d$**. Since the diameter is twice the radius, then $d = 2 \times r$. So, we can also write $C = 2 \times \pi \times r$. As an exercise, let the students calculate the circumference of a circle given its radius/diameter.

STEPAM Integration

- **Science:** Collecting/recording data
- **Technology:** Using apps to measure length
- **Engineering:** Finding a way to measure the circumference, especially for large objects
- **Physical Education:** Performing the measurement outside the classroom, rolling the hula hoop to draw a straight line
- **Art:** Not specifically addressed in this lesson
- **Mathematics:** Performing simple calculations (circumference divided by diameter), finding the formula for circumference



Definition of a Circle

Discovering Circles Through Distance, Movement, and Fair Play

This lesson introduces students to the concept of a circle through a practical game. By investigating how distance affects fairness, students discover that all points on a circle are the same distance from its centre and develop an understanding of centre, radius, circumference, interior, and exterior.

Key Takeaway

A circle is a set of points that are all the same distance from a fixed point called the centre. This distance is the radius. Students discover this concept by creating a fair playing arrangement around a target.

Practical Considerations

- **Student level:** Upper primary / lower secondary
- **Prerequisites:**
- **Time needed:** 45-60 min
- **Learning space:** Playground, gym, or other open area
- **Equipment:**
- Coins or ping-pong balls
- Basket or target
- Rope
- Chalk
- Metre stick
- Measuring tape
- Ruler
- Optional measurement app

Advance preparation

- Prepare the target, throwing materials, and measuring tools.
- Mark an open area around the target.
- Prepare a rope and chalk for drawing the circle.

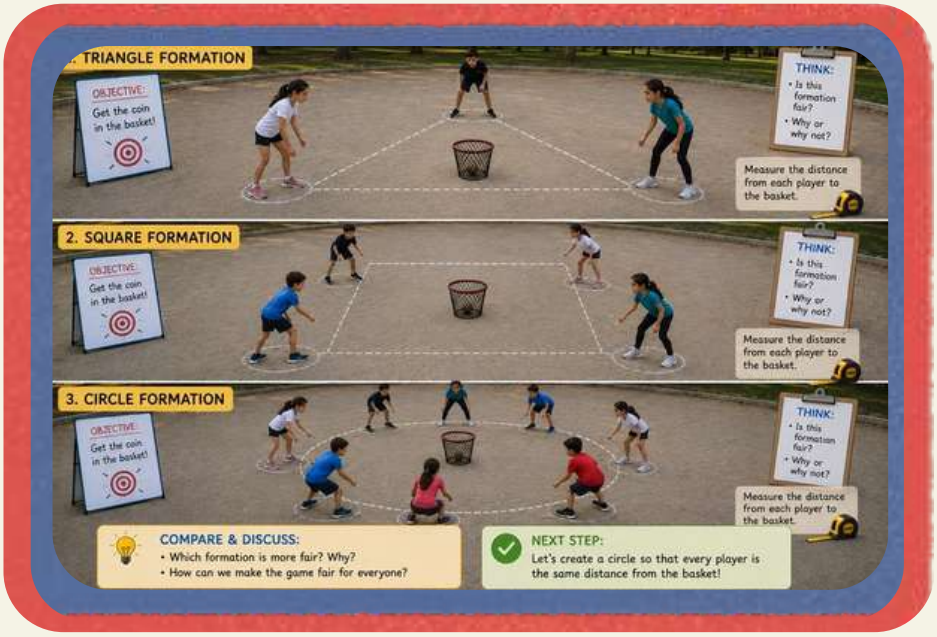
Teacher's Role

The teacher organises the game, encourages students to investigate fairness through measurement, and guides them from their observations toward the mathematical definition and properties of a circle.

Students' Role

Students play the game, compare distances, measure positions, and use their findings to construct and describe a fair circular arrangement.

Activity !!



