STEAMIFIED TRANSVERSAL SKILLS DEVELOPMENT

COMPREHENSIVE TOOLBOOK FOR ELEMENTARY TEACHERS

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Skills of tomorrow for children of present: complex future-skill development with the synergy of learning activities, game-based learning and STEAM
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1. INTRODUCTION

Dear Teacher!

This toolbox is the third volume of the three comprehensive toolbox produced by the "SPIRIT – Skills for the Future for Today's Children" Erasmus+ project, which contains 20 Gamified STEAM programs for comprehensive skills development developed by five project partner countries. The 20 STEAM programs presented in this handbook were collected, adapted, tested and compiled into a comprehensive collection with the specific aim of enriching primary school teachers' repertoires with tried-and-tested STEAM programs that develop the transversal skills needed for today's primary school children to maintain their emotional and social well-being 15 years from now.

The selection and testing of the Gamified STEAM programs was carried out by 40 elementary school teachers from the 5 partner countries, and nearly 1,200 students from the 40 classes they taught were involved in testing activities. We grouped the STEAM programs in the handbook according to the students' ages, and we considered it particularly important that the developed programs align in every respect with the age-specific characteristics and cognitive development levels of the children. Thus, each program meets the students' needs in terms of time required, playfulness, and the subject matter covered. In accordance with this, the individual Gamified STEAM programs have the following time requirements:

- 1st grade – 90–120 minutes
- 2nd grade – 120–180 minutes
- 3rd grade – 180–240 minutes
- 4th grade requires more than 240 minutes.

Each program consists of 3–6 interconnected modules and develops SPIRIT skills in a comprehensive manner. Every activity includes detailed implementation guidance. In addition to the above-mentioned aspects, we considered four fundamental principles during the development of the Gamified STEAM programs:

- Connection to the Real World;
- Connection to Research and Inquiry-Based Learning;
- Motivating Learners to Engage Actively;
- Development of Transversal Skills - Particularly the 10 SPIRIT Skills

This toolbook has been produced the result of a collaboration between some of Europe's leading organisations involved in education, initial and in-services teacher training, and research – Erasmushogeschool Brussel (Belgium), Magyar Digitális Oktatásért Egyesület (MDOE, Hungary), Patrizio Paoletti Foundation (Italy), , Sapientia Hungarian University of Transylvania (Romania), VitaComm Education (Cyprus) and Thinking Skills Development Research Group (ELTE Faculty of Primary and Pre-School Education) as the associate partner of MDOE

The book is also available online on the SPIRIT portal tomorrowskills4kids.eu/steamified-skills-development/

We strongly believe that the proposed Gamified STEAM programs or called them "STEAMified skills development program" will bring great joy to both students and their teachers. We wish everyone fun, happy teaching, and joyful learning.

The SPIRIT- Skills of tomorrow for children of today - project team

2. STEAM APPROACH AND STEAMIFIED TRANSVERSAL SKILL DEVELOPMENT

2.1. EVOLUTION OF STEAM EDUCATION

To cultivate the competencies central to the SPIRIT framework, it is essential to understand the foundation and evolution of STEAM education. STEM - Science, Technology, Engineering, and Mathematics - emerged as a formal educational framework in 2001, when the acronym was coined by leaders at the US National Science Foundation. However, discussions about strengthening these disciplines in education had begun years earlier, driven by concerns about student performance and future workforce readiness. The impetus for STEM education arose from international assessments such as TIMSS (Trends in International Mathematics and Science Study) and PISA (Programme for International Student Assessment), which revealed significant gaps in student achievement. These findings sparked urgent conversations about educational reform, not only to improve academic outcomes but also to address declining interest in STEM careers. Policymakers recognized that these trends posed risks to economic competitiveness and innovation capacity on both national and global scales. In response, nations worldwide began realigning their educational systems, emphasizing interdisciplinary approaches that connect classroom learning to authentic, real-world challenges.

Within the SPIRIT project, STEAM education serves as a powerful vehicle for developing the ten transversal skills essential for children's future well-being. What distinguishes STEAM from traditional subject-based instruction is its emphasis on integration and application. Rather than treating Science, Technology, Engineering, Arts, and Mathematics as isolated domains, STEAM weaves them together through hands-on, inquiry-based experiences that mirror the complexity of real-world problems. This approach naturally cultivates critical thinking, creativity, collaboration, and several other transversal skills that align directly with the SPIRIT framework's vision for preparing children to navigate an uncertain and rapidly changing future. In essence, STEAM education embodies a holistic approach to learning that extends beyond academic achievement. It equips children with both knowledge and competencies while fostering a mindset oriented toward innovation, empathy, and problem-solving. As outlined in the SPIRIT framework, this interdisciplinary methodology creates natural opportunities for children aged 6-10 to develop the transversal skills that will serve them throughout their lives. Through STEAM, learning becomes active, meaningful, and connected to the real world - preparing children not merely to succeed in school but to thrive as adaptable, resilient, and creative individuals in an interconnected global society.

2.2 STEAM LESSON APPROACHES

2.2.1 Addressing versatility in approaches

Educators engaging with STEAM education quickly encounter a landscape marked by diversity and adaptability. This variety stems partly from the evolving nature of the field itself. The term has proven remarkably flexible, giving rise to variations such as STEAM (STEM + Arts), STREAM (STEM + Arts + Reading/Research), and even STEMM (STEM + Medicine).

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Beyond definitional variations, STEAM approaches differ in their degree of disciplinary integration. Four levels of integration are identified:

- Disciplinary (subjects taught separately),
- Multidisciplinary (subjects taught in parallel around a common theme),
- Interdisciplinary (subjects merged with blurred boundaries), and
- Transdisciplinary (subjects fully integrated around real-world problems).

These levels represent a continuum, offering educators flexibility in designing learning experiences that suit their students' developmental stages and curricular contexts.

Despite this diversity, a unifying principle underlies all effective STEAM education: the rigorous academic concepts are coupled with real-world lessons as students apply science, technology, engineering, and mathematics in contexts that make connections between school, community, work, and the global enterprise."

Within the SPIRIT project, we embrace this diversity and adaptability while maintaining a clear focus on skill development. The STEAM programs provided by the consortium reflect this versatility - educators will encounter different approaches, each designed to foster transversal competencies while addressing varied learning objectives and classroom contexts. Some activities emphasize exploration and inquiry; others focus on design and prototyping. Some integrate all five STEAM disciplines; others highlight connections between two or three. Some of the programs among the tools that have been developed apply the STEAM approach to outdoor education and focus more on nature connection, valuing nature and people, hands-on activities, dirty learning, etc., in addition to the subject-related connection. This flexibility is intentional, allowing teachers to select approaches that align with their students' developmental levels, school's pedagogical vision, and the specific skills they wish to cultivate.

A noteworthy educational approach to STEAM Education is **the STEMOOVIE approach**, developed by educators in Belgium which exemplifies one particularly robust framework for structuring STEAM learning experiences . STEMOOVIE places dynamic research and design processes at its centre, recognizing that authentic learning occurs through cycles of investigation, creation, testing, and refinement. The model comprises three interconnected components:

- Learning by Research enables students to acquire insights and develop critical mindsets through systematic investigation. Students formulate questions, gather information, design experiments, make predictions, conduct observations, and draw evidence-based conclusions. Importantly, this process is iterative rather than linear - students may revisit earlier steps as new questions emerge.
- Learning by Design empowers students to transform ideas into tangible prototypes. Beginning with brainstorming and ideation, students' progress through planning, creating, testing, and refining their solutions. This phase emphasizes creativity, problem-solving, and resilience as students encounter challenges and iterate toward improvement.
- Connect serves as both the engine and glue of the STEMOOVIE model. This dimension links students to their real-world environment, to each other through collaboration, and to the higher-order cognitive skills they develop during STEAM activities. Connection ensures that learning extends beyond the classroom, fostering relevance and meaningful engagement.

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All STEAM approaches are used by SPIRIT partners resonate powerfully with Kolb's Learning Cycle, which the SPIRIT handbook identifies as essential for developing transversal skills. Kolb's cycle comprises four stages: Concrete Experience, Reflective Observation, Abstract Conceptualization, and Active Experimentation. Each stage supports the development of behavioural competencies in young learners.

- **Concrete Experience** corresponds with the initial engagement phase of STEAM activities. Students encounter hands-on challenges - planting seeds, building structures, investigating phenomena - that require them to exercise teamwork, empathy, problem-solving, and resilience. For example, when students work together to design an automatic plant watering system, they immediately experience the demands of collaboration and creative thinking.
- **Reflective Observation** follows naturally as teachers guide students to discuss their experiences. Questions such as "How did you feel during the activity?" or "What strategies helped your team succeed?" encourage students to examine their emotional responses and interpersonal dynamics. In the STEMOOVIE model, this reflection occurs organically as students evaluate why their prototypes succeeded or failed, prompting them to consider alternative approaches.
- **Abstract Conceptualization** involves connecting specific experiences to broader principles. Teachers help students recognize patterns and name the skills they are developing. For instance, after a design challenge, educators might introduce vocabulary related to problem-solving steps or teamwork strategies, creating a shared language that students can apply across contexts. This phase mirrors the moments in STEMOOVIE when students move from observing a specific outcome to understanding underlying principles, such as how moisture sensors function or why certain materials behave in particular ways.
- **Active Experimentation** occurs when students apply their learning to new situations. In STEAM contexts, this manifests as iterative testing and refinement - students adjust their designs, try alternative materials, or tackle new challenges using strategies they have developed. This phase embodies the growth mindset central to the SPIRIT framework, encouraging students to view setbacks as opportunities for learning rather than failures.

By recognizing the alignment between STEAM approach and Kolb's experiential learning framework, educators can appreciate how STEAM activities naturally support the development of transversal skills. The STEAM approach emphasizes active engagement, reflection, conceptual understanding, and iterative application - precisely the conditions under which children aged 6-10 develop lasting competencies and SPIRIT skills.

2.2.2 Focusing on the SPIRIT STEAM Core

While STEAM education encompasses diverse approaches and methodologies, the SPIRIT project identifies four core parameters that define high-quality STEAM learning experiences. These parameters ensure that activities not only engage students intellectually but also cultivate the transversal skills essential for future well-being. Every STEAM activity within the SPIRIT framework is designed around these interconnected dimensions:

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1. **Connection to the Real World**: Authentic learning occurs when students perceive relevance beyond the classroom. STEAM activities grounded in real-world contexts - investigating local environmental issues, designing solutions to community challenges, or exploring phenomena students encounter in daily life - foster motivation and meaningful engagement. This connection also develops the SPIRIT skill of connectedness, helping children recognize their role within broader social and ecological systems.
2. **Connection to Research and Inquiry-Based Learning**: Curiosity drives deep learning. STEAM activities invite students to formulate questions, investigate phenomena, gather evidence, and draw conclusions. This inquiry stance nurtures critical thinking, flexibility, and the sense of wonder that fuels lifelong learning. Rather than passively receiving information, students actively construct understanding through exploration and discovery.
3. **Motivating Learners to Engage Actively**: Effective STEAM activities spark intrinsic motivation. Through hands-on challenges, creative problem-solving, and opportunities for collaboration, students become invested in their learning. Activities that offer choice, allow for multiple solution paths, and provide tangible outcomes naturally engage children's interest and encourage persistence. This active participation builds resilience and self-efficacy as students see themselves as capable problem-solvers and creators.
4. **Development of Transversal Skills - Particularly the 10 SPIRIT Skills**: While content knowledge matters, the primary purpose of SPIRIT STEAM activities is skill development. Every activity intentionally creates opportunities for students to practice and refine emotional regulation, creativity, problem-solving, critical thinking, resilience, flexibility, curiosity, empathy, valuing people and nature, and connectedness. These competencies emerge naturally through collaborative challenges, design iterations, reflective discussions, and the authentic application of knowledge to meaningful problems.

These four parameters form the SPIRIT STEAM Core - the foundation upon which all exemplary STEAM learning experiences rest. In the sections that follow, we will explore how this core translates into educational practice, examining both the skill development potential and the curricular integration possibilities that make STEAM such a powerful pedagogical approach within the SPIRIT framework.

2.3 TRANSVERSAL SKILLS DEVELOPMENT POTENTIALS

2.3.1 Integrating Transversal Skill Development

Transversal skills are the core of the SPIRIT project, and STEAM education is a uniquely rich medium for developing them through authentic, interdisciplinary challenges. These cognitive, social, and emotional capacities - often called soft, life, or 21st-century skills - help learners collaborate, adapt, and navigate complexity, remaining valuable long after specific content changes.

The SPIRIT framework identifies ten essential transversal skills for children aged 6-10, each crucial for future well-being in an uncertain world. STEAM education offers unique pathways for developing each of these competencies:

1. **Emotional Awareness, Regulation, and Communication**: STEAM activities create emotionally rich collaborative experiences where students encounter frustration when prototypes fail, excitement when solutions work and must communicate feelings constructively while navigating group dynamics and setbacks.

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2. **Creativity**: STEAM challenges require divergent thinking and novel problem-solving through open-ended design tasks that have multiple viable solutions, encouraging students to generate original ideas, combine concepts unexpectedly, and express thinking through diverse modalities including artistic, verbal, and kinesthetic forms.
3. **Problem-Solving**: The engineering design cycle at STEAM's core explicitly teaches systematic problem-solving as students define challenges, gather information, generate solutions, test ideas, analyse results, and refine approaches through iterative cycles.
4. **Critical Thinking**: STEAM's inquiry-based investigations cultivate analytical reasoning as students design fair tests, control variables, interpret data, evaluate evidence against criteria, distinguish reliable information from speculation, and form evidence-based conclusions.
5. **Resilience**: The iterative design process ensures students regularly encounter failure as structures collapse and predictions prove incorrect, reframing setbacks as essential learning opportunities while building tolerance for frustration and persistence through challenge.
6. **Flexibility**: STEAM's open-ended challenges demand adaptability as unexpected results requires revised hypotheses, initial designs need pivoting to alternative solutions, and collaboration with peers necessitates remaining open to different perspectives and approaches.
7. **Curiosity, Sense of Wonder, and Openness**: STEAM activities begin with phenomena that genuinely spark interest - investigating why objects float, exploring how bridges hold weight, discovering how plants respond to environments - tapping into children's natural wonder while the Arts component reveals beauty in patterns and concepts, connecting intellectual understanding with aesthetic appreciation.
8. **Empathy**: Collaborative STEAM work requires attending to teammates' ideas and recognizing peers' emotions, while activities addressing real-world problems like designing assistive devices or investigating environmental impacts prompt students to consider diverse human needs and experiences.
9. **Valuing People and Nature**: STEAM investigations of ecosystems, environmental phenomena, and sustainability develop ecological awareness and appreciation for nature's complexity, while collaborative challenges teach students to recognize and celebrate diverse contributions as they experience how complementary talents strengthen collective work. Placing STEAM activities in an outdoor environment - "Dirty STEAM Learning" -, the direct integration of STEAM activities into nature, explicitly boosts the development of green and sustainability competences, the exploration of the relationship between nature and humans, and the awareness that all creatures of nature are interdependent and part of a single universe.
10. **Connectedness**: STEAM's interdisciplinary nature reveals how Science, Technology, Engineering, Arts, and Mathematics interweave in authentic contexts, while investigations of local environmental issues, global technologies, and cross-cultural innovations help students recognize relationships among people, communities (local, national and global), and natural systems rather than viewing knowledge or existence as isolated fragments.

Understanding how STEAM activities naturally foster these competencies helps educators facilitate with intentionality. By recognizing moments when skills emerge - when a failed test offers a resilience-building opportunity, when diverse team ideas create space for empathy and flexibility, when surprising results spark curiosity - teachers can use strategic questions and reflective prompts to make skill development explicit, helping students recognize and name the competencies they're practicing so these skills transfer to new contexts beyond the STEAM activity itself.

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2.3.2 Integrating Content and Curriculum

While skill development forms the primary focus of the SPIRIT project, educators understandably wonder how STEAM activities integrate with mandatory curricular content and learning objectives. A common concern is that STEAM approaches, however valuable for skill development, may divert precious instructional time from required academic material. However, this concern rests on a false dichotomy. High-quality STEAM education does not require choosing between skills and content; rather, it provides a powerful vehicle for achieving both simultaneously.

STEAM activities inherently address rigorous academic concepts across multiple disciplines. When students investigate plant growth, they engage deeply with life science curriculum standards related to organisms and environments. When designing bridges, they apply mathematical concepts.

A project investigating water quality might simultaneously engage students in scientific investigation skills, mathematical data collection and graphing, literacy research and writing, technological tool use, and artistic communication of findings. This integration allows teachers to address diverse curricular requirements efficiently while providing students with the holistic, contextualized learning that supports deep understanding and retention.

The versatility of STEAM approaches allows teachers to adapt the framework to their specific curricular needs, student interests, and available resources. A teacher focusing on geometry might engage students in designing architectural models. A teacher exploring cultural studies might facilitate students' creation of artistic and engineering artifacts reflecting different societies' innovations. The common thread is not specific content but rather the interdisciplinary, inquiry-based, design-oriented approach that characterizes STEAM learning.

Furthermore, STEAM education directly responds to the reality that our world operates interdisciplinarily. Professional scientists collaborate with engineers, artists, and mathematicians. Community challenges require integrated knowledge from multiple domains. Global issues like climate change, public health, and technological ethics demand citizens who think across disciplinary boundaries and recognize complex interconnections. By providing students with educational experiences that mirror this interdisciplinary reality, STEAM prepares them not merely for school success but for meaningful participation in contemporary society.

For educators committed to the SPIRIT framework's vision of preparing children for an uncertain future, STEAM education offers a coherent pedagogical approach that honours both academic rigor and skill development. The activities provided by the SPIRIT consortium demonstrate this balance, each designed to engage students in substantive content learning while creating authentic opportunities to develop the ten SPIRIT skills. As teachers explore these activities, they will discover that investing time in STEAM approaches yields rich dividends: students who are not only knowledgeable but also curious, creative, resilient, empathetic, and equipped to navigate the complex challenges of the 21st century.

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3. STEAM PROGRAMS AND EVENTS FOR TRANSVERSAL SKILLS DEVELOPMENT

FIRST GRADE STUDENTS

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3.1 Activating the senses – Activity in a nearby meadow or park

Children often spend their daily lives in artificial environments - frequently in urban settings - surrounded by limited material and natural stimuli. For them, it is especially important to connect with nature through direct, personal experiences. Even for those who live closer to nature, it is valuable to reflect on and organize their spontaneous experiences for deeper understanding.

The conscious use of the senses is the foundation of learning. Observation, measurement, and experimentation all build on this. At this age, children typically view the world from an egocentric perspective, but such activities help them realize that others may see the same thing differently. Direct experiences with nature and building connections with living things are essential in today's world. Only through these can sustainable and environmentally conscious attitudes and mindsets take root.

Basic Information Sheet

Age group	Student number	Duration	Number of stages	Subjects connection and relevance
1st grade students	Whole class (max. 30 students)	min. 2 x 45 minutes	7 outdoor stages	natural sciences, visual arts, physical education, music, native language (vocabulary expansion, mathematics

STEAM Event Summary

This playful STEAM event, which consists of seven stages linked to nature pedagogy. In the program the class goes on an excursion to a nearby park or meadow, where they make observations in nature. During their observations, they focus on using one sense more actively at a time. The session also includes other playful activities to make the program more colourful, allowing students to make further meaningful observations and thus connect closer to nature. Share a personal story or memory related to that emotion.

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SPIRIT Skill Focus

This 7-stage STEAM event- while linked to the school curriculum see in the table - primarily aims to develop the following skills of 6-year-old (first grade) students:

- Creativity
- Curiosity, sense of wonder and openness
- Valuing people and nature
- Resilience
- Connectedness
- Flexibility
- Emotional awareness, regulation and communication
- Empathy

National Curriculum Link and Objectives

- Learning about the senses and organizing perceivable properties
- Creating artworks from natural materials
- Rhythm games
- Exploring movement-based games

Real-world STEAM Connection and Problem definition

Average urban children have little or no connection with nature in their everyday lives, living in a built environment far from the natural world. The children spend their daily lives in artificial environments -frequently in urban settings - surrounded by limited natural stimuli. This has a negative impact on their well-being, in the medium term. For them, it is especially important to connect with nature through direct personal experiences. Even for those who live closer to nature, it is valuable to reflect on and organize their spontaneous experiences for deeper understanding. Through discovering and learning about nature

Through being in nature and exploring and learning about nature, they experience that the conscious use of their senses is the basis for learning. Observation, measurement, and experimentation all build on this, which can both stimulate and satisfy their curiosity. At this age, children typically view the world from an egocentric perspective, but such activities help them realize that others may see the same thing differently. This shift in perspective helps develop flexibility, resilience, valuing the nature and people - the key competencies for the future.

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Direct experiences with nature and building connections with living things are essential in today's world. Only through these can sustainable and environmentally conscious attitudes and mindsets take root. During the event, they will experience the importance of nature and its impact on their well-being, the lack of which is a fundamental problem for the current generation.

Materials at a Glance

In a small backpack:

- 1 water bottle (filled with water or tea)
- Raincoat (even if the weather doesn't call for it - it can be used to sit on and will be part of the activities)
- Tissues
- (Any necessary documents or tickets)

Indoor/Outdoor and Classroom layout

These activities are designed for outdoor settings, with the layout determined by the specific location(s). Therefore, it is recommended that the teacher visit the site(s) in advance to conduct a walkthrough. This allows them to adapt the tasks - or their sequence - to the local characteristics of the environment.

Notes on Research-based approach and integration

During the activity, children are encouraged to independently observe nature - its sounds, colours, and scents. They carry out collecting tasks in the natural environment, where they can explore the diversity of living organisms. This collection is done in groups (or individually), and each group is likely to discover different things. A key part of the activity is sharing these discoveries with one another and learning from each other.

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Lesson Flow Overview (linked to details below)

Stage	Title	Brief Description	SPIRIT Skills	Duration	Link to Details
1st	**Going to the park**	The activities can already be done during the travel. During the journey, children could have tasks. If traveling on foot: Say when you see something that starts with the letter R. Word chain (with possible restrictions, e.g., only animals, only names) Which traffic signs do you know? Do you see any that you don't understand? If using public transport: Count how many stops the vehicle has. Is there a stop named after a famous person? Does anyone know who they are? (It's helpful if the teacher prepares in advance.) "How many fingers am I holding, and how many not?" game If possible, the program can be combined with a hike, during which stops can be made and tasks assigned to the students. For example: During a rest break, observe 1 minute of silence. During this time, listen carefully and list the sounds you hear. Were any of the sounds coming from the built environment? During the break, observe how many different shades of a single colour you can see, for example, green. First, everyone quietly collects observations, then together, by pointing and naming, identify the different shades. During the hike, count the trail markers (touch them if possible). With older students, you can also ask them to estimate beforehand how many markers they will see on a given section of the trail. During the hike, count how many birds you hear rustling in the leaves or singing in the trees. (Extra task: try to identify the species.)	• Flexibility	This depends on the possibilities of the given community (10 to 30 minutes).	**STAGE 1 – Going to the park**

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2nd	**Observing the weather**	Upon arriving at the location, the children sit down in a pile (on their raincoats). Close your eyes! What do you feel? What is the weather like now? (Temperature, sunshine, wind, freshness of the air) How did you know what the weather was like with your eyes closed? How (with what) did you sense it? It is currently ___ °C. Who feels cold? Who doesn't feel cold? How is it possible that we felt differently even though we are in the same place and the temperature is the same? What does this depend on? Can people perceive different things? Can people feel differently? How do we actually know what the temperature is? Does it depend on who observes it? We can measure and observe certain properties of the things around us.	• Flexibility, • Valuing people and nature	10 minutes	**STAGE 2 – Observing the Weather**
3rd	**Run, touch and find!**	In this stage, we make the children move. The task is to find something in nature that has a feature that the teacher "suddenly" asks for. The children do not know in advance what the teacher will ask for. Children should find different materials in nature by touching. Stand up! Run and touch something that is..." • made of wood! • made of metal! • rough to the touch! • soft to the touch! • wet! • dry! • cool! • warm!	• Flexibility • Valuing people and nature	5 minutes	**STAGE 3 – Run, touch and find!**

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4th	**Rhythm game**	The children look for natural objects they can use to "make music" with. Examples include snapping dry sticks, rustling dry leaves, blowing on grass, clinking stones, hitting sticks together, or tapping sticks on the ground. The children search on their own, but the teacher can also offer suggestions. The children are divided into three groups. The teacher demonstrates the rhythm each group should follow: • Group 1: TA-TA-TA-TA • Group 2: TI-TI-TA-TI-TI-TA • Group 3: TI-TI-TI-TI-TI-TI-TI-TI First, each group practices separately. Then the teacher gradually adds groups one by one until all three groups play together. Once they manage this, the groups switch rhythms. If background noises are heard (e.g., a singing bird or construction sounds), incorporate those rhythms into the activity as well.	• Curiosity, sense of wonder, and openness • Creativity • Valuing people and nature	10 minutes	**STAGE 4 – Rhythm game**
5th	**Art from Natural Materials**	The children create a picture using natural materials found in the area (nothing should be picked up or torn). It is best to work in teams (you can divide the previous task's groups further). The children have 20 minutes to work, after which everyone walks around to look at each other's creations. The composition can be made freely, but a common theme can also be given to guide the artwork, such as nest, human figure, or ant playground.	• Creativity • Valuing people and nature • Curiosity, sense of wonder and openness	20 + 10 minutes	**STAGE 5 – Art from Natural Materials**

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6th	**Living Camera**	The children pair up. One will be the “camera”, and the other will be the photographer. The “camera” must keep their eyes closed. The photographer can position the camera by gently guiding their partner to the spot where they want to take a picture. The photo is taken as follows: the photographer lightly taps the camera’s right shoulder, and the camera can open their eyes until the photographer taps again, signalling to close their eyes once more. Draw the children’s attention to the following points: • The “shutter speed - exposition time” (the time between the two shoulder taps) can be short or long. It shouldn’t be too short, or the photo won’t well and rich in details enough. • Zooming is possible - if the camera is guided close to something, it takes a close-up picture; if positioned farther away, more will be included in the picture. • The camera can be carefully kneeled down, or their head moved gently. • The photographer should plan in advance, what should be in the picture. • 3 to 4 pictures should be taken by a photographer and make sure they are varied! • After the photographer finishes, they switch roles. If possible, the children can draw their favourite pictures on-site (bring drawing boards, paper, and pencil cases), or back in the classroom, they can “make” the photos. (It’s useful to first recall the pictures with eyes closed in a “darkroom” setting.) Please decorate the classroom with the pictures.	• Creativity • Valuing people and nature • Curiosity, sense of wonder, and openness • Empathy	20-30 minutes	**STAGE 6 – Living Camera**

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7th	**Take Cover! (Closing Activity)**	In this closing activity, one child is chosen (to be a "HUNYÓ" - a seeker). She/he stands in the middle of the play area with closed eyes, extend their arms sideways at shoulder height, shout "TAKE COVER!", and counts down from 19. During this time, the other players must quickly run up, touch the HUNYÓ's hand (while saying their own name), and then hide somewhere in the play area. When the HUNYÓ finishes counting, opens her/his eyes and try to spot the players without leaving their spot. They can move slightly, but one foot must remain in place at all times. If the HUNYÓ sees someone, calls out the player's name, and that person must come out of hiding. If the HUNYÓ no longer sees anyone, they close their eyes again, extend their arms, shout "TAKE COVER!" once more, and counts down again - but this time starting only from 17. With each new round, the countdown begins from a number 2 less than the previous round, giving players less and less time to hide. This increases the challenge and encourages players to hide closer to the seeker. A key rule is that players cannot hide in the same spot twice in a row. Game variation: To make the game more dynamic, the HUNYÓ may take up to three steps while searching the players. If they still don't see anyone after the third step, they shout "TAKE COVER!" again from their new position. This keeps the hiding spots changing and adds excitement to the game.	• Flexibility • Problem-solving	20-30 minutes	**STAGE 7 – Take Cover! (Closing Activity)**

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Tips and Tricks for dealing with challenges (for the whole STEAM program)

- The time frame can vary significantly between groups. This is partly because first graders have different levels of endurance, and partly because some groups may become more deeply engaged in certain activities. In the first case, it's perfectly fine to split the sessions into multiple parts and go outside more frequently or plan the program from the start with longer breaks between activities (free play, meals, changing locations, etc.).
- If the children want to immerse themselves more deeply in a particular activity, we should allow them enough time and definitely avoid rushing them.
- Ideally, these sessions can be part of a whole-morning or even full-day program, such as a field trip. Reflection and summarizing can take place on site, but feedback can also be postponed to the following day in the classroom setting, where there is an opportunity for discussion and drawing the experiences or "photos."

Difficulty level tailoring notes

If there is an opportunity to spend more time in nature, the activity can be expanded with additional tasks.

1) Checklist

The children receive a sheet with pictures (pictograms) of various items. They mark on the sheet what they have seen and what they haven't.

Recommended checklist: bird; litter; flower; insect; tire track; animal track; barrier/gate; spring; fallen tree; cave; fire pit; airplane;

2) Taste and Smell

Experiencing this is more difficult, but here are a few ideas that should be tried with proper expertise:

- Drinkable spring water
- Tasting well-identified (medicinal) plants (e.g., lemon balm, wild garlic – not lily of the valley! –, nettle [after being folded])
- The scent of forest soil
- The smell of leaves (by rubbing them)
- Identifying scents carried by the wind (e.g., smoke, a nearby animal farm, exhaust fumes from vehicles on a nearby road, etc.)

STEAM Program Debriefing and Reflection Questions

- Did you recognize an emotion that you hadn't thought about much before?
- Which emotions do you think are the hardest to talk about?

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- How do you usually express emotions like anger or sadness? Do you think that's helpful?
- How can we better recognize emotions in others and support them when they feel that way?
- How did you feel hearing your classmates talk about these emotions?
- Which emotions are easiest or hardest for you to talk about?
- What can we do to help someone who is feeling this emotion?

Based on the experiences gained, knowledge related to the senses can later be made conscious and organized in the classroom. The main focus of the day was engaging the senses, so the follow-up questions should also relate to these.

For example:

- Which of your senses did you have to use during the trip? Which ones were used in which activity and how?
- How do we use each sense? We see, hear, touch, smell (taste).
- What kinds of perception do we have? Hearing, sight, touch, smell (taste).
- Which of your senses did you use the most?
- Which one did you use the least?
- Was there a sense you had to use more intentionally today, or one you paid more attention to while using it?

You can also ask questions related to the nature walk itself:

- What living things did you encounter? (Encourage children to think not only of animals but also of plants and fungi!)
- What kinds of habitats did we visit?

In terms of competence development, you might also ask:

- Was there a moment today when you had to try something again? What helped you not give up? (To support perseverance and intrinsic motivation.)
- What was the biggest surprise for you today? How did you react? (To reflect on adaptation to unexpected situations.)
- Was there a time when you had to cooperate with others to solve something? How did you manage it? (To develop social skills and collaborative problem-solving.)
- Was there something you didn't understand at first but figured out later? What helped you understand it? (To strengthen the awareness of learning and personal growth.)

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3.1.2. Stage details and Activities Flow

STAGE 1 – Going to the park

How does this develop particular SPIRIT skills

During the journey, a specific task must be carried out in a changing environment (because the bus is moving or we are walking), so the children need to be flexible and continuously interpret and solve the task within the ever-changing surroundings.

What do we want to achieve regarding SPIRIT skill development (student understanding and/or behaviour)?

Children should be able to focus on the same task even in a changing environment and be able to return to it after briefly drifting away.

- Academic/Curriculum Objective connection:
- Teaching traffic knowledge
- Developing counting and estimation skills
- Improving observation skills
- Expanding vocabulary and vocabulary usage
- Spatial orientation

Materials and tools needed for implementation

No special materials and tools for this stage

Preparation notes

The teacher must be familiar with the route, the timing, and the possibilities.

Guided Questions

- How can you quickly switch between tasks when the environment changes?
- How does it feel when you see or hear something unexpected? How can you adapt to it?
- Can you pay attention to your surroundings and the game at the same time? How do you do that?
- If your mind wanders away from the task for a moment, how do you get back to it?
- What happens if you don't recognize a traffic sign? How can you find out what it means?

Stage Debriefing Questions (Optional)

- How did you feel during the journey?
- How did you spend your time?
- Which part of the trip did you like the most?

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Tips and Tricks for dealing with stage challenges

- Games and activities should be offered to the children, but participation is not mandatory. However, these activities can lay the foundation for later tasks, engage the children's thinking, entertain them during the journey, and help prevent misbehaviour. Therefore, the teacher should observe which children need to take part in the suggested activities.
- Some activities are done together (for example, one minute of silence during a break), and in these cases, everyone participates at least by not disturbing others' work.

STAGE 2 – Observing the Weather

How does this develop particular SPIRIT skills

Resilience fundamentally requires understanding how our own perceptions work and how they relate to reality. This way, we will be able to determine how to interpret the effects that impact us.

What do we want to achieve regarding SPIRIT skill development (student understanding and/or behaviour)?

Students experience the subjective and objective interpretation of things. They should realize that what they perceive subjectively can also be viewed objectively, and this objective perspective reinterprets our subjective perception without questioning the reality of that subjective experience.

Academic/Curriculum Objective connection

- Observation and conscious use of the senses
- Measuring temperature
- Observing elements of the weather
- Developing debate skills

Materials and tools needed for implementation

None

Preparation notes

Not necessary

Guided Questions

- How do you react when the weather or environment suddenly changes, and you need to refocus?
- What can you do if others perceive the same situation differently, and your opinions don't match because of that?
- How can you calm yourself down or concentrate when your perceptions are confusing or conflicting?
- In what ways can you use others' observations to reassess your own?

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Stage Debriefing Questions (Optional)

- Was there a moment when you experienced something different from what you expected? How did you handle it?
- Were you able to change your opinion after one of your observations? What helped you do that?
- What was difficult about this task, and how were you able to overcome it?
- Was there a situation when you thought differently from the others? How did that make you feel?
- How did it feel when you had to reinterpret something you had originally thought differently about?

Tips and Tricks for dealing with stage challenges

- Children at this age tend to interpret the world very subjectively. They may have difficulty accepting their peers' opinions. In such cases, gently guide them, as they still need time to be able to accept different viewpoints. However, they can only develop this ability if they encounter perspectives different from their own, so it's okay to provoke these situations.
- Pay attention to when to close a possibly arising debate, even if they haven't reached an agreement. For example: "I understand what you're saying, but we can't agree on this right now. We can talk about it later, and everyone can think about it until then... Now let's move on, because there are still interesting things to discover.

STAGE 3 – Run, touch and find!

How does this develop particular SPIRIT skills

While touching different materials, children continuously perceive various textures, which stimulate their sensory nerves. These nerves must constantly adapt, providing a physiological foundation for both cognitive and emotional flexibility. In addition, children must quickly and spontaneously respond to unexpected instructions by finding and touching an item that fits the given description as fast as possible

What do we want to achieve regarding SPIRIT skill development (student understanding and/or behaviour)?

During the activity, children develop sensory awareness as they recognize different materials and temperature qualities while moving. The quickly changing instructions promote cognitive and emotional flexibility, as they need to adapt to new situations and stay focused on the task. This supports their self-confidence and flexible attitude toward situations, while also strengthening their social skills.

Academic/Curriculum Objective connection

Recognition of different materials and experiencing their properties.

Materials and tools needed for implementation

No need materials. Things in their environment

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Preparation notes

The teacher should be familiar with the location in order to give varied and engaging instructions.

Guided Questions

- How can you react quickly when you receive an unexpected instruction?
- How do you feel when you suddenly have to change what you are doing?
- How do you quickly find the material you need to look for based on the instruction?
- What helps you keep your focus when you have to touch different materials one after another?
- How can you stay calm when the instructions change quickly?

Stage Debriefing Questions (Optional)

- Was there a moment when it was difficult to switch quickly between tasks? How did you handle it?
- What did it feel like when you had to unexpectedly change your activity?
- Were you able to help others if they reacted more slowly to the instructions?
- What helped you stay calm when you had to touch different materials one after another?
- How could you handle unexpected changes even better next time?

Tips and Tricks for dealing with stage challenges

In this stage, the same issues may arise as were described in the previous stage. In this case the guidelines described there also apply.

STAGE 4 – Rhythm game

How does this develop particular SPIRIT skills

During the activity, the children need to be able to partially separate the rhythms of the other groups in order to focus on their own. This is the first step in developing resilience: learning to filter out and exclude the influences and stimuli that frustrate or hinder them. At the same time, more experienced children are not only able to distance themselves from the rhythms of others but can also perceive them simultaneously. This allows them to have a more complex musical experience. This represents a higher level of resilience, where although I can separate stimuli and feelings, I am still able to pay attention to them, interpret them, and incorporate them into my own experiences.

What do we want to achieve regarding SPIRIT skill development (student understanding and/or behaviour)?

The rhythm activity aims to develop children's ability to focus their attention, particularly in filtering out distracting stimuli, which enhances their flexibility and adaptability.

During the activity, students learn how to separate their own rhythm from environmental noises, strengthening their self-control and emotional stability - key components of resilience. Additionally, the activity helps them to perceive and integrate multiple stimuli simultaneously, fostering more complex and conscious processing skills that contribute to the development of their problem-solving and adaptive abilities.

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Academic/Curriculum Objective connection

- Following the rhythm
- Maintaining the rhythm
- Experiencing the properties of materials (hardness, flexibility, etc.)
- Identifying given materials by their sound

Materials and tools needed for implementation

Natural materials found in their environment. Artificial materials can also be included if necessary.

Preparation notes

The activity is conducted in a location where a variety of materials can be found (e.g., riverbank – stones, trees, seeds, empty snail shells, etc.)

Guided Questions

- How can you pay attention to your own rhythm while others are playing around you?
- What happens if another group's rhythm is different from yours? How can you still concentrate?
- How do you react when you have to quickly switch to a different rhythm?
- What can you do if your attention drifts because of the other groups' rhythms?

Stage Debriefing Questions (Optional)

- Was there a moment when it was hard to focus on your own rhythm? How did you handle it?
- How did it feel when you had to adapt to another group's rhythm?
- What was the most difficult part of the activity, and how did you overcome it?
- What did you learn about staying calm and focused when there is a lot of noise around you?

Tips and Tricks for dealing with stage challenges

- When dealing with challenges during rhythm activity, it is important to encourage children to focus on their own rhythm while staying open to the sounds of others, which helps them adapt to changes more easily.
- If a child has difficulty concentrating amid the surrounding noise, help them take deep breaths and slowly refocus on their own rhythm. Introducing new rhythms gradually allows children to better follow the transitions. Start with simple, easy-to-remember rhythms and gradually increase the difficulty to develop their attention and adaptability.
- If someone gets distracted, encourage them to observe the rhythms of others and then try to rejoin their own group. Creating a calm and friendly atmosphere where making mistakes is not a problem helps children feel more confident to try new thing.

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STAGE 5 – Art from natural materials

How does this develop particular SPIRIT skills

In this activity, children are encouraged to view and use natural materials in new and unfamiliar ways. They need to rely on their imagination to discover the potential in different objects and to find creative uses for them.

The task also requires teamwork, which involves listening to and understanding each other's ideas, and connecting to them with flexibility. It's important for the children to accept if the final result doesn't fully reflect their own initial vision. This kind of acceptance may happen smoothly, but it can also involve small conflicts – working through these challenges contributes to the development of resilience.

What do we want to achieve regarding SPIRIT skill development (student understanding and/or behaviour)?

The goal of the activity is for children to learn how to use natural materials creatively and in ways that differ from their usual experiences, using their imagination to assign new meaning to familiar objects. This fosters the development of imagination, openness to new types of thinking, and the ability to reinterpret existing elements flexibly. Through working together, they practice how to adapt to others' ideas, collaborate with peers who may have different perspectives, and accept when the process or outcome does not fully match their own expectations. All of this helps them build patience, flexibility, and a problem-solving attitude during cooperative creative work.

Academic/Curriculum Objective connection

- Visual creation using natural materials
- Observing the shapes and forms of natural materials
- Shaping and manipulating natural materials

Materials and tools needed for implementation

Natural materials found in their environment.

Preparation notes

The activity should be carried out in a location where a variety of materials can be found, for example, at the borders of different habitats - where a forest, a field, and a riverside meet.

Guided Questions

- How were you able to accept it when the picture turned out based on someone else's idea, not the way you wanted?
- What was the reason that made you look for a new solution during the group work?
- How did you manage to solve it together when someone wanted something different to appear in the picture?
- How did it feel when your idea changed during the work?

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Stage Debriefing Questions (Optional)

The children present their works to each other, and related questions can be asked either by the children themselves or formulated by the teacher.

- Was there a moment when it was difficult to accept others' ideas? How did you solve it?
- What did you learn about working together with people who think differently?
- How did it feel when you had to be flexible during the group work?
- How can you apply what you learned now even better next time in group work?

Tips and Tricks for dealing with stage challenges

The duration of the activity can vary, so the teacher should adjust it according to the situation.

- If there is a big difference between groups, those who finish earlier can continue working on their creation or make additional pictures. It is important for the teacher to move continuously between groups, monitor the work, and provide help if needed.
- Challenges may include preserving the integrity of materials, encouraging creativity, managing disagreements during group work, properly managing time, and handling external environmental distractions.

STAGE 6 – Living Camera

How does this develop particular SPIRIT skills

During the activity, the children will suddenly face a visual scene completely vulnerable with their eyes closed. They do not have control over the situation and must quickly take in the view. Beyond the feeling of uncertainty, the learner always experiences a positive moment, ensured by their partner. An important component of resilience is the ability to trust others who help and look out for you, knowing you can turn to them and that you are not alone.

From another perspective (the photographer's point of view), they must interpret things from their partner's viewpoint. For example, I can step over a branch because I see it, but my partner cannot because they do not see it; I am still far from the tree, but my partner is already close; I see something, so how can I show it to them, so they see the same? These aspects develop flexibility.

What do we want to achieve regarding SPIRIT skill development (student understanding and/or behaviour)?

The goal of the activity is to help children develop their resilience and flexibility by learning to trust their peers, accept uncertainty, and quickly adapt to unexpected situations. This supports their ability to function effectively both independently and in groups, respond flexibly to changing circumstances, and become emotionally more stable in school life and everyday situations.

Academic/Curriculum Objective connection

- Learning principles of composition
- Shifting perspectives
- Trust-building exercises

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Materials and tools needed for implementation

- If time allows, use a drawing board, paper, and coloured pencils (or crayons).
- If creating on-site is not possible, the images can also be "developed" later in the classroom.

Preparation notes

It is recommended to conduct the activity in an open area where there is the opportunity to see both near and far, such as a clearing or a hilltop.

Guided Questions

- What do you need to pay attention to when guiding your partner to keep them safe?
- How can you make sure they see what you think is important?
- What can help you feel safe even when your eyes are closed?
- How do you decide where to take the next picture from?

Stage Debriefing Questions (Optional)

- How did it feel when you weren't the one in control, but just followed someone else?
- Was there a moment when things didn't go the way you wanted? What did you do then?
- What was the best part of having someone else show you the world?
- What did you learn from having to pay attention to your partner - and them paying attention to you?
- Did the thought of playing a trick cross your mind? Why didn't you do it? (If there is concern about safety during the activity, these types of questions and rules can also be discussed beforehand).

Tips and Tricks for dealing with stage challenges

- It is difficult to determine a fixed duration for this activity, as sometimes children finish quickly, while other times they become deeply engaged in the task. The teacher should decide on the ideal duration based on the current situation.
- After explaining the task (5 minutes), it is still recommended to dedicate at least 15 minutes to the activity, even if everyone finishes quickly. In such cases, the group can be brought together to give advice on not rushing and offer tips on how to become more immersed in the task. A minimum of 15 minutes is necessary for meaningful engagement: finding a location and subject, carefully guiding the partner, and switching roles.
- If there are big differences between the pace of pairs, those who finish early can take more photos. The teacher should closely observe the students' work and give advice when needed to ensure truly meaningful and well-thought-out pictures are taken.

STAGE 7 – Take cover! (closing activity)

How does this develop particular SPIRIT skills

The game supports the development of flexibility as students must quickly make decisions about new hiding places and adapt to constantly changing situations. Resilience is strengthened as children learn to cope with setbacks (e.g., being found early) and try again. Within a safe and joyful environment, the game helps build perseverance, self-regulation, and attention to others.

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What do we want to achieve regarding SPIRIT skill development (student understanding and/or behaviour)?

The goal of the game is for students to develop the ability to quickly adapt to changing situations and respond flexibly to new challenges. Strengthening resilience is important, meaning learning to manage setbacks and develop a persistent, restarting attitude. Additionally, the game helps improve attention, self-regulation, and the ability to be considerate of peers.

Academic/Curriculum Objective connection

- Outdoor movement game
- Counting backward one by one
- Number sequences decreasing by twos.

Materials and tools needed for implementation

None

Preparation notes

Choose an area with plenty of hiding spots, such as bushes, shrubs, trees, small hills, etc.

Guided Questions

- How did you handle it when you couldn't find your hiding spot right away?
- What did you do when you had to hide quickly and had little time?
- How did you feel when someone else was chosen as the seeker?
- What did you do when the game didn't go the way you expected?

Stage Debriefing Questions (Optional)

- What helped you adapt quickly when the rules or situations changed?
- How did you feel when you had to start the game over again and again?
- What did you learn about playing with others who think or act differently?
- How can you use what you learned in this game in other situations, like at school or at home?

Tips and Tricks for dealing with stage challenges

- The main purpose of the game is to release the tension built up during the many activities, so it is definitely worth ending the session with this or another active game. The children have done serious mental and emotional work. Of course, skills are also developed during the game, but the focus here is not on that; rather, it is about closing the entire program with a positive, light-hearted experience.
- Common issues in children's play:
  - The seeker does not shout loud enough.
  - The seeker should start counting from an odd number each round, which is 2 less than the starting number in the previous round. Children often get this wrong. It's not very important, but it's good to pay attention to it because it helps develop skills.
  - They clap too hard on the seeker's palm. Remind them if it feels uncomfortable for the seeker

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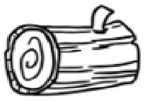
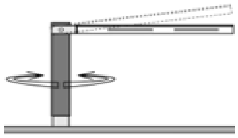
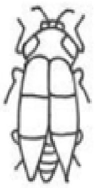
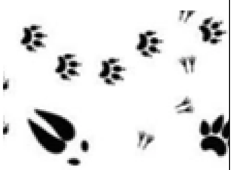
Annexes

Pilot implementation (detailed example with lesson/activity plan), attachments

Did you see the following during the field trip? Put a ✓ if yes, and an X if no!					
bird		fallen tree		barrier	
					
flower		campfire site		tire track	
					
insect		stream / spring		airplane	
					
animal track		cave		trash	
					

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3.2 Create a lunar landscape

This 100-minute STEAM program helps 1st-grade students understand gravity and how Moon craters are formed. Kids start by jumping and feeling how gravity pulls them down, then they listen to a story about the Moon. Using a sandbox and different stones, they experiment to see how the weight and size of an object change the crater it makes. They learn cool facts, like how heavy and light objects actually fall at the same speed, which often surprises them. Finally, the students use what they learned to design their own lunar landscape and explain their "scientific" results.

Basic Information Sheet

Age group/ Grade	Student number	Duration	Number of stages	Subjects connection and relevance
1st grade students	Whole class	100 minutes	4 stages	natural sciences, visual arts, native language (vocabulary expansion, awareness), mathematics

STEAM Event Summary

SPIRIT Skill Focus

- Problem-solving
- Curiosity, sense of wonder and openness

National curriculum Link and Objectives

Science objectives:

- Students investigate different types of forces: gravity.
- Students describe the Moon: craters.
- Students learn the basic principles of doing scientific research: careful observation and fair comparison.

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Arts objectives:

- Reflecting on images.
- Describe the impressions evoked by the observation. E.g.: What do I see in this image? How might this image have been created?
- Recognising and organising simple shapes.
- Creating an image (2D or 3D) by deliberately placing objects in space. E.g.: designing a robot, utilising the space on the page

Math objectives:

- Measuring: bigger, heavier, deeper, etc.

Language objectives:

- Listening to narrative and artistic-literary texts:
- Based on age-appropriate spoken stories, students will be able to:
- Understand the essence of the story;
- Follow and understand the storyline;
- Reconstruct the storyline fairly literally;
- Express personal feelings and opinions about the story;
- Distinguish between reality and fantasy;
- Assess the authenticity of story details.
- Reflecting on word meanings in concrete speaking situations
- Answer teacher questions about a topic covered within different subject areas:
- Respond to questions related to meanings

Real-world STEAM Connection and Problem definition

The Moon is a celestial body that children see every day, always in a different phase, and it strongly captures their curiosity. Many images of the Moon show craters. In this STEAM activity, children will investigate, on the one hand, how craters are formed and, on the other hand, what is the impact of gravity is on the falling of different objects in size and weight.

In addition, misconceptions about gravity are addressed. For example, children are often surprised that a feather and a stone fall at the same speed. By experimenting and exploring (e.g., experiencing gravity with objects, specifically stones), they acquire the necessary knowledge.

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As an application, children are challenged to recreate a lunar landscape with craters of different sizes by dropping stones. In this way, they actively apply the knowledge they have learned.

Materials at a Glance

- Story: pictures from the picture book: Journey to the Moon (see attachment)
- Stones preferably with an irregular shape, both large and small, both light and heavy.
  Ideally:
  - Large and heavy
  - Large and light (e.g. lava stone, but could also be replaced by a sponge)
  - Small and heavy
  - Small and light
- White sand
- A container (that can hold at least 5 cm of sand)
- (alternatives: sandbox in the playground, flour instead of sand; flour creates more dust/sticks more, sand is “cleaner”)
- A small squeegee (to smooth the sand evenly each time)
- A folding ruler (so the children can easily see from what height their object falls)
- A globe
- A moon (about 1/4 the size of the globe, e.g. a tennis ball painted black).

Indoor/Outdoor and Classroom layout

We recommend that the program be implemented in an indoor setting. In this case, the recommended spatial layout for the program is as follows:

- Space for jumping: (e.g., behind their chairs)
- Space to listen to the story
- Space to conduct the stone experiment.
- Space to discuss the conclusion.

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Notes on Research-based approach and integration

In the activity, they start with an open-ended investigation, which, under guidance, evolves into a structured "child-friendly scientific inquiry." From this, they learn the underlying principles. They are required to apply mathematical skills and prior knowledge, such as measuring and estimating, in order to record and compare the results of their investigation.

Lesson Flow Overview (linked to details below)

Stage	Title	Brief Description	SPIRIT Skills	Duration	Link to Details
1st	**Exploring gravity with own body**	Students will experience certain principles of gravity. • The students explore and reflect on this (through the teacher's guiding questions). • How high can you jump? Try jumping "high." Can you jump higher? • Who can stay in the air? • Can you fall down more slowly after jumping? • Let your head hang down. What do you feel? • (optional: give someone a backpack with a weight inside → how does that feel?) Essence / conclusion: We are always pulled towards the ground. We cannot stay in the air. There is an invisible force that pulls everything to the ground. This is gravity	• Problem-solving • Curiosity, sense of wonder and openness	10 minutes	**STAGE 1 – Exploring gravity with own body**
2nd	**Reading Journey to the Moon**	The students study a lunar landscape from a picture book. The teacher shows the illustrations while telling the story.	• Problem-solving • Curiosity, sense of wonder and openness • Critical thinking	20 minutes	**STAGE 2 – Reading Journey to the Moon**

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3rd	**Investigating Gravity - Inquiry-based learning**	**Afterwards, they investigate how to play with the size and depth of craters from gravity.** Students receive a box with various stones and a sandbox. A. They may freely explore crater formation. (*e.g. guiding questions: create craters of different sizes/depths. How can you make the largest/deepest craters?*) • Briefly discuss what they have observed. • Encourage them to describe their observations as precisely as possible! • Optionally compare the craters made by the children with photographs of real craters on the Moon. B. Then move on to a focused investigation. Central research question: *What determines the size (depth and width/length) of a lunar crater?* Ensuring a fair test (explicitly explain to students) • Always drop from the same height. • Hold the stone still and simply let it fall (starting speed always zero). • Always drop straight down. • Change only one variable at a time (e.g. not comparing large and heavy with small and light). • Smooth the sand after each test.	• Problem-solving • Curiosity, sense of wonder and openness • Critical thinking	30 minutes	**STAGE 3 – Investigating Gravity: Inquiry-based learning**

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		Guided investigation steps **B1. The role of mass (weight) of the stone** • Hypothesis: The heavier the meteorite, the deeper the crater will be. • Use objects that are the same size but with different mass. • First let students sort stones into two groups: light and heavy. • Discuss together how they can judge if something is heavier or lighter. • Then let them test: take two stones of the same size but different mass and compare crater depth. **B2. Do heavy and light stones (same size) fall at different speeds?** • Likely, students think a heavier stone falls faster. • Let them test: drop a heavy and a light stone from the same height at the same time. • They discover: both hit the ground simultaneously → surprise → discussion: Why is that? • Key concept: mass does not affect falling speed. • Follow-up: if they fall at the same speed, why is one crater bigger/deeper? → Because of the impact force. **B3. The role of size of the stone** • Use objects that are equally heavy/light but differ in size. • Compare the craters formed			

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4th	**Final task: Design-based learning, designing a lunar landscape**	At the end they make in sand with falling objects lunar landscapes with different crater sizes. **Final task: Create a lunar landscape with 4 craters** • 1 large/long and deep crater • 1 small/short and shallow crater • 1 large (long) and deep crater • 1 large (long) and shallow crater Take a photo in black and white: • once with the stones next to the craters • once without the stones. Afterwards, students explain how they formed this landscape. They must use the scientific vocabulary they have learned.	• Problem-solving • Creativity • Critical thinking • Resilience • Flexibility • Curiosity, openness and sense of wonder	20 minutes	**STAGE 4 - Final task: Design-based learning, designing a lunar landscape**

Tips and Tricks for dealing with challenges (for the whole STEAM program)

- Monitor the lesson time. Depending on this, you can shorten or extend Stage 3 with the different sub-topics.

Difficulty level tailoring notes

The selection of stones is very important. This determines the difficulty of the categorization.

STEAM Program Debriefing and Reflection Questions

- What surprised you the most about the Moon?
- What surprised you the most about gravity?
- What was the biggest challenge in the gravity investigation?
- What would you do differently next time in the investigation?
- What difficulties did you encounter when designing a lunar landscape?
- What is the most useful tip you would give to other groups based on your experience during the investigation.

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3.2.2. Stage details and Activities Flow

STAGE 1 – Exploring gravity with own body

How does this develop particular SPIRIT skills

The teacher's challenge - to stay "longer" in the air - They wonder when they try to stay in the air that they always fall back to the ground. They experience this with their own bodies. In particular, it helps them realize that it is not possible to stay 'longer' in the air.

What do we want to achieve regarding SPIRIT skill development (student understanding and/or behaviour)?

Children learn to think critically about gravity by experimenting with their own bodies, for example by jumping, trying to fly or dropping objects. They experience what works and what doesn't, ask themselves questions and look for explanations. You can see problem-solving thinking in:

- Trying out different ways to jump higher or stay in the air longer
- Comparing their own experiences with those of others ('Why can you jump further?')
- Searching for solutions ('What if I take a run-up before jumping? Why am I not flying now?')
- Adjusting their approach after feedback or failed attempts

Their behaviour shows curiosity, experimentation and a search for explanations. Their results demonstrate a growing understanding of what gravity does and why some solutions work and others do not.

Academic/Curriculum Objective connection

Science: gravity

Materials and tools needed for implementation

No special materials are needed for implementation

Preparation notes

Does not require any special preparation on the behalf of the teacher

Guided Questions

- Who can jump the highest?
- Who can stay in the air the longest?
- Why can't we stay in the air for long?
- Is there a force that pushes us to the ground?
- Is it everywhere? Where is it and where isn't it?

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Stage Debriefing Questions (Optional)

- When you tried to jump as high as you could, what happened every single time you tried to stay up in the air?
- What do you think was pulling you back down to the ground instead of letting you stay up in the sky like a bird?
- Do you think this invisible 'pull' happens only when we jump, or does it happen to other things too?
- Can you think of something else that always falls back to the ground?

These questions are designed to be open-ended, allowing the students to voice their observations and start forming their own understanding of gravity through their unique perspectives.

Tips and Tricks for dealing with stage challenges

Important misconception to avoid: Do not say: we are pulled “down”, because then you get the problem of “people in Australia” standing “upside down” without falling off the Earth. Instead, say: we are pulled toward the ground / toward the Earth.

STAGE 2 – Reading Journey to the Moon

How does this develop particular SPIRIT skills

To spark wonder about the Moon and, through various questions, lead the students to the topic of craters.

What do we want to achieve regarding SPIRIT skill development (student understanding and/or behaviour)?

You can amaze children and spark their curiosity during a picture book story about gravity and the lunar landscape by telling the story vividly, asking questions and leaving room for wonder. Use surprising illustrations, let children imagine what it feels like to jump on the moon, and compare this to their own experiences on Earth. You will see curiosity, sense of wonder in:

- Wide eyes, open mouths, or enthusiastic reactions (‘Wow, can you really jump that high on the moon?’)
- Asking lots of questions (‘Why do things float there?’)
- Imagining and sharing their own ideas (‘Could you fly if you took a big jump?’)
- Wanting to imitate or experiment after the story (jumping, dropping things, drawing)

Their behaviour shows that they are fascinated, actively thinking along and want to discover more. Their results include imaginative drawings, stories or experiments that build on the picture book.

Academic/Curriculum Objective connection

- Listening to narrative and artistic-literary texts:
- Based on age-appropriate spoken stories, students will be able to:
  - ➢ Understand the essence of the story;
  - ➢ Follow and understand the storyline;
  - ➢ Reconstruct the storyline fairly literally;

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- Express personal feelings and opinions about the story;
- Distinguish between reality and fantasy;
- Assess the authenticity of story details.

- Reflecting on word meanings in concrete speaking situations
- Answer teacher questions about a topic covered within different subject areas:
- Respond to questions related to meanings;

Materials and tools needed for implementation

Pictures of the moon landscape.

Preparation notes

Story of the book.

Guided Questions

- What does the moon look like in the picture?
- Have you ever seen a crescent moon like this?
- Can the moon look different?
- Is the moon really just a crescent?
- What shape is the landscape?
- Is the landscape flat? Or are there places where you go uphill?

Stage Debriefing Questions (Optional)

- If you could jump on the moon just like the character in our story, do you think you would jump higher or lower than you did in our classroom, and why?
- The story showed us that the moon has many big, round holes called craters. What do you imagine happened to create those shapes on the surface?
- If you were packing a suitcase to go on a trip to the moon like the characters in our book, what is the one special thing you would want to take with you to help you explore, and why?

Tips and Tricks for dealing with stage challenges

Not Applicable.

STAGE 3 – Investigating Gravity: Inquiry-based learning

How does this develop particular SPIRIT skills

This phase significantly promotes critical thinking, curiosity, wonder, and openness, as well as scientific questioning, as it guides children from unstructured play toward systematic observation. Through interaction with the physical environment—specifically, by using the sandbox and various types of rocks—students actively practice the skills of observation, formulating and testing hypotheses, and isolating and identifying variables. At this stage, children discover gravity through hands-on experience, which helps them think like “scientists.” By playing with different rocks in the sandbox, they learn to observe small details and ask questions (“What happens if...?”), which lays the foundation for their critical thinking. When they realize that they need to change their strategy for the experiment to succeed (for example, how to drop the rock), this directly develops their problem-solving skills.

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This activity guides them from passive reception to active discovery, where they discover cause-and-effect relationships (weight of the stone = depth of the crater) on their own, rather than having them handed to them

What do we want to achieve regarding SPIRIT skill development (student understanding and/or behaviour)?

As the result of this stage's activities, we want to achieve the followings:

- Observation-based Critical thinking: We want the children not only to "throw" the rocks but also to observe what happens. The goal is for them to try to describe exactly what they see: "Look, this rock made a hole as big as a palm!"—this is the first step toward scientific observation.
- Experiment-Based Problem-solving and discovering Cause-and-Effect Relationships: The goal is for them to learn, in accordance with their age-appropriate characteristics and knowledge, the connections between the experiment and the underlying causes. A key objective is for children to discover simple cause-and-effect relationships on their own. For example, that the heavier stone creates a deeper crater because it hits the sand with greater force. This doesn't need to be explained to them; instead, they should be allowed to see it with their own eyes during the experiment.
- Curiosity and Openness – experiencing Wonder: We want the children to be excited by the discovery. When they realize that heavy and light stones hit the ground at the same time, their surprise is the most important part: this helps them remain open to new ideas and not just believe what they had assumed beforehand.

Academic/Curriculum Objective connection

- Exploring gravity and the force of impact.

Materials and tools needed for implementation

Sandbox, stones, measuring tools, windscreen wiper.

Preparation notes

To carry out this section effectively, teachers should prepare sandbox boxes and create a collection of rocks in advance, with stones of varying weights and sizes. It is helpful to have photographs of real lunar craters on hand to bridge the gap between the classroom experiment and reality. Before beginning, the teacher should briefly explain how to conduct a "successful experiment." This includes introducing the students to specific procedural rules: the rock must always be dropped from the same height; before dropping it, the student must ensure that the rock is completely motionless so that its initial speed is zero; the rock must be dropped straight down; and the sand must be smoothed out after each trial. Teachers should also be prepared to guide students through the sorting process, helping them categorize the stones into "light" and "heavy" groups to facilitate comparison.

The teachers have to:

- Categorize the stones beforehand into lighter and heavier, smaller and larger.
- Carry out the research question and procedure step by step with them (providing more whole-class guidance).
- Provide individual support for a group.

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Guided Questions

- Are there light and heavy stones or are they all the same?
- Which stone created the “largest” crater?
- Which created the deepest crater?
- Which stone falls the fastest?
- How can we test the fall of our stones so that the same thing can be examined for everyone?

Stage Debriefing Questions (Optional)

- What was difficult about working with the stones?
- When we let the stones fall, it was like a race! Did the heavy stone win the race, or did they land in the sand at the exact same time?
- Both stones landed at the same time, but look at the holes—why do you think the heavy one made a deeper 'splat' in the sand than the light one?
- If you look at our sandboxes and the pictures of the Moon, what do you see that looks the same?
- Can you spot any craters in our sand that look like the ones we saw in the pictures?

Tips and Tricks for dealing with stage challenges

- The temptation to “throw”: It’s a child’s natural instinct to throw the stones into the sand to see a big “splash,” rather than just dropping them. in this cae don’t present the rule as a “ban,” but rather as part of a story. Tell them that their hands are now a precise “landing craft” that must remain completely still when they release the stone so that the experiment is accurate.
- The embarrassing result: Children are often convinced that the heavier stone falls faster, and they are surprised (or even embarrassed) when they see that the heavy and light stones hit the ground at the same time. In this case don’t explain complicated laws of physics to them. Use this moment to spark their curiosity. Ask them, “Did you expect the heavier one to be faster? Why did this surprise us?” This will help them trust their own observations rather than their preconceived notions.
- Smoothing the Sand: Smoothing the surface of the sandbox after every single throw might seem like a bit of a tedious task for a 6-year-old. Inthis case we suggest to rename this step “preparing the landing site.” Tell them that every professional lunar explorer needs a clean, flat “landing site” so that the results of the next exciting experiment will be clearly visible.
- "Fluctuation" in the height of the throw: It can be difficult for children to release the rocks from exactly the same height every time, since their hands aren’t steady enough yet or they might not be paying attention. If one stone falls from a higher height than another, the experiment will no longer be “fair,” and the results will not be comparable. In such cases, mark a specific height using a tool that indicates where the stone should be dropped from. This gives the children a visual guide to follow, making it easier for them to work accurately.

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STAGE 4 – Final task: Design-based learning, designing a lunar landscape

How does this develop particular SPIRIT skills

Cause-and-effect-based critical thinking: The children draw on the "experiences" they gained in previous experiments. They no longer make random attempts but instead deliberately and consciously select the appropriate rock (weight, size) for a given crater because they understand the relationship: a heavier or larger rock leaves a different mark than a lighter one.

Problem-Solving and Design: The task is to accurately create a predefined "map of the Moon," which requires serious visual and creative design. The children must first imagine (visualize) the finished image, then put their plan into practice step by step. This helps them solve tasks while keeping the goal in mind, which is the foundation of problem-solving.

Creativity: Although the task is specific (they must create four specific types of craters), children must be creative in how they arrange them across the sandy "landscape" and how they shape the surface so that it truly resembles a lunar environment. In addition, they must take creative photos that—since they are black-and-white—can be compared to actual lunar photos. This creates a strong connection between the task, reality, and "theory."

Resilience and Flexibility: This phase puts their perseverance to the greatest test. If a crater isn't as deep or wide as planned, they don't give up but adjust their strategy (for example, by choosing a different rock or smoothing out the sand again). They learn that a "mistake" isn't a failure but a natural opportunity to improve the experiment, which increases their flexibility. In this way, children become open to experimentation and flexible adjustments.

Through the experience of curiosity and wonder, and through photography: Taking photographs is a magical part of the process that fosters a sense of wonder. When the children take the photos—especially the "with rock" and "without rock" versions—their own little sandbox suddenly transforms, through the camera's viewfinder, into a realistic, distant lunar landscape. This shift in perspective—seeing their own work through the "eyes of an astronaut"—deepens their enthusiasm for science and fills them with pride.

What do we want to achieve regarding SPIRIT skill development (student understanding and/or behaviour)?

Children learn problem-solving thinking about gravity when they drop different types of stones (large/small, heavy/light) into a sandpit to create a lunar landscape. Through experimentation, they discover how the stones create craters and what role gravity plays in this, how deep they sink, and what effects the weight and height of the drop have. You can see problem-solving thinking in:

- Trying out different stones and heights to see what effect this has on the sand
- Comparing results ('Which stone makes the biggest crater?')
- Adjusting their approach if something doesn't work ('Maybe I should hold the stone higher')
- Looking for solutions when a crater does not turn out well ('Can I press the sand differently?')
- Their behaviour shows curiosity, experimentation, comparison and improvement. Their results show different types of craters and a lunar landscape that shows they have thought about cause and effect.

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Academic/Curriculum Objective connection

- The application of gravity and its force on the impact when objects fall
- Creating an image (2D or 3D) by deliberately placing objects in space.
- Students learn the basic principles of doing scientific research: careful observation and fair comparison. In the translation it must be adapted! They are the national curriculum!

Materials and tools needed for implementation

Sandbox, stones, measuring tools, windscreen wiper, tablets, and/or cameras ((tripods).

Preparation notes

Visual aids: Supporting the planning phase is crucial for 6-year-old students. Create a simple illustrated chart (showing the 4 types of craters) that the children can see while they work. This will help students visualize the future landscape and consciously plan the sizes of the craters.

Science Vocabulary: An integral part of the activity is developing and using “scientific” vocabulary in their reports. Create flashcards with the words they’ve learned (e.g., crater, impact, depth, weight) to make it easier for them to use these terms in their reports.

Technology: Set up and test the tablet or camera in advance. Show the students how to take photos of the sand from above. Define fixed photography positions (tripod or a fixed camera position above the sandbox) so that the “with rock” and “without rock” photos can be clearly compared and evaluated.

Guided Questions

Since the task is complex (planning, execution, documentation, presentation) for 6-year-olds, the main point of our guidance in this case is not to provide the solution, but to offer direction that encourages them to discover things on their own.

Planning phase: These questions help children visualize and stick to their plan.

- Which stone on your tray looks the heaviest? What kind of mark do you think it will leave in the sand?"
- Take a look at your plan! Where do you want to make the deepest crater, and which stone will you try to use for it?
- Before you let go of the stone, think about it: how should you hold your hand so that your experiment is just as precise as when you practiced?

Challenges of execution phase (when they get stuck or the "crater" doesn’t work out). These questions support the resilience and flexibility when things don’t work out as planned.

- This crater turned out shallower than we’d hoped. What do you think would happen if you used a different stone?
- I know this turned out a little differently than you planned. Why do you think it took this shape?
- Look at your two attempts! What’s the difference between them? What might be causing this difference?" (Here, we draw attention to the cause-and-effect relationship.)
- How could you fix this crater so it looks more like your plan?

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Reflection and Wonder: These questions foster curiosity and a sense of pride.

- Look at the photo! Which crater turned out best, and why is that one in particular?"
- If an astronaut looked at your landscape, what would they think? Do you think they'd believe this is a real lunar landscape?"

Stage Debriefing Questions (Optional)

- Before you started creating the moon landscape, did you think about which crater you could make with which stone? Tell us how did you choose the stones for your design! Why did you think that you'd be able to make a 'big and deep' or a 'small and shallow' crater with that particular stone?
- We know that on the Moon, things don't always work as planned the first time. Was there a crater in your creation that didn't turn out exactly as you'd planned? What did you do in that case: how did you adjust your approach or the stones to ensure you were still satisfied with the result?
- We know that on the Moon, things don't always work as planned the first time. Was there a crater in your creation that didn't turn out exactly as you'd planned? What did you do in that case: how did you adjust your approach or the stones to ensure you were still satisfied with the result?

Tip for teachers: If the children get stuck while answering, don't give them the answer—instead, ask them a follow-up question: "Do you remember when we said the heavy rock made a loud thud? Do you think that helped make the crater deeper?" This way, you can guide them toward articulating cause-and-effect relationships.

Tips and Tricks for dealing with stage challenges

- Planning phase: It can be difficult for 6-year-olds to pay attention to 4 different types of craters at once. Use a simpler layout or fewer requested craters. Provide a pre-drawn plan or a photo to help them with their planning. For children who are more experienced with planning, give them a planning sheet (an A4 sheet) with four squares on it. The children can first sketch where they will place the large/deep or small/shallow craters.
- The difficulty of designing the craters: The "large but shallow" crater is a challenging task (it requires a light stone, but one that's large in size). If you see them getting stuck, show them an example: "Let's try using a stone with a large surface area but that's light!
- Check before taking photos: Taking photos is an exciting activity for children. That's why they often want to take a photo of their work quickly, before it's completely finished or before they've checked whether it matches the plan. Introduce a "Scientific Control" before taking photos. The children should compare the craters in the sand to their design sheets. Ask: "Is this crater deep enough compared to the design?" This step develops critical thinking and precision.
- The "failure-tolerant" retry: If a crater doesn't turn out right (e.g., it's not deep enough), a 6-year-old can easily get discouraged. Don't let them give up. Teach them the concept of "scientific correction": "Okay, this one didn't turn out deep enough, but what can we do? Which rock should we try again with, just on this small section?" This helps develop resilience and flexibility.

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- The “failure-tolerant” retry: If a crater doesn’t turn out right (e.g., it’s not deep enough), a 6-year-old can easily get discouraged. Don’t let them give up. Teach them the concept of “scientific correction”: “Okay, this one didn’t turn out deep enough, but what can we do? Which rock should we try again with, just on this small section?” This helps develop resilience and flexibility.
- Using “Scientific Vocabulary”: Six-year-olds don’t yet use scientific terms confidently. Create flashcards. These can help them when they present their lunar landscape, so they can use the new terms more confidently when describing cause-and-effect relationships.

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3.3 Recycled Paper Making: "Kind Words for Mothers and Mother Earth

Through mixed-age collaboration, this two hours STEAM program aims to develop empathy and connectedness of the 1st grade students by collaborating with 2nd or 3rd grades during the intricate paper-making process. Papermaking with kids is a fun and creative activity that can be done with common household items! Making paper teaches children how one of our most commonly used materials - PAPER - is made, and it's also a fun sensory project for kids of all ages.

Basic Information Sheet

Age group	Student number	Duration	Number of stages	Subjects connection and relevance
Mixed group 1st grade with support of 2/3rd grade inmixed group	whole class in teams of 8 students	80 - 120 minutes	5 stages	Environmental Science and Literacy

STEAM Event Summary

This STEAM project sharpens emotional awareness as children use choose feeling words, and draft a gratitude message that is kind, specific, and respectful. By identifying and solving "production problems" - such as sheets being too thin or too wet - students build resilience and practical problem-solving skills. The station-rotation technique fosters self-regulation and responsibility, requiring teams to manage their own time, tools, and environmental cleanup. It encourages critical thinking by linking personal "inputs" (kind words) and environmental "inputs" (recycling) to their broader community impact. The age-mixed structure serves as a powerful "social laboratory" where older students refine their leadership and coaching skills, while younger students gain confidence through peer-led modelling and safe, respectful mentorship.

SPIRIT Skill Focus

- Valuing people and nature
- Connectedness
- Empathy
- Emotional awareness regulation and communication

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National Curriculum Link and Objectives

- Understand recycling as a way to reduce waste and protect the environment (paper cycle, reuse of fibres).
- Observe and describe the basic process of making recycled paper (pulping, forming sheets, removing water, drying).
- Practice expressive literacy: writing a structured message of gratitude using emotionally appropriate language.
- Strengthen vocabulary related to emotions and sustainability (e.g., gratitude, appreciate, recycle, pulp, care, protect).
- Collaborate in mixed-age teams, giving and receiving help respectfully.

Real-world STEAM Connection and Problem definition

Connection (student perspective):
We use paper every day, and throwing it away creates waste. If we recycle paper into something beautiful, we help Earth. If we also choose kind, thoughtful words, we help people feel good inside.

Problem definition (student perspective, age-specific):
"How can we turn old paper into a new, beautiful card that makes someone feel loved - and also helps Mother Earth by using less waste?"

Materials at a Glance

Energiser/framing

- Kinder Egg-style containers (plastic capsule only), baking soda, water (quick metaphor demo)

Paper making

- Recycled paper scraps (pre-soaked if possible)
- Blender or manual pulping tools
- Trays/tubs for pulp
- Mold and deckle frames
- Sponges/cloths for pressing water out
- Drying area (rack/flat surface + towels)

Card making + writing

- Cardstock backing / folding card bases
- Glue sticks or white glue
    - Pens/markers/coloured pencils

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- Writing prompts + word banks + sentence stems
- Optional decoration: dried flowers/leaves, stamps, wax seal tools (supervised), stickers
- Envelopes or simple wraps

Safety + cleanup

- Aprons, towels/wipes, bin bags, table covers.