Physical Education & Mathematics – A Fair Circle Game

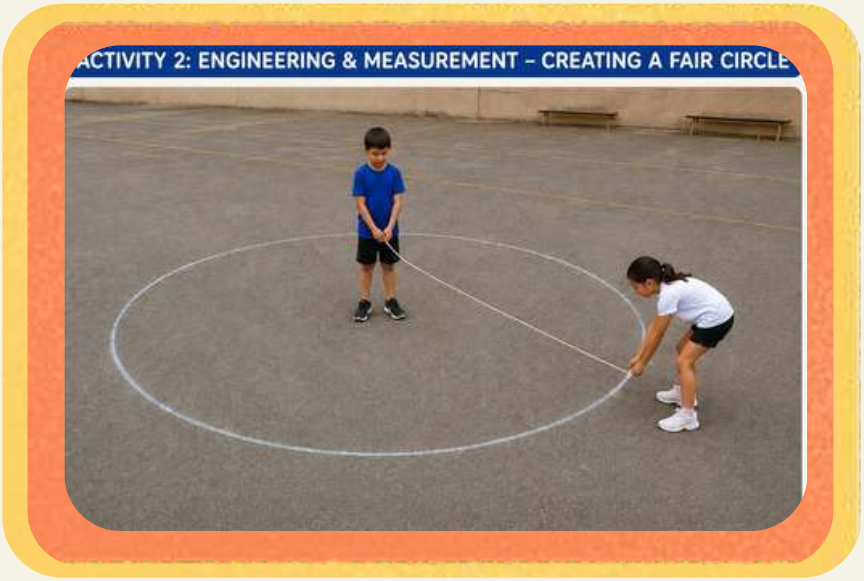
1

Students begin by playing a target game in which they throw coins or ping-pong balls into a basket. They work in small groups, with students positioned around the basket in different arrangements, such as squares, triangles, and circles. A successful shot counts as a score, and students who achieve three successful shots progress to the next round.

After playing, students compare the different positions and consider whether everyone had the same chance of success. The teacher asks: “Is every player at the same distance from the basket?”

Students then use measuring tapes, metre sticks, rulers, or a measurement app to measure the distance from different positions to the basket. They record and compare their measurements to identify why some arrangements may be less fair than others.

Activity!!



Engineering & Measurement – Creating a Fair Circle

Students use a rope and chalk to construct a circle around the basket. One end of the rope remains at the basket while another student stretches the rope to a chosen length and moves around the basket, marking points on the ground.

Students use the completed circle as the new shooting line and compare the distances from several positions to the basket. They should observe that each position on the circle is the same distance from the basket, making the game fairer.

Mathematics – Discovering the Parts of a Circle

Using the game and the circle they constructed, the teacher introduces the key terms:

- **Centre:** the fixed point in the middle of the circle — the basket.
- **Radius:** the distance from the centre to any point on the circle.
- **Circumference:** the set of points forming the boundary of the circle.
- **Interior Area:** the area inside the circle.
- **Exterior Area**: the area outside the circle.

Students measure several radii to confirm that the distance from the centre to points on the circumference remains the same.

Student Reflection (Teacher-Guided)

Guide students to discuss:

- Which arrangement was fairest? Why?
- How did measuring the distances help you decide?
- What makes all positions on the circle equivalent?
- Where is the centre of our circle?
- What does the radius represent?
- What is the difference between being inside, on, and outside the circle?

Reflection and Consolidation

Conclude by returning to the original game: the circle creates a fair boundary because every point on its circumference is the same distance from the centre.

STEPAM Integration

- **Science:** Collecting and comparing observations and distance data
- **Technology:** Using digital tools to measure distances
- **Engineering:** Constructing a circle using a rope, chalk, and a fixed centre
- **Physical Education:** Developing throwing accuracy, coordination, and movement through the target game
- **Art:** Creating and marking the circular design on the ground
- **Mathematics:** Exploring the definition of a circle and identifying its centre, radius, circumference, interior, and exterior



Shadow in Motion: Language & Spatial Awareness

Exploring Light and Spatial Language

Special activity developed by:
Sandra Tasić
MA in Language, Literature and Culture · English Philologist · Master Professor of English Language

This activity introduces students to the relationship between light, shadows, and spatial position through hands-on investigations, movement, language practice, and creative activities. Students explore how the position of a light source affects shadows while developing observation, spatial reasoning, and communication skills.

Key Takeaway

A shadow forms when an object blocks light, and its position, size, and shape can change when the light source or object moves. By observing and describing these changes, students connect scientific concepts of light and shadow with spatial language and movement.

Practical Considerations

- **Student level:** 4–6 years and lower-primary grades
- **Prerequisites:** None
- **Time needed:** 10 minutes
- **Learning space:** Classroom or darkened room.
- **Equipment:**
- Mobile phone or other light source
- Song for younger pupils (optional)

Advance preparation

- Prepare light sources
- Gather transparent and opaque materials

Students' Role

Students investigate how shadows are formed and how they change when light sources, objects, or positions move. They use spatial language to describe positions and distance, explore materials and geometric shapes, and collaborate to communicate their observations.