Indoor/Outdoor and Classroom layout

Indoor (recommended)

- Central meeting spot for intro + sharing
- 3–4 stations around the room:
  1. Teacher station: writing coaching + meaning check
  2. Paper making station (assistant-led): pulp → mold/deckle → sponge press → drying
  3. Draft/edit station: independent writing + peer feedback corner
  4. Decoration/assembly station (assistant-supervised): layout, glue, natural decoration
- Drying zone clearly labelled "Wet Paper - Do Not Touch.

Notes on Research-based approach and integration

In this activity, students explore a real-life sustainability challenge - waste paper - through an emotionally meaningful goal: creating a card that communicates genuine appreciation. They begin with a shared metaphor about "inputs and impact" to connect caring words and caring actions to both people and the planet. Then they move through a simple inquiry cycle: noticing how paper behaves in water, learning why fibres can be reused, and testing how pressing and drying changes the strength of their sheet.

As they design and build their recycled paper, students make small adjustments based on what they observe (too wet, too thin, too uneven), mirroring a child-friendly research process: observe → try → improve. Literacy is integrated as a purposeful tool: students draft, revise, and choose words that match the feelings they want to communicate. The mixed-age structure strengthens connectedness through mentoring, shared responsibility, and respectful collaboration.

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Lesson Flow Overview (linked to details below)

Stage	Title	Brief Description	SPIRIT Skills	Duration	Link to Details
1st	**Framing: "What we give has impact"**	A short symbolic energiser introduces the idea that words/actions affect people "inside" and choices affect Earth. Students connect this to mothers/guardians and Mother Earth.	• Emotional awareness, regulation and communication • Empathy • Valuing people and nature	10 minutes.	**STAGE 1 – Framing: "What we give has impact"**
2nd	**Plan the message**	Students brainstorm what they truly appreciate, use a word bank to choose feeling words, and draft a gratitude message that is kind, specific, and respectful.	• Emotional awareness, regulation and communication • Empathy	10 - 15 minutes	**STAGE 2 – Plan the message**
3rd	**Station Rotation I: Make the paper + refine writing**	Students rotate through paper making (pulp → mold/deckle → press → dry) and writing refinement. Older students mentor younger peers	• Valuing people and nature • Connectedness	30 - 40 minutes	**STAGE 3 – Station Rotation I: Make the paper + refine writing**
4th	**Station Rotation II Assemble and decorate**	Students assemble their cards using recycled paper, add natural/eco-friendly decoration, and ensure the design matches the feeling/message.	• Empathy • Valuing people and nature • Connectedness	30 - 40 minutes	**STAGE 4 – Station Rotation II: Assemble and decorate**

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5th	**Share, reflect, and close**	Students share in pairs/small group, reflect on caring for people and Earth, and name one action they will take next.	• Connectedness • Emotional awareness, regulation and communication • Empathy	10 - 15 minutes	**STAGE 5 – Share, reflect, and close**

Tips and Tricks for dealing with challenges (for the whole STEAM program)

- Mixed-age differences: Pair older students as “paper mentors” and “word coaches.” Rotate helpers so it stays fair.
- Paper drying time: Pre-dry some sheets in advance as backup for assembly and let student-made sheets dry for a later “swap-in” if needed.
- Mess management: Contain pulp station with trays + table covers; assign a rotating “Earth Helper” to manage wipes and water.
- Emotional sensitivity: Allow private writing; sharing can be optional or done in pairs only.
- Overwhelm with decoration: Offer “choose 2 decorations only” to keep it meaningful and manageable.

Difficulty level tailoring notes

- **Beginner learners:** Provide fill-in-the-blank card templates and allow drawing + dictation.
- **Intermediate:** Require 1–2 emotion words + one specific example (“Thank you for…”).
- **Advanced learners:** Add a short “promise line” (one action they’ll take to care for Earth or help at home).

STEAM Program Debriefing and Reflection Questions

- What did you learn about how paper can be reused?
- What did you learn about choosing words that affect how someone feels inside?
- How did someone help you today - and how did that feel?
- How does making a gift from waste show care for Mother Earth?
- What is one caring action you want to do next?

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3.3.2. Stage details and Activities Flow

STAGE 1 – Framing: "What we give has impact"

How does this develop particular SPIRIT skills

- Builds emotional awareness and communication by naming how words and actions can affect someone's feelings inside
- Strengthens empathy by helping students imagine what a mother/guardian might feel when receiving thoughtful words
- Develops valuing people and nature by linking caring choices (recycling) to real impact on Mother Earth.

What do we want to achieve regarding SPIRIT skill development (student understanding and/or behaviour)?

As a result of this activity, students will be able to:

- Emotional awareness/communication: name one feeling that kind words can create (e.g., loved, proud, calm).
- Empathy: explain what they want their mother/guardian to feel when reading the card.
- Valuing people and nature: name one way recycling paper helps Earth.

Academic/Curriculum Objective connection

Introduces cause-effect thinking for both emotions (social input → emotional impact) and sustainability (waste → environmental impact).

Materials and tools needed for implementation

Kinder capsule demo materials, "Inside–Input–Impact" visual, emotion word cards.

Preparation notes

Keep energiser short and symbolic (not the main event). Use concrete daily examples.

Guided Questions

- "What happens inside a person when they hear kind words?"
- "What happens to Earth when we throw paper away?"
- "What could we give today that helps both people and Earth?"

Stage Debriefing Questions (Optional)

- "Why should we think before we speak - or before we throw things away?"

Tips and Tricks for dealing with stage challenges

- **Challenge:** Metaphor feels abstract for younger students.
  Tip: Use everyday examples ("When someone says 'thank you,' how do you feel inside?").
- **Challenge:** Students get stuck on "Mother Earth" idea.
  Tip: Make it concrete: "Earth gives us trees, air, water - how can we give back?"

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STAGE 2 – Plan the message (Teacher-led literacy planning)

How does this develop particular SPIRIT skills

- Strengthens empathy by focusing on the receiver's feelings and needs
- Develops emotional awareness and communication by choosing emotion words and expressing gratitude clearly and respectfully
- Supports connectedness through idea-sharing and gentle peer feedback (without forcing public performance)

What do we want to achieve regarding SPIRIT skill development (student understanding and/or behaviour)?

As a result of this activity, students will be able to:

- Emotional awareness/communication: write or dictate a gratitude message using at least one feeling word (e.g., "I feel grateful…").
- Empathy: include one specific reason that shows they truly noticed the person ("Thank you for helping me when…").
- Connectedness: offer one supportive comment to a peer ("That sounds kind," "That will make her happy").

Academic/Curriculum Objective connection

Purposeful writing: drafting, vocabulary selection, audience awareness, and tone.

Materials and tools needed for implementation

Writing templates, word banks, sentence stems, sample card.

Preparation notes

Differentiate: older students can write independently; younger can draw + dictate.

Guided Questions

- "What do you want your mother/guardian to feel when reading this?"
- "Which words show real care?"
- "What is one moment you remember that you can thank them for?"

Stage Debriefing Questions (Optional)

- "Which line feels the most true and meaningful?"

Tips and Tricks for dealing with stage challenges

- **Challenge:** Students write generic messages ("You're the best").
  Tip: Prompt specificity: "What did they do that helped you?"
- **Challenge:** Younger students struggle to write.
  Tip: Allow drawing + one sentence; older buddy can scribe.

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STAGE 3 – Station Rotation I: Make the paper + refine writing

How does this develop particular SPIRIT skills

- Develops valuing people & nature by turning waste paper into something useful and beautiful
- Builds connectedness through mixed-age teamwork, mentoring, shared roles, and helping hands
- Supports empathy and emotional communication by improving messages with care (choosing words that protect and uplift)

What do we want to achieve regarding SPIRIT skill development (student understanding and/or behaviour)?

As a result of this activity, students will be able to:

- Valuing people and nature: explain how recycled paper reduces waste and supports Earth (in simple terms).
- Connectedness: collaborate in a station role (mixer, mold holder, sponge presser, dryer helper) and help someone succeed.
- Emotional awareness/communication: revise one part of their message to sound kinder, clearer, or more meaningful.

Academic/Curriculum Objective connection

Environmental science (recycling process, fibres + water) + literacy (revision).

Materials and tools needed for implementation

Paper scraps, pulping tools, tubs, mold/deckle, sponges, drying area; writing drafts.

Preparation notes

Pre-soak paper scraps if possible. Label station steps visually (1–2–3–4).

Guided Questions

- "Why is making paper from old paper good for Earth?"
- "What do you notice about the pulp - too thick or too watery?"
- "How can you make your message sound more caring and specific?"

Stage Debriefing Questions (Optional)

- "What surprised you about making paper?"
- "Did you change any words after thinking more?"

Tips and Tricks for dealing with stage challenges

- **Challenge:** Paper sheets tear when lifting.
  Tip: Use a thicker pulp or a slower lift; support with a buddy's hands.
- **Challenge:** Waiting time at stations.
  Tip: Give clear micro-tasks (wipe area, label sheet, add name tag, revise one sentence).

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STAGE 4 – Station Rotation II: Assemble and decorate the card

How does this develop particular SPIRIT skills

- Strengthens empathy by designing the card with the recipient in mind ("What would feel special to them?")
- Develops valuing people & nature through eco-friendly design choices and respectful use of natural materials
- Builds connectedness through sharing tools, giving gentle suggestions, and appreciating each other's ideas.

What do we want to achieve regarding SPIRIT skill development (student understanding and/or behaviour)?

As a result of this activity, students will be able to:

- Empathy: explain one design choice that was made to make the recipient feel loved/seen.
- Valuing people and nature: choose materials thoughtfully (recycled base + limited decorations) and avoid waste.
- Connectedness: ask for or offer help respectfully during assembly (gluing, layout, fine-motor tasks).

Academic/Curriculum Objective connection

Design + literacy presentation: organizing text, readability, layout, and responsible material use.

Materials and tools needed for implementation

Card bases, glue, markers, dried flowers/leaves, stamps/wax seals (supervised).

Preparation notes

Set clear limits ("choose 2 decoration elements") to prevent overwhelm and waste.

Guided Questions

- "What do you want your card to say and what do you want it to feel like?"
- "How can your decorations show care without using too much?"
- "What would make your mother/guardian smile when they see this?"

Stage Debriefing Questions (Optional)

- "What part was hardest to make - and how did you solve it kindly?"

Tips and Tricks for dealing with stage challenges

- **Challenge:** Students overdecorate and lose the message.
  Tip: "Message first" rule - read the message aloud, then add 1–2 small details.
- **Challenge:** Fine motor difficulties.
  Tip: Provide pre-cut shapes, glue dots, or buddy support.

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STAGE 5 – Sharing, reflection and closure

How does this develop particular SPIRIT skills

- Strengthens connectedness by sharing work, listening respectfully, and celebrating each other's effort
- Develops emotional awareness and communication through reflecting on feelings, intention, and word choice
- Deepens empathy by hearing what others created and recognizing different ways of expressing care
- Reinforces valuing people & nature by naming how the gift helps both a person and the planet

What do we want to achieve regarding SPIRIT skill development (student understanding and/or behaviour)?

As a result of this activity, students will be able to:

- Connectedness: share their work with a partner/small group and respond kindly to someone else's sharing.
- Emotional awareness/communication: name one feeling they hope their card creates and one feeling they had while making it.
- Empathy: speak about the recipient with respect and care.
- Valuing people and nature: state one action they will take to reduce waste or show care at home.

Academic/Curriculum Objective connection

Oral expression + reflection + consolidation of environmental science and literacy learning.

Materials and tools needed for implementation

Reflection prompts, finished cards, envelopes/wraps, sentence stems.

Preparation notes

Use think–pair–share before group sharing to keep it safe and inclusive.

Guided Questions

- "What did you put inside your card and why?"
- "How did making paper change how you think about waste?"
- "What is one caring action you want to do next for a person or for Earth?"

Stage Debriefing Questions (Optional)

- "What is one thing you are grateful for today?"

Tips and Tricks for dealing with stage challenges

- **Challenge:** Students feel shy about sharing personal gratitude.
  Tip: Pair-sharing only; allow "pass" in whole-group.
- **Challenge:** Mixed-age voices dominate.
  Tip: Structured turn-taking and a "younger-first" sharing rule.

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3.4 Emotions in Nature

Imagine turning a simple walk in the park into a magical "emotion hunt" where 1st graders discover feelings. This 2-hour outdoor STEAM project helps 1st-grade students connect their inner feelings with the natural world around them. Through 6 exciting stages, children go from learning about basic emotions to exploring the wild to find "sad" broken sticks or "joyful" bright petals. Working in pairs, children go on an "emotion hunt" to collect or draw natural objects like leaves and stones that represent feelings like joy or anger. Students use these materials to create "emotion maps" and "nature faces," blending science observation with artistic expression. They become little scientists and artists, collecting natural treasures to build creative "emotion maps" and "nature faces." The activity helps kids name their emotions and develop empathy by sharing their discoveries and listening to their classmates.

Basic Information Sheet

Age group	Student number	Duration	Number of stages	Subjects connection and relevance
1st grade students	Whole class (Pairs or small groups)	2h	6 stages	Science art

STEAM Event Summary

Emotions in Nature is a 1.5-hour outdoor activity for children aged 6–8 that links emotions with elements found in nature. Working in pairs or small groups, kids go on an “emotion hunt,” collecting or drawing natural items that represent basic feelings. They then sort and present their finds, explaining the emotional connections. The activity encourages emotional expression, empathy, and observation skills in a natural setting.

SPIRIT Skill Focus

- Connectedness
- Emotional awareness, regulation and communication
- Empathy
- Creativity

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National Curriculum Link and Objectives

- Develop observation skills and environmental awareness (science).
- Use classification and comparison techniques.

Real-world STEAM Connection and Problem definition

Children often encounter emotions they struggle to name or understand. In daily life - whether at school, at home, or during play - they might feel sad, angry, or joyful without knowing how to express it. This activity links these emotional experiences to tangible, familiar elements in nature, encouraging children to externalize inner feelings through observation and metaphor. By identifying emotions in the environment, they practice emotional literacy while sharpening their scientific observation skills. The problem at the heart of this activity is: “How can I recognize and express my feelings using the world around me?” This encourages students to explore personal and shared emotions in connection with the natural world they live in every day.

Materials at a Glance

- Each child has a notebook or clipboard with paper, and coloured pencils or crayons.
- Optional: emotion word cards or a “feeling wheel” to help children identify and name emotions.
- Blank emotion-nature matching cards (prepared in advance or created by the students themselves during the activity).

Indoor/Outdoor and Classroom layout

Setting: Outdoor – preferably a natural environment such as a garden, school yard, park, or wooded area. The space should include a variety of natural elements like trees, flowers, stones, and open sky, offering diverse stimuli for emotional associations.

Layout and Materials:

- A starting circle where the teacher introduces the activity and gives instructions (can be marked with natural materials like logs or mats).
- Space to walk, observe, and sit quietly during individual reflection.
- A sharing area (e.g., logs or benches in a circle) for debriefing.

The teacher facilitates movement between moments of silent observation, note-taking or sketching, and small group or whole-class sharing. Children can work individually at first, then come together for collaborative reflection.

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Notes on Research-based approach and integration

This activity encourages children to adopt an inquiry-based mindset as they explore their natural surroundings. Rather than being told what to feel, students are invited to observe, ask questions, and make connections between external elements and their internal emotional states.

Children engage in an active process of meaning-making:

- They notice details in the environment that evoke specific feelings.
- They formulate personal hypotheses (e.g., “Why does this tree make me feel calm?”).
- They test their assumptions by comparing with peers’ interpretations and by reflecting on different elements of nature.
- They are encouraged to relate their findings to familiar experiences in their everyday lives (e.g., "This flower reminds me of my grandma’s garden").

This approach aligns with the core of STEAM education by merging scientific observation, personal reflection, and creative expression to foster both emotional awareness and cognitive empathy.

Lesson Flow Overview (linked to details below)

Stage	Title	Brief Description	SPIRIT Skills	Duration	Link to Details
1st	**Emotion–Nature Association Introduction**	The teacher introduces the idea that emotions can be reflected in nature. Using a large visual chart, students explore how five basic emotions (joy, sadness, anger, fear, calm) can be represented by colours or weather (e.g., joy = sunshine, sadness = rain).	• Emotional awareness, regulation and communication • Empathy	15 minutes	STAGE 1 – Emotion-Nature Association Introduction
2nd	**Receiving instructions and emotion cards**	After the introductory discussion, children receive their “Emotion Hunt” cards. These cards display 4–5 basic emotions through simple icons and colour codes (e.g., blue for sadness, yellow for joy). Each student or pair is invited to explore the natural environment and collect or draw items that feel emotionally connected to the listed feelings.	• Emotional awareness, regulation and communication • Empathy	10 minutes	STAGE 2 – Receiving instructions and motion cards
3rd	**Outdoor exploration and**	Children explore a structured outdoor environment (school garden, park, courtyard) with their “Emotion Hunt” cards and small pouches	• Emotional awareness,	25-30 minutes	STAGE 3 – Outdoor

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	object collection	or bags. Their task is to collect or draw one natural item per listed emotion (e.g., a soft flower for joy, a broken stick for anger). The focus is on personal associations - there are no wrong answers.	regulation and communication • Empathy • Connectedness		**exploration and object collection**
4th	**Creative expression through natural materials**	After the exploration, children return to a central area. They use their collected natural objects to create "emotion maps" or "emotion faces" on a large sheet of paper. Leaves, stones, twigs, petals, etc., are arranged to represent emotions visually - for example, a smiling face for joy made with yellow leaves, or a tangled spiral of sticks for confusion.	• Emotional awareness, regulation and communication • Empathy • Creativity	20 minutes	**STAGE 4 – Creative expression through nature materials**
5th	**Verbal expression and peer listening**	Children sit in a circle with their emotion creations (maps or faces) in front of them. One at a time, they present their work to the group, explaining why they chose specific items for each emotion. The rest of the group listens and may ask respectful questions or share if they've had similar feelings or associations.	• Emotional awareness, regulation and communication • Empathy	25 minutes	**STAGE 5 – Verbal expression and peer listening**
6th	**Final reflection and emotional integration**	At the end of the activity, children sit together in a circle in the natural setting or back in class. The teacher facilitates a short reflective moment, asking students to connect their inner emotions with the natural elements they explored. This moment helps consolidate emotional awareness and encourages shared reflection.	• Emotional awareness, regulation and communication • Empathy	15 minutes	**STAGE 6 – Final reflection and motional integration**

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Tips and Tricks for dealing with challenges (for the whole STEAM program)

- Be prepared for children to become distracted outdoors - use it as an opportunity. If an insect or animal grabs their attention, ask, "How does seeing this make you feel?"
- Encourage quiet observation and let moments of silence be part of the emotional exploration.
- If some children struggle to name their emotions, suggest a few options or associate feelings with colours or weather (e.g., "Is it a stormy or a sunny feeling?").
- Make group sharing optional to create a safe, low-pressure environment.

Difficulty level tailoring notes

- **Beginner learners:** if you have younger or less emotionally expressive students, air them with an empathetic peer or adult; allow drawing instead of verbal sharing; accept simpler associations ("This is happy because it's yellow").
- **Advanced learners:** For more mature students, ask for metaphorical interpretations (e.g., "This dry leaf feels like my tiredness after school"). They can also create short stories about the emotions found.
- **Expert learners:** Use more subtle and sophisticated emotions (e.g. jealousy). Try to think of situations in which several emotions coexist at the same time or one emotion follows another (e.g. I'm getting angry, and then I feel sorry for getting angry).

STEAM Program Debriefing and Reflection Questions

- Which emotion was easiest to find in nature? Why?
- How did your body feel when you were looking for these emotions?
- Did you find that others chose similar or different objects?
- What did nature teach you about your feelings?

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3.4.2. Stage details and Activities Flow

STAGE 1 – Emotion-Nature association introduction

How does this develop particular SPIRIT skills

- Helps develop emotional awareness by inviting children to name emotions and relate them to sensory or natural experiences
- Encourages abstract thinking by associating internal states with external cues (e.g., moss = calm, storm = anger)

What do we want to achieve regarding SPIRIT skill development (student understanding and/or behaviour)?

As a result of this activity:

- Students will begin to recognize and describe emotions using metaphor and environment
- They will understand that emotions can be expressed and observed beyond words

Academic/Curriculum Objectives Connection

- Science: Observation of weather/nature patterns
- Language: Emotional vocabulary, use of metaphor
- Art: Visual interpretation of abstract concepts

Materials and tools needed for implementation

- Visual chart (printed or digital) with emotions, weather symbols, and colour metaphors
- Optional: real-life nature photos, emotion flashcards

Preparation notes

- Prepare visual materials in advance
- Be ready to guide conversation gently toward the five selected emotions.

Guided Questions

- What do you feel when it's rainy/sunny/windy?
- What colour feels like “joy” to you?
- Can a tree or a stone have a feeling?

Stage Debriefing Questions (Optional)

- Did anything in nature ever remind you of how you were feeling?

Tips and Tricks for dealing with stage challenges

- Some students may struggle with metaphorical thinking - use concrete examples first
- Allow multiple associations for each emotion (e.g., calm = lake or soft grass.

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STAGE 2 – Receiving instructions and motion cards

How does this develop particular SPIRIT skills

This stage supports:

- Emotional awareness – by encouraging children to observe and interpret emotions through sensory input.
- Empathy – as children begin to recognize how external cues may reflect internal feelings.

What do we want to achieve regarding SPIRIT skill development (student understanding and/or behaviour)?

As a result of this stage, the activities:

- Help children link abstract emotions with tangible items.
- Encourage mindfulness and observation.
- Strengthen symbolic thinking.

Academic/Curriculum Objective connection

- Natural sciences – classification of natural elements
- Arts – symbolic use of natural materials
- Civic education – emotional literacy

Materials and tools needed for implementation

- Printed emotion cards with symbols and colours
- Small pouches or paper bags for collection

Preparation notes

- Prepare enough cards for each pair or child
- Choose a safe and rich natural environment (e.g., school garden)

Guided Questions

- What kind of object could feel ‘angry’ or ‘sad’?
- Can colours or textures help you decide?
- What do you notice about nature when you’re feeling calm or joyful?

Stage Debriefing Questions (Optional)

- “Was it easy to find something for each emotion?”
- “Did any items surprise you?

Tips and Tricks for dealing with stage challenges

- Remind children there is no ‘wrong’ object – this is about perception.
- Support children who feel unsure by walking with them and offering examples.
- Have backup paper and pencils for children who prefer drawing to collecting.

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STAGE 3 – Outdoor exploration and object collection

How does this develop particular SPIRIT skills

- Emotional awareness – by recognizing how emotional states can be reflected in natural forms.
- Empathy – by considering how others might associate different objects with emotions

What do we want to achieve regarding SPIRIT skill development (student understanding and/or behaviour)?

As a result of this stage, the activities:

- Strengthen observation and reflection skills.
- Build emotional vocabulary through non-verbal symbols.
- Encourage self-awareness in natural surroundings.

Academic/Curriculum Objective connection

- Natural sciences – exploring textures, forms, and materials in nature
- Art – symbolic representation of emotions
- Civic education – mindfulness and emotional intelligence.

Materials and tools needed for implementation

- Emotion Hunt cards
- Bags or pouches for collecting objects
- Optional: drawing paper and pencils for children who prefer to sketch.

Preparation notes

- Ensure the area is safe and has a diversity of natural elements
- Remind students to respect nature - no picking live plants unless permitted.

Guided Questions

- What does this object make you feel?
- Do you think someone else might choose something different for the same emotion?
- Can one object represent more than one feeling?

Stage Debriefing Questions (Optional)

- Was it easier to find some emotions than others?
- Which emotion was hardest to 'see' in nature?

Tips and Tricks for dealing with stage challenges

- Pair less confident children with a buddy.
- Offer extra time if students are engaged and focused.
- Allow drawing or describing when a child can't find a matching object.

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STAGE 4 – Creative expression through nature materials

How does this develop particular SPIRIT skills

- Emotional awareness – by transforming abstract feelings into concrete visual representations
- Creativity – by using found objects symbolically to communicate inner states.

What do we want to achieve regarding SPIRIT skill development (student understanding and/or behaviour)?

As a result of this stage, the activities:

- Strengthen symbolic thinking and self-expression
- Develop emotional articulation through non-verbal mediums
- Promote ownership and reflection of emotional experiences.

Academic/Curriculum Objective connection

- Art – composition, colour, shape and symbolism
- Science – natural material identification and categorization
- Social-emotional learning – emotional vocabulary and self-expression

Materials and tools needed for implementation

- Large paper sheets (one per child or pair)
- Natural materials collected by students
- Optional: glue, markers or pencils for drawing additional elements.

Preparation notes

- Provide space for students to spread out and work without crowding
- Encourage multiple interpretations - no right or wrong creations

Guided Questions

- Why did you choose this object for that emotion?
- If your face/map had a story, what would it be?
- Does your creation show only your emotions, or could it reflect someone else’s too?

Stage Debriefing Questions (Optional)

- What emotion was the easiest to represent visually?
- Did you learn something new about your feelings while creating this?

Tips and Tricks for dealing with stage challenges

- Offer prompts or examples for students who feel stuck
- Allow combinations of drawing and natural objects for more flexibility
- Celebrate all creations equally to promote confidence

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STAGE 5 – Verbal expression and peer listening

How does this develop particular SPIRIT skills

- Empathy – by listening to others' emotional perspectives and experiences
- Emotional awareness – by articulating personal emotional connections
- Communication – by using descriptive language and explaining abstract feelings.

What do we want to achieve regarding SPIRIT skill development (student understanding and/or behaviour)?

As a result of this stage, the activities:

- Increase confidence in expressing emotions to others
- Strengthen respectful listening and emotional validation
- Develop curiosity and openness toward others' experiences.

Academic/Curriculum Objective connection

- Language Arts – speaking, listening, vocabulary building

Materials and tools needed for implementation

- Emotion creations (from Stage 4)
- Optional: a talking object (stone, leaf, etc.) to take turns speaking.

Preparation notes

- Set group expectations for respectful listening and no judgment
- Model a short example first if needed
- Encourage curiosity over correction.

Guided Questions

- What does this item represent to you?
- Have you felt this way recently?
- Did anyone choose a similar object for a different emotion?

Stage Debriefing Questions (Optional)

- How did it feel to share your emotions with the group?
- What surprised you about your classmates' presentations?

Tips and Tricks for dealing with stage challenges

- Help shy children by offering to co-present or summarize for them
- Reinforce group norms if students interrupt or laugh inappropriately
- Validate all emotional expressions, even if they seem "small" or surprising.

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STAGE 6 – Final reflection and motional integration

How does this develop particular SPIRIT skills

- Emotional awareness – by recognizing how emotions manifest in personal experiences and nature
- Empathy – by listening to how others felt during the experience
- Self-regulation – by slowing down and reflecting calmly.

What do we want to achieve regarding SPIRIT skill development (student understanding and/or behaviour)?

As a result of this stage, the activities:

- Deepen the connection between emotional states and external symbols
- Reinforce shared emotional vocabulary
- Foster group cohesion through calm closure.

Academic/Curriculum Objective connection

- Science – understanding nature through sensory/emotional interpretation
- Language Arts – reflective speaking and listening

Materials and tools needed for implementation

- Natural elements collected during the hunt
- Optional: emotion cards or images for visual support.

Preparation notes

- Choose a quiet spot for the circle
- Ensure everyone has a chance to speak or be heard
- Encourage non-verbal participation (e.g., showing an item to represent a feeling.

Guided Questions

- Was there a moment in nature today that surprised you?
- Which object helped you understand an emotion better?
- Did you learn something new about your own feelings?

Stage Debriefing Questions (Optional)

- How does nature help you connect with your emotions?
- Would you like to do this kind of activity again? Why?

Tips and Tricks for dealing with stage challenges

- Accept all levels of participation, including silence or gestures
- Keep the tone calm and reassuring
- Rephrase questions if needed using simpler language or emotional icons.

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3.5 CODING IN NATURE: PROGRAM A HUMAN ROBOT

This 90-minute STEAM project introduces 1st graders to the basics of coding through a movement-based activity in a natural setting. The lesson is structured into 2 clear stages, starting with an outdoor session where students act as "programmers" and "robots." By giving step-by-step verbal commands to guide their partners around stones and branches, students learn to "debug" their instructions in real-time when the "robot" take a wrong turn. The second stage takes place in the classroom, where students translate their physical experience into visual "route maps" using symbols and arrows. It is an interdisciplinary approach that connects math, physical activities and digital literacy, showing children how to solve complex problems through simple, logical steps. Also it teaches kids that mistakes are just puzzles waiting to be solved.

Basic Information Sheet

Age group	Student number	Duration	Number of stages	Subjects connection and relevance
1st grade students	Whole class (max. 20-25 students)	min. 2 x 45 minutes	2 stages	Mathematics, Environmental Studies, Physical Education, Visual Arts, Digital Literacy

STEAM Event Summary

In this activity, teachers introduce first-grade students to the basics of algorithmic thinking through a playful outdoor game. Students take turns acting as a “programmer” and a “human robot,” using simple verbal commands to guide movement in a natural environment. The activity is designed to be highly interactive, movement-based, and age-appropriate, supporting both cognitive and physical development.

SPIRIT Skill Focus

- Flexibility
- Critical thinking
- Problem-solving

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National curriculum Link and Objectives

- Mathematics: Counting steps, understanding directions, spatial reasoning
- Physical Education: Motor coordination, obstacle course navigation
- Visual Arts: Drawing “route maps”
- Environmental Studies: Recognizing natural obstacles, observing surroundings

Real-world STEAM Connection and Problem definition

Have you ever tried to guide someone who cannot see exactly where to step? In this activity, students face the challenge of guiding a “human robot” through a natural environment full of obstacles such as stones, branches, or bushes. The goal is to give clear, short, step-by-step instructions so the robot can safely reach a target. When instructions do not work, students try again and improve them just like programmers fixing mistakes in code. At the same time, children learn to move carefully in nature and become more aware of their surroundings.

Materials at a Glance

Outdoor Materials:

- Natural obstacles such as stones, sticks, branches, bushes, or tree roots (found on site)
- Markers to define routes and destinations (e.g., pebbles, ribbons, cones, or sticks)
- Optional stopwatch for timed challenges

Classroom Materials:

- Paper or drawing sheets for route maps and algorithm planning
- Command sheets or instruction templates with arrows and symbols
- Pencils, coloured pencils, or crayons
- Notebooks (optional)

Visual and Support Materials (optional but recommended):

- Printed command cards or icons (e.g., move forward, turn left/right, jump, stop)
- Example “program” or route drawing shown by the teacher
- Visual arrows or symbols for students who need additional support

Indoor/Outdoor and Classroom layout

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- Phase 1 – Outdoor (schoolyard or park): Human-robot game in a natural environment, focusing on movement, listening, and giving clear instructions.
- Phase 2 – Classroom: Drawing the route and translating actions into simple, visual "programs," followed by reflection and improvement (debugging).

Notes on Research-based approach and integration

This activity is based on discovery learning and problem-based learning. Students learn by doing: they test ideas, notice mistakes, and improve their solutions through experience. The interdisciplinary STEAM approach supports active engagement, cooperation, and deeper understanding in a playful way. The STEAM elements are integrated as follows:

- Science: Observing natural obstacles and understanding the environment.
- Technology: Using step-by-step instructions as algorithms.
- Engineering: Planning efficient routes and overcoming challenges.
- Art: Creatively designing paths and visualizing solutions.
- Math: Sequencing steps, patterns, and logical reasoning

Lesson Flow Overview (linked to details below)

Stage	Title	Brief Description	SPIRIT Skills	Duration	Link to Details
1st	**Human-Robot Game Outdoors**	Students work in pairs. One is the "robot," the other the "programmer." The programmer gives commands (e.g., "take two steps forward, turn left, jump"), which the robot performs. The obstacle course is made of natural elements (sticks, stones, bushes). The teacher demonstrates the game with a volunteer acting as a robot.	• Problem-solving • Critical thinking • Flexibility • Creativity	45 minutes	**STAGE 1 – Human-Robot Game Outdoors**

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2nd	**Paper-Based Algorithm Creation and Debugging**	Students return to the classroom and individually or in pairs draw the route they followed. They add commands (arrows, symbols, numbers). The teacher introduces simple algorithm ideas such as steps in order (sequence), repeating steps (repetition), and fixing mistakes (debugging) using drawings and symbols. Students test their "programs" by acting them out again. This stage helps students connect their physical experience from the outdoor game with visual and symbolic representations.	• Creativity • Problem-solving	45 minutes	**STAGE 2 – Paper-Based Algorithm Creation and Debugging**

Tips and Tricks for dealing with challenges (for the whole STEAM program)

- Use visual aids (arrows) if students get stuck
- Encourage shy children through role changes or team programming
- Teach that mistakes are part of programming (debugging = finding and fixing errors)
- Use timed challenges to maintain momentum.

Difficulty level tailoring notes

The activity allows flexible adaptation to group needs:

- **Beginner learners:** Pre-made command sheets with visual aids (arrows, icons); robot follows only simple commands
- **Advanced learners:** Students formulate and explain their own commands
- **Expert learners:** Students independently design paths, debug errors, and suggest alternative solutions

STEAM Program Debriefing and Reflection Questions

- What was the most interesting part of the activity?
- Which command was hardest to follow/give and why?
- What did we do when we made a mistake? How did we fix it?
- What did you learn about clear communication and teamwork?
- If you could do the task again, what would you do differently?
- How could we make this game even more fun?
- Can you think of similar commands you could try at home or on the playground?

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3.5.2. Stage details and Activities Flow

STAGE 1 – HUMAN ROBOT GAME OUTDOORS

How does this develop particular SPIRIT skills

- Problem-Solving: Children plan and refine step-by-step commands to guide the "human robot" through natural obstacles, practicing practical solutions.
- Critical Thinking: They analyse the environment, anticipate challenges, and sequence commands logically to achieve the goal.
- Flexibility: Students adjust strategies and instructions when obstacles or mistakes occur, learning to adapt.
- Creativity: Designing routes and visualizing solutions encourages imaginative thinking and innovative approaches
- Curiosity, Sense of Wonder and Openness: Exploring the natural environment fosters observation, inquiry, and engagement with nature.
- Valuing People and Nature: Collaboration with partners and awareness of natural elements promote respect, empathy, and responsibility
- Creativity and Curiosity: designing paths and exploring natural elements encourages imaginative thinking and engagement with the environment.

What do we want to achieve regarding SPIRIT skill development (student understanding and/or behaviour)?

Through this activity, students are expected to develop the following SPIRIT skills:

- Problem-solving and Critical thinking: students plan routes and give precise directional commands, then analyse and correct mistakes ("debugging").
- Flexibility and Resilience: they adapt strategies when obstacles or errors occur, learning to persevere.
- Valuing People and Nature: confidence and verbal expression improve through role-switching and partner collaboration, fostering respect and teamwork

Materials and tools needed for implementation

- Math: Directions, counting steps
- Environmental Studies: Identifying natural obstacles
- PE: Motor coordination, obstacle navigation
- Digital Culture: Basics of algorithmic thinking

Preparation notes

- Teacher should pre-arrange the obstacle course
- Ensure every pair tries both roles.

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Guided Questions

- How can you plan your steps to overcome obstacles?
- What can you do when your first plan doesn't work?
- Can you think of new ways to guide the robot through the environment?
- How can you support your partner and work together to reach the goal?

Stage Debriefing Questions (Optional)

- Which command was hardest to follow?
- What was funny or surprising about the game?

Tips and Tricks for dealing with stage challenges

- Encourage shy students to start as the robot
- Introduce a timed challenge: who can guide their robot fastest?
- Use visual arrows if verbal guidance is difficult.

STAGE 2 – Paper Based Algorithm Creation and Debugging

How does this develop particular SPIRIT skills

- Creativity: designing personal route plans and "programs"
- Problem-Solving: identifying and fixing mistakes.

What do we want to achieve regarding SPIRIT skill development (student understanding and/or behaviour)?

Through this activity, students will develop problem-solving skills by:

- Recording simple algorithms: Translating actions into clear, step-by-step instructions.
- Debugging and redesigning steps: Identifying mistakes and revising their plans to overcome obstacles.
- Applying creative solutions: Thinking flexibly and inventively to solve unexpected challenges during the activity

This progression ensures that students follow through from planning to testing to improving, reinforcing structured problem-solving strategies.

Academic/Curriculum Objective connection

- Math: Sequences, counting steps
- Visual Arts: Drawing paths, using symbols
- Digital Culture: Recognizing algorithmic structures

Materials and tools needed for implementation

- Paper, coloured pencils, direction arrows
- Instruction templates
- Visual aids for inspiration

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Preparation notes

- Show an example of a simple drawn "program"
- Assist with using symbols (e.g., → = move forward)

Guided Questions

- How would you draw your program?
- What happens if the robot gets lost?
- Which command would you change and why?

Stage Debriefing Questions (Optional)

- What did you like about your own program?
- How did you solve it when something didn't work?

Tips and Tricks for dealing with stage challenges

- Don't aim for perfection: encourage learning from mistakes
- Provide templates to help students who need more support.

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Annexes

Pilot implementation (detailed example with lesson/activity plan), attachments

The activity was piloted with a group of first graders (ages 6–7) in an outdoor schoolyard setting. The following materials were tested:

1. Command Sheet Template:

Icons used: → Step forward ↶ Turn left ↷ Turn right ⬆ Jump ■ Stop
Students can draw or cut and arrange these icons in sequence.

2. Robot Path Drawing Sheet:

Blank template for students to draw the route (The teacher can pre-draw or leave it to students' creativity)

3. Teacher Guide:
   - Example commands (e.g., take two steps, turn right)
   - Typical errors and fixes
   - Differentiation strategies (e.g., visual aids)
4. Student Evaluation Sheet (Simple feedback questions with pictograms):
   - What did you like most? 🙂
   - What was difficult? 🙁
   - What was funny/surprising? 🤔
5. Word and Picture Cards:

Printable command cards for vocabulary and command sequence activities →, ↶, ↷, ⬆, ■

6. Obstacle Course Layout Plan:
   - Made from natural elements (stones, branches, bushes)
   - Three difficulty levels (short-straight / winding / obstacle-avoiding)
   - Teacher instructions included

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4. STEAM PROGRAMS AND EVENTS FOR TRANSVERSAL SKILLS DEVELOPMENT

SECOND GRADE STUDENTS

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4.1 Escape room activity based on the story of The Stork and the Fox

This two-hour STEAM program for 2nd graders uses an "escape room" format to strengthen their resilience by managing unfamiliar tasks and uncertainty without immediate teacher feedback through the classic story of the Stork and the Fox. Working in teams, students solve real-world problems like measuring weights for the fox's lunch and using chopsticks to mimic how a stork eats. The activities develop fine motor skills and logical thinking through tasks like folding paper airplanes and decoding Roman numeral "invitations." Students must practice flexibility and resilience as they collect secret codes without immediate help, relying on their teammates to move forward. Collaborative problem-solving develops social-emotional skills, requiring students to listen, resolve disagreements, and support peers who get stuck. The final digital "code entry" phase fosters critical thinking and self-reflection as teams evaluate their own cooperation and strategy for future challenges.

Basic Information Sheet

Age group	Student number	Duration	Number of stages	Subjects connection and relevance
2nd grade	One class (max. 30 students)	120 - 140 minutes	3 stages	mathematics, environmental studies, literature, design and technology, visual arts

STEAM Event Summary

Students work independently in groups to solve various tasks. Through engaging activities, they collect codes, which they enter into an online platform (Genially) to unlock and discover the story of The Stork and the Fox.

SPIRIT Skill Focus

- Curiosity, sense of wonder and openness
- Creativity
- Problem-solving
- Emotional awareness, regulation and communication
- Flexibility
- Resilience

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National curriculum Link and Objectives

- Sorting and counting elements in sets; recognizing Roman numerals; comparing the weight of objects through measurement; grouping numbers based on place value
- Reading comprehension, developing the ability to identify key information, alphabetizing words
- Developing fine motor skills; folding paper based on origami symbols
- Developing cooperation skills through group activities
- Identifying body parts of animals and their role in human nutrition
- Enhancing problem-solving skills, cooperation, and attention

Real-world STEAM Connection and Problem definition

During the task series, the children encounter and solve real-life problems related to the story, covering areas of science, technology, engineering, art, and mathematics (STEAM). The challenges connected to the characters of the stork and the fox - such as measuring objects, counting, paper folding, or observing – are activities that help the children learn through experience while developing their fine motor skills, problem-solving thinking, and teamwork. Throughout the tasks, the children learn to recognize and handle unexpected difficulties, adapt flexibly to changing situations, and support each other in achieving a common goal.
This comprehensive approach provides an opportunity for learners not only to acquire knowledge but also to develop their personal abilities and social skills, which are essential for successful functioning in real life.

Materials at a Glance

- Task sheet
- Wide-mouth 0.5-liter plastic bottles, Chinese chopsticks bound with rubber bands at one end, and 5–10 cm pieces of yarn (each pair receives one set).
- Balance scale with clothespins at the ends / coat hanger; several paper bags of varying weights, each labelled with a different number.
- Task sheet is cut into as many pieces as there are team members, coloured pencils.
- One A4 sheet of paper per student and a printed guide for the folding steps.
- Printed pictures of animals, one set per team.
- Computer, internet

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Indoor/Outdoor and Classroom layout

It is recommended that students complete the tasks independently in a familiar environment appropriate to their age. With the support of older students or adults, the activity can also be carried out at an external location. A computer is required to complete the final stage.

Notes on Research-based approach and integration

The tasks are designed to promote critical thinking and collaborative problem-solving among students. Each activity requires students to independently identify, analyse, discuss, and resolve challenges, reflecting authentic inquiry-based learning principles. The interdisciplinary nature of the tasks allows learners with diverse interests and abilities to engage meaningfully, supporting differentiated instruction. Through group discussions in the final task, students consolidate their understanding and share solutions, fostering communication skills and reinforcing integrated learning across subjects.

Lesson Flow Overview (linked to details below)

Stage	Title	Brief Description	SPIRIT Skills	Duration	Link to Details
1st	**Preparation and Warm-up**	Preparation phase: forming groups and providing instructions • Forming teams • Warm-up and motivation: group discussion in the classroom • Distributing task sheets	• Curiosity, sense of wonder and openness	15 minutes	**STAGE 1 – Preparation and Warm-up**
2nd	**Escape Room - Task solving**	In this stage, students work in teams to complete a variety of unfamiliar tasks. • Eat like a stork! - Using chopsticks to pick up and count pieces of string from plastic bottles • Find the fox's lunch! - Comparing the weight of objects through measurement • When is the birthday party? - Decoding the time using recognition of Roman numerals • Send the invitation by airplane! - Folding paper airplanes based on origami symbols • Which animals were invited to the party? - Identifying four-legged animals from pictures.	• Creativity • Problem-solving • Emotional awareness, regulation and communication • Flexibility • Resilience	5 x 15 - 20 minutes (it is advisable)	**STAGE 2 – Escape Room - Task solving**

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3rd	**Task Discussion and Activity Closure**	Entering codes into the Genially platform, evaluating the group work together. • The teams gather in the classroom. After discussing the tasks, they must enter the codes into a Genially task. If the code is correct, they can watch the animated video. • Next, there is a discussion about the story and the characters' traits. • Each group evaluates their teamwork, sharing requests and advice with one another based on the activity log.	• Curiosity, sense of wonder and openness	20-25 minutes	**STAGE 3 – Task Discussion and Activity Closure**

Tips and Tricks for dealing with challenges (for the whole STEAM program)

- The stations can be set up in one room if we don’t want to lose sight of the students, but, if possible, let them move independently. The descriptions of the stations are clear, but we can also phrase them mysteriously.

Difficulty level tailoring notes

We can make the tasks more challenging, for example, by requiring the comparison of the weights of multiple objects; by choosing more difficult folding; or by pre-writing the solution on the sheets in a way that the number only becomes clear after folding the paper airplane.

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STEAM Program Debriefing and Reflection Questions

- Which activity did you like the most? Why?
- What was the hardest part for you? Why?
- What advice would you give your classmates before doing a similar activity?
- What was your favourite moment of the day?
- Which task was the biggest challenge for you? How did you solve it?
- Did you learn anything about yourself today? For example, how do you react when something is difficult?
- How did it feel to work with others when you didn't agree?
- If you could do today again, is there anything you would try to do differently?
- What is something new you learned from the others?
- How will you use what you learned today the next time you get a difficult task?

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4.1.2. Stage details and Activities Flow

STAGE 1 – Preparation and Warm-up

How does this develop particular SPIRIT skills

Forming teams and having a group discussion about the tasks helps the children prepare for unexpected situations and adapt to changing circumstances. During the warm-up, students' resilience is also strengthened, as they understand that by supporting each other, they can more easily solve new and challenging tasks together. Distributing the task sheets provides a structured framework that supports independent and disciplined work.

What do we want to achieve regarding SPIRIT skill development (student understanding and/or behaviour)?

The activity aims to enable students to respond flexibly to unexpected situations and effectively adapt to changing circumstances. It is important that they learn how to face challenges through collaboration and mutual support, thereby strengthening their resilience. Structured frameworks, such as using task sheets, promote independent and disciplined work, contributing to the development of students' self-confidence and perseverance. As a result, students not only improve their skills but also develop a positive attitude toward problem-solving and teamwork.

Academic/Curriculum Objective connection

Reading comprehension and key information identification development

Materials and tools needed for implementation

Task sheet

Preparation notes

The storyline of the activity: The stork and the fox are organizing a birthday party, and we have been invited too. To enter the party, we must overcome various obstacles and solve the code needed for entry. If the students obtain the code, they will also get to learn the story of the stork and the fox.

Guided Questions

- How did you feel when you found out who your teammate would be?
- What did you do to get along well with your new teammates?
- Was there anything that made you feel a little unsure or nervous? What did you do then?
- How can we help each other if something unexpected happens?
- What should you do if you are having trouble solving the task?
- Is there any station on the task sheet that you don't know?

Stage Debriefing Questions (Optional)

- What was the best thing about forming groups?
- How did you feel when you talked in your team for the first time?
- What did you learn about how to be a good teammate?
- How can we help each other when we face a difficult situation?

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Tips and Tricks for dealing with stage challenges

Ways to form groups:

- Random: Code sheets are placed in sealed envelopes, and each participant draws one. The colour of the code sheet determines which team they join. In this case, we cannot influence the composition of the teams, which may cause difficulties during collaboration.
- Directed: We distribute the code sheets by name.
- For each station, students from higher grades can be selected to explain the tasks and assist the teams. It is important that the helpers pay attention to when intervention is needed and when it is better to let the teams solve problems independently.
- It is advisable to discuss the basic rules of cooperation with the groups, such as attentive listening and supporting each other.

STAGE 2 – Escape Room – Task solving

How does this develop particular SPIRIT skills

In this stage, students work in teams to complete a variety of unfamiliar tasks. They must flexibly adapt to changes in locations, task types, and unexpected situations, as well as to each other's ways of thinking and working. They do not receive immediate feedback on whether their solutions are correct, so they have to rely on their own judgment, perseverance, and the support of their teammates. This develops resilience by helping them learn to manage uncertainty and keep going even without instant confirmation. Flexibility is strengthened as they continuously adjust to the challenges of the tasks, the situations, and working together as a team.

What do we want to achieve regarding SPIRIT skill development (student understanding and/or behaviour)?

The goal is to help students become more resilient by learning how to manage uncertainty, work through challenges without immediate feedback, and rely on their team for support. Through unfamiliar and varied tasks, they develop flexibility by adjusting their thinking, behaviour, and strategies in response to new situations. By working collaboratively in a dynamic setting, students gain confidence in their problem-solving abilities, learn to stay calm in unexpected situations, and become more open to change and cooperation.

Academic/Curriculum Objective connection

- Sorting and counting elements in sets; recognizing Roman numerals; comparing object weights through measurement; grouping numbers by place value
- Developing reading comprehension and key information identification; alphabetizing words
- Developing fine motor skills; folding paper based on origami symbols
- Identifying animal body parts and understanding their role in human nutrition
- Developing problem-solving thinking, cooperation, and attention.

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Materials and tools needed for implementation

- Wide-mouth 0.5-liter plastic bottles, Chinese chopsticks bound with rubber bands at one end, and 5–10 cm pieces of yarn (each pair receives one set).
- Balance scale with clothespins at the ends / coat hanger; several paper bags of varying weights, each labelled with a different number.
- Task sheet cut into as many pieces as there are team members, coloured pencils.
- One A4 sheet of paper per student and a printed guide for the folding steps.
- Printed pictures of animals, one set per team

Preparation notes

The tasks and their related background information must be printed and displayed at each station.

Guided Questions

- What do you do when you don't know what to do next?
- How do you help each other when someone gets stuck?
- What is the hardest part of this task, and how do you try to solve it?

Stage Debriefing Questions (Optional)

- What happened when the task was different from what you expected?
- What did you do when you didn't know what the next step was?
- How did you help each other when someone got stuck?
- What was the hardest part of the task, and how did you solve it?

Tips and Tricks for dealing with stage challenges

It is important for the teams to coordinate their solutions and discuss their experiences. It is advisable to provide filler activities for waiting times, such as animal-themed colouring sheets. It is helpful to clarify in advance who they can ask for help in case of disputes or difficulties. Support can be given in more challenging situations, for example with knowledge of Roman numerals or the alphabet. Additionally, it is important to pay attention to when it is necessary to support independent problem-solving and when it is better to intervene.

STAGE 3 – Task Discussion and Activity Closure

How does this develop particular SPIRIT skills

During the discussion, students can share their experiences related to the tasks and how they solved them. This supports the development of resilience by giving them the opportunity to recognize how they dealt with difficulties, uncertainties, or failures. Reflecting on the experiences gained during the problem-solving process strengthens their self-confidence and perseverance. Flexibility is developed as children listen to each other's stories, realize that there are different ways to approach a problem, and learn how to adapt to others during future group work. Giving and receiving advice and feedback also strengthens empathy and collaboration skills.

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What do we want to achieve regarding SPIRIT skill development (student understanding and/or behaviour)?

The aim of the discussion is to help students become aware of how they experienced working together on the tasks, what strategies they used, and how they supported each other when facing difficulties. This is intended to foster the development of their resilience - that is, their ability to cope with uncertainty and challenges. It is important for them to recognize that making mistakes is allowed, and that we can learn from them.

In addition, their flexibility is also strengthened as they listen to each other's experiences, become open to different approaches, and learn how to adapt to differences that arise during teamwork. The goal is to strengthen students' self-reflection, improve their approach to challenges and cooperation, and help them respond more confidently to new or difficult situations.

Academic/Curriculum Objective connection

Reading comprehension and key information identification development.

Materials and tools needed for implementation

Computer, internet

Preparation notes

The story is available on the internet in multiple languages. The Genially activity can be edited and reused after registration. It is also possible to change the language.

Guided Questions

- Which character would you like to be friends with? Why?
- Did you invite anyone to a birthday party? How did you prepare for it?
- How did you feel when you faced difficulties during the tasks?
- What did you do if you didn't know the solution right away?
- Was there a time when you had to change your plan? How did you decide that?
- How did you react if someone thought or did the task differently than you?

Stage Debriefing Questions (Optional)

- What was the most important thing you learned about working together?
- How did you help each other to be successful as a team?
- How did it feel when you managed to get out of a difficult situation?
- What happened when the task was different from what you expected?
- What do you think you can do next time to adapt even better if a new challenge comes?

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Tips and Tricks for dealing with stage challenges

- It is worth spending time discussing the task solutions and the ideas behind them. It is important that students feel safe during the conversation, so creating a supportive and accepting atmosphere is recommended. They should be encouraged to openly share their feelings and experiences, even if these sometimes involve difficulties or uncertainties. It is good to establish a rule within the group that everyone is listened to and opinions are respected.

  If disagreements or different viewpoints arise, it is helpful to discuss them together and emphasize that diverse thinking strengthens the team. It is also beneficial if the teacher acts as a moderator, guiding the conversation towards positive experiences and how to learn and grow from challenges.

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Annexes

Pilot implementation (detailed example with lesson/activity plan), attachments

Escape Room Activity Based on the Story of The Stork and the Fox

(The story can be found online in many languages and versions. For example, in English: https://www.youtube.com/watch?v=7n538d6rHhE)

The activity takes place on school grounds. Since the children are in a familiar environment, it is enough to name the locations, but this can also be supported with a simple map. Helpers can be invited from upper grades. Each team starts at a different station. At the end, the codes must be entered in the correct order as indicated on the code sheet.
Children should have a pencil case with pencils and pens ready!

Schedule:
Group formation and motivation: 15 minutes
Task solving: 85 minutes
Closure: 20 minutes

Team Formation: with colours (red, yellow, blue, green, white)
A) Random: The code sheets are placed in sealed envelopes. Each student draws one, and the colour of the code sheet determines their team. In this case, the composition of the teams cannot be influenced, which may present challenges during collaborative work.
B) Guided: The code sheets are distributed by the teacher according to the students' names

Route sheet

Station	Location	Received code	How did you feel during this task? Color the appropriate symbol!
1.	school canteen		☺ 😐 ☹
2.	library		☺ 😐 ☹
3.	gym		☺ 😐 ☹
4.	small yard		☺ 😐 ☹
5.	reception		☺ 😐 ☹

If you have completed the tasks, please come back to the classroom!

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Stations:

1. **Eat like the stork!**

Subject Integration: Environmental Studies, Mathematics
Materials: Half-liter plastic bottles with wider mouths, Chinese chopsticks tied together at the end with a rubber band, 5–10 cm long pieces of yarn. It is recommended that each pair receives one set.
Task: The stork is a wading bird. With its long beak, it cleverly picks up small animals: insects, beetles, toads, mice, voles, lizards, snakes. In the story, it eats lunch from a bottle. Can you also get the "delicacies" out of the bottle?
Code: Count how many pieces of yarn are in the bottle!
Solution: 9

2. **Find the fox's lunch!**

Subject Integration: Mathematics, Environmental Studies
Materials: A balance scale or coat hanger with clothespins at the ends; several paper bags of different weights, each labelled with a different number
Task: The fox is a predator. Its diet mainly consists of small rodents, but it also eats insects, worms, fish, and lots of fruit in the autumn. The fox's lunch in the story is in the heaviest bag. Can you find it?
Code: The number written on the heaviest bag
Solution: 1

3. **What time is the party?**

Subject Integration: Mathematics, Visual Arts, Reading
Materials: A worksheet cut into as many pieces as there are team members, coloured pencils

A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T
X	V	X	V	X	V	X	V	X	V	IX	X	IX	X	IX	X	V	V	I	X
III	IV	I	IV	IV	IV	IV	III	X	I	IV	IV	IV	IV	I	IV	IV	IV	IV	I
V	IV	IX	IV	V	X	V	I	V	X	I	V	V	IV	X	IV	IX	I	IV	V
II	IV	I	IV	V	II	X	II	I	III	V	I	X	IV	V	IV	IX	X	IV	V
X	IV	I	IV	II	V	V	X	IV	V	V	IX	I	IV	III	IV	X	V	IV	III
V	IV	IX	IV	IV	IV	IV	III	I	X	II	IV	IV	IV	X	IV	I	III	IV	X
II	IV	I	IV	I	X	IV	II	IV	I	X	III	I	IV	V	IV	V	V	IV	V
V	IV	V	IV	V	III	IV	x	II	I	V	V	III	IV	IX	IV	II	X	IV	V
X	IV	I	IV	II	I	IV	I	V	III	I	x	I	IV	II	IV	III	I	IV	II
III	IV	I	IV	IV	IV	IV	II	X	I	IV	IV	IV	IV	I	IV	IV	IV	IV	V
IX	I	IX	V	I	V	I	I	IX	III	I	V	III	I	X	II	IX	X	II	I

A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T
X	V	X	V	X	V	X	V	X	V	IX	X	IX	X	IX	X	V	V	I	X
III	IV	I	IV	IV	IV	IV	III	X	I	IV	IV	IV	IV	I	IV	IV	IV	IV	I
V	IV	IX	IV	V	X	V	I	V	X	I	V	V	IV	X	IV	IX	I	IV	V
II	IV	I	IV	V	II	X	II	I	III	V	I	X	IV	V	IV	IX	X	IV	V
X	IV	I	IV	II	V	V	X	IV	V	V	IX	I	IV	III	IV	X	V	IV	III
V	IV	IX	IV	IV	IV	IV	III	I	X	II	IV	IV	IV	X	IV	I	III	IV	X
II	IV	I	IV	I	X	IV	II	IV	I	X	III	I	IV	V	IV	V	V	IV	V
V	IV	V	IV	V	III	IV	x	II	I	V	V	III	IV	IX	IV	II	X	IV	V
X	IV	I	IV	II	I	IV	I	V	III	I	x	I	IV	II	IV	III	I	IV	II
III	IV	I	IV	IV	IV	IV	II	X	I	IV	IV	IV	IV	I	IV	IV	IV	IV	V
IX	I	IX	V	I	V	I	I	IX	III	I	V	III	I	X	II	IX	X	II	I

Task: Do you know Roman numerals? Find all the Roman numeral IVs and colour in the correct squares! If you arrange the columns in alphabetical order, you'll find out what time the party starts.
Code: The digit in the tens place of the digital clock's minute display
Solution: 3

4. **Send the Invitation by Airplane!**

Subject Integration: Design and Technology, Mathematics
Materials: One A4 paper per child, printed instructions for folding
Task: Fold a paper airplane!
Code: The station leader will reveal the code if every child successfully folds a working airplane. (Team members may help each other but should not fold it for one another!)
Solution: 8

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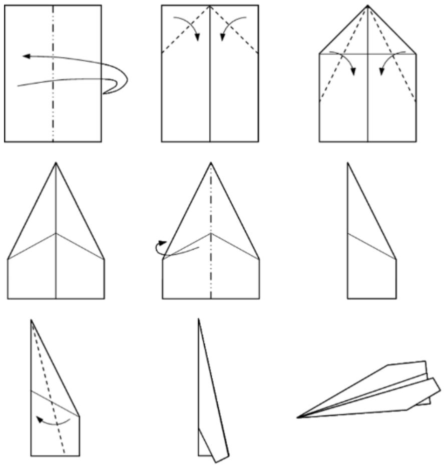
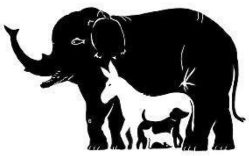


5. **Who Was Invited to the Party?**

Subject Integration: Environmental Studies, Mathematics
Materials: Printed picture



Task: Count how many animals with four legs you can see in the picture! (Optionally, the group can also talk with the station leader about these animals.)
Code: The number of four-legged animals.
Solution: 7

Time filler: If one of the teams finishes earlier, they will receive a colourable illustration related to the story.
https://www.istockphoto.com/hu/vektor/r%C3%B3ka-%C3%A9s-g%C3%B3lya-mese-illusztr%C3%A1ci%C3%B3-gyerekeknek-vicces-rajzfilmfigur%C3%A1k-gm649289912-118011323

The solution:
The teams gather in the classroom. The codes must be entered into a Genially task, which they discuss together. If the code is correct, they can watch the animated video.
After that, there is a discussion about the story and the characters' traits.

Genially: https://view.genially.com/6820a971f80d552083de1dd1/interactive-content-the-fox-and-the-stork

Evaluation of the activity:
Each group reflects on their teamwork, giving feedback, requests, and advice to one another based on the progress sheet.
Teacher's evaluation: praise and guidance given individually and to the group as a whole.

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4.2 Landscape elements

This minimum 2-hour STEAM programme is an excellent combination of science and visual art. By analysing familiar locations like their own school street or local park, students investigate how the placement of large and small objects on a ground plane creates the illusion of depth. Through "peephole" experiments and trial-and-error, students build problem-solving, resilience and flexibility skills by discovering how to manipulate perspective and scale on a 2D surface. The final collage phase fosters creativity, requiring students to make deliberate choices about horizon lines and element overlapping to build a realistic scene. By evaluating each other's work against "real-world" criteria, students practice reason based communication to explain why certain artistic choices look "real" or "impossible." It develops their critical thinking.

Basic Information Sheet

Age group	Student number	Duration	Number of stages	Subjects connection and relevance
2nd grade	Whole class (max. 30 students)	min. 2 hours	3 stages	Sciences (geography), visual arts

STEAM Event Summary

This STEAM program for children aged 6-8 combines knowledge and insights about science and visual arts. Using specific landscape elements linked to a particular environment, the street or the park, the children will make a collage in an (atmospheric) perspective. In the first phase of this Steam lesson, there is a millimetre and weight phase in which the pupils discover 2 types of landscapes according to their specific landscape elements. This is followed by a musical lesson phase in which, starting from observation of images from the children's world, they investigate the suggestion of space and the placement of elements (large/small) in the ground plane (atmospheric perspective).Finally, the pupils create a characteristic landscape (street or park) in a collage where depth is suggested by placing specific landscape elements.

SPIRIT Skill Focus

- Critical thinking
- Problem-solving
- Creativity

National curriculum Link and Objectives

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- Science Objective: students can describe a landscape using simple landscape elements.
- Art Objective: students can arrange visual elements in a spatial place in a ground plane
- Cross-disciplinary objective: students can use spatial suggestion to represent a specific landscape and its elements in a collage.

Real-world STEAM Connection and Problem definition

Children like to play in the park. However, the city or village street is something else entirely. Especially if you want to play! We live in different environments that are deliberately constructed to meet specific criteria that enable usefulness, ease of use and safety. Together with the children, we explore 2 such environments, the street and the park. In these we discover e.g. that the park is aimed at relaxation and play but also safety how to make all that possible. By looking critically at our own environment, we discover these landscape elements and clear choices in designing an environment or a landscape. After this, we want to design our own landscape by means of a collage. But how do you get all this on your drawing sheet and make sure that the landscape is right? In this Steam activity, students are also given tools to solve this problem because representing a space, a landscape on your drawing sheet is not that easy. There are many critical choices to make.

Materials at a Glance

For the Science Phase:

- pictures of 2 types of landscapes near the school

For the Art Phase:

- pictures of landscapes with focus on placing of elements in the ground plane (big/small, near/far)
- view camera

For the Application Phase:

- b/w copies of landscape elements (small/large)
- A3 drawing paper
- glue (Pritt stick)
- scissors
- HB drawing pencil, black coloured pencil/black coloured marker

Indoor/Outdoor and Classroom layout

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Indoor - in the classroom, with the possibility of working outside. This lesson can be translated to an outdoor learning lesson by making some adjustments in its structure and organisation.

Layout:

- have the students work together in islands of 4 (put the benches together 2x2).

Notes on Research-based approach and integration

This lesson appeals very much to critical thinking. And therefore, needs the student's full attention and involvement. The more the images to be discussed come from the students' immediate environment the more engaged they will remain during this lesson. The combination of scientific concepts and visual research leads to a creative final investigation in which the children were given clear criteria for solving this problem. The more your appeal back critical thinking from the students the more success they will experience in making the creative final assignment. Therefore, dare to build enough test and practice phases into your lesson so that the student arrives at a clever and own final result through trial and error and reflection.

Lesson Flow Overview (linked to details below)

Stage	Title	Brief Description	SPIRIT Skills	Duration	Link to Details
1st	**Science, landscape elements**	The teacher shows pictures of the street in which the school is located (or surrounding streets) but does not say so. Students figure out for themselves that it is the school's street. Then pictures of a park near the school are shown. • Students will react enthusiastically because they recognise these places. • Students may already tell what they do in these places and what they recognise. We are going to look at these 2 places (landscapes) in more detail so that you learn the name of everything you see here. • students are given several photos and cards with certain names on them (e.g. A row house)	• Critical thinking	40 minutes	**STAGE 1 – Science, landscape elements**

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		• students must divide the photos into 2 groups (the street and the park) and put the corresponding name in the right place on the photo. Based on what the pupils have classified, a short teaching-learning discussion follows. A blackboard diagram is drawn up making clear the difference between the two landscapes (and landscape elements). We classify to 2 categories • the street • the park The teacher introduces the concepts of landscape, landscape elements, etc. This is followed by a final control phase: students are shown 4 landscape pictures and must think "critically" whether they are correct or not. E.g. In a busy street, there is a swing in the middle: So, this is not possible? (Note: the "wrong" landscapes were created with ChatGPT)			
2nd	**Visual Arts – space, placement in the ground plane**	The teacher shows pictures again trough observation (pictures) we look for and name the visual characteristics of a landscape. But now we look not so much at the elements but at their position and distribution in the overall picture. • horizon line: the line that becomes visible where air and earth meet • Placement and characteristic of that line determine the image that we see of the landscape -e.g. Brussels Ridge- straight horizon line Mountain landscape- wavy to angular horizon line	• Critical thinking • Problem-solving	40 minutes	**STAGE 2 – Visual Arts – space, placement in the ground plane**

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<table>
<tr>
<td></td>
<td></td>
<td>Where is far and what is near in a landscape?
• how do we see that?
• Using landscape elements, we look for criteria for near/far

Emphasis on large and small figures and landscape elements that define depth in an image
Let the children specifically perceive the size of the objects in the image and compare.
What stands out?
• large figures/elements mean increasingly closer in the picture
• small figures/elements mean further away in the image
• how do we see that?

This is followed by a checking phase:
We look for other possibilities
• who is the smallest in the class?
• who is the biggest of the class?

Now, in a picture, can we make X bigger than Y?
• Introduce the peephole board (1 per group of 4)
• How?

In groups (islands, benches 2x2) students look for the picture
Teacher checks if the picture taken is correct. Students can make smaller objects appear larger than a larger object

One or more photos are shown to the class and discussed.</td>
<td></td>
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<table>
<tr>
<td>3rd</td>
<td>Creative application phase: Science and art</td>
<td>Briefly review the criteria for stage 1.
Choose now a specific landscape and find these elements in the selection of black and white copies.
divide the black and white copies (both landscapes mixed together).
Check: Is their choice of landscape correct?
Can they justify their choice?
cut out 7 different elements, at least 1 large and 1 very small
Drawing paper is distributed.
arrange your cut-out elements from large to small on your sheet of paper.
Check: is this working?
look together, validate and evaluate each other's work.
Critical thinking: is this correct?
Arrange now your cut-out elements from large to small on your sheet of paper, but with overlap (in front of and behind each other)
check: what happens to your image? Could this image be a real landscape?
Critical thinking: is this possible?
Drawing a landscape + making a collage with landscape elements
You are now going to make your own landscape!
take your sheet of paper and lay it horizontally.
We will start by dividing the sheet into two parts (teacher demonstrates all steps)
this is the horizon line</td>
<td>• Critical thinking
• Problem-solving
• Creativity</td>
<td>40 minutes</td>
<td><u>STAGE 3 – Creative application phase: Science and art</u></td>
</tr>
</table>

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		• you choose whether to place this line in the middle or at the top • you choose whether this horizon line is straight or curved The sky goes in the top section. Below that is the ground, where the small and large elements go. (See appendix, teacher also demonstrates this on the blackboard.) Now arrange your cut-out landscape elements on your sheet of paper. Remember, the large elements go at the front and the small ones at the back. The pupils arrange their landscape with their elements on their sheet of paper from near to far (atmospheric perspective). Check: is this correct? • Students check each other's work to see if it is correct. Can the image become a real landscape? Critical thinking: What was closest to your sheet/image? Feedback to blackboard diagram: • what was far away? • where do large/small landscape elements come from? Once the teacher has checked it, you can stick it onto the sheet. Then continue drawing your landscape with a pencil. The teacher walks around and asks individual pupils various questions about the process. • why are you putting that element there? • why is this large element in front? • why is the small element behind?			

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		• what kind of landscape did you choose and why? The pupils draw their landscape with a pencil or black pencil, black markers until their chosen landscape is completely visible. • They only work in black and white, no colour!			

Tips and Tricks for dealing with challenges (for the whole STEAM program)

- Leaving choices open (which landscape to choose, where and how the horizon line should run) can make the task more straightforward for the students. The fewer open choices there are, the easier the task becomes. However, it should be noted that making everything closed and not giving any freedom of choice also largely excludes critical thinking.

Difficulty level tailoring notes

- the terminology should be adapted to the student's language level. E.g. the choice of the term 'plants' over 'vegetation'.
- other landscape-shaping layers (glasses) can also be selected. E.g. water, relief, etc. The more landscape-shaping layers are applied in this assignment, the more challenging the Steam lesson becomes.
- when only natural landscapes or layers are considered, the processing material can also be adjusted. For example, only natural materials (leaves, grass, sand, pebbles, twigs, moss, soil, etc.) can be used to create a landscape. This transforms this Steam lesson to an excellent outdoor learning activity.

STEAM Program Debriefing and Reflection Questions

- What can you see in the landscape?
- Why did you choose this landscape?
- What does the landscape look like?
- What did you find difficult/easy?
- Which landscape would you like to walk around in? Why?
- Which landscapes are most clearly defined according to landscape criteria?
- Which landscape has the most depth? Why?
- Which landscape seems the most "real"? As if it could really exist. Why?

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4.2.2. Stage details and Activities Flow

STAGE 1 – Science, landscape elements

How does this develop particular SPIRIT skills

Critical thinking becomes very dominantly addressed at this stage. By moving from open-ended questions to criteria and classification, we come to the necessary conclusions. This stage develops critical thinking, problem-solving, and curiosity and openness by requiring students to separate what appears to be real from what is impossible, and to gather even basic information in order to make these decisions. Facts are established which in turn form a basis for new "proper" critical thinking. In order to ensure that this development is truly effective, teachers need to ask guiding questions and prepare lessons that revolve around "Why?" and "How?" and connect visual illusions with reality.

What do we want to achieve regarding SPIRIT skill development (student understanding and/or behaviour)?

- students can use simple landscape elements to describe a specific landscape.

Materials and tools needed for implementation

- pictures of 2 types of landscapes near the school, PowerPoint, blackboard diagram

Preparation notes

- group students into duo's, make a critical selection of pictures to be discussed.

Guided Questions

At this stage, questions should focus on helping children justify their decisions. Here are some examples of more specific guiding questions:

- Imagine you're standing here in this picture! What would you most like to do here: run around and play, or look around very carefully to make sure no car is coming?
- I can see you're all thinking about whether that object fits into the picture. Now let's play a game of detective! Find the thing in the picture that wasn't grown by nature but was made by humans, maybe so they'd have a place to live or play!
- When you look at the pictures, what things (elements of the landscape) do you see on every street that aren't there in the park?
- Can a building to live in stand in a park? Do you think we could build a real house right in the middle of the park? Why or why not?
- Does a swing stand in the middle of the street? Do you ever see a swing in the middle of the street in real life? Do you think we could put a playground where cars drive? What do you think why not?
- Do you see footpaths in a park? why yes/why not?

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Stage Debriefing Questions (Optional)

To strengthen reasoning-based problem-solving and critical thinking:

- When you sorted the pictures into "street" and "park" groups, was there an object that made you think it would fit in both places (like a bench or a tree)? How is a bench on the street different from a bench in the park?
- We saw a picture with a "mistake" where there was a swing in the middle of a busy road.
- If you were the urban planner, how would you explain why this scene isn't just "strange," but dangerous and "impossible"?
- What criteria would you use to decide whether a completely new object belongs on the street or in a park? What do you think, what is the most important factor to consider when designing parks?

Tips and Tricks for dealing with stage challenges

- the terminology should be adapted to the student's language level. E.g. the choice of the term 'plants' over 'vegetation'.
- give enough preference to open-ended questioning, students come to the necessary criteria, but ask through instead of giving the answer themselves
- give students enough opportunity and time to come up with answers
- let them observe in a focused way and name what else can be seen beyond what we observe first.

STAGE 2 – Visual Arts – space, placement in the ground plane

How does this develop particular SPIRIT skills

Critical thinking: Critical thinking becomes very dominantly addressed at this stage. By moving from open-ended questions to criteria and classification, we come to the necessary conclusions. Facts are established which in turn form a basis for new "proper" critical thinking.

Problem-solving: By disconnecting perception from specified photographs but having to take a picture themselves in which far away/small and near/large must form an application they face a problem. Can we manipulate the same in one photograph.

What do we want to achieve regarding SPIRIT skill development (student understanding and/or behaviour)?

As a result of this activity:

- The students become aware that visual and other information should not simply be accepted, but must be consciously analysed and evaluated based on established rules.
- Based on their visual experiences, they become aware that people can be tricked, and therefore they must evaluate the information they receive.
- They understand the importance of cause-and-effect relationships, which help them recognize when the information available or received is misleading.

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Academic/Curriculum Objective connection

- Describing space and the location of objects in space using space concepts. (big/small, near/further away)
- Create an image (2D or 3D) by consciously placing objects in space

Materials and tools needed for implementation

- PowerPoint with photos, blackboard diagram, peephole board.

Preparation notes

- PowerPoint, peephole board (1 each group).

Guided Questions

- Where are small and large elements in the picture?
- Is the small element really smaller than the large object in the same picture? (E.g. same kind of cars)
- Why is this?
- Does a clear line stand out in a landscape?

Stage Debriefing Questions (Optional)

- When you looked through the peephole board, how were you able to tricks your eyes? How was it possible to make a smaller object appear larger than an object that was originally larger? Do you think it's possible to trick people this way in other situations? How do you think this can be avoided or prevented?
- We've seen that the horizon line separating the sky from the earth is straight. What would happen to the image if we didn't draw the horizon line straight, but instead in a zigzag or wavy pattern? What kind of landscape would that represent instead of an urban street? Would it improve our mood, or would it have the opposite effect? Can we be tricked in this way into feeling better or worse in a given situation than we would in reality?
- If something on your paper is very small, how can we know that in reality it isn't small, but rather a normal-sized object that's just very far away? What do you think we need to consider in order to decide this?