Teacher's Role

The teacher introduces key concepts about light and shadows, guides students through investigations, & encourages them to observe how light position, distance, and materials affect shadows. The teacher supports the use of spatial language, facilitates creative and movement activities, and guides students' reflection and discussion.

Activity !!



1

Activity

The teacher places a light source behind one student and moves it to different positions around the student. As the light changes position, the teacher asks simple questions such as “Where is the light source now?” Students respond using basic spatial expressions, such as “It’s on the left/right,” “It’s near/far,” or “It’s up/down.” For younger pupils, the activity can be accompanied by a short song to reinforce the vocabulary through rhythm, repetition, and movement.

Language & Science Connection

Language: Students practise simple English sentences describing the position and movement of the light source.

Optics: Students observe how changing the position of a light source affects what they see and develop their understanding of light direction, position, and spatial relationships.

Physical Activity: Students turn, point, move, or change position in response to the teacher's instructions, adding a light movement component to the language practice.

Student Reflection (Teacher-Guided)

Guide students to discuss:

- Where is the light now?
- Did the light move closer or farther away?
- What changed when the light moved?

STEPAM Integration

- **Science:** Exploring light sources, direction, and spatial relationships
- **Technology:** Using a mobile phone or other device as a light source
- **Engineering:**
- **Physical Education:** Responding to light positions through simple movements
- **Art:** Creating and marking the circular design on the ground
- **Mathematics:** Developing spatial concepts such as left/right, near/far, and up/down
- **Language:** Practising English vocabulary and sentence structures related to position and movement



Jobs Around Us: Farmer

Exploring Farming, Nature, Language, & Movement Through STEAM

Special activity developed by:
Sandra Tasić
MA in Language, Literature and Culture · English Philologist · Master Professor of English Language

This lesson introduces children to the profession of a farmer through stories, songs, movement, creative activities, and hands-on exploration. Children learn about farm animals and plant growth while developing basic English vocabulary, mathematical thinking, coordination, creativity, and independence.

Key Takeaway

Farming involves caring for animals, planting and growing plants, and using different tools and skills. Through play, movement, and hands-on activities, children connect these ideas with simple English language and STEAM concepts.

Practical Considerations

- **Student level:** 4–6 years and lower-primary grades
- **Prerequisites:** None
- **Time needed:** 1–2 × 60–90 min
- **Learning space:** Classroom
- **Equipment:**
- Farm animal figures/cards
- Xylophone
- Jars, soil, and beans/seeds
- Small watering cans and water
- Collage and drawing paper
- Scratch paper and markers
- Cones, hoops, bottles, spoons, and floor markers
- Jack and the Beanstalk props: toy animals, seeds, coins, eggs, picture cards

Advance preparation

- Prepare farm animal cards, story props, and a xylophone.
- Set up planting materials and observation jars.
- Prepare shape, drawing, and collage materials.
- Set up equipment for the movement games.

Teacher's Role

Introduce the farmer theme, model key English vocabulary & movements, guide hands-on activities, & support children's exploration, observation, & participation.

Students' Role

Explore farming through songs, stories, movement, art, and hands-on activities, while practising simple English, making choices, and observing plant growth.

Activity!!



Physical Education + Language- Song and Animal Sounds

1

The teacher begins by discussing, in the children's native language:

- ***Who is a farmer?***
- ***What does a farmer do?***
- ***Which animals live on a farm?***

Later, the teacher plays the melody “Old MacDonald Had a Farm” on a xylophone and asks simple English questions:

What does the cow say?

Children choose an animal and respond:

Mooo! (for the cow)
Quack-quack! (for the duck)
Meow-meow! (for a cat)

Children then imitate the selected animals through movement, such as waddling like ducks or stomping like cows.

Activity !!

Farm Animal Relay 2



Children work in small groups and create a movement pathway using cones, hoops, and floor markers. Each child selects an animal card and travels through the pathway while imitating that animal. Group members count the number of steps or movements. The child returns and tags the next participant.

Cognitive + Language – The Farmer's Story 3



Introduce the farmer's responsibilities, such as caring for animals and planting seeds.
Use **Jack and the Beanstalk** as a storytelling context. The teacher reads and dramatizes the story using props such as toy animals, seeds, coins, and eggs. Key vocabulary is reinforced with picture cards showing elements such as the **castle, giant, and beanstalk**.

Children participate by:

- Acting out story characters and events.
- Performing actions from a related song using **Total Physical Response (TPR).**
- Exploring the sequence of events in the story.

The story also introduces the idea of **planting and growing**, preparing children for the next activities.

Activity !!