Tips and Tricks for dealing with stage challenges

- The structure of this stage is largely the same as the science stage. Crucial here is again to choose images that the children recognise from their own environment but also other images that also play with the (atmospheric) perspective in a funny way. E.g. a zoomed-in nose of a cow in the park's farm.
- Dwell sufficiently on perceiving the size of the objects in the image. If possible, also outline the objects in the picture to make perception more focused for the children and show them clearly that size depends on placement in the picture
- If necessary, you can just point out the objects large and small and their placing. The horizon line gives a foothold in the image for placing but it is not always clearly perceptible and therefore clear in a cityscape.

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STAGE 3 – Creative application phase: Science and art

How does this develop particular SPIRIT skills

Problem-solving and critical thinking:

Stage 3 is designed in such a way that students must put the knowledge they have acquired in the previous stages (1 and 2) into practice. Without critical thinking, they cannot solve this problem, which involves organising a specific landscape with its own elements into a perspective. It is about making problem-solving thinking explicit and at the same time giving them the tools to form their own answers. This is done in the form of a collage design. Further elaboration through drawing gives them even more opportunities to finish this creatively. Because their own input and the chance of success are high, you automatically have the involvement and motivation of the students in this Steam lesson.

What do we want to achieve regarding SPIRIT skill development (student understanding and/or behaviour)?

As a result of this activity:

- The students are able to verbally explain their visually-based decisions, responding to questions from the teacher or classmates about why they placed a large or small landscape element in a particular spot. (reason-based decision making)
- The student is able to observe, review, and evaluate the work of their peers, deciding and arguing whether a given artwork depicts a “real” landscape.(Critical thinking)
- They are able to thoughtfully assess their choices and their consequences for the final visual result. In this way, their problem-solving thinking becomes explicit (consciously articulated and visible) in practice.

Academic/Curriculum Objective connection

- Design a landscape using simple landscape elements (e.g. meadows, trees, houses, streets, squares, parks, rivers, forests, factories, etc.).
- Describing the space and the location of objects in space using spatial concepts (large/small, near/far).
- Creating an image (2D or 3D) by consciously placing objects in space.
- Using spatial suggestion in 2D: using a horizon in a visual work

Materials and tools needed for implementation

- black and white copies, scissors, A3 drawing paper, glue, drawing pencil, black pencil and/or marker, blackboard diagram.

Preparation notes

This section aims to develop the given SPIRIT skills through the completion of a complex task (cutting, scaling, masking, gluing, drawing). Teacher preparation (both required materials and conceptual) should focus here on preventing cognitive overload and on step-by-step checking.

- Preparing visual contrasts: When printing black-and-white landscape elements, ensure that the size differences are extreme (very small cars/trees and very large cars/trees). If the difference is too small, 7-year-olds will not perceive spatial depth.

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- Rules for gluing: Lay out the pieces and agree on the rules for gluing: students may initially only arrange the cut-out elements on the sheet. They may only glue them down once the teacher or their peers have checked the perspective (large shapes in front, small shapes in back). This promotes trial-and-error-based problem-solving.
- Demonstration of the Horizon Line: During the discussion of the blackboard diagram, do not show a finished picture. Present it step by step: draw a line and ask which part is the sky and which is the ground. Place a small and a large shape on the board and ask the class if they are in the right places, engaging them in critical thinking even before the activity begins.
- Setting up workstations: Arrange the desks into 2x2 "islands." Set up the space so that students can observe how the person sitting across from them is constructing the landscape.

Guided Questions

- I see you placed this [name the shape] right here, in this spot. Tell me, what's going to happen in this part, and why is this the absolute best spot for it in your landscape? (why are you putting that element there?)
- Look, this huge shape is right in front of our noses—it's practically jumping off the page! If I wanted to walk right into your picture right now, how would you explain to me why this thing looks so big here at the bottom of the page? (why is this large element in front?)
- You placed that tiny figure far away. Imagine if we wanted to walk from the bottom of the page all the way over there! Do you think it would take a long time to get there? How does this small figure help make your landscape seem very deep and distant? (why is the small element behind?)
- If we could magically step into your drawing right now, where would we find ourselves: on a bustling street or in a peaceful park? What was the first thing you chose that made you decide to build this particular world? (what kind of landscape did you choose and why?)

Stage Debriefing Questions (Optional)

- When you looked at each other's creations at the very end, how were you able to decide whether a landscape looked "real" or if there was something "impossible" about it? What common rule did you have in mind regarding the large and small paper shapes that helped you make that decision?
- Everyone received the same black-and-white shapes, yet you arranged them differently in front of and behind (overlapping) each other. If someone were to ask you now why you arranged your landscape exactly the way you did, how would you argue that the your final decision solution is the best?
- Was there a moment while you were arranging things when you placed a form on the paper, but when you took a closer look, you realized, "Oops, this looks really weird!"? What was that, and how did you correct your own idea all by yourself, before you even reached for the glue?
- If tomorrow we had to take a picture of our friends in the yard with a real camera in such a way that one of them looks giant and the other looks very small, how would we actually use the trick we figured out today with the paper shapes?

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Tips and Tricks for dealing with stage challenges

- Allow the children to consider the sizes of their cut-out elements by letting them experiment with their landscape image. Therefore, allow them to lay out the sizes and variations before they continue working on their own pieces.
- Encourage them to observe how other groups create and develop their landscapes and consistently engage their critical thinking skills. Encourage them to carefully consider their choices and their consequences.
- Limiting or increasing the number of elements to be cut out makes the assignment easier or more difficult. Adjust this to suit your class.

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4.3 STEAM-ing Ice-Cream

This minimum 90-minute STEAM project helps 2nd-grade students develop problem-solving and flexibility as they turn liquid ingredients into ice cream without a machine. Through a "shake-freeze-pass" process, children build connectedness and teamwork by rotating roles and supporting each other during the experiment. Students sharpen their reasoned based thinking by observing how temperature and motion change materials, adjusting their strategy if the mixture does not freeze evenly. The session concludes with a reflection where teams evaluate their collaboration and suggest improvements for future scientific trials.

Basic Information Sheet

Age group	Student number	Duration	Number of stages	Subjects connection and relevance
2nd grade students	12-14 students in small groups	minimum 90 minutes	5 stages	natural sciences (states of matter, temperature change), Social-Emotional Learning

STEAM Event Summary

This session playfully introduces children to scientific observation as they watch a liquid turn into ice cream. Teachers guide the critical shaking phase using a "musical statues" game, which helps manage energy levels and ensures a fair, peaceful rotation of roles within the team. Alongside science concepts like cooling and states of matter, students practice hygiene and care for their peers' food allergies. It is highly recommended to choose this activity because it teaches cause-and-effect relationships through the creation of a highly appealing, everyday treat. Furthermore, the delicious, instant result guarantees enthusiasm and naturally builds strong teamwork among the students.

SPIRIT Skill Focus

- Connectedness
- Valuing people and nature
- Sense of wonder / Curiosity / Openness

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Complementary/Secondary SPIRIT Skill(s)

- Flexibility
- Problem-solving

National curriculum Link and Objectives

- Observe and describe a change of state (liquid → semi-solid) through cooling and mixing.
- Understand in a simple way that ice + salt gets colder and helps freezing happen.
- Practice basic measuring (cups/spoons) and following a sequence safely.
- Build vocabulary: freeze, melt, shake, cold, mix, teamwork, share, experiment.
- Explore cause–effect: shaking, spreading, time, and temperature impact results.

Real-world STEAM Connection and Problem definition

Real-world connection (student perspective): People can make ice cream without a machine by using cold + movement. Scientists and chefs both test ideas, observe changes, and improve their method step by step.
Problem definition (students' perspective, age-specific):
"How can our team work together to turn a liquid mixture into ice cream using ice, salt, and shaking - and how can we solve problems and change our strategy if it doesn't freeze evenly?"

Materials at a Glance

- Vegan ice cream base per team: plant-based milk, plant-based cream, sugar, vanilla essence, pinch of salt
- Measuring cups/spoons, small bowls, whisk/spoon
- 1 small zip-top bag (ingredients) + 1 larger zip-top bag (ice/salt bath) per team
- Ice and rock salt (or coarse salt)
- Towels (for shaking + protecting hands)
- Sprinkles/sauces or safe toppings
- Music player for "musical statues"
- Allergy/sensitivity checklist + hygiene materials
- Cups/spoons for sharing, bin, cleanup cloths

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Indoor/Outdoor and Classroom layout

- Central gathering spot for intro, safety, allergy check
- Team tables/floor areas for measuring and bag setup
- Open space for the "musical statues" shaking (indoors or shaded outdoors in mild weather)
- Decoration + cleanup station.

Notes on Research-based approach and integration

In this activity, children explore a familiar real-life phenomenon - ice cream freezing - through playful scientific inquiry and teamwork. They begin by predicting what will happen when a liquid mixture is placed in a very cold ice-and-salt bath, drawing on everyday experiences with melting and freezing. Then, they test their ideas by measuring ingredients, sealing bags carefully, and shaking in a structured routine that allows observation and comparison.

This follows a simple research cycle: students predict, test, and observe how cold and motion change materials, then adjust their approach when problems appear (uneven freezing, weak mixing, cold hands, leaks). They also connect science learning to values by practicing care for people (allergies, fairness, hygiene) and care for nature (plant-based ingredients, minimizing waste, cleaning up). The result is immediate and meaningful: students experience how curiosity, cooperation, and smart strategy lead to a shared outcome.

Lesson Flow Overview (linked to details below)

Stage	Title	Brief Description	SPIRIT Skills	Duration	Link to Details
1st	**Intro and Team Mission**	Students do a quick pair-share about favourite cold treats, then hear the mission: make ice cream without a machine. They review hygiene/allergies and make a class "scientist promise" to work safely and kindly.	• Connectedness • Curiosity • Valuing people and nature	15 minutes	**STAGE 1 – Intro and Team Mission**
2nd	**Plan, Measure and Set Up (Research/Design)**	Teams follow picture recipe cards to measure and mix ingredients, seal the inner bag, and prepare the ice-and-salt bath. They assign roles and solve setup problems (spills, sealing, missing tools).	• Problem-solving • Valuing people and nature • Connectedness	20 minutes	**STAGE 2 – Plan, Measure and Set Up (Research/Design)**

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3rd	**Shaking Experiment (Musical Statues)**	Teams wrap the bags in towels and play musical statues: shake → freeze → pass. They observe changes and adjust strategy (spreading mixture thin, steadier shaking, switching roles) to freeze more evenly	• Flexibility • Connectedness • Curiosity • Problem-solving	20-25 minutes	[**STAGE 3 – Shaking Experiment (Musical Statues)**]
4th	**Taste, Decorate and Share (Analysis and Conclusion)**	Students open the inner bag, scoop the ice cream, decorate, and share fairly. They describe the change from liquid to ice cream and name how their team helped the result happen.	• Valuing people and nature • Connectedness • Curiosity	10 - 15 minutes	[**STAGE 4 – Taste, Decorate and Share (Analysis and Conclusion)**]
5th	**Reflection and "Next Time" Ideas**	Teams reflect on what worked, what problem they solved, and what they would change next time. They end by sharing one new wonder-question to explore later.	• Curiosity • Flexibility • Problem-solving • Connectedness	15 minutes	[**STAGE 5 – Reflection and "Next Time" Ideas**]

Tips and Tricks for dealing with challenges (for the whole STEAM program)

- **Challenge:** Bags leak/spill.
  Tip: Double-seal and do a "squeeze test" over a bowl before shaking; keep backup small bags ready.
- **Challenge:** Cold hands.
  Tip: Always wrap in towels; rotate shakers frequently; allow an observer/coach role for short turns.
- **Challenge:** Unequal participation.
  Tip: Use rotating role cards: measurer, mixer, sealer-checker, shaker, observer-encourager.
- **Challenge:** Mixture freezes unevenly.
  Tip: Flatten/spread the inner bag often and keep ice packed around it; shake steadily rather than wildly.
- **Challenge:** High energy during musical statues.
  Tip: Practice one round without bags first; keep music bursts short; teach "freeze like a statue" rule.

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Difficulty level tailoring notes

- **Beginner learners:**-Pre-measure ingredients; use picture cards; use verbal observation prompts instead of writing.
- **Intermediate learners:** Students measure themselves and explain “cold + shaking” in their own words.
- **Advanced learners:**-Compare two conditions (e.g., spread thin vs. not spread; longer shaking vs. shorter) and vote on which strategy worked best and why.)

STEAM Program Debriefing and Reflection Questions

- Where did you show connectedness today - how did you help your team?
- How did you practice valuing people and nature (allergies, hygiene, fairness, cleanup, not wasting)?
- What gave you the biggest sense of wonder - what surprised you about the change?
- When did you need flexibility - what did you change when something wasn’t working?
- What problem did your team solve, and how did you solve it?

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4.3.2. Stage details and Activities Flow

STAGE 1 – Intro and Team Mission (Connect)

How does this develop particular SPIRIT skills

- Builds connectedness by helping students share personal ideas, listen to a partner, and feel part of a shared team mission
- Sparks sense of wonder/curiosity by inviting children to predict how “cold + shaking” could transform a liquid into ice cream
- Reinforces valuing people and nature by setting allergy-aware, hygienic, and respectful rules before touching materials.

What do we want to achieve regarding SPIRIT skill development (student understanding and/or behaviour)?

As a result of this activity, students will be able to:

- Connectedness: share an idea with a partner, listen respectfully, and use kind team language (“We can do it together”).
- Curiosity / wonder: say one “I wonder…” or prediction about what will happen to the mixture when it gets very cold.
- Valuing people and nature: follow one safety/hygiene rule that protects others (allergies, clean hands) and respects ingredients.
- Sense of wonder: express curiosity about how these teamwork habits will help them succeed in the bubble mission for the community.

Academic/Curriculum Objective connection

Introduces state change and sets an observation mindset.

Materials and tools needed for implementation

Visual aid (liquid → ice cream), team assignment cue, allergy checklist.

Preparation notes

Prepare simple visuals; confirm allergies; group students into teams.

Guided Questions

- “What do you think will happen when our mixture gets very cold?”
- “How will we work as a kind, fair team today?”
- “What rule keeps everyone safe and included?”

Stage Debriefing Questions (Optional)

- “What are you most curious about right now?”

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Tips and Tricks for dealing with stage challenges

- **Challenge:** Some students don't speak.
  Tip: sentence starters ("My favourite...", "I wonder...").
- **Challenge:** Students rush safety.
  Tip: "Science pause" - no materials until rules are repeated.

STAGE 2 – Plan, Measure and Set Up (Research/Design)

How does this develop particular SPIRIT skills

- Develops problem-solving as students follow a sequence, measure carefully, and fix setup issues (sealing, spills, missing tools)
- Reinforces valuing people and nature through careful ingredient use (no waste), hygiene, and respecting dietary needs
- Builds connectedness by sharing roles and helping teammates succeed with accuracy and patience.

What do we want to achieve regarding SPIRIT skill development (student understanding and/or behaviour)?

As a result of this activity, students will be able to:

- Problem-solving: follow a step-by-step recipe plan and solve one setup problem (seal better, clean spill, re-measure) without giving up.
- Valuing people and nature: measure carefully to reduce waste and follow allergy-safe and hygiene routines.
- Connectedness: cooperate in roles (measurer, mixer, checker) and support a teammate when a step is tricky.

Academic/Curriculum Objective connection

Measuring + preparing the experiment environment for cooling/freezing.

Materials and tools needed for implementation

Measuring tools, bowls, whisk/spoon, small and large zip-top bags, ice, salt, towels.

Preparation notes

Picture recipe cards, adult demonstrates sealing, supplies ready per team.

Guided Questions

- "How many spoons/cups did you add?"
- "How can you check if your bag is sealed safely?"
- "What will you do if something spills?"

Stage Debriefing Questions (Optional)

- "What helped your team stay accurate and calm?"

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Tips and Tricks for dealing with stage challenges

- **Challenge:** Measuring confusion.
  Tip: pre-marked scoops or quantity picture cards.
- **Challenge:** Leaks.
  Tip: double-bag the inner bag; do a quick squeeze test over a bowl.

STAGE 3 – Shaking Experiment with Musical Statues (Design and Research)

How does this develop particular SPIRIT skills

- Builds flexibility as teams adjust their method when freezing is uneven (spread thinner, change shaking style, switch roles)
- Strengthens connectedness through fair turn-taking, encouragement, and shared rhythm during the shake–freeze–pass routine
- Sparks curiosity/sense of wonder as students watch the mixture change step-by-step and ask “What’s happening now?”
- Develops problem-solving by identifying what isn’t working and choosing one improvement to test next.

What do we want to achieve regarding SPIRIT skill development (student understanding and/or behaviour)?

As a result of this activity, students will be able to:

- Flexibility: try a new strategy when the first approach doesn’t work well (spread the bag, shake steadier, rotate turns faster).
- Connectedness: take turns fairly, encourage teammates, and follow shared game rules without conflict.
- Curiosity / wonder: describe at least one observed change inside the bag over time (thicker edges, icy bits, softer middle).
- Problem-solving: name one problem (too runny, too cold hands, uneven freezing) and choose one solution to test.

Academic/Curriculum Objective connection

Experience state change and connect it to temperature, movement, and time.

Materials and tools needed for implementation

Prepared bags, towels, music player.

Preparation notes

Practice one round without bags; short music bursts; “gentle scientist shake” demo.

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Guided Questions

- "What do you notice changing inside the bag?"
- "What is one small change your team can try next?"
- "How can you make sure everyone gets a turn?"

Stage Debriefing Questions (Optional)

- "What strategy helped your team most, and why?"

Tips and Tricks for dealing with stage challenges

- **Challenge:** Too wild shaking.
  Tip: model gentle shaking; assign a safety monitor.
- **Challenge:** Cold discomfort.
  Tip: thicker towels, faster rotation, optional observer turn.

STAGE 4 – Tasting, Decorating and Sharing (Analysis and Conclusion)

How does this develop particular SPIRIT skills

- Reinforces valuing people and nature through fair sharing, hygiene, allergy respect, and appreciation of plant-based ingredients
- Builds connectedness by celebrating together, using kind language, and noticing each other's contributions
- Keeps curiosity/sense of wonder alive by connecting the tasty outcome to the scientific change they just observed.

What do we want to achieve regarding SPIRIT skill development (student understanding and/or behaviour)?

As a result of this activity, students will be able to:

- Valuing people and nature: share safely and fairly, follow hygiene rules, and show respect for dietary needs and ingredients.
- Connectedness: say one kind or grateful sentence to a teammate ("Thank you for…") and celebrate team effort.
- Curiosity / wonder: describe the "before and after" change using simple science words (liquid → thicker → ice cream).

Academic/Curriculum Objective connection

Reinforces observation and cause–effect with a real sensory result.

Materials and tools needed for implementation

Toppings, cups/spoons, prompt cards.

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Preparation notes

Hygienic sharing protocols; pre-portion toppings; separate spoons.

Guided Questions

- "How did it change from the start?"
- "What helped it freeze best?"
- "How did your team help each other?"

Stage Debriefing Questions (Optional)

- "What would you try differently next time?"

Tips and Tricks for dealing with stage challenges

- **Challenge:** Texture not perfect.
  Tip: celebrate learning; compare "soft serve" vs. "hard."
- **Challenge:** Cross-contamination risk.
  Tip: single-serve cups/spoons; clear allergy labelling.

STAGE 5 – Reflection and Closure (Further Investigation)

How does this develop particular SPIRIT skills

- Deepens curiosity/sense of wonder by turning the experience into new questions and "next experiments"
- Builds flexibility by helping students think about how they would change their strategy next time
- Develops problem-solving through naming what went wrong/right and choosing one improvement
- Reinforces connectedness by sharing reflections and appreciating teammates' efforts.

What do we want to achieve regarding SPIRIT skill development (student understanding and/or behaviour)?

As a result of this activity, students will be able to:

- Curiosity / wonder: share one new "I wonder…" question about freezing, shaking, or ingredients.
- Flexibility: suggest one strategy change they would try next time and explain why.
- Problem-solving: identify one problem their team faced and describe the solution they used (or would use).
- Connectedness: name one helpful team behaviour they saw and thank a teammate for it.

Academic/Curriculum Objective connection

Encourages further investigation and iteration mindset.

Materials and tools needed for implementation

Reflection sheet or sticky notes; sentence stems.

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Preparation notes

Keep it brief; provide stems: “Next time I would…”, “I noticed…”, “I wonder…”.

Guided Questions

- “What would you change to make it freeze faster?”
- “What problem did you solve today?”
- “What are you still wondering about?”

Stage Debriefing Questions (Optional)

- “What surprised you the most today?”

Tips and Tricks for dealing with stage challenges

- **Challenge:** Kids can’t think of a new idea.
  Tip: offer option cards (time, shaking, spreading).
- **Challenge:** Reflections stay vague.
  Tip: require one skill word in the answer (connectedness / valuing / curiosity / flexibility / problem-solving).

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4.4 Emotion Builders

This 2-hour STEAM program for 2nd-grade students uses building materials to turn abstract feelings into visible, physical structures. Through sketching and construction, children learn basic engineering principles like balance and symmetry to represent different moods. The project develops emotional awareness and empathy as students share personal stories and listen to their peers' experiences. Working in small groups strengthens flexibility and problem-solving, as teams must adapt their designs to work with recycled materials. The activity concludes with presentations and reflection, helping students build confidence in communicating complex emotions through art and design.

Basic Information Sheet

Age group	Student number	Duration	Number of stages	Subjects connection and relevance
2nd grade students	Whole class Groups of 3–4 students	minimum 2 hours	7 stages	Science, Art, Engineering

STEAM Event Summary

This session fosters a safe and accepting classroom environment, empowering children to translate feelings that are hard to describe with words into visual shapes and colours. Educators guide students through a design thinking process, taking them from identifying emotions and sketching to the actual physical construction. This project is highly recommended for teachers because the creative process allows even those students who struggle with verbal communication to express themselves confidently and without anxiety. Meanwhile, as children test their resilience by working with imperfect, recycled materials, they naturally learn to listen without judgment and accept the diverse emotional experiences of their peers.

SPIRIT Skill Focus

- Flexibility
- Creativity
- Emotional awareness, regulation and communication
- Empathy

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National curriculum Link and Objectives

- Learn basic engineering principles (balance, symmetry, design).
- Practice observation and problem-solving while building

Real-world STEAM Connection and Problem definition

In everyday life, emotions are expressed not only through words but also through gestures, objects, colours, and forms. For example, children often struggle to express their feelings verbally, but they might build a messy room when feeling chaotic, or a tall tower when excited. This activity transforms that intuitive language into a shared, conscious process. The challenge: "Can we build something that represents how we feel?" arises from their lived experience and gives them the tools to make emotions visible and discussable.

Materials at a Glance

- Wooden blocks, LEGO, magnetic tiles, or recycled materials (cardboard, tubes, bottle caps)
- Colourful paper or fabric strips
- Basic drawing tools (markers, crayons)
- Emotion cards or face icons
- Tape and glue

Indoor/Outdoor and Classroom layout

Indoor Setting: preferably a large room or classroom corner where children can move around freely and access building materials.
Layout: Organize the room with clearly defined areas:

- A building zone with all construction materials sorted in boxes or trays.
- A display area where finished emotional structures can be observed and discussed.

A reflection corner with cushions or chairs and emotion cards to help children identify feelings before building.

The layout should promote autonomy and collaboration, with free access to materials and enough room to create without constraints.

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Notes on Research-based approach and integration

This activity encourages children to approach the task like young researchers. As they build their emotional structures, they are invited to observe and reflect on the connections between colours, shapes, and emotions they encounter in everyday life. Through guided questions, they formulate hypotheses such as "What shape might represent anger?" or "Does yellow always mean happiness?" and test them through the design process. The activity integrates emotional reflection with design thinking, inviting children to connect emotional experiences from home, school, or their environment with their creative construction choices.

Lesson Flow Overview (linked to details below)

Stage	Title	Brief Description	SPIRIT Skills	Duration	Link to Details
1st	**Emotion Circle Warm-up**	The activity begins with a group circle to introduce the core emotional vocabulary and to start building a safe and expressive group climate. Children sit in a circle with the teacher. An illustrated chart shows 5–6 basic emotions (e.g., happy, sad, scared, angry, calm, excited). The teacher points to each and says: “Can you think of a time when you felt…?” Students share short stories or examples	• Emotional awareness and communication • Empathy	15 minutes	STAGE 1 – Emotion Circle Warm-up
2nd	**Group formation + Emotion Card assignment**	Students are divided into small groups, and each group is given a card with a randomly assigned emotion. This step sets the structure for collaborative work throughout the activity. The teacher divides the class into small groups (3–5 students each), ensuring a mix of personalities. Each group receives a card showing an emotion from the warm-up circle.	• Emotional awareness and communication • Empathy	10 minutes	STAGE 2 – Group formation + Emotion Card assignment

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3rd	**Sharing personal experiences and brainstorming emotional expressions**	Each group discusses the emotion they received. Students are invited to share personal stories connected to that emotion, using drawing or sentence starters to support expression and inclusion. Students sit in small groups and talk about a time when they felt the assigned emotion. They can: • Share short personal stories using sentence starters like "I felt ___ when ___" • Draw the moment they are remembering • Use simple emotion vocabulary or emojis as prompts if needed	• Emotional awareness and communication • Empathy	20 minutes	**STAGE 3 – Sharing personal experiences and brainstorming emotional expressions**
4th	**Sketching and planning an emotional structure**	Each group begins designing their "Emotion Tower." They reflect on how to visually represent the assigned emotion using shapes, colours, height, and balance. This stage supports the transition from abstract feeling to concrete form. Groups sit together with paper and markers to: • Brainstorm how their tower will visually represent their emotion • ketch their design ideas • Discuss features like height (tall/low), shape (sharp/round), balance (stable/unstable), colour (bright/dark) • Make simple choices about materials and structure.	• Emotional awareness and communication • Empathy • Creativity	15 minutes	**STAGE 4 – Sketching and planning an emotional structure**
5th	**Emotion Tower construction**	Students use recyclable materials to bring their group's "Emotion Tower" design to life. They collaborate, adapt their plans, and reflect together during the building process. • Students gather around a workspace with their materials • They start constructing the structure based on their sketch • Some students build, while others support or guide based on the group plan • Adults circulate to observe, ask questions, and support discussions on emotions and teamwork.	• Emotional awareness and communication • Empathy • Creativity • Flexibility	30 minutes	**STAGE 5 – Emotion Tower construction**

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6th	**Group presentations of Emotion Towers**	Each group presents their Emotion Tower to the class, explaining which emotion they represented, how they expressed it through the structure, and sharing some stories or thoughts discussed during the design process. • Groups stand by their towers and take turns presenting • Each member may speak about a different aspect: the emotion, the design choices, or the personal stories • The class listens and may ask questions or give feedback.	• Emotional awareness and communication • Empathy	15-20 minutes	**STAGE 6 – Group presentations of Emotion Towers**
7th	**Final reflection circle**	Children gather in a circle to reflect on the activity. They are invited to share what they discovered about their own emotions and how listening to others helped them better understand their classmates. • Students sit in a circle, possibly with the emotion towers around them • Each child is invited to share a thought, feeling, or learning from the experience • A soft object (e.g., talking stick) can be used to take turns.	• Emotional awareness and communication • Empathy	10-15 minutes	**STAGE 7 – Final reflection circle**

Tips and Tricks for dealing with challenges (for the whole STEAM program)

To support the children throughout the lesson, it's helpful to:

- Create a calm, welcoming atmosphere so everyone feels safe to share their thoughts.
- Use emotion cards or a visual chart to help children identify and name their feelings.
- Offer a short demonstration to inspire those unsure where to start building.
- Ask open-ended questions such as, "What does this shape remind you of?" to spark curiosity and reflection.
- Let students pair-share before whole group discussions to lower anxiety and support communication.
- Be flexible - if energy drops, introduce a quick movement break or switch to drawing to keep engagement high.

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Difficulty level tailoring notes

- **Beginner learners:** Provide a set of pictures/situations that represent emotions to help with identification. Allow building first, then storytelling.
- **Advanced learners:** Invite children to explore emotional intensity (e.g., how would a “very angry” tower differ from a “slightly annoyed” one?). Let them build more abstract representations
- **Expert learners:** use more subtle and sophisticated emotions (e.g. jealousy). Think together about situations where multiple towers can coexist.

STEAM Program Debriefing and Reflection Questions

- How did it feel to build something that showed how you feel?
- What part of your tower best expresses your group’s emotion?
- What did you discover about your teammates’ feelings?
- What can we do to better understand others’ emotions in class?

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4.4.2. Stage details and Activities Flow

STAGE 1 – Emotion Circle Warm-up

How does this develop particular SPIRIT skills

- Promotes emotional awareness by prompting children to recall and name personal emotional experiences
- Encourages attentive listening and mutual respect
- Fosters a safe emotional environment that supports later teamwork and creativity.

What do we want to achieve regarding SPIRIT skill development (student understanding and/or behaviour)?

- Students become more confident expressing emotions in front of peers
- Students begin to recognize emotions in others by listening to shared examples
- The group begins to build trust and emotional openness.

Academic/Curriculum Objective connection

- Language: practicing oral expression and storytelling
- Citizenship: learning respectful listening and empathy in group settings.

Materials and tools needed for implementation

- Emotion chart with images/icons (can include weather/colour metaphors)
- A soft item (e.g., plush ball) to pass around when speaking.

Preparation notes

- Prepare a visible and clear emotion chart
- Arrange the space in a circle
- Practice a few examples in advance to model sharing

Guided Questions

- When did you last feel this emotion?
- What did your face or body feel like at that moment?
- What helped you feel better (or stay with) that feeling?

Stage Debriefing Questions (Optional)

- How does it feel to talk about emotions in a group?
- Did you learn something new about a classmate today?

Tips and Tricks for dealing with stage challenges

- Some children may feel shy – let them pass or give the option to just point to an emotion
- Model vulnerability with a personal example to open the space
- Keep the rhythm going by using a soft object to signal who speaks next.

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STAGE 2 – Group formation + Emotion Card assignment

How does this develop particular SPIRIT skills

- Students will collaborate on understanding one emotional concept deeply
- They will begin to recognize that emotions can be experienced in different ways
- They start sharing roles and responsibilities in a respectful and inclusive way.

What do we want to achieve regarding SPIRIT skill development (student understanding and/or behaviour)?

As a result of this activity,

- Students will collaborate on understanding one emotional concept deeply
- They will begin to recognize that emotions can be experienced in different ways
- They start sharing roles and responsibilities in a respectful and inclusive way.

Academic/Curriculum Objective connection

- SEL: Identifying and exploring core emotions
- Citizenship: Practicing inclusive group work
- Language/Art: Preparing for expressive tasks based on shared content.

Materials and tools needed for implementation

- Emotion cards (with name, icon, and possibly colour cues)
- Pre-made list or chart for assigning students to groups.

Preparation notes

- Print and laminate emotion cards
- Consider student dynamics when forming groups
- Optionally let students draw cards for added engagement.

Guided Questions

- Have you ever felt this emotion?
- What do you already know about it?
- How might this emotion look different for different people?

Stage Debriefing Questions (Optional)

- How did your group start talking about the emotion?
- Did you all have similar experiences, or were they different?

Tips and Tricks for dealing with stage challenges

- If students struggle to engage, offer optional sentence starters
- Ensure all students have a voice - consider assigning rotating mini-roles if helpful
- Choose simple, relatable emotions for younger groups.

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STAGE 3 – Sharing personal experiences and brainstorming emotional expressions

How does this develop particular SPIRIT skills

- Develops empathy through peer listening
- Supports emotional awareness by making private feelings visible and shareable
- Strengthens collaboration through respectful storytelling.

What do we want to achieve regarding SPIRIT skill development (student understanding and/or behaviour)?

As a result of this activity,

- Students learn to recognize and name their own emotional experiences
- They practice expressing feelings clearly and listening to others without judgment
- They explore how one emotion can feel different to different people.

Academic/Curriculum Objective connection

- Language: Using personal narrative and sentence structures
- Visual arts: Expressing feelings through symbolic drawing.

Materials and tools needed for implementation

- Emotion sentence starters on cards
- Blank paper and coloured pencils
- Emoji/emotion posters for extra support.

Preparation notes

- Prepare differentiated supports for younger students or multilingual learners
- Offer the option of storytelling, drawing, or both
- Ensure psychological safety by reinforcing norms of respectful listening.

Guided Questions

- What does this emotion feel like in your body?
- What kind of situations usually make you feel this way?
- How would you describe this emotion to a robot or alien who doesn't understand feelings?

Stage Debriefing Questions (Optional)

- Did your group find similar stories or very different ones?
- Was it easy or hard to share a story about this emotion?

Tips and Tricks for dealing with stage challenges

- Allow students to pass if they don't feel ready to share
- Validate all stories as important, no matter how big or small
- Give examples or model your own short story if needed.

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STAGE 4 – Sketching and planning an emotional structure

How does this develop particular SPIRIT skills

- Enhances emotional awareness by thinking deeply about how feelings can be represented physically
- Builds communication and decision-making skills through group planning
- Encourages creative thinking and symbolic reasoning.

What do we want to achieve regarding SPIRIT skill development (student understanding and/or behaviour)?

As a result of this activity,

- Students understand that emotions can be expressed in non-verbal, creative ways
- They explore how shapes, balance, and colours reflect inner states
- They learn to work as a team to plan and agree on a shared goal.

Academic/Curriculum Objective connection

- Visual arts: Exploring elements of design (line, shape, colour, texture)
- Language: Describing intentions and choices.

Materials and tools needed for implementation

- Large paper for sketching
- Coloured pencils or markers
- Emotion cards as visual reference.

Preparation notes

- Encourage all group members to contribute ideas
- Offer visual prompts (e.g., sample towers, colour/emotion charts)
- Support students who may struggle with visual imagination through discussion or gesture.

Guided Questions

- What shape best fits this emotion?
- Would this emotion be a tall or short structure?
- What colours match how it feels?
- How can you show balance or imbalance?

Stage Debriefing Questions (Optional)

- Was it easy to agree on a design?
- Did anyone in the group have a different idea of what the emotion should look like?

Tips and Tricks for dealing with stage challenges

- Remind students that there are no “wrong” designs – all ideas are valid
- Step in to help groups that are stuck by prompting with “What if…” ideas
- Use emojis or emotion posters to support fewer verbal students

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STAGE 5 – Emotion Tower construction

How does this develop particular SPIRIT skills

- Strengthens teamwork, communication, and compromise
- Encourages creativity and emotional expression in a hands-on context
- Promotes perseverance and flexibility in adapting the design to real-world materials.

What do we want to achieve regarding SPIRIT skill development (student understanding and/or behaviour)?

As a result of this activity,

- Students demonstrate their understanding of emotions through symbolic building
- They listen and collaborate to create a shared product
- They develop patience, resilience, and problem-solving while working with imperfect or limited resources.

Academic/Curriculum Objective connection

- Art and Design: Constructing 3D models using various materials
- Science/Engineering: Applying basic design and stability principles

Materials and tools needed for implementation

- Recycled materials (boxes, tubes, string, paper, plastic containers)
- Tape, glue, scissors
- Markers, paint, stickers (optional for decoration)

Preparation notes

- Ensure enough materials for all groups
- Define a clear area for construction
- Have cleanup materials ready for the end of the session.

Guided Questions

- How does your tower show the emotion you were assigned?
- What part of the building process is hardest so far?
- Are you staying close to your design, or making changes as you build?
- How are you helping each other stay focused?

Stage Debriefing Questions (Optional)

- Did anything unexpected happen while building?
- Did your emotion change as you worked?

Tips and Tricks for dealing with stage challenges

- Remind students to refer back to their sketches if they get stuck
- Offer gentle guidance to groups that are struggling with teamwork
- Celebrate effort and process, not just the final product.

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STAGE 6 – Group presentations of Emotion Towers

How does this develop particular SPIRIT skills

- Enhances emotional vocabulary and communication
- Encourages empathy by hearing classmates' emotional experiences
- Builds presentation and public speaking skills in a safe, supported context.

What do we want to achieve regarding SPIRIT skill development (student understanding and/or behaviour)?

As a result of this activity,

- Students articulate emotional understanding through symbolic language and design
- They show appreciation and curiosity for others' emotional experiences
- They become more confident in expressing their own ideas and emotions in public.

Academic/Curriculum Objective connection

- Oral communication and presentation skills (language arts)
- Art: Interpreting and presenting creative choices

Materials and tools needed for implementation

- Emotion Towers
- Emotion card used by each group (if available)

Preparation notes

- Provide a calm, focused space for presentations
- Remind students to listen respectfully and applaud after each group.

Guided Questions

- What emotion does your tower represent?
- What story or feeling inspired your design?
- Which part of your tower best shows the emotion?
- Did you learn something about this emotion during the process?

Stage Debriefing Questions (Optional)

- Was it easy or hard to talk about this emotion? Why?
- What did you notice about other groups' towers and emotions.

Tips and Tricks for dealing with stage challenges

- Support shy students with sentence starters or team support
- Encourage positive peer feedback after each presentation
- Remind students that all emotions are valid and valuable.

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STAGE 7 – Final reflection circle

How does this develop particular SPIRIT skills

- Encourages self-awareness by reflecting on emotional experiences
- Develops empathy through sharing and listening to others
- Promotes positive group identity and emotional expression.

What do we want to achieve regarding SPIRIT skill development (student understanding and/or behaviour)?

As a result of this activity,

- Students learn to express what they feel and reflect on the meaning of the experience
- They recognize the diversity of emotional responses and how they are expressed
- They become more comfortable talking about emotions in a group setting.

Academic/Curriculum Objective connection

- Language Arts: Speaking and listening
- Ethics/Education for citizenship: Respect and appreciation of others' perspectives.

Materials and tools needed for implementation

- Emotion Towers (visual anchor)
- Talking object (optional)
- Visual emotion chart (optional).

Preparation notes

- Create a calm, respectful atmosphere
- Encourage voluntary sharing, without pressure
- Have prompts ready in case students need help to start.

Guided Questions

- What did you learn about your emotion during this activity?
- How did it feel to build something together as a group?
- What surprised you about the other towers or emotions?
- How did your feelings change during the activity?

Stage Debriefing Questions (Optional)

- What will you remember most from this experience?
- Is there something new you discovered about a classmate today?

Tips and Tricks for dealing with stage challenges

- Accept all types of reflections – short, long, serious, funny
- Acknowledge each contribution with a nod or smile
- If a child doesn't want to speak, allow them to draw or gesture their answer

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4.5 Magical Rainbow

In this 3-stage STEAM program, 2nd-grade students explore the science of rainbows through storytelling and hands-on experiments. Children use mirrors, CDs, and water spray bottles to investigate how light and water interact to create different colours. The activity builds critical thinking and curiosity as students observe natural phenomena and test their own scientific ideas. Students develop problem-solving and flexibility skills by adjusting their tools and light sources to get the best results. The project concludes with artistic drawing and group reflection, helping children value nature and think step-by-step like scientists.

Basic Information Sheet

Age group	Student number	Duration	Number of stages	Subjects connection and relevance
2nd grade students	Whole class (max. 20-25 students)	3 x 45 minutes	3 stages	Science, Technology, Engineering, Arts, Mathematics

STEAM Event Summary

In this STEAM activity, teachers guide second-grade students in exploring the natural phenomenon of rainbows through storytelling, hands-on experimentation, and creative expression. Students investigate how light and water interact by working with simple tools such as mirrors, water, spray bottles, CDs, and prisms. Through guided inquiry, observation, and discussion, children move from curiosity and questions toward basic scientific explanations, while also expressing their understanding through art. The activity is multi-sensory, inquiry-based, and age-appropriate, supporting early scientific thinking, creativity, collaboration, and reflective learning.

SPIRIT Skill Focus

- Critical thinking
- Problem-solving
- Creativity
- Curiosity, sense of wonder and openness
- Valuing people and nature

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National curriculum Link and Objectives

- Science / Environmental Studies: Light, water, refraction, natural phenomena (rainbows)
- Technology: Use of light sources and simple optical tools
- Visual Arts: Creative representation of observations
- Mathematics: Sequencing, drawing conclusions, noticing angles and patterns

Real-world STEAM Connection and Problem definition

Have you ever seen a rainbow and wondered where its colours come from? In everyday life, children often notice rainbows after rain, but the reason behind them is not obvious. In this activity, students face the challenge of discovering how light and water work together to create a rainbow. Through experiments, observation, and discussion, they explore questions such as: What happens to light when it passes through water? Why do colours appear? What conditions are needed to see a rainbow? By experimenting, making mistakes, and trying again, students experience how scientists explore the world - showing that science is not magic, but curiosity, careful observation, and thinking step by step.

Materials at a Glance

Station 1 – Mirror + Water + Light (refraction/reflection)

- Transparent cup or bowl filled with water
- Small mirror (fits into the cup/bowl at an angle)
- Flashlight or strong directed lamp
- White paper/surface to help students see the colours (recommended)

Station 2 – CD or Prism + Light Source (splitting light into colours)

- CDs (one per group) and/or prisms (if available)
- Flashlight / strong lamp or sunlight near a window
- White paper/surface (recommended)

Station 3 – Water Spray + Sunlight (mini rainbow)

- Spray bottles (filled with clean water)
- Direct sunlight (outdoors or by a sunny window)
- Optional: dark background (e.g., jacket/cardboard) to make colours easier to see

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Classroom and Documentation Materials

- Observation worksheets (drawing + short text, or differentiated versions)
- Pencils and coloured pencils/crayons
- Station instruction cards with pictures and simple step-by-step prompt
- Clipboards (optional, helpful outdoors)

Safety and Practical Materials

- Paper towels or cloths for spills
- Table covers (optional)
- A tray per station to keep materials together (recommended)
- Hand-washing / cleaning wipes (optional)

Visual and Support Materials (optional but recommended)

- Illustrated story / slides of "Mari the Little Scientist" (for Stage 1)
- Rainbow pictures or short video as a backup if sunlight is not available
- Pre-drawn rainbow arc templates (for students needing more support)

Indoor/Outdoor and Classroom layout

- Phase 1 – Indoor (Classroom): Storytelling, motivation, shared questioning, and hypothesis building.
- Phase 2 – Indoor and Outdoor (Experimental stations): Hands-on experiments using light, water, mirrors, CDs, and spray bottles. Note: The water spray experiment should be outdoors or near sunlight; other stations can be indoors with controlled lighting.
- Phase 3 – Indoor (Classroom): Artistic representation, reflection, and group discussion. Experimental stations should be organized in a carousel system, with clear visual instructions at each station.

Notes on Research-based approach and integration

This activity follows an inquiry-based and discovery-learning approach, where students are encouraged to explore phenomena rather than receive ready-made explanations. The teacher acts as a facilitator and guide, supporting students in asking questions, testing ideas, and drawing conclusions from their own experiences.

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STEAM integration is achieved as follows:

- Science: Observing and explaining light–water interaction
- Technology: Using tools (flashlights, mirrors, prisms) purposefully
- Engineering: Designing and adjusting experimental setups
- Art: Visualizing scientific observations creatively
- Math: Recognizing patterns, sequencing, and logical relationships.

Lesson Flow Overview (linked to details below)

Stage	Title	Brief Description	SPIRIT Skills	Duration	Link to Details
1st	**Introduction and Motivation**	Students listen to the story of Mari the Little Scientist, discuss personal experiences with rainbows, and formulate initial hypotheses. The teacher collects key vocabulary and ideas, creating a shared starting point for investigation.	• Curiosity, sense of wonder and openness • Critical thinking • Flexibility • Resilience	45 minutes	**STAGE 1 – Introduction and Motivation**
2nd	**Experimentation**	Students work in small groups at three pre-set science experiment stations. The goal is to explore light refraction and understand how rainbows are formed. Stations: 1) Mirror + Water + Light: A transparent cup is filled with water, and a small mirror is placed inside at an angle. A flashlight shines onto the mirror. Students observe how light reflects and what colours appear. 2) CD or Prism + Light Source: Students shine sunlight or a flashlight onto a CD or through a prism and observe the splitting of light into colours. 3) Water Spray + Sunlight: Using a spray bottle, students create a fine mist in direct sunlight (outside or by a window) and try to spot a real mini rainbow. Each group fills in a worksheet with drawings and short written responses to guided questions.	• Critical thinking • Problem-solving • Curiosity • Creativity	45 minutes	**STAGE 2 – Experimentation**
3rd	**Reflection and Artistic**	Based on the experiences gained during the experiments, students individually or in pairs create a rainbow-themed drawing that	• Critical thinking • Valuing people	45 minutes	**STAGE 3 – Reflection and**

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	Representation	illustrates how the rainbow was formed, what they observed during the experiments, and which tools they used. They may add a short written or oral explanation next to their drawing. This is followed by a class discussion, where students share their experiences, and the teacher facilitates guided reflection and self-assessment through open-ended questions!	and nature • Curiosity • Creativity		**Artistic Representation**

Tips and Tricks for dealing with challenges (for the whole STEAM program)

- Invisible results during experiments: If the rainbow does not appear, the teacher supports inquiry with guiding questions like: "What could we try differently?" Don't treat failure as a mistake - encourage it as a new opportunity to try again.
- Groups working at different speeds: Prepare differentiated worksheets with optional extra questions or colouring templates for rainbows.
- Poor lighting conditions: Use alternatives such as a video, projected images, or LED light sources.
- Maintaining focus: Turn experiments into short challenges, e.g., "You have 5 minutes to observe as many colours as possible!"
- Fostering a sense of community: Let students create a large collaborative rainbow collage and offer each a "Young Explorer Certificate" at the end.

Difficulty level tailoring notes

This activity can be adapted to different student skill levels while maintaining uniformity across partner settings:

- **Beginner learners:** Students act as observers, using drawing templates or selecting answers from provided options. Focus is on observation skills and familiarization with phenomena.
- **Advanced learners:** Students actively participate in experiments, ask questions, record observations, create visual representations, and provide simple explanations. This level develops communication, creativity, and curiosity.
- **Expert learners:** Students independently explore variations (e.g., changing light angles, testing materials), connect findings to real-world phenomena, and generate new questions. This level develops critical thinking, problem-solving, and flexibility.

Teachers can use these levels for assessment or self-assessment (e.g., with a sticker or badge system), ensuring consistent differentiation and evaluation across partners

STEAM Program Debriefing and Reflection Questions

These aim to promote student self-reflection and give the teacher useful feedback:

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- What was the most interesting part of the activity for you?
- Which experiment would you try again, and why?
- What did you learn about light that you didn't know before?
- What task was the hardest for you?
- If you could do it again, what would you do differently?
- Could you try one of these experiments at home?

Responses may be verbal or visual depending on ability. Students can also use self-assessment tools, such as coloured dots or emoji stickers.)

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4.5.2. Stage details and Activities Flow

STAGE 1 – Introduction and Motivation

How does this develop particular SPIRIT skills

- Curiosity, sense of wonder and openness: Storytelling and questioning spark curiosity, encouraging students to explore personal experiences.
- Critical thinking: Children analyse observations, challenge assumptions, and develop hypotheses.
- Flexibility: Students consider multiple explanations and remain open to revising their ideas.
- Resilience: Students are encouraged to express ideas, try out hypotheses, and value each contribution in the learning process.

What do we want to achieve regarding SPIRIT skill development (student understanding and/or behaviour)?

As a result of this activity:

- Students can formulate questions related to a natural phenomenon.
- They understand that it's okay not to have immediate answers, solutions can be discovered.
- Their verbal expression improves: narrating experiences and using scientific vocabulary (e.g., light, refraction, reflection).
- They become aware that scientists ask questions and experiment, they are not expected to know everything from the start.

Academic/Curriculum Objective connection

- Environmental Studies: Weather phenomena, the role of light and water in nature
- Language and Literature: Listening comprehension; expressive speaking
- Self-awareness and Identity (cross-curricular): Sharing personal experiences; valuing others' ideas
- Science: Forming hypotheses; revealing prior conceptions.

Materials and tools needed for implementation

- Projectable or illustrated story of "Mari the Little Scientist" (on A3 paper, digital format, or as a puppet)
- Printed or projected images of rainbows (from books or the internet)
- Blackboard or poster to collect keywords
- Chalk or markers; optional note sheets for children who wish to write.

Preparation notes

- The teacher should rehearse how to tell Mari's story engagingly (e.g., with role-play, images, or puppets)
- Prepare rainbow images and place them where students can easily see them
- Plan in advance which open-ended questions to use for discussion
- Foster a supportive atmosphere: all answers are valid starting points

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- Consider recording students' initial hypotheses (written or verbal) for future reference during experimentation.

Guided Questions

- Where have you seen a rainbow before? What were you doing then?
- What do you think causes those colours?
- What happens to light when it goes through water or a window?
- How could Mari begin her investigation to discover the rainbow's secret?
- Can you think of anything that looks like a rainbow but isn't?

Stage Debriefing Questions (Optional)

- What was the most interesting part of Mari's story for you?
- Did you think of something you've never said out loud before?
- Why might it be helpful to ask questions before we experiment?
- Do you think it's a good thing when someone doesn't know the answer right away but decides to go and find it?

Tips and Tricks for dealing with stage challenges

- For shy children: Allow them to draw or just listen, they can join in later
- For overly active students: Use images or storytelling with movement to channel energy
- For quiet classes: Direct questions to individuals (e.g., "Anna, what do you think?")
- For different ability levels: Accept varied responses; adapt questions from simple to more abstract depending on the student.

STAGE 2 – Experimentation

How does this develop particular SPIRIT skills

- Critical thinking: Students analyse experimental outcomes, compare them with initial hypotheses, and draw reasoned conclusions.
- Problem-solving: Students repeat experiments, adjust tools or methods, and find solutions when results are unclear.
- Valuing people and nature: Groups divide tasks, support each other, and work together to make discoveries.
- Creativity: Students represent observations visually, exploring imaginative ways to present data.
- Curiosity, sense of wonder and openness: Students explore phenomena, ask questions, and remain engaged in discovering new aspects of light and water interaction.

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What do we want to achieve regarding SPIRIT skill development (student understanding and/or behaviour)?

As a result of this activity, the following students' skills will be developed:

- Critical thinking: Draw conclusions based on observations and relate them to initial hypotheses.
- Problem-solving: Understand that scientific results require repetition, adjustment, and precision to achieve reliable outcomes.
- Valuing people and nature: Improve communication and teamwork skills through group interaction and shared experimentation.
- Creativity: Represent observations visually and explore imaginative ways to explain phenomena.
- Curiosity, sense of wonder and openness: Remain engaged, ask questions, and explore the natural behaviour of light and water.

Academic/Curriculum Objective connection

- Environmental Studies: Light, water, and natural phenomena
- Digital Literacy / Technology: Use of light sources and optical tools
- Mathematics / Logical Thinking: Drawing conclusions, sequencing
- Social Learning: Group work, joint decision-making, argumentation

Materials and tools needed for implementation

- Paper, coloured pencils, direction arrows
- Transparent cups, water, small mirrors, flashlights
- CDs, prisms
- Spray bottles, sunlight (or strong lamps)
- Worksheets with pencils and coloured pencils
- Station instruction cards with pictures and simple steps
- Visual aids for inspiration
- Paper towels for spills or water accidents.

Preparation notes

- Test each experiment in advance! Try them before the session to ensure feasibility
- Ensure proper lighting, ideally natural sunlight for best results
- Provide clear, illustrated instructions at each station (one per group)
- Organize and lay out all materials beforehand, clearly sorted by station
- Check for safety and stability (e.g., make sure cups are steady, flashlights are charged)

Guided Questions

- What happens to the light when it passes through water or hits a mirror?
- How does the light change when you shine it on a CD or prism?
- Did you see colours in the water spray? What conditions were needed?
- Which experiment did you like the most? Why?

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Stage Debriefing Questions (Optional)

- Which experiment was the most spectacular or exciting for you?
- Did any result surprise you?
- What answers did you find to your questions? Do you think you've understood the secret of the rainbow?

Tips and Tricks for dealing with stage challenges

- Water spray experiment: Best outdoors in sunshine; if rainy, use a video projection of the spray effect indoors
- Lighting issues: Shade the room or use darker spaces for flashlight-based experiments
- Group participation balance: Assign rotating roles (e.g., "light operator," "observer," "recorder")
- Shy students: Let them observe first, then try when they feel more comfortable
- Tool difficulties: Provide alternatives, e.g., CDs if prisms aren't available or too tricky to handle.

STAGE 3 – Reflection and Artistic Representation

How does this develop particular SPIRIT skills

- Critical thinking: Analysing observations, connecting them to prior knowledge, and correcting misconceptions.
- Curiosity, sense of wonder and openness: Engaging with new phenomena and exploring multiple perspectives.
- Valuing people and nature: Sharing creations respectfully and appreciating diverse interpretations.

What do we want to achieve regarding SPIRIT skill development (student understanding and/or behaviour)?

As a result of this activity, the following students' skills will be developed:

- Critical thinking: Describe and interpret observations, connect them to prior knowledge, and refine understanding of natural phenomena.
- Creativity: Express understanding and observations through art, exploring imaginative ways to represent concepts like light, refraction, and colours. Students interpret experiences freely and explore imaginative ways to express observations.
- Curiosity, sense of wonder and openness: Engage actively with natural phenomena, asking questions and exploring how rainbows form.
- Valuing people and nature: Reflect on observations, appreciating both the natural environment and diverse perspectives from classmates.

Academic/Curriculum Objective connection

- Visual Arts: Depicting gradients, forms, and light effects
- Environmental Studies: Processing natural phenomena
- Language and Communication: Oral or written summaries, vocabulary expansion
- Self-awareness and Identity: Sharing experiences, self-assessment.

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Materials and tools needed for implementation

- White drawing paper or watercolour paper
- Coloured pencils, watercolours, brushes, water cups
- Example rainbow photos Sentence starters for reflection (e.g. "In the experiment I saw that...", "The rainbow was formed because...").

Preparation notes

- Prepare sample drawings in different artistic styles
- Support students who struggle with writing by offering sentence starters or templates
- Allocate time for peer or class-level presentation
- Display student artwork as posters on the classroom wall or bulletin board.

Guided Questions

- Which experiment did you choose to draw? What did you observe in it?
- What happens to light when it meets water?
- Why do we see the colours in an arc shape?
- What would you explain to a friend who wasn't here today?
- Which tool did you find most interesting and why?

Stage Debriefing Questions (Optional)

- What did you learn about rainbows that you didn't know before?
- What was your most surprising observation?
- Which tool helped you understand the most?
- If you could do it again, what would you try differently?

Tips and Tricks for dealing with stage challenges

- For students with weaker drawing skills: Provide templates or pre-printed outlines
- For fast finishers: Encourage them to add extra explanations or draw a second experiment
- For shy students: Use pair-sharing instead of whole-class presentation
- To maintain motivation: Hold a short "gallery walk" at the end where students view each other's work
- Simple assessment idea: Use emotion icons (🙂 🙁 🤔) for self-evaluation of understanding or enjoyment.

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Annexes

Pilot implementation (detailed example with lesson/activity plan), attachments

1. Mari's Story

Short narrative about "Mari the Little Scientist," exploring the mystery of rainbows. Available in illustrated A4 format or digital version for projection. Can also be presented with puppets or through drama. "Once upon a time, there was a little girl named Mari who loved asking questions. Not a day went by without her looking up at the sky, listening to the rain, or playing with a glass of water in the sunlight. One day, a rainbow appeared in the sky. Mari stopped, looked up, and said: 'How do those colours get there? Why does the rainbow appear only when it rains and the sun is shining?' Other children ran ahead, but Mari stood still, watching. Then she decided: she would find out! She would become a scientist - someone who doesn't just look at the world but asks questions and does experiments. That's how Mari's journey began into the mysterious world of light and water..."

2. Experiment Station Instruction Cards

Each station has a visual instruction sheet with simple icons and steps (e.g., water, mirror, arrow), making them suitable even for students who can't yet read independently.

3. Observation Worksheet (Drawing + Text Versions)

Space for students to record their findings during each experiment: drawing and short sentences like "I observed...", "We used...". A differentiated version may include pictograms or image choices.

4. Rainbow Creation Template

Pre-drawn arc templates for beginners; blank A4 sheets for advanced students. Title suggestion: "This is how a rainbow is born!"

5. Student Reflection Sheet (Yes/No answers with pictograms):

Questions include:

- I observed how light changes.
- I drew a rainbow.
- I took part in the experiment.
- I asked at least one question.

Can also be completed verbally with teacher support.

6. Teacher's Guide

Includes step-by-step experimental instructions, alternative setups (e.g., for poor lighting or limited time), differentiation strategies, pre-written guiding questions, possible answers, and assessment tools (oral, visual, group).

7. Class Poster Template – "Explorer Wall"

Large A3 or A2 paper for creating a collaborative rainbow poster with everyone's artwork. Suggested central title: "This is how a rainbow is born – we tried it ourselves!" Used for closure and group reflection on the experience

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5. STEAM PROGRAMS AND EVENTS FOR TRANSVERSAL SKILLS DEVELOPMENT

THIRD GRADE STUDENTS

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5.1 Painting and creative work in school

This 3-hour STEAM program develops 2nd graders SPRIT skills through 2 stages of a combination of art with science and maker pedagogy through the theme of a hot air balloon (interesting physical object) found in a piece of artwork by a well-known artist. In the first stage, children look at paintings by famous artists. Their flexibility is developed by listening to their classmates' different ideas about what the artist was thinking. In the second stage, students build a hot air balloon/or any interesting items using simple materials such as egg cartons and foam while the problem-solving valuing others, creativity and emotional regulation skills are developed. The object is chosen by the children from one of the paintings. By preparing, testing and improving, they learn to stay calm and find new ways to achieve their goals. Group discussions also help students develop empathy by listening to and valuing the opinions of others. Finally, the project also builds resilience by showing learners that trying again after making a mistake is an important part of learning. The STEAM project can be continued with other self-made creations, but in this case, the children must see the object they are going to create in one of the paintings.

Basic Information Sheet

Age group	Student number	Duration	Number of stages	Subjects connection and relevance
3rd grade	One class (max. 30 students)	180 minutes	2 stages	grammar and literature, environmental studies, digital culture, design and technology, visual arts

STEAM Event Summary

As part of the activity, students become familiar with the artworks of Pál Szinyei Merse, preferably through an on-site visit to the Hungarian National Gallery. If the museum visit cannot take place, the artist’s life and work are presented in the classroom environment through a discussion accompanied by visual projections, including the analysis of selected paintings, with special attention to the one depicting a hot air balloon.
In the next part of the program, students engage in a creative activity: they construct hot air balloons using polystyrene and egg cartons, reflecting on the motif seen in the painting. Throughout the creative process, students develop their fine motor skills, problem-solving abilities, and spatial thinking. The activities also aim to foster students’ resilience and flexibility, with a special focus on enhancing adaptability, perseverance, and a positive attitude toward new challenges.

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SPIRIT Skill Focus

- Creativity
- Problem-solving
- Valuing people and nature
- Curiosity, sense of wonder and openness

National curriculum Link and Objectives

- Development of observation skills, analytical thinking, and memory
- Improvement of reading comprehension and vocabulary expansion
- Development of opinion formation and visual communication
- Interpretation of the themes and motifs of artworks (e.g. nature, hot air balloon, relationship between humans and the environment)
- Basic understanding of how hot air balloon's function and their role as a means of transport
- Material awareness: recognizing the properties of materials used (polystyrene, paper, plastic)
- Model creation following simple technical steps
- Understanding the role of basic structural elements (e.g. how a hot air balloon model can stay airborne)
- Practical knowledge of working with and using different materials.

Real-world STEAM Connection and Problem definition

The program is based on the artistic representation of phenomena from everyday life, offering students the opportunity to reflect on the world through aesthetic experiences. Through the painting of a hot air balloon by Pál Szinyei Merse, a connection is created between art, technology, and history, while students explore the significance of the development of means of transportation. The construction of a hot air balloon serves as a modelling activity, during which students create, experiment, use recycled materials, and develop their problem-solving thinking. The task emphasizes creativity, environmental awareness, as well as collaboration and adaptability – all of which are essential competencies for navigating everyday life.

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Materials at a Glance

Pál Szinyei Merse's paintings in some form (original paintings in the museum; projected images or printed images displayed on the wall in the classroom).

- scissors
- glue
- wooden skewers
- egg carton
- styrofoam ball
- paint, coloured paper, glitter, etc. (for decoration)
- painter's tape

Indoor/Outdoor and Classroom layout

Adaptation to the conditions of the museum setting. In the case of classroom-based activities, images should be displayed or projected in a way that ensures they are clearly visible to all students.
During the creative process, the classroom should be arranged to support group work, considering the needs of the students.

Notes on Research-based approach and integration

During the program, careful observation and analysis of the paintings encourage students to ask questions, express their opinions, and conduct independent or group research on the topic. This process strengthens critical thinking and the ability for autonomous learning. In the hot air balloon construction activity, students apply the knowledge gained from their observations and analysis in modelling, while developing their problem-solving skills and creativity. The integrated approach provides an opportunity to connect art, technology, and science, promoting multidisciplinary thinking and the practical application of learned concepts.

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Lesson Flow Overview (linked to details below)

Stage	Title	Brief Description	SPIRIT Skills	Duration	Link to Details
1st	**Museum Education Session, Getting to Know the Paintings**	• Museum Education Session / Classroom "Walk" Introducing the Paintings. • Exploring the works of Pál Szinyei Merse, observing and analysing selected paintings	• Valuing people and nature • Curiosity, sense of wonder and openness	90 minutes	STAGE 1 – Museum Education Session, Getting to Know the Paintings
2nd	**Creative work – making a hot-air balloon from Styrofoam and egg cartons**	Making a Hot Air Balloon: • Cut out the part of the egg carton where the eggs sit - this will serve as the basket of the hot air balloon. • Attach 4 to 6 equal-length toothpicks to the inside of the basket using painter's tape. The number of toothpicks can be freely chosen by the students (4, 5, or 6 are all acceptable). • Place a styrofoam ball on top of the toothpicks and secure it with a small amount of liquid glue. • The hot air balloon can be decorated as desired. • If the diameter of the styrofoam ball is larger than the width of the basket, it can be placed onto the toothpicks without glue by piercing it onto them. However, to ensure stability, it is recommended to use a little glue even in this case.  	• Creativity • Problem-solving	90 minutes	STAGE 2 – Creative work – making a hot-air balloon from Styrofoam and egg cartons

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Tips and Tricks for dealing with challenges (for the whole STEAM program)

- By considering different learning styles, varied questions and tasks can be used to encourage thinking and active participation. Positive feedback is essential, as it reinforces students' willingness to experiment and their perseverance. If students find it difficult to express their thoughts about artworks, visual or playful methods - such as drawing or short storytelling - can be helpful. During the creative process, a flexible schedule can support experimentation and problem-solving, while ensuring the safe use of materials and tools.

Difficulty level tailoring notes

When observing and analysing the paintings, it is useful to focus on simpler, easily noticeable visual elements, while offering more complex, in-depth questions as optional prompts. The number of artworks discussed can also be adjusted according to student needs.

During the creative activity, the airship-making task can be easily adapted: the simpler version involves fewer elements, while more advanced versions allow for elaborate decorations and more complex structures. Teachers should continuously monitor students' needs and provide support when necessary to ensure that all students experience success during the activity.

STEAM Program Debriefing and Reflection Questions

- What part of today's program did you like the most, and why?
- Did you encounter any difficulties during your work that you were able to solve? How did you manage it?
- How did you feel when something didn't work out the first time as you wanted?
- What did you learn today about adapting and finding new solutions?
- How did your classmates' opinions or help contribute to doing the task better?
- What are you most proud of after today?

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5.1.2. Stage details and Activities Flow

STAGE 1 – Museum Education Session, Getting to Know the Paintings

How does this develop particular SPIRIT skills

The aim of the session is for students to develop resilience and flexibility through observing and interpreting the paintings of Pál Szinyei Merse. By closely examining the artworks and discussing various interpretations, students experience that understanding is not always immediate but can be achieved through perseverance and thoughtful reflection. Resilience is strengthened by cultivating patience and acceptance of uncertainty, while flexibility is demonstrated through embracing different viewpoints, openness, and responsiveness to new perspectives.

What do we want to achieve regarding SPIRIT skill development (student understanding and/or behaviour)?

Students learn to observe visual details persistently and consciously, even if they do not understand their meaning at first. They accept that making mistakes or not knowing something is not a failure, but part of the learning process. They become capable of listening to and accepting different interpretations and confidently expressing their own thoughts. Their openness, emotional awareness, and ability to adapt flexibly to different viewpoints improve.

Academic/Curriculum Objective connection

- Developing observation skills, analytical abilities, and memory
- Improving reading comprehension and expanding vocabulary
- Enhancing opinion formation and visual communication
- Interpreting the themes and motifs of artworks (e.g., nature, hot air balloon, relationship between humans and the environment)

Materials and tools needed for implementation

Pál Szinyei Merse’s paintings in some form (original paintings in the museum; projected images or printed images displayed on the wall in the classroom).

Preparation notes

High-quality reproductions of the paintings need to be prepared for projection or in printed form. It is important to provide a basic, age-appropriate overview of the artist’s life and work - avoiding overly complex biographical details.
It is advisable to give a brief, storytelling-style context beforehand to support the reception of the artworks, and to allow time for silent observation as well. Planning the questions in advance helps guide the observation process (see appendix).
The educator should also be prepared to activate the students’ imagination and prior experiences (e.g., have they ever seen a hot air balloon, visited a museum, or what “old painting” means to them).

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Guided Questions

- What was the first thing you noticed in the painting? And now, if you look again, do you see anything else?
- What do you think was the artist's intention? Why do you think they painted this particular scene?
- What would you do if you didn't understand what is happening in the painting? What could help in such a situation?
- Was there any detail in the painting that you found difficult to understand? What do you think about it now?

Stage Debriefing Questions (Optional)

- Was there a moment when you weren't sure what you were seeing? What did you do then?
- Did your opinion about the painting change as you looked at it more? Why?
- How did it feel when others saw the same painting differently than you did?
- What was the most difficult part of this task, and how did you solve it?

Tips and Tricks for dealing with stage challenges

- For hesitant students, it is helpful to use simple, open-ended questions, such as "What do you notice first?" and to reinforce that every answer is valuable. When answers are quick and superficial, asking about other senses, for example, "What sounds might you hear there?" can deepen observation. In cases of differing opinions, it is important to emphasize that art can be interpreted in many ways, which helps develop flexibility. Shy students can be engaged through small group or pair discussions. For those with attention difficulties, giving specific search tasks, like "Find a unique shape!", helps them focus better. To foster resilience, praise students who try again or seek alternative solutions after making mistakes.

STAGE 2 – Creative work – making a hot-air balloon from Styrofoam and egg cartons

How does this develop particular SPIRIT skills

During the creative activity, students encounter situations where their initial plans may not work out at first, or they need to adjust while using materials and tools. This supports the development of resilience, as they learn to experience and accept failures and seek new solutions. The competency of flexibility is demonstrated when students adapt to changing conditions, think creatively, and find alternatives to emerging problems. Throughout the activity, students actively engage in problem-solving, communicate, and reflect on their work, which also supports the competencies of self-regulation and collaboration.

What do we want to achieve regarding SPIRIT skill development (student understanding and/or behaviour)?

The aim of the activity is for students to learn to accept failure and be able to restart the task, thereby strengthening their resilience. It is important that students develop flexibility in adapting to emerging problems and become capable of seeking alternative solutions.

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The activity also aims for students to recognize and express their own feelings and thoughts during the creative process, supporting their ability for self-reflection. Part of the development is to boost the children's self-confidence and encourage them to embrace challenges with perseverance in completing the task. Finally, the goal is for students to improve their collaboration skills and be able to listen to others' ideas in order to find solutions together with flexibility.

Academic/Curriculum Objective connection

- Development of memory
- Improvement of reading comprehension and vocabulary expansion
- Interpretation of the themes and motifs of artworks (e.g., nature, hot-air balloon, the relationship between humans and the environment)
- Basic understanding of the function and role of the hot-air balloon as a means of transportation
- Material knowledge: recognizing the properties of the materials used (Styrofoam, paper, plastic)
- Model-making through simple technical steps
- Understanding the role of basic structural elements (e.g., how a model hot-air balloon can stay in the air)
- Practical knowledge of how to work with and use materials

Materials and tools needed for implementation

- scissors
- glue
- wooden skewers
- egg carton
- Styrofoam ball
- paint, coloured paper, glitter, etc. (for decoration)
- painter's tape

Preparation notes

To successfully carry out the activity, it is essential to prepare all necessary materials in advance. It is helpful to demonstrate the steps of building the hot-air balloon beforehand and show examples to support students' visual understanding. Clear and simple instructions should be provided, and students should be given enough time to experiment and start over if needed. It is important to consider students' varying abilities and offer flexible support throughout the creative process. Safety guidelines should also be explained in advance, with special attention to the use of glue and small parts.

Guided Questions

- What is your plan if something doesn't work out the way you imagined?
- What can you do if the glue doesn't hold well enough? Do you have another idea?
- How would you change your original idea if it doesn't work as planned?
- What other materials could you use if this one isn't available?

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Stage Debriefing Questions (Optional)

- Was there a part you had to start over? How did you feel during that?
- What was something you found difficult at first but managed to solve in the end?
- If you could make it again, what would you do differently?
- What are you most proud of in your finished hot-air balloon?

Tips and Tricks for dealing with stage challenges

- If students feel uncertain or are afraid of making mistakes, encourage them to try without fear and emphasize that mistakes are valuable opportunities for learning. If the glue does not hold properly, help them find alternative solutions or allow more time for drying. When different ideas arise, highlight the value of creativity and multiple solutions, thus developing their flexibility and ability to collaborate.

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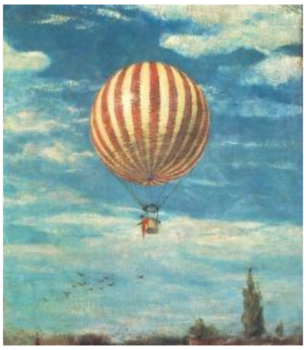
Annexes

Pilot implementation (detailed example with lesson/activity plan), attachments

The paintings used, with descriptions and suggested questions.

	**Picnic in May (1873)** ● This painting marked the end of Szinyei's first artistic period. ● It was created in the studio, not outdoors. ● Szinyei himself is in the picture (the man lying on his stomach with his back to us, symbolically turning his back on critics). ● **Suggested questions:** What colours do you see in the painting? (lots of green; the people - red, burgundy - blend well into the green grass) What are they doing? Do you think they are friends? Is the painter in the picture? If yes, which one do you think he is? Do you also go on picnics or hikes?
	**Lady in Violet (1874)** ● His wife posed as the model. ● The colours are not very vibrant. ● The landscape was partly painted from memory. ● This was also created in the studio. ● The trees cast shadows on the woman. ● Interestingly, the dress was sewn by the painter's wife, Zsófia Probstner. ● **Suggested questions:** What are the colours like in the painting? (darker, the dress itself is also dark) Who do you think is in the picture? How do you think she feels? (She was distressed because she didn't like posing and was pregnant with their first child, making the dress tight.) Have you ever drawn a family member or friend?
	**The Ballon (1882)** ● He painted his brother-in-law's balloon. ● He was fascinated by flight. ● With this balloon, Szinyei's brother-in-law travelled across Europe and parts of Asia, even settling in Japan for a while. ● The airship can symbolize many things: longing, the soaring of creativity, artistic freedom. ● **Suggested questions:** What colours does the airship have? (white and red, warm and cool contrast) Where is it located? (flying, but still close to the ground) Who might be waving from the basket? (Szinyei's brother-in-law) Where can you still see this balloon today? Have you ever flown before?

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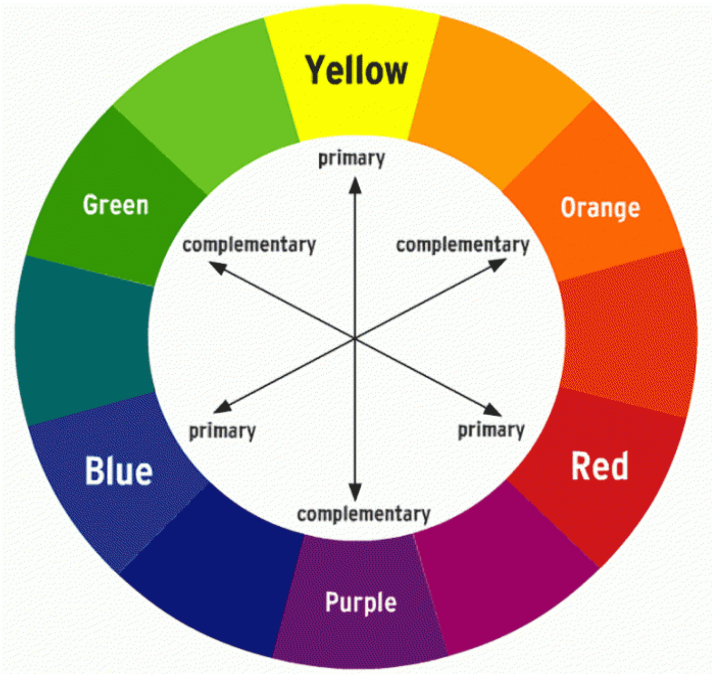
	**Skylark (1882)** ● Most of the painting is sky (about 3/4 of it). ● The blue and green colours next to each other almost vibrate. ● The lady is looking at the skylark soaring in the sky (a contrast between freedom and being earthbound). ● This was also painted in the studio. ● **Suggested questions:** What colours dominate the painting and which colour is more abundant? Why do you think there is bluer? (it symbolizes freedom) The painting's title is *Skylark*, but where is the bird? Have you ever seen a skylark? Have you heard its song? Do you have a favourite bird?
	**Meadow with Poppies (1902)** ● The green and red contrast also creates a vibrating effect. ● Although the poppies are small, they dominate the painting. ● The focus is not only on the flowers but also on the path next to them. ● **Suggested questions:** What kind of flowers are in the painting? Colores opposite each other on the colour wheel are complementary colours, such as orange-blue, lemon-purple, green red. Do you see any of these in the painting? What effect does using such contrasts have? (It makes the painting vibrate.)



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5.2 How does precipitation sound?

This 3-hour STEAM program for 3rd graders has 3 stages that develop the SPIRIT skills of the students by combining the science of weather with the art of music. In the first stage, students practice creativity and critical thinking by exploring how to make loud and soft sounds using everyday materials and instruments. The second stage encourages curiosity and a sense of wonder as children learn to identify different forms of precipitation, such as rain, snow, and hail. In the final stage, teams use creativity again to perform "sound stories" that imitate specific weather scenarios, like a soft drizzle or a heavy hailstorm. By linking science to sound, students learn to observe the natural world more carefully and express their scientific knowledge through artistic performance.

Basic Information Sheet

Age group	Student number	Duration	Number of stages	Subjects connection and relevance
3rd grade	Whole class	3 hours	3 stages	Sciences (geography), music

STEAM Event Summary

In this STEAM challenge, teachers blend free, creative art with structured science education, while third-graders learn about the weather and different types of precipitation (such as snow, rain, and hail) in a playful way, linking them to various sounds. We highly recommend STEAM activity because, instead of traditional teacher assessment, children playfully check their own and their peers' knowledge by actively listening to one another. Throughout the project, students are given the freedom to experiment independently with sounds, providing massive motivation in the classroom. This approach also helps build empathy, as students must listen to and respect which sounds their classmates find pleasant. It is an excellent choice for educators who want a lesson where learning dry meteorological concepts transforms into a stress-free, "eyes-closed" guessing game and a shared experience.

SPIRIT Skill Focus

- Critical thinking
- Problem-solving
- Creativity
- Curiosity, sense of wonder and openness
    - Emotional awareness, regulation and communication

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- Empathy
- Resilience
- Flexibility

National curriculum Link and Objectives

- Science Objective: Students can describe the different forms of precipitation.
- Art Objective: Students can produce loud and soft sounds.

Real-world STEAM Connection and Problem definition

In everyday life, weather is not only seen but also heard. The gentle dripping of rain, the soft rustling of snow, or the loud crashing of hail are sounds children encounter regularly, yet they often do not consciously connect them to the different forms of precipitation.

In this activity, students first learn to identify the different forms of precipitation they can encounter in daily life. Next, they link these forms to sounds and reflect on the question: "What does precipitation sound like?" This process gives their learning deeper meaning: they are challenged to think more critically, which helps them to better remember the content from Science.

By combining science and music, this activity makes natural experiences both tangible and creative.

Materials at a Glance

For the Art Phase:

- Own body (without voice)
- Classroom materials
- Orff musical instruments
- Percussion instruments

For the Science Phase:

- PowerPoint with current precipitation images
- Worksheet
- Whiteboard

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For the Application Phase:

- Cards with descriptions of precipitation scenario

Indoor/Outdoor and Classroom layout

Indoor - in the classroom, with the possibility of extra space in the corridors or an additional room where students can experiment with/practice the different sounds.

Notes on Research-based approach and integration

During the arts-based segment, students engage in open-ended research that stimulates their creativity. They are given the freedom to experiment independently, which sharpens their creative thinking skills.
The science segment focuses on scientific concepts, established terminology, and factual knowledge that are systematically taught. This provides a solid knowledge base that students can later draw upon.
The combination of these two approaches – open, creative inquiry and structured scientific knowledge – creates a rich learning process. It culminates in a creative final project where students integrate and apply their knowledge and skills in an original way.

Lesson Flow Overview (linked to details below)

Stage	Title	Brief Description	SPIRIT Skills	Duration	Link to Details
1st	**Exploring Sounds**	There are four tables with different material: • Students explore how to make sounds with the materials. • Each group presents their "solutions." Students try to imitate the softest sound possible. • They try to imitate the loudest sound possible. • They try to imitate a sound that is neither too soft nor too loud. • THIS ALWAYS HAPPENS WITH THE SAME 'MATERIAL' Each group presents their 'solutions.	• Critical thinking • Creativity • Problem-solving	45 minutes	**STAGE 1 – Exploring Sounds**

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2nd	**Science – precipitation forms**	**Warming up** In the previous lesson, we learned how precipitation forms. • Who can explain this again? • What was 'condensation' again? • What is a cloud made of? Tweets and weather photos from the past few days are shown; Ask the students what they see and read. This way, the students will understand that there are different forms of precipitation. **Explanation** We discuss the different forms of precipitation (with their associated intensity) and their typical appearance. The photo is shown, and the teacher asks questions (e.g., what do you see here? How is this photo related to precipitation?). The teacher writes the different forms of precipitation on the board (+ explanation + different intensities)." Students record each form of precipitation on their sheet and can choose how to explain it (through drawing or words). Ask the students what they would like to know more about regarding one of these forms of precipitation **Review exercise** The whole classroom together: First, review the photos/tweets from the orientation phase and see if they can now name/describe them correctly Individual: Distribute a worksheet. In the left column, you will find the different forms of precipitation. In the right column, you can find the descriptions of the different forms of precipitation. It is up to the students to determine which description matches which form of precipitation. Be careful: there is one description missing. We will then correct the worksheet together.	• Critical thinking • Problem-solving • Creativity • Curiosity, sense of wonder and openness	90 minutes	**STAGE 2 – Science – precipitation forms**

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3rd	**Creative application phase: Science and art**	The teacher gives each group a card with a description of a precipitation situation. Possible sentences they need to vocalize: · • First, the snow falls slowly and then turns into a heavy snowfall. • The thick fog rolls slowly over the field, and visibility disappears. • The hail taps softly at first, then harder, until eventually a threatening hailstorm arrives. • On a sultry summer evening, the thunderclouds ominously approach. • After a loud thunderclap, a short, intense rainstorm bursts out, gradually turning into a fine drizzle. It is up to each group to imitate the sentence/precipitation. They must pay attention to the volume, varying between 'loud' and 'soft'. The students are given time to vocalize their sentences about precipitation. As an interim check, the teacher visits each group. This way, the teacher can hear if the vocalization is correct (test phase of the STEMOOV model) Afterwards, the goal is for each group to 'vocalize' their sentence to the rest of the class without reading it aloud. Each group comes forward and 'let's their sentence be heard'. The other students do not look and must try to figure out what was on their card. It is important for the teacher to pay attention to the quality of the vocalization: are they really soft or loud sounds? Does the vocalization accurately match the weather situation? If not, it is important to point this out and have them go back to the 'test' phase. Play a sound clip of precipitation The students listen (and do not look) (http://www.youtube.com/watch?v=EGRoX2jy7dI).	• Critical thinking • Problem-solving • Creativity • Empathy • Resilience • Flexibility • Emotional awareness, regulation and communication	45 minutes	**STAGE 3 – Creative application phase: Science and art**

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		• Discuss which precipitation forms were heard and how the sounds were represented. - What differences did you hear? Focus especially on the volume • Reflect on how their understanding has grown since the beginning of the lesson. Let them listen to the video again, but this time they can watch and participate. • Discuss how their associative field has expanded compared to the first lesson phase			

Tips and Tricks for dealing with challenges (for the whole STEAM program)

- Ideally, students have already learned how precipitation forms (water cycle) and that clouds consist of fine water droplets.
- Ideally, students know what thunder and lightning are.
- Make sure that all terminology used is clear for the students.

Difficulty level tailoring notes

- When you limit the “instruments” to their own bodies, it becomes much more challenging.
- Depending on the students’ level, you can assign them a specific group of instruments (some easier or more difficult).
- You can adjust the challenge according to the complexity of the sentences.
- You can also vary the number of precipitation types covered.

STEAM Program Debriefing and Reflection Questions

- Creativity: In what ways did you manage to produce more sounds than you initially thought possible?
- Critical thinking: Which sound fragment do you think was the best or least effective representation of the weather sentence, and why?
- Problem-solving: What challenges did you encounter, and how did you deal with them?
- Curiosity, sense of wondering: At what moment during the lesson were you most surprised?

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5.2.2. Stage details and Activities Flow

STAGE 1 – Exploring Sounds

How does this develop particular SPIRIT skills

Critical thinking (is this the softest sound possible?), creativity (how can we make the sound softer?)

What do we want to achieve regarding SPIRIT skill development (student understanding and/or behaviour)?

Critical Thinking (e.g., "Is this the softest sound possible?"):
Children actively reflect on their sounds and adjust their techniques to produce softer sounds. They compare their sounds and question whether it can be softer. Behaviour:

- Pause and rethink their approach.
- Experiment with materials by making small adjustments.
- Discuss with each other about the result (e.g., "Is this the softest sound?").

Creativity (e.g., "How can we make the sound softer?"):
Children try new approaches and explore different techniques to achieve their goal. They think outside the box and experiment with the materials. Behaviour:

- Experiment with various ways to modify the sound.
- Collaborate within their group on alternative methods.
- Flexibility in their approach, by making changes when their initial attempts fail

Academic/Curriculum Objective connection

- Students can produce loud and soft sounds with different kinds of materials.

In the translation it must be adapted! They are the national curriculum!

Materials and tools needed for implementation

- Own body (without voice) - valuable free material - Orff musical instruments - Percussion instruments.

Preparation notes

- group students into small teams.

Guided Questions

Is this the softest sound we can produce? Encourage critical thinking of the kids by the following questions (just ask and encourage the child to think:

- Imagine there’s a tiny mouse sleeping in the corner of the room, and we don’t want to wake it up! How could we produce a sound using this object even more gently- almost as if we were just lightly stroking it?”
- I see you just used your whole palm. What happens with the sound if next time we touch it very slowly with just the tip of your little finger?

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When children think they've made the loudest sound they can, help them with the following questions: (encouraging creative experimentation.)

- If I were standing out in the yard, do you think I'd hear this sound? Which part of this instrument would you have to hit or shake to make the sound grow really loud?
- If we want to imitate the loudest storm, would hitting it just once be enough? What happens if we repeat the movement many times, quickly? Let's try it together!"

When they can't think of how to use their own bodies as instruments

- What are two parts of your body that you can touch together? Try rubbing your palms together really fast next to your ears! What does that sound like?"
- Do you think your feet are only for walking, or can you use them to make a sound on the floor that sounds like soft rain falling?

When it's hard to find the "medium" sound

- Do you remember the mouse's very soft sound and the bear's really loud one? Now try making a sound that's just right for an average-sized puppy! Not too tiny, not too scary. Let's see how we can do that!"

Who liked this sound? Empathy and emotional communication building support:

- Let's all close our eyes for a moment and listen to this sound again! How did it feel to your ears? Was it pleasant, warm, and soothing for some of you, or was it rather cold or too loud for others? If this sound were a small animal, would it be a sweet, cuddly puppy, or a grumpy, scary lion? Ask the person sitting next to you: do they see the same little animal in their mind as you do, or did this sound make them think of something completely different?

Stage Debriefing Questions (Optional)

- When you first thought you'd found the quietest sound, but then managed to make an even quieter one: how did you figure out the trick? What changed when you decided to try again instead of giving up after your first guess?
- I noticed that you tried many different methods using the same object or your own bodies until you finally found the sound you were looking for. What did you do when your first idea didn't work - how did you come up with something completely new?
- How did you notice within your group if someone really liked a sound, or, on the contrary, if it was unpleasant to their ears? How did you understand each other's feelings? How were you able to agree on a volume level that everyone on the team liked in the end?

Tips and Tricks for dealing with stage challenges

- Place the groups in a different room or space so they can carry out their sound investigation without interruptions.
- It is important for you, as the teacher, to visit each group during the activity to challenge them to explore even more creative ways to produce loud or soft sounds with their instruments.
- Encourage multiple solutions and really challenge them to find an even softer sound

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STAGE 2 – Precipitation forms

How does this develop particular SPIRIT skills

- Wondering (By mentioning various facts and records about the forms of precipitation, you create a sense of wonder - for example, how large the biggest hailstone was),
- Curiosity, critical thinking (They need to make choices about what the correct solution is. This is critical thinking).

What do we want to achieve regarding SPIRIT skill development (student understanding and/or behaviour)?

Wondering (e.g., "How large was the biggest hailstone?")
Children's sense of wonder is sparked by the interesting facts and records shared, prompting them to ask questions and express surprise. Their curiosity leads them to explore and seek answers to new questions about precipitation.

Expected behavioural changes:

- Wide-eyed curiosity when new facts or surprising details are shared.
- Raising hands or sharing thoughts about facts they find intriguing (e.g., about hailstone size).
- Engaging in discussions with peers about unusual or surprising facts, showing excitement to learn more.

Curiosity (e.g., "What do you want to know more about?")
Children show their curiosity by asking questions and seeking further exploration of precipitation forms. They feel the need to explore topics that spark their interest.

Expected behavioural changes:

- Asking follow-up questions based on the teacher's explanations or photos.
- Sharing personal observations or wondering out loud ("How does hail form?" or "How big can hailstones get?").
- Looking for patterns or connections between different types of precipitation and their real-world implications.

Critical Thinking (e.g., "What is the correct solution?")
Children demonstrate critical thinking when they are tasked with making choices about the correct descriptions of precipitation forms. They compare options and evaluate the accuracy of information based on their understanding.

Expected behavioural changes:

- Looking carefully at the pictures or tweets and then deciding which form of precipitation matches which description.
- Discussing with peers to evaluate which description fits best, showing they can compare and analyse.
- Cross-checking their choices with others or with the teacher's explanations, showing confidence or hesitation as they refine their answers.

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Academic/Curriculum Objective connection

The students can name and describe the different forms of precipitation

Materials and tools needed for implementation

- PowerPoint with photos of the different rain forms + board notes + Worksheet.

Preparation notes

- PowerPoint and worksheet.

Guided Questions

- If precipitation is almost always made of water, how is it that snow is fluffy and white, ice is hard and makes a clinking sound, and fog is almost impossible to grasp with our hands? What could be happening to them up high in the sky, or on their way through the air, that makes them arrive here so differently?
- When a child has trouble distinguishing between different types of precipitation in a picture (drizzle, rain, or hail), the following question can help: Imagine you're standing outside in the schoolyard without an umbrella! How would it feel on your skin if drizzle were falling on you, and how would it feel if hail suddenly started falling? Which would make a louder thud when it hits the ground, and which would you barely be able to see in the air?
- Did you notice that one of the types of precipitation disappeared, leaving an empty space? What's the word that doesn't have a description? If you were the weather forecaster, how would you explain this precipitation to others?

Stage Debriefing Questions (Optional)

- When you were filling out the worksheet, how did you figure out which description belonged to which type of precipitation? What was your strategy: did you just guess, or were there descriptions that you ruled out step by step because they didn't fit with the others?
- What was the strangest or most surprising thing you learned today about fog, snow, or ice from the pictures and the worksheet? What question about the weather are you now even more curious about—after completing this activity—than you were at the beginning of class?
- Was there a moment when someone in your group thought a completely different solution on the worksheet was correct than the rest of you? How did you manage to discuss this: were you able to convince each other with arguments without arguing, or did you work together to find the right answer?
- What do you think was the size of the largest piece of ice that fell from the sky during the hailstorm? Could we research this together afterward?

Tips and Tricks for dealing with stage challenges

- Ask plenty of questions about the photos showing different types of precipitation. Have the students describe what they see.
- Choose very recognizable and recent weather photos and phenomena.
- Review exercise: If necessary, work through it as a whole class.

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STAGE 3 – Creative application phase: Science and art

How does this develop particular SPIRIT skills

Stage 3 is a complex task in which the children must combine the meteorological knowledge they acquired in the previous two stages with "music" and the sounds they create, and then present it to the others, (who must figure out, with their eyes closed, what kind of weather the group has translated into music) fundamentally develops the creativity of both the performers and the audience. To do this, they must think outside the box.

When children have to figure out and plan how to use the limited objects available to them in unusual ways for their performance, (for example, slowly and rhythmically rubbing their palms can imitate the whisper of fog, while rapidly drumming their fingertips on the desk brings drizzling rain to life), they develop both their creativity and their problem-solving skills.

In cases when the audience cannot figure out what kind of weather they have "set to music," the performing group must examine why the others did not "understand" their performance and, based on this, must modify and re-create it. In addition to the above-mentioned transversal skills, this process also develops their resilience, ability to overcome failure, and flexibility in a playful way—all of these are also two important elements of the SPIRIT skills.

What do we want to achieve regarding SPIRIT skill development (student understanding and/or behaviour)?

Critical Thinking (e.g., "Is this the correct sound for this weather situation?")
Children show critical thinking when they evaluate their vocalizations to see if they truly match the described weather situation. They think about whether their sound choices are appropriate in terms of volume and accuracy. Behaviour:

- Pausing to reflect on whether their vocalizations match the weather description (e.g., "Is this a loud or soft sound for a thunderstorm?").
- Discussing with group members if the sound represents the weather correctly and making adjustments.
- Listening carefully to their own vocalizations and comparing them to their peers, ensuring the sound fits the situation.

Problem-Solving/Creativity (e.g., "How can we represent this specific weather situation through sound?")
Children use creativity to experiment with different vocal techniques to capture the essence of a weather situation, focusing on the volume and intensity of their sounds. They engage in problem-solving to figure out how to best replicate precipitation sounds. Behaviour:

- Collaborating within their group, trying different methods to vocalize the weather situation (e.g., soft snow vs. heavy rain).
- Exploring different vocal techniques (e.g., using whispers, loud shouts, or varied rhythms) to match the weather description.
- Adjusting their approach after testing, showing flexibility in their solutions and trying again until they feel satisfied with their representation.

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Academic/Curriculum Objective connection

Students can produce loud and soft sounds with different kinds of materials.

Materials and tools needed for implementation

- Cards with a precipitation situation
- Own body (without voice) - valuable free material –
- Orff musical instruments
- Percussion instruments.

Preparation notes

Cards with a precipitation situation

Guided Questions

When the sound has to be improved:

- If I closed my eyes right now, would I really feel like I was standing outside in thick fog or a pounding hailstorm, or does this feel more like something else? How about we try this out?
- Let's say just one of you performs the sounds while the rest of us close our eyes and describe how it feels. Then based on that, we could make some adjustments.

Empathy / Reflection: Which sound is the most pleasant?

- Which sound did your ears like the most? Ask each other if they had the same feeling like you when they hearing that sound, or if something completely different sound would be pleasant to them. What do you think - by understanding each other's feelings, could we choose the best sound more effectively?

When kids get stuck before their own presentation

- I notice you're a little nervous about the performance. When you start playing, everyone else will close their eyes completely, so no one will actually be watching you! How about we all take a deep breath together before the performance, and as we exhale, pretend that the wind is blowing all our nerves away?

Stage Debriefing Questions (Optional)

- How did you use your imagination when you had to recreate the sound of a quiet fog or a knocking hailstorm using objects or instruments that are not meant for that at all? What was the biggest challenge you faced while coming up with these sounds, and how did you work together to overcome it?
- How did you manage to completely forget what these objects are normally used for and think outside the box?
- How did you feel, and what did you do when the others didn't immediately guess your weather story during the presentation?
- How did you manage to quickly adapt and come up with something new without losing your enthusiasm for the game?

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- How helpful was it to you in preparing and ensuring the success of your presentation to try to think and feel like your classmates, who would be listening to your presentation with their eyes closed? How could you do it?
- How did you feel when your classmates figured out your weather stories? How would you describe the feeling of success?

Tips and Tricks for dealing with stage challenges

- You can also give the same sentence to two groups. This way, they will realize that not everyone vocalizes the same sentence in the same way.
- The different sentences can be written on the board as a help for the other students who need to guess what was vocalized.
- Ensure that the sentences describing the weather situations are understood (so that students know what they mean). If necessary, review the sentences with the whole class beforehand.

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Annexes

Pilot implementation (detailed example with lesson/activity plan), attachments

Match the different descriptions with the correct form of precipitation.

Precipitation type	Description
1 Fog	A. Water droplets that fall to the ground.
2 Frost	B. Water cloud with fewer droplets, close to the ground, so you can still see quite well (up to 5 km).
3 Rain	C. Raindrops that fall on a surface that has a temperature below freezing. The water freezes immediately and forms a smooth layer of ice on the surface.
4 Snow	D. Water cloud that floats close to the ground, reducing visibility to a maximum of 1 km.
5 Hail	E. This precipitation often appears in the morning. Condensation occurs, forming small water droplets on the grass.
6 Dew	F. Very fine water droplets that fall down.
7 Freezing rain	G. Round ice stones that fall down.
8 Fog	H. Frozen water droplets that fall down.
9 Drizzle	

Answer boxes:

1	2	3	4	5	6	7	8	9

worksheet, PowerPoint

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5.3 Spaghetti and Marshmallow Pyramid Challenge

During the 200-minute STEAM programme, 3rd graders will develop creativity, problem solving, critical thinking, resilience, valuing people, curiosity, a sense of wonder and openness through 7 phases of building spaghetti and marshmallow pyramids. The activity develops these skills while students create models of pyramids and identify points, lines and angles. Teams practice problem solving, as well as evaluating others' ideas and being open to them by designing stable structures within strict quantitative constraints to avoid wasting resources. Through two tests of construction (prototyping, evaluation and improvement), learners strengthen their resilience and flexibility by adjusting their designs in case of structures faltering or breaking. The project concludes with a reflection where students compare their results and use geometric vocabulary to explain their team's success.

Basic Information Sheet

Age group	Student number	Duration	Number of stages	Subjects connection and relevance
3rd grade (core activity; extensions for Grades 4–5 in “Difficulty level tailoring notes”)	Whole class (max ~30 students)	180–200 minutes (plus optional extension time)	7 stages	Mathematics – Geometry (3D shapes + Euclid-style vocabulary: point/line/parallel/angle)

STEAM Event Summary

The Spaghetti Marshmallow activity is designed to get learners working together to build and test their designs with an emphasis on radical collaboration and bias to action. This STEAM exercise is a great way to push students to build, test, and iterate. This activity also encourages critical thinking by asking students to synthesize what they learned quickly to create new designs. Students must also demonstrate resilience in the face of challenges or frustrations.

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SPIRIT Skill Focus

- Problem-solving
- Critical thinking
- Flexibility
- Resilience

Complementary/Secondary SPIRIT Skill(s)

- Valuing people and nature (resource stewardship: limited materials, reuse, waste minimization)

National curriculum Link and Objectives

- Recognize and use geometry vocabulary: point, line/straight line, parallel lines, angle
- Identify and compare solids: triangular pyramid, square pyramid, rectangular pyramid
- Understand that pyramids are named by their base shape
- Apply spatial reasoning and geometric language while building a 3D model
- Collaborate to plan, test, improve, and reflect on a design under constraints

Real-world STEAM Connection and Problem definition

- Connection (student perspective):

Engineers and architects build strong structures with limited materials. They have to look closely at models, plan carefully, test ideas, fix failures, and avoid wasting resources.

- Problem definition (student perspective):

"How can our team use limited spaghetti and marshmallows to build a stable rectangular pyramid with a 4×3 rectangular base that matches the teacher's model, while using materials wisely and learning to describe what we see with geometry words?"

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Materials at a Glance

- Tablets/LMS access (optional in-class replay of videos if needed)
- Exit-ticket printouts (from flipped videos)
- 3 prebuilt rectangular pyramid models (4×3 rectangular base) visible at each table
- Dry spaghetti sticks (limited supply per team)
- Marshmallows (limited supply per team)
- Chart paper and markers (team plan + notes)
- Timer/stopwatch
- Constraint sheet (resource limits + waste minimization prompt)
- Quick observation checklist sheets (points/lines/parallel/angles)

Indoor/Outdoor and Classroom layout

Indoor

- Tables arranged in pods (4–6 students per team)
- One model pyramid per pod (or 3 models distributed across the room)
- Whiteboard/chart area for whole-class question + final reflection
- “Materials station” with pre-measured team packs (to support fairness and stewardship)

Notes on Research-based approach and integration

Students arrive with baseline concept input from short videos (flipped classroom), freeing class time for hands-on investigation, building, and iteration. They begin by observing a real model and identifying geometric features (research), then create and test a prototype under constraints (design), and finally compare results and reflect on both strategies and resource use (connect). The two-trial structure plus peer “snowball” exchange mirrors real engineering cycles: observe → plan → test → learn → improve.

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Lesson Flow Overview (linked to details below)

Stage	Title	Brief Description	SPIRIT Skills	Duration	Link to Details
1st	**Geometry Warm-Up and Naming Pyramids**	Teams combine exit-ticket ideas and answer: “Why are pyramids called triangular/square/rectangular?” using base shape evidence.	• Critical thinking	15 minutes	STAGE 1 – Geometry Warm-Up and Naming Pyramids
2nd	**Model Investigation**	Students individually inspect the rectangular pyramid model and identify points, lines, parallel lines, and angles using a checklist.	• Critical thinking	20 minutes	STAGE 2 – Model Investigation
3rd	**Team Action Plan and Stewardship Rules**	Teams share notes, assign roles, and create a build plan that includes material-saving rules	• Problem-solving • Valuing people and nature	20 minutes	STAGE 3 – Team Action Plan and Stewardship Rules
4th	**Build Trial 1**	Teams build under time and material limits, adapting quickly when pieces break or wobble.	• Resilience • Problem-solving	30 minutes	STAGE 4 – Build Trial 1
5th	**Mid-Debrief + Snowball Exchange**	Teams evaluate what happened, exchange one tip with another team, and choose one change to try.	• Flexibility • Critical thinking	30 minutes	STAGE 5 – Mid-Debrief + Snowball Exchange
6th	**Build Trial 2**	Teams rebuild using their chosen change and aim for better stability + less waste.	• Flexibility • Resilience	30 minutes	STAGE 6 – Build Trial 2
7th	**Group reflection and Model Comparison**	Teams compare to the model, name one geometry insight, one strategy insight, and one stewardship takeaway.	• Critical thinking • Valuing people and nature	30 minutes	STAGE 7 – Group reflection and Model Comparison

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Tips and Tricks for dealing with challenges (for the whole STEAM program)

- Normalize failure: "Engineers expect breaks and rebuilds - that's normal. "Use the mantra Break → Breathe → Rebuild.
- Use a visible timer with checkpoints ("Half time - check your base!").
- Encourage reuse: broken spaghetti pieces can become braces/supports.
- If teams get stuck, ask: "What is the smallest change you can test next?"
- Make stewardship visible: each team keeps a "reuse pile" and "waste corner
- Noise/chaos: Use a quick signal ("Scientist hands!") for freeze + reset.
- Unequal participation: Role cards + rotate roles between Trial 1 and Trial 2.

Difficulty level tailoring notes

A) Grade-level tailoring (content depth)

- Grade 3 (Core):
  - Identify pyramid names by the base shape
  - Find points/lines/parallel lines/angles using a guided checklist
  - Build for stability and match the model "as close as possible"
- Grade 4 (Extension):
  - Count faces/edges/vertices and compare to the model
  - Classify angles more explicitly (right/acute/obtuse) using a reference chart
  - Add a simple "stability score" (stands 10 seconds = success)
- Grade 5 (Extension):
  - Add an "efficiency score" (stable structure + minimal waste)
  - Require claim–evidence reasoning: "We changed X because Y happened."
  - Explore the scaling question: "What changes if the base becomes 5×4?"

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B) Skill-level tailoring (same task, different scaffolds)

- Problem-solving
  - Beginner: Provide a 3-step plan card (Base → Corners → Apex) + role cards. Prompt: “What’s the first smallest step?”
  - Intermediate: Teams write their own plan + choose one stability strategy before building.
  - Advanced: Teams follow the one-change rule between Trial 1 and Trial 2 and explain cause–effect.
- Critical thinking
  - Beginner: “Point-and-name” checklist with visuals (point/line/parallel/angle).
  - Intermediate: Add evidence sentence: “It’s a rectangular pyramid because the base is a rectangle.”
  - Advanced: Compare model vs build using two criteria (accuracy + stability) and justify with evidence.
- Flexibility
  - Beginner: Provide a “Try next” menu (shorten edge / rebuild base / add brace / swap roles).
  - Intermediate: Adopt one peer suggestion from snowball exchange and explain why it fits.
  - Advanced: Evaluate two suggestions, reject one with a reason, implement the best.
- Resilience
  - Beginner: Class mantra: “Break → breathe → rebuild.” Assign a “reset role.”
  - Intermediate: Record one challenge + one coping action (“We felt stuck when… so we…”).
  - Advanced: Frame failure as data: “Trial 1 taught us… so Trial 2 we…”
- Valuing people and nature
  - Beginner: “Reuse once before taking new.” Keep a reuse tray.
  - Intermediate: Quick tally: used / reused / wasted + one improvement goal for Trial 2.
  - Advanced: Efficiency claim: “We improved stability while wasting less because.)

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STEAM Program Debriefing and Reflection Questions

- What made your pyramid stronger or weaker?
- What did you do when your plan didn't work the first time?
- How did feedback change your second design?
- What did you do to avoid wasting materials?
- Why does the base shape decide the pyramid's name?

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5.3.2. Stage details and Activities Flow

STAGE 1 – Geometry Warm-Up and Naming Pyramids

How does this develop particular SPIRIT skills

- Builds critical thinking by classifying pyramids and justifying answers using base-shape evidence
- Encourages students to select the most accurate explanation based on observation

What do we want to achieve regarding SPIRIT skill development (student understanding and/or behaviour)?

As a result of this activity, students will be able to:

- Critical thinking: explain that pyramids are named by their base shape and give one example.
- Critical thinking: use at least two geometry words correctly (base, face, point/vertex, edge/line).

Academic/Curriculum Objective connection

- Identifying and naming 3D shapes based on defining features
- Using geometry vocabulary in speech and reasoning.

Materials and tools needed for implementation

- Exit-ticket sheets (from videos)
- Chart paper + markers
- Teacher model pyramid (visible).

Preparation notes

- Prepare a prompt card: “Name comes from the base.”
- Have visuals ready: triangle → triangular, square → square, rectangle → rectangular.

Guided Questions

- “What shape is the base?”
- “If the base is a rectangle, what do we call the pyramid?”
- “Which part decides the name: the faces or the base?”

Stage Debriefing Questions (Optional)

- “How did you use evidence, not guessing, to choose your answer?”

Tips and Tricks for dealing with stage challenges

- **Challenge:** Students confuse base and face.
  Tip: Physically point to the bottom and say: “Base = bottom shape. Name comes from base.”
- **Challenge:** Some students stay quiet.
  Tip: Use sentence stems: “I think it is ____ because ____.”.

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STAGE 2 – Individual Model Investigation and Note-Taking

How does this develop particular SPIRIT skills

- Develops critical thinking through careful observation and pattern noticing
- Builds precision by connecting vocabulary (point/line/parallel/angle) to a real object

What do we want to achieve regarding SPIRIT skill development (student understanding and/or behaviour)?

As a result of this activity, students will be able to:

- Critical thinking: identify one point (vertex) and one line (edge) on the model.
- Critical thinking: find one pair of parallel lines on the base and explain “they don’t meet.”
- Critical thinking: point to one angle and describe it as a “corner where two lines meet.”

Academic/Curriculum Objective connection

- Identify points, lines, parallel lines, and angles in 2D/3D forms
- Strengthen geometry vocabulary through observation.

Materials and tools needed for implementation

- Teacher model pyramid(s)
- Student observation checklist sheets
- Pencils
- Optional: angle/parallel-lines visual reference card.

Preparation notes

- Ensure each student can see a model clearly (one model per pod is ideal).
- Provide clipboards if students move around.

Guided Questions

- “Where is a point (vertex)?”
- “Which spaghetti edge is a straight line?”
- “Can you find two lines on the base that go the same direction?”
- “Where is a corner (angle) on the base?”

Stage Debriefing Questions (Optional)

- “Which geometry word was easiest to find? Which was hardest?”

Tips and Tricks for dealing with stage challenges

- **Challenge** (beginner): Vocabulary feels abstract.
  Tip: Use matching language: “Marshmallow = point, spaghetti = line.” Provide picture checklist.
- **Challenge** (advanced): Students finish quickly.
  Tip: Add evidence sentence: “It’s rectangular because the base is a rectangle.”

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STAGE 3 – Group Brainstorm and Action Plan (with Stewardship Rules)

How does this develop particular SPIRIT skills

- Builds problem-solving by converting observations into a plan with roles and steps
- Develops valuing people and nature by setting resource rules before building.

What do we want to achieve regarding SPIRIT skill development (student understanding and/or behaviour)?

As a result of this activity, students will be able to:

- Problem-solving: write a step-by-step build plan and assign roles.
- Problem-solving: choose one stability strategy (base first / reinforce corners / add braces).
- Valuing people and nature: agree on two resource rules (reuse pile, measure before snapping, avoid waste).

Academic/Curriculum Objective connection

- Apply planning and reasoning to a 3D construction task
- Connect resource constraints to responsible decision-making.

Materials and tools needed for implementation

- Team plan sheet + role cards
- Chart paper + markers
- Constraint sheet (materials limit + reuse rule).

Preparation notes

- Pre-pack each team's materials in a tray (no refills until after Trial 1 reflection).
- Prepare a "Try-next" menu card for teams that get stuck.

Guided Questions

- "What should we build first: base or top?"
- "How will we make corners strong?"
- "How will we make sure everyone has a job?"
- "What will we do with broken pieces?"

Stage Debriefing Questions (Optional)

- "Does everyone agree on the plan? What is your team's first step?"

Tips and Tricks for dealing with stage challenges

- **Challenge:** Teams argue too long.
  Tip: Use a quick vote + choose a leader to finalize the plan in 30 seconds.
- **Challenge:** Teams waste spaghetti early.
  Tip: Add "reuse tray" and rule: "Reuse once before taking new."

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STAGE 4 – Build Trial 1 (Design and Test)

How does this develop particular SPIRIT skills

- Strengthens resilience by working through breakage and time pressure
- Builds problem-solving through real-time troubleshooting and stability decisions

What do we want to achieve regarding SPIRIT skill development (student understanding and/or behaviour)?

As a result of this activity, students will be able to:

- Problem-solving: build a first prototype with a recognizable 4×3 rectangular base and attempt an apex.
- Resilience: respond to a challenge by choosing a next step (rebuild/brace/swap role).
- Valuing people and nature: place broken or unused pieces into a reuse pile, not the trash.

Academic/Curriculum Objective connection

- Apply spatial reasoning and geometric accuracy to a hands-on model
- Use geometric language while building (base/edge/vertex).

Materials and tools needed for implementation

- Team spaghetti + marshmallows
- Timer/stopwatch
- Quick build log (Trial 1).

Preparation notes

- Set clear safety/food rules (marshmallows are connectors, not snacks).
- Set time checkpoint reminders (e.g., “Check base at 5 minutes.”).

Guided Questions

- “Is your base flat and rectangular?”
- “Do your corners feel strong?”
- “What is wobbling - and what can you change?”
- “What is the smallest fix you can try first?”

Stage Debriefing Questions (Optional)

- What worked best in Trial 1? What broke first?”

Tips and Tricks for dealing with stage challenges

- **Challenge** (resilience): Students get frustrated when it collapses.
  Tip: Use mantra: Break → Breathe → Rebuild and assign a “reset role.”
- **Challenge** (problem-solving): Teams try many fixes at once.
  Tip: Teacher prompts: “Try one change, then test again.”

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STAGE 5 – Mid-Trial Debrief and Snowball Pairing

How does this develop particular SPIRIT skills

- Develops flexibility by accepting feedback and adjusting direction
- Strengthens critical thinking by selecting the most useful suggestion based on evidence

What do we want to achieve regarding SPIRIT skill development (student understanding and/or behaviour)?

As a result of this activity, students will be able to:

- Critical thinking: name one cause of failure using evidence ("base uneven," "weak corners").
- Flexibility: choose one peer suggestion and explain why it fits their problem.
- Resilience: speak about mistakes as learning (not blame).

Academic/Curriculum Objective connection

- Peer review and improvement cycle (observe → evaluate → revise)
- Use clear reasoning and evidence in discussion.

Materials and tools needed for implementation

- Sticky notes
- Mid-trial reflection prompts sheet.

Preparation notes

- Pre-assign pairing partners so snowball takes 2 minutes, not 10.
- Provide sentence stem for feedback: "Try ___ because ___."

Guided Questions

- "What is one thing you want to improve?"
- "What suggestion did the other team give you?"
- "Which one change will you test next?"

Stage Debriefing Questions (Optional)

- "Which feedback felt most helpful and why?"

Tips and Tricks for dealing with stage challenges

- **Challenge:** Teams copy feedback without thinking.
- **Tip:** Require the "because" sentence before they rebuild.
- **Challenge:** Too many suggestions overwhelm the team.
  Tip: "Pick one change only" rule for Trial 2.

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STAGE 6 – Second Build Trial (Implement Adjustments)

How does this develop particular SPIRIT skills

- Strengthens flexibility by testing a revised strategy
- Builds resilience by improving calmly under pressure and recovering quickly

What do we want to achieve regarding SPIRIT skill development (student understanding and/or behaviour)?

As a result of this activity, students will be able to:

- Flexibility: apply one planned change from Stage 5 consistently.
- Problem-solving: improve stability compared to Trial 1 (stands independently for a chosen time).
- Valuing people and nature: reuse at least one broken piece as a brace/support if possible.

Academic/Curriculum Objective connection

- Iterative design: revise based on feedback and evidence
- Improve geometric accuracy and stability through planning

Materials and tools needed for implementation

- Remaining spaghetti + marshmallows
- Timer/stopwatch
- Trial 2 build log

Preparation notes

- Remind teams: “One-change rule” (especially for developing/advanced learners).
- Rotate roles if needed so participation is fair.

Guided Questions

- “What is the one change you are testing?”
- “What looks stronger than Trial 1?”
- “How did your base shape stay rectangular?”
- “What did you reuse instead of wasting?”

Stage Debriefing Questions (Optional)

- “Did your one change help? How do you know?”

Tips and Tricks for dealing with stage challenges

- **Challenge:** Teams change too many things at once.
  Tip: Enforce “one-change rule,” then test and observe.
- **Challenge:** Second collapse causes giving up.
  Tip: Prompt: “What did Trial 1 teach us?” then reset with the mantra and rebuild one small section first.

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STAGE 7 – Group Reflection and Model Comparison

How does this develop particular SPIRIT skills

- Develops critical thinking through comparison and evidence-based conclusions
- Strengthens valuing people and nature by reflecting on resource use and responsible choices
- Supports resilience by recognizing growth and effort

What do we want to achieve regarding SPIRIT skill development (student understanding and/or behaviour)?

As a result of this activity, students will be able to:

- Critical thinking: compare their pyramid to the model using geometry words and one cause–effect explanation.
- Resilience: name one challenge they overcame and how they handled it.
- Valuing people and nature: state one stewardship choice they made (reuse, fewer materials, careful planning).

Academic/Curriculum Objective connection

- Use geometry vocabulary to describe 3D structures
- Reflect on design choices and outcomes using evidence

Materials and tools needed for implementation

- Teacher model pyramid
- Reflection sheet (geometry + skills reflection)
- Optional: “gallery walk” labels (Team A, Team B...).

Preparation notes

Prepare reflection sentence stems:

- “Our pyramid is similar because...”
- “It is different because...”
- “We improved by...”
- “We wasted less by...”

Guided Questions

- “How is your pyramid similar to the model?”
- “What did you change from Trial 1 to Trial 2?”
- “What did you learn about the base and the name?”
- “How did you use materials wisely?”

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Stage Debriefing Questions (Optional)

- "What would you do first if you built it again tomorrow?"

Tips and Tricks for dealing with stage challenges

- **Challenge:** Students only say, "ours is better/worse."
  Tip: Require one "because" sentence with evidence: "It leaned because..."
- **Challenge:** Some students don't want to mention mistakes.
  Tip: Normalize: "Mistakes are data." Ask for "one lesson learned" rather than "one failure."

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5.4 My Robot Friend

During this 3-hour STEAM program, 3rd graders go through 7 stages to design a robot that understands and responds to human emotions. The project builds emotional awareness as kids learn to identify feelings in others and choose kind ways to respond. The journey begins with an emotion circle and scenario discussions to develop empathy and social awareness. Working in small groups helps students practice empathy and cooperative problem-solving while tackling social challenges together. In the Planning the Robot Response stage, students use IF-THEN logic to code caring responses, which builds both empathy and emotional awareness, regulation and communication. Next, teams build and pilot where the focus is on demonstrating how the robot reacts empathetically to the emotion. The program ends with presentations and a reflection circle to improve communication and self-regulation skills.

Basic Information Sheet

Age group	Student number	Duration	Number of stages and	Subjects connection and relevance
3rd; grade students	Whole class (Groups of 4 students)	3 hours	7 stages	Coding

STEAM Event Summary

SPIRIT Skill Focus

- Creativity
- Emotional awareness regulation and communication
- Empathy

National curriculum Link and Objectives

- Understand basic logic and programming principles (if/then, sequences).
- Develop engineering and design thinking through prototyping.

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Real-world STEAM Connection and Problem definition

Children today are surrounded by smart devices and virtual assistants, yet these technologies often lack emotional understanding. This activity helps students reflect on a real-world issue: "Can a machine be a good friend?" or "What does it take to support someone emotionally?" By imagining and designing a robot that reacts to human emotions, students connect abstract coding concepts with real-life social needs. The challenge here is designing a technological solution to a problem they face everyday: "how to recognize emotions in others and respond kindly".

Materials at a Glance

- Paper
- Pencils
- coloured markers
- glue
- scissors
- recycled materials for building the robot (cardboard, bottle caps, tubes, etc.)
- Printable "IF–THEN" coding blocks
- Emotion scenario cards

Indoor/Outdoor and Classroom layout

Setting: Indoor
Layout suggestion: Arrange desks in small groups of 4–5 students to encourage collaboration. Provide a central "materials station" with all recycled items and tools. Leave a free area or table at the front of the classroom for students to display or test their robot prototypes. If available, place a poster or screen nearby showing simple examples of robots or facial expressions for inspiration.

Notes on Research-based approach and integration

In this activity, children are encouraged to explore how we communicate emotions - both as humans and through artificial creations. They begin by observing how facial expressions convey feelings in real life, drawing from personal experiences and stories. Then, they apply this knowledge to imagine and design a robot that can express empathy. This process mirrors a basic research cycle: observing emotional cues, defining what makes them effective, hypothesizing how to replicate them in a robot, and testing their ideas through drawing or building. The connection to real life (e.g., how they feel when someone understands them) makes the learning more engaging and meaningful.

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Lesson Flow Overview (linked to details below)

Stage	Title	Brief Description	SPIRIT Skills	Duration	Link to Details
1st	**Introduction and Warm-up Discussion**	Children are invited to reflect on what makes someone a good friend, then imagine if a robot could be a good friend too. They are shown pictures or videos of robots and introduced to the idea of a robot that understands emotions.	• Empathy • Emotional awareness, regulation and communication • Creativity	15 minutes	STAGE 1 – Introduction and Warm-up Discussion
2nd	**Group formation and empathy scenario discussion**	After the introductory discussion, students form groups of four. Within each group, students choose or are assigned specific roles (e.g., robot designer, coder, writer, presenter) to ensure shared responsibility and active participation. Then, each group selects or receives an Emotion Scenario Card describing a situation where someone needs empathy. Students read and discuss the scenario, identify the emotional state involved, and begin thinking about how their robot might respond to help.	• Empathy • Emotional awareness, regulation and communication	15-20 minutes	STAGE 2 – Group formation and empathy scenario discussion
3rd	**Planning the Robot Response**	Based on the scenario discussed in the previous stage, students work in groups to plan how their robot should respond to different emotional states. Using simple IF–THEN logic, they match feelings with caring, appropriate responses. These ideas will later guide the robot's design and presentation. Example: • IF a classmate is sad → THEN robot offers comforting words and glows soft blue • IF someone is angry → THEN robot plays relaxing sounds • IF a child is afraid → THEN robot says, “You’re not alone” and displays a calming animation	• Empathy • Emotional awareness, regulation and communication	15-20 minutes	STAGE 3 – Planning the Robot Response
4th	**Designing the Robot**	Each group builds a simple robot prototype using recycled or craft materials. The design should visually and functionally represent the	• Empathy • Emotional	40-45 minutes	STAGE 4 – Designing the

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		emotional responses defined in the previous stage. Students creatively integrate visual elements (like colours, facial expressions, light signals) to show emotions and empathetic reactions. The robot might include features like: • Interchangeable "faces" showing different emotions • Coloured "emotional lights" (e.g., blue = calm, red = angry) • Movable parts for gestures (e.g., arms to give a hug) • Cardboard buttons or panels labelled with actions • The robot does not need to be functional - it is a prototype that represents empathic responses.	awareness, regulation and communication • Creativity		**Robot**
5th	**Rehearsal and Role-play**	In this stage, students rehearse their chosen emotional scenario using the robot they designed. One student plays the role of the child in need, another controls the robot's actions and responses, while the rest of the team supports the scene. The focus is on demonstrating how the robot reacts empathetically to the emotion.	• Empathy • Emotional awareness, regulation and communication	20 minutes	**STAGE 5 – Rehearsal and Role-play**
6th	**Presentations**	Each group presents their robot to the rest of the class. They explain the emotion scenario they worked on, show how their robot is designed to respond empathetically, and act out the 7scene using their prototype. The class observes and may ask questions or offer feedback.	• Empathy • Emotional awareness, regulation and communication	30 minutes	**STAGE 6 – Presentations**
7th	**Final Reflection Circle**	After all presentations, the class gathers in a circle to reflect on the activity as a whole. Using emotion cards, question prompts, or sentence starters, students are invited to share what they learned about emotions, empathy, and collaboration. This moment helps consolidate learning and creates space for personal insights and peer connection.	• Empathy • Emotional awareness, regulation and communication	5 minutes	**STAGE 7 – Final Reflection Circle**

Tips and Tricks for dealing with challenges (for the whole STEAM program)

- Some students might feel frustrated if their robot doesn't work as expected: remind them that trial and error is a key part of real engineering.

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- Celebrate failed attempts as valuable learning experiences.
- Encourage students to test small changes one at a time.
- If a group is stuck, gently ask what they've already tried and what they could try next.
- Teachers should model curiosity and patience, showing that emotions and mistakes are natural parts of invention.

Difficulty level tailoring notes

- **Beginner learners:** For students with emerging emotional vocabulary, offer sentence frames ("When someone is sad, I can...") and model robot responses. Use emoji cards to support understanding.
- **Advanced learners:** Encourage students to recognise more subtle emotional cues and think about how the robot should respond. Make the robot's response more complex and articulate.
- **Expert learners:** Add complexity with mixed-emotion situations (e.g., nervous and excited) or invite them to design a robot that can learn from interactions.

STEAM Program Debriefing and Reflection Questions

- What emotion did your robot respond to best?
- How did your team decide what kindness looks like?
- What did you learn about helping others?
- Can you act like your robot in real life?

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5.4.2. Stage details and Activities Flow

STAGE 1 – Introduction and Warm-up Discussion

How does this develop particular SPIRIT skills

- Develops emotional awareness by linking emotions to real-life and imagined contexts
- Stimulates empathy by asking students to imagine emotional needs in others (including a robot!)
- Promotes creative thinking through the open-ended question

What do we want to achieve regarding SPIRIT skill development (student understanding and/or behaviour)?

- Students begin to articulate qualities of empathy and support
- Students start imagining how emotions could be recognized and responded to
- Students gain curiosity about combining emotions and technology

Academic/Curriculum Objective connection

- Civic education: understanding emotions, relationships
- Science/technology introduction: robots and automation
- Language: expressing feelings and describing behaviours

Materials and tools needed for implementation

- Images or short videos of robots (printed or projected)
- Whiteboard or chart for keywords
- Optional: emotion cards

Preparation notes

- Choose age-appropriate robot visuals (simple design, expressive features if possible). Prepare 1–2 sample definitions of “good friend” to support discussion

Guided Questions

- What makes someone a good friend?
- Could a robot become a good friend? Why or why not?
- How could a robot know how we feel?
- What would you want a robot to do if you were sad or scared?

Stage Debriefing Questions (Optional)

- Did anyone think a robot could show feelings? Why?
- What was the most surprising idea shared in our discussion?

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Tips and Tricks for dealing with stage challenges

- If children struggle to imagine robots as friends, use cartoons or familiar characters (e.g., Baymax, Wall-E)
- Use sentence starters for shy children ("A good friend is someone who…")
- Validate all contributions to encourage imagination

STAGE 2 – Group formation and empathy scenario discussion

How does this develop particular SPIRIT skills

- Students practice identifying and understanding other people's emotions
- They collaborate to imagine supportive, compassionate responses
- They learn to recognize emotional cues and relational needs.

What do we want to achieve regarding SPIRIT skill development (student understanding and/or behaviour)?

- Students develop their ability to take others' perspectives
- They become more comfortable naming and recognizing emotions
- They discover there are different ways to support someone in need
- They build teamwork and respectful listening within small groups.

Academic/Curriculum Objective connection

- Civic and emotional education
- Strengthening emotional vocabulary and empathy
- Supporting cooperative work and social-emotional learning.

Materials and tools needed for implementation

- Printed or handwritten Emotion Scenario Cards (1 per group)
- Blank paper or sketch sheets for notes or early ideas (optional)
- Poster paper or flipchart for collective sharing (optional).

Preparation notes

- Prepare age-appropriate scenario cards in advance
- Organize the space for group work (e.g., desk islands or floor space)
- Clarify group roles and expectations with short descriptions/examples.

Guided Questions

- How do you think the person in this situation feels?
- Has something like this ever happened to you or a friend?
- What could we do to help them feel better?
- How might a kind and empathetic robot respond in this case?

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Stage Debriefing Questions (Optional)

- Which scenario made you think the most?
- What feelings did this discussion bring up for you?

Tips and Tricks for dealing with stage challenges

- If children have trouble choosing roles, suggest short role descriptions or let them rotate
- Offer sentence starters to help groups communicate (“I think that...”, “Maybe we could...”)
- For unclear situations, read them aloud or provide a quick example to support comprehension.

STAGE 3 – Planning the Robot Response

How does this develop particular SPIRIT skills

- Children explore how to respond sensitively and appropriately to others' emotions
- They practice imagining what kind of support someone in distress might need
- They create caring and meaningful responses through structured logic.

What do we want to achieve regarding SPIRIT skill development (student understanding and/or behaviour)?

- Students learn to match emotions with helpful behaviours
- Students develop greater awareness of how words, tone, and gestures can support others
- Students connect abstract emotional knowledge with concrete actions
- Students gain confidence in expressing empathy in clear, structured ways.

Academic/Curriculum Objective connection

- Introduction to logical thinking and decision making (IF–THEN structure)
- Social and emotional learning (SEL)
- Oral and written communication.

Materials and tools needed for implementation

- Emotion Scenario Card (from previous stage)
- IF–THEN planning worksheet or blank paper
- Pens, markers, optional logic flow templates

Preparation notes

- Prepare a few examples of IF–THEN statements to model for the class
- Encourage diversity in responses (emotions can have more than one possible supportive action)
- Reinforce that all ideas are welcome, as long as they show care and understanding.

Guided Questions

- What would a caring friend do in this situation?
- How could your robot show kindness or support?
- What could help this person feel better, safer, or calmer?
- What would YOU want someone to do if you felt this way?

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Stage Debriefing Questions (Optional)

- Did you find some emotions harder to respond to than others?
- How did your group decide on the best robot action for each feeling?

Tips and Tricks for dealing with stage challenges

- Some children may suggest "funny" or silly robot responses - guide them to think about the needs of the person in the scenario
- Offer emotion word banks and example responses for students who struggle with vocabulary
- Support students in combining kindness with creativity - there is no one right answer.

STAGE 4 – Designing the Robot

How does this develop particular SPIRIT skills

- Students embody empathy through creative design
- They think carefully about how to visually represent care, comfort, and emotional support
- They practice perspective-taking, imagining how someone might feel when seeing or interacting with their robot.

What do we want to achieve regarding SPIRIT skill development (student understanding and/or behaviour)?

- Students will be able to represent emotional responses through design choices
- They learn how to express empathy using visual and physical elements
- They will better understand how emotional cues can be communicated non-verbally
- They practice teamwork, negotiation, and listening during construction.

Academic/Curriculum Objective connection

- Basic design thinking and prototyping
- Emotional literacy through physical and visual representation
- Art and creativity integration with SEL.

Materials and tools needed for implementation

- Recycled items (e.g., boxes, tubes, caps, fabrics)
- Scissors, tape, glue, string, paper
- Markers, pens, coloured paper
- (Optional) LEDs, stickers, sound cards, etc.

Preparation notes

- Prepare a "materials table" where each group can collect supplies
- Display examples or inspiration images of simple robot prototypes
- Remind students that the purpose is to express emotions, not to make a high-tech machine.

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Guided Questions

- How does your robot show empathy?
- Which part of your design represents how the robot supports someone?
- What colours, shapes, or movements help show how your robot feels?
- How do the robot's features reflect your IF–THEN plan?

Stage Debriefing Questions (Optional)

- What emotion was the hardest to represent physically?
- Did everyone in the group contribute something to the robot's design?

Tips and Tricks for dealing with stage challenges

- Some groups might struggle with agreeing on a design - remind them to refer to their IF–THEN plan for guidance
- Offer sentence starters like: "Our robot helps by…" or "We chose this face/light because…"
- Emphasize function over perfection - the robot doesn't need to "work," it needs to express empathy.

STAGE 5 – Rehearsal and Role-play

How does this develop particular SPIRIT skills

- Students simulate real-life situations where empathy is needed
- They must recognize and respond to emotional cues
- They practice offering support and comfort using their robot as a tool.

What do we want to achieve regarding SPIRIT skill development (student understanding and/or behaviour)?

- Students will demonstrate their understanding of emotional needs through acting and interaction
- They will apply their robot design to support someone empathetically
- Students gain confidence in expressing and responding to emotions in a safe setting.

Academic/Curriculum Objective connection

- Drama and role-play for emotional literacy
- Application of design thinking to real-life scenarios
- Reinforcement of IF–THEN logic through live demonstration.

Materials and tools needed for implementation

- Robot prototype
- Emotion scenario card
- (Optional) simple props or costume pieces to support role-play

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Preparation notes

- Remind students that role-play is about trying out ideas, not about acting perfectly
- Encourage kindness and sensitivity during scenes
- Support shy students by allowing them to choose less exposed roles (e.g., narrator or robot operator).

Guided Questions

- ow does your robot help the person in this situation?
- How did it feel to act out that emotion?
- What did you notice about your partner's reaction?
- Did the robot do something that would actually help in real life?

Stage Debriefing Questions (Optional)

- Was the robot's response clear to the audience?
- How did your team work together to bring empathy to life?

Tips and Tricks for dealing with stage challenges

- Some students may feel embarrassed – create a warm, encouraging environment
- Keep scenes short and focused to maintain engagement
- If needed, model a simple role-play first with the whole class.

STAGE 6 – Presentations

How does this develop particular SPIRIT skills

- Encourages articulation of emotional understanding
- Promotes appreciation of others' perspectives and creative solutions.

What do we want to achieve regarding SPIRIT skill development (student understanding and/or behaviour)?

- Students will articulate their understanding of empathy in their own words
- They will observe and learn from peers' interpretations of emotional needs
- They will strengthen confidence in presenting ideas and listening actively.

Academic/Curriculum Objective connection

- Oral presentation and storytelling skills
- Design thinking communication
- Social-emotional learning and reflective practice.

Materials and tools needed for implementation

- Robot prototype
- Scenario card
- Any visual aids or drawings the team prepared

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Preparation notes

- Give each group a set amount of time and a simple structure (e.g., 1 min scenario, 1 min robot, 1–2 min demo)
- Coach students on how to listen respectfully and ask meaningful questions
- Encourage applause and positive comments after each presentation.

Guided Questions

- What made your robot a good friend in this situation?
- How does your robot show it understands emotions?
- Did anything surprise you about how your group worked together?
- What would you add or change if you could improve your robot?

Stage Debriefing Questions (Optional)

- Which robot responses felt the most comforting or useful?
- What did you notice about how different groups approached the same emotion?

Tips and Tricks for dealing with stage challenges

- Support shy students by letting them share smaller parts of the presentation
- If a group is struggling, help them prepare a script or key points
- Keep presentations on time to allow all groups to present.

STAGE 7 – Final Reflection Circle

How does this develop particular SPIRIT skills

- Encourages students to connect with each other's reflections
- Builds emotional vocabulary and reflective capacity
- Fosters active listening and shared understanding.

What do we want to achieve regarding SPIRIT skill development (student understanding and/or behaviour)?

- Students recognize different emotional experiences and responses
- They reflect on how empathy can take different forms
- They become more comfortable talking about emotions in a group setting.

Academic/Curriculum Objective connection

- Supports oral expression and group discussion
- Promotes critical thinking and emotional literacy
- Connects SEL with communication outcomes.

Materials and tools needed for implementation

- Emotion cards (or simple emojis)
- Scenario cards from earlier stages
- Optional: sentence starters like "I learned that...", "I felt proud when...", "I noticed that..."

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Preparation notes

- Set up a calm and welcoming space for sharing
- Remind students about respectful listening and no interruptions
- Have optional prompts available for shy students.

Guided Questions

- What was one emotion your group worked with today?
- How did your robot show empathy?
- What did you learn about helping others through this activity?
- Was there a moment today when you felt really connected to someone else?
- What surprised you about how empathy can look or feel?

Stage Debriefing Questions (Optional)

- How would you feel if your robot helped you in real life?
- Did this activity make you think differently about friendship or emotions?

Tips and Tricks for dealing with stage challenges

- Let students pass if they don't want to speak
- Use visual aids to support fewer verbal children
- Reinforce that all answers are welcome and valued
- Keep it brief and gentle to maintain a positive tone.

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5.5 Eco-Engineers

This 4 stages minimum 3 hours STEAM program for 3rd-grade students explores how to clean dirty water using natural materials like sand, gravel, and charcoal. Students develop critical thinking by making guesses and testing which material layers filter the water most effectively.

Teams practice problem-solving and design thinking skills by building their own models and fixing designs that do not work at first. The activity builds collaboration and a sense of wonder as students work together to find solutions for a global environmental problem. Through planning, experimentation, observation, and reflection, learners experience how design thinking and scientific reasoning can be applied to environmental problems. The activity emphasizes problem-solving, collaboration, sustainability awareness, and creativity, while making abstract global issues tangible and age-appropriate. Children improve their communication skills through drawing and discussion, where they explain their observations and what they learned.

Basic Information Sheet

Age group	Student number	Duration	Number of stages	Subjects connection and relevance
3rd grade students	Whole class (max. 20-25 students)	4 x 45 minutes	4 stages	Science, Technology, Engineering, Arts, Mathematics

STEAM Event Summary

In this STEAM activity, teachers guide third-grade students in exploring the real-world challenge of clean water access and water pollution through hands-on engineering and inquiry-based learning. Students design, build, and test a simple water filtration system using natural and everyday materials such as sand, gravel, and activated charcoal. Through planning, experimentation, observation, and reflection, learners experience how engineering thinking and scientific reasoning can be applied to environmental problems. The activity emphasizes problem-solving, collaboration, sustainability awareness, and creativity, while making abstract global issues tangible and age-appropriate.

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SPIRIT Skill Focus

- Critical thinking
- Problem-solving
- Creativity
- Curiosity, sense of wonder and openness
- Valuing people and nature
- Flexibility
- Resilience

National curriculum Link and Objectives

- Environmental Studies: the role of water in nature and human life, causes and consequences of water pollution, water purification as a real-world solution
- Technology and Engineering: designing and building functional, hands-on models, using simple materials for real-life challenges
- Visual Arts: Artistic representation and creative visual interpretation, process drawing and symbolic communication
- Mathematics: Estimating and measuring quantities, time awareness and simple calculations, comparing amounts.

Real-world STEAM Connection and Problem definition

Access to clean drinking water is a global challenge that affects communities around the world. Children may take clean water for granted, yet many people must rely on polluted or unsafe sources. In this activity, students are challenged to answer the question: How can dirty water be cleaned using simple, natural materials? By designing and testing their own water filters, students discover that science and engineering offer practical solutions to real environmental problems. They learn that improving a solution often requires trial, observation, adjustment, and teamwork, just like real engineers do.

Materials at a Glance

Filtration and Engineering Materials

- Transparent plastic bottles (pre-cut to use as funnels)
- Fine sand
- Small and large gravel / pebbles
- Activated charcoal

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- Coffee filters, cloth, or paper towels

Testing Materials

- “Polluted water” (clean water mixed with soil, sand, leaves, food colouring)
- Clear containers for collecting filtered water

Classroom and Documentation Materials

- Planning sheets with filter diagrams
- Observation worksheets (drawing + text versions)
- Pencils, crayons, markers
- Measuring cups, small containers

Safety and Organization Materials

- Trays or plastic table covers
- Paper towels, cloths
- Child-safe scissors, tape
- Hand-washing supplies

Visual and Support Materials (optional but recommended)

- Illustrated story prompt (Lary/Mary’s Adventure)
- Visual instruction cards with icons
- Example filter diagrams
- Reflection sentence starters

Indoor/Outdoor and Classroom layout

- Phase 1 (Introduction) – Indoor / Classroom setting: Students sit in a circle or U-shape formation to ensure visibility and active participation. Interactive discussions, visual stimuli, and hypothesis generation take place. Recommended tools: projector, printed visuals, key terms displayed on the board or flipchart.
- Phase 2 (Planning and building) – Indoor / Group table arrangement: Students work in small groups at separate tables where materials and tools are pre-arranged. A large tray or table cover helps manage mess. A shared "material station" is available for replenishing supplies.

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- Phase 3 (Testing) – Outdoor or designated indoor "experiment zone": If possible, testing should take place outside or near washrooms, where spills are manageable. Indoors, a protected space (lined with plastic or trays) is prepared. The teacher ensures safe water handling procedures.
- Phase 4 (Artistic reflection) – Indoor / Individual or pair work setting: After experimentation, students reflect and create artwork or posters at their desks. Their work can be displayed in a "gallery zone" (e.g., classroom wall, windowsill, board space) to share results.

Note: It is recommended to organize the design, construction, testing, and reflection phases as a carousel brainstorm method (For more details on the carousel brainstorm method and examples of hands-on STEAM activities), allowing groups to progress step-by-step or work in time blocks, supporting flow and organization.

Notes on Research-based approach and integration

This STEAM activity is based on inquiry-based learning: students do not receive ready-made scientific facts about water purification but instead discover them through hands-on experimentation. The teacher acts as a facilitator and guide, encouraging brainstorming, revisiting problems, and retrying solutions. Students begin by forming hypotheses about possible purification methods, then design and build their own filter systems, and finally test them using realistic, playful experimentation. Through this process, they internalize the steps of scientific thinking: Question → Idea → Plan → Experiment → Observation → Conclusion → Revision. The activity applies an interdisciplinary approach:

- Science: observing and understanding natural filter materials
- Technology: using simple tools for real-world problem-solving
- Engineering: planning and building a working physical model
- Arts: expressing and communicating findings creatively
- Mathematics: comparing quantities, measuring time, counting materials (e.g., pebbles)

Small group work promotes social learning, encourages collaboration, and fosters emotional safety. Learners are active participants in the learning process, making discoveries and learning from their own successes and mistakes. This program offers excellent opportunities for differentiated instruction: Less confident students may take roles such as observers or illustrators, more active learners formulate hypotheses and rebuild solutions, advanced learners analyse functional differences independently. This STEAM activity also serves as a model for education for sustainability: access to clean drinking water is a global issue, and students explore it through their own solutions, fostering ownership and awareness.

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Lesson Flow Overview (linked to details below)

Stage	Title	Brief Description	SPIRIT Skills	Duration	Link to Details
1st	**Introduction and Motivation**	The teacher introduces the topic through a fictional but realistic story: "Once upon a time, there was a little boy/girl named Lary/Mary. On a hot summer day, they went hiking with their family. After walking for a long time, they ran out of drinking water. Nearby, they found a puddle - but the water looked dirty. 'How could we drink from this water if it's dirty?' - the child asked. And so began their engineering adventure..." Following the story, the teacher initiates a discussion by asking questions such as: Why can't we drink just any water we find? How do you think we could clean it? What would you do if all you had was dirty water? Do you think we can solve a problem like this ourselves? The goal is to spark interest, establish a personal connection, and introduce the idea of inquiry-based learning. Students are invited to share their own experiences, brainstorm ideas together, and begin thinking about possible solutions.	• Curiosity, sense of wonder and openness • Critical thinking • Flexibility • Resilience • Problem-solving • Connectedness	45 minutes	**STAGE 1 – Introduction and Motivation**
2nd	**Planning and Building**	In small teams, students plan and build their own water filter system using natural materials. First, they discuss and sketch a plan for the filter: What order will they layer the materials in? Why? They are encouraged to make assumptions about which materials will trap dirt most effectively. Once the plan is agreed upon, they begin constructing the water filter using a cut plastic bottle as the base. The materials they can use include gravel, sand, paper filter or cloth, and activated charcoal. These are placed in different layers inside the bottle. During the process, students are encouraged to make changes if something doesn't fit or if a new idea arises. The goal is not perfection but experimentation, collaboration, and testing their ideas in practice.	• Problem-solving • Curiosity, sense of wonder and openness • Creativity • Flexibility • Resilience	45 minutes	**STAGE 2 – Planning and Building**

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3rd	**Testing and Observation**	Each group tests their self-built water filter by pouring "polluted water" (a mix of clean water with natural impurities such as soil, small leaves, sand, or food colouring) into the top of their bottle filter. The water flows through the layers of materials and drips into a clear container placed below. Students observe what happens, collect the filtered water, and compare the before and after. They record their observations by drawing the two water samples and describing them using adjectives (e.g., cloudy, clearer, brown, almost clean). Groups compare their results with one another and discuss why some filters worked better than others. The goal is not just to get clean water, but to understand the filtering process and how different materials influence the result.	• Critical thinking • Curiosity, sense of wonder and openness • Problem-solving • Resilience • Creativity	45 minutes	**STAGE 3 – Testing and Observation**
4th	**Reflection and Artistic Processing**	After completing the filter construction and testing, students reflect on their experiences through creative visual expression. Individually or in pairs, they create a poster, drawing, or comic strip that illustrates: How their water filter worked, what materials they used and in what order, What the water looked like before and after, what they learned from the experiment. Some may choose to draw a "before and after" comparison, while others may illustrate the full story of their engineering adventure, including challenges or surprises. Students are encouraged to label their drawings with simple words or phrases, and then they present their work to the class or display it in a "gallery" area. This fosters pride in learning and gives space for multiple forms of expression	• Critical thinking • Empathy • Resilience • Creativity	45 minutes	**STAGE 4 – Reflection and Artistic Processing**

Tips and Tricks for dealing with challenges (for the whole STEAM program)

- Different group paces: Prepare differentiated tasks (e.g., extra experiment, colourable filter model, redesign template).
- Handling failure: Emphasize that in science it's okay not to succeed on the first try – it's part of the learning process!
- Material/tool shortages: Have backup options ready (e.g., CD case pieces as prisms, soil instead of charcoal, small stones).
- Noise and focus management: Use timed tasks such as: "You have 5 minutes to plan!" – helps maintain concentration.
- Hygiene and order: Always include handwashing before and after working with water; paper towels should be easily accessible.

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- Shared success experience: At the end, each group receives a certificate or an “Eco Engineer Stamp” to boost motivation.

Difficulty level tailoring notes

The activity is easily adaptable to students’ abilities:

- Basic participation: The student observes, uses a template for drawing, chooses answers from picture options. Speaks minimally but can participate through pair work or quiet presentation.
- Intermediate participation: Actively takes part in building and testing, explains the process in their own words. Adds simple explanations to observations and draws independently.
- Advanced participation: Experiments with variations, suggests alternative materials, analyses results from multiple angles. Asks deeper questions, explores multiple working methods.
- Teachers may use these levels for formative or self-assessment, e.g., with coloured sticker systems or visual self-evaluation sheets.

STEAM Program Debriefing and Reflection Questions

- What was the most exciting part of the day for you?
- What was the biggest challenge?
- What did you learn about water filtration?
- Did this help you understand why clean water is important?
- What idea did you come up with for the future?
- If you could do this again, what would you change?
- Could you build a filter at home? What would you use?

Reflection tools:

- Emoji scale (🙂 😐 🙁)
- “I liked – I was surprised by – I’d like to try” reflection board
- Word cloud on the board (e.g., clean, dirty, filter, gravel, success)

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5.5.2. Stage details and Activities Flow

STAGE 1 – Introduction and Motivation

How does this develop particular SPIRIT skills

The activity develops several SPIRIT skills in an authentic, hands-on way

- Curiosity: The story context and guiding questions spark children's sense of wonder about water and the environment.
- Critical thinking: Students challenge everyday assumptions (e.g., "tap water is always clean") and evaluate which filter designs work best.
- Problem-solving: They experiment with different materials and methods until they find effective solutions.
- Resilience: Trial-and-error builds persistence; failed attempts are reframed as opportunities to improve.
- Empathy and Valuing people and nature: By reflecting on communities without access to clean water, learners connect their work to real human and environmental needs.
- Connectedness: Group work fosters collaboration and helps children see their role in contributing to shared, global challenges

What do we want to achieve regarding SPIRIT skill development (student understanding and/or behaviour)?

- Students recognize that solving a problem begins with asking the right questions.
- They are able to formulate and test hypotheses (e.g., "I think the gravel will catch the dirt").
- They develop critical thinking by questioning everyday assumptions about water quality and problem-solving by testing and revising different filter designs.
- Their oral expression based on personal experience improves (e.g., sharing what they know or think about water with peers).
- They realize that effective solutions don't require being a scientist - they begin with curiosity, creativity, and collaboration.
- The activity also strengthens social skills: learners practice listening, turn-taking, and constructive group discussion, which are complementary to cognitive skill growth.

Academic/Curriculum Objective connection

- Environmental Studies: water use, pollution, importance of clean drinking water
- Language and Literacy: storytelling, understanding and discussing a heard text
- Natural Sciences: identifying problems, hypothesis formulation

Materials and tools needed for implementation

- The story (told aloud, illustrated, or with props/puppets)
- Pictures of various types of water sources: tap water, bottled water, swamp, puddle
- Chalkboard or flipchart for collecting key terms
- Drawing paper, notes sheet, chalk or markers
- Concept map of key terms (e.g., water – clean – polluted – filter – materials)

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Preparation notes

- Practice telling the story beforehand; optionally add drama elements (e.g., role play)
- Prepare printed or digital images of different water types
- Plan open-ended guiding questions
- Arrange classroom seating in a circle or small groups to encourage participation
- Collect and display key terms on the board to support learning in the next phases

Guided Questions

- Where do you usually get your drinking water?
- Have you ever seen dirty water? What was in it?
- Which water would you choose to drink from? Why?
- How do you think we could clean up a puddle?
- Why is it important to always drink clean water?
- What can happen if we drink polluted water?

Stage Debriefing Questions (Optional)

- What was the most interesting part of the story for you?
- Did you say something today that you hadn't thought about before?
- What challenge do you think we'll face today?
- Do you believe your group can solve a problem like this?

Tips and Tricks for dealing with stage challenges

- For shy students: Offer them the option to draw or just listen first, they can join in later when they feel ready.
- For highly energetic students: Use structured question–answer formats to channel their energy productively.
- For quiet classrooms: Use direct, labelled questions to gently invite responses (e.g., "Lary, what would you do in this situation?")
- To support diverse responses: Use visual prompts and pictograms to aid thinking and expression.
- As a warm-up: Play a quick activity like "Show me what a thirsty person looks like!" or "Draw the dirtiest water you've ever seen!

STAGE 2 – Planning and Building

How does this develop particular SPIRIT skills

- Problem-solving: Students take an abstract challenge (dirty water) and work to create a practical solution.
- Creativity: They use everyday materials in novel ways to design an effective filter.
- Resilience: When their first idea doesn't work, they revise and try again.
- Flexibility: They adapt their approach when outcomes differ from expectations.

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- Curiosity, sense of wonder and openness: Students explore how different materials affect water quality and ask questions about the process.
- They practice giving and receiving feedback within their team.

What do we want to achieve regarding SPIRIT skill development (student understanding and/or behaviour)?

- Students are able to describe why they chose a specific sequence of layers in their filter.
- They become more confident in planning and building simple functional models.
- They improve their fine motor skills and develop material sense through hands-on work.
- They learn that testing and redesigning is part of every engineering process.

Academic/Curriculum Objective connection

- Environmental Studies: understanding how filtration works using natural materials
- Science and Engineering: planning, building and testing a simple model
- Mathematics: estimating material quantities, comparing volumes, basic sequencing
- Communication and Collaboration: team discussion, collective problem-solving

Materials and tools needed for implementation

- 1 empty transparent plastic bottle per group (cut open to use as a funnel)
- Filtering materials: fine sand, small and large gravel/pebbles, activated charcoal
- Filtering base: coffee filter, cloth, or paper towel
- Tape, scissors (child-safe), measuring cup, small containers
- Tray or plastic tablecloth to catch spills
- Planning sheet (with blank filter diagram)
- Pencil, crayons for labelling or sketching
- Access to "Material Station" with spare supplies

Preparation notes

- Prepare material kits in advance, one per group, with a backup "material station" for refills.
- Print or draw a filter diagram as a visual planning aid.
- Consider group dynamics: assign flexible roles (e.g., designer, builder, materials manager) to balance participation.
- Allow enough time for construction, and expect some teams to revise mid-process.
- Pre-cut the bottles for safety and time-saving.
- Have paper towels or cloths ready for cleanup

Guided Questions

- Which material do you think will block the most dirt? Why?
- What happens if we put the sand first? Or last?
- How could we stop the small pieces from falling through?
- What order do you think will work best to clean the water?
- If this doesn't work, what could you change next time?
- How can we make sure the water passes slowly through the filter?

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Stage Debriefing Questions (Optional)

- What was your team's plan, and how did it change during building?
- What did you find difficult about making your filter?
- Did everyone in your group get to help? How?
- What would you do differently if you started again?
- What would you tell another group trying