4

Science + Tools + Movement - Planting and Growing



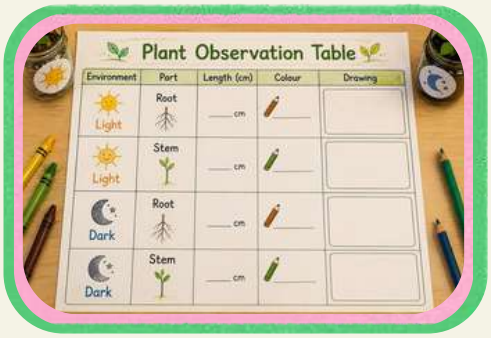
Children independently explore the soil and seeds, following Montessori-inspired principles of autonomy and hands-on exploration.
The teacher asks, in the children's native language:

What does a seed need to grow?

Guide children toward the importance of **soil, water, and sunlight**.

Planting and Watering
Children plant a seed in a jar and water it using a small watering can. The teacher introduces simple English sentences:

I plant the seed.
I water the plant.
The plant grows.



The children create a **sun collage** and attach it to their jars. Guide them to place some of them in a **light environment** and others in a **dark environment**. Over the following weeks, they observe and compare the growth of the plants.

Activity!!



5

Seed Carry Race

Children work in small groups. Each child carries a **seed on a spoon** through a pathway designed with cones. They move through a zig-zag course and carefully place the seed into a bottle.

Children can sing **“Jack and the Beanstalk”** during the activity. The game continues until one group collects 10 seeds.

Student Reflection (Teacher-Guided)

Guide children to reflect through simple questions:

- What does a farmer do?
- Which animals live on a farm?
- What does a seed need to grow?
- What happened to our plants over the weeks?
- What did you enjoy doing?

For younger children, reflection can be supported through pictures, gestures, pointing, and simple English responses.

STEPAM Integration

- **Science:** Understanding that plants need soil, water, and sunlight to grow; exploring farm animals and their movements
- **Tools/Technology:** Using watering cans, jars, spoons, bottles, cones, and other hands-on materials
- **Engineering:** Designing movement pathways and organising simple activity sequences
- **Physical Education:** Imitating animal movements and developing coordination, balance, and gross motor skills
- **Art:** Creating sun collages and drawing farm animals using geometric shapes
- **Mathematics:** Identifying shapes and counting steps, movements, seeds, and objects
- **Language:** Practising English vocabulary and sentence structures related to position and movement

06

Implementation Guidelines for Educators





6.1 Teacher Roles and Autonomy

In STEPAM, teachers are not only facilitators of physical activity but also designers of interdisciplinary learning experiences. They are trusted to adapt activities to their students' needs, make cross-curricular connections, and integrate local cultural practices. Autonomy is essential—educators are empowered to customize implementations while aligning with STEPAM's inclusive, inquiry-driven ethos.

6.2 Co-Design with Communities & Students

STEPAM values education as a collective process. Teachers are encouraged to co-design lessons and activities in partnership with students, families, and community members. This could include:

- **Adapting traditional games to reflect curriculum goals**
- **Inviting local artists or health professionals to enrich experiences**
- **Using student interests to guide activity design**

This approach builds ownership, relevance, and engagement, fostering stronger community-school relationships.



6.3 Use of Technology

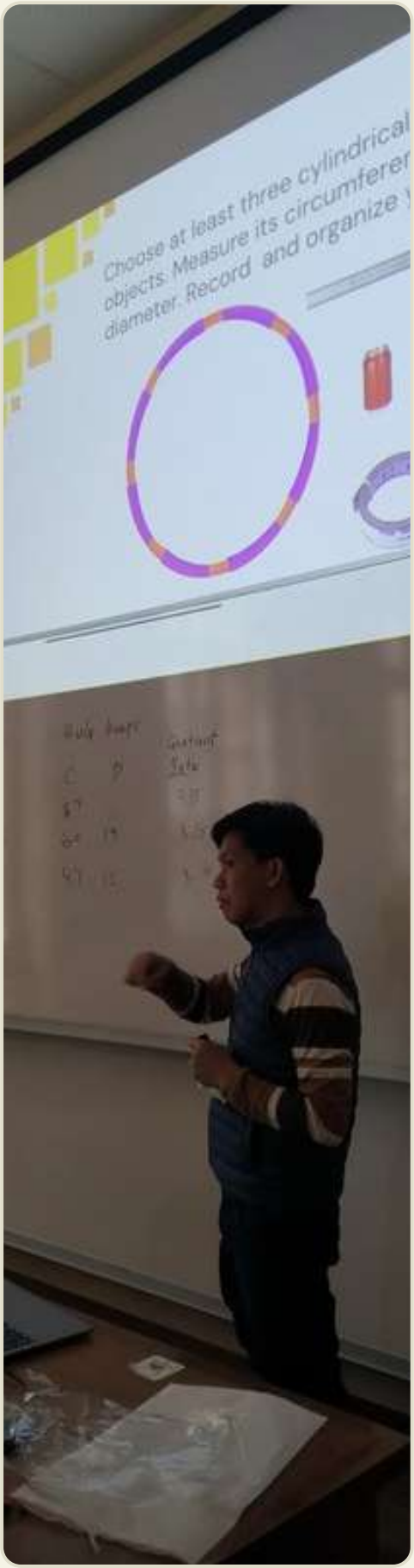
Technology plays a supportive and creative role in STEPAM implementation. Tools can:

- **Enhance understanding (e.g., measuring heart rate with apps)**
- **Enable creative output (e.g., designing symmetrical patterns in Mathigon)**
- **Support data analysis (e.g., step count graphs with Makey Makey). Educators are encouraged to use accessible, low-cost or open-source tools that allow experimentation and inclusion.**

6.4 Professional Development Recommendations

To ensure high-quality implementation, STEPAM recommends:

- **Initial training on the STEPAM framework and its interdisciplinary model**
- **Ongoing workshops on inclusive practices, classroom management in active settings, and low-tech innovation**
- **Teacher learning communities for sharing practices and resources. Professional development should be contextualized, reflective, and collaborative.**



6.5 Inclusive Practices in Mixed-Ability Classes

Inclusive education is a non-negotiable pillar of STEPAM. Teachers are guided to:

- **Differentiate movement tasks (e.g., varying intensity, support, or rules)**
- **Ensure visual, verbal, and tactile cues are used**
- **Create non-competitive environments that celebrate effort and creativity. All children, including those with disabilities or learning differences, must feel seen, supported, and celebrated.**

6.6 Adapting for Urban vs. Rural Contexts

STEPAM is flexible by design. In urban areas, activities may use school yards, gyms, or tech-supported tools. In rural areas, fields, forests, or public spaces become learning environments. Teachers are encouraged to:

- **Leverage what is locally available**
- **Draw from environmental and cultural assets**
- **Adapt time, space, and equipment creatively. This place-based approach ensures that all students can benefit, regardless of geography.**

07 International Context and Policy Integration



7.1 Lessons from Austria, Serbia, & Finland

- **Austria:** Structured national curriculum, some regional variation. Potential to strengthen cross-curricular integration.
- **Serbia:** Modernized policies, but limited infrastructure and uneven teacher training.
- **Finland:** Strong teacher autonomy and phenomenon-based learning. Local variation remains a challenge.

7.2 Comparative Policy Insights

- Weekly PE time varies (~2–3 hours).
- Teacher training is strongest in Finland, evolving in Serbia, and regionally variable in Austria.
- STEAM links are explicit in Finland, implicit or emerging in Austria and Serbia.

7.3 Opportunities for Policy Alignment

- Define shared benchmarks (e.g., 3 PE hours/week).
- Improve infrastructure and teacher development.
- Codify STEAM-PE integration across countries.

7.4 Recommended Competencies for Policymakers

- Promote inclusive PE and Support cross-curricular learning.
- Ensure basic access to safe, engaging spaces.
- Encourage collaboration and exchange (e.g., Erasmus+, regional labs).

08 Monitoring, Evaluation and Reporting



8.1 Simple Data Collection Tools

- Steps counters, reflections journals, and student surveys.
- Teachers checklists to assess participatios and engagement.

8.2 Peer and Self-Evaluation

- Encourage students voice throught peer feedback and journaling.
- Use visual Tools for tracking physical and academic progress.
- Use of AI assistants to support reflections and peer assessment.

8.3 Local ad Cross-National Benchmarking

- Local reports to the municipalities to highlights strenghts and gaps
- Aggregated data can inform national or EU-level evaluations.

8.4 Research Partnerships

- Work with uinversities and NGOs to explore long-term impact.
- Focus areas: fitness, STEAM Learning, inclusion and well-being.





09 Acknowledgments and Contributors



9.1 Core Team

- Multidisciplinary educators and researchers across Austria, Serbia, and Finland.

9.2 Partner Institutions

- Ministries of Education
- National Curriculum Boards
- Local schools and STEAM labs

9.3 Community Educators

- Teachers, principals, and students in pilot locations who brought STEPAM to life.



Thank You !!!

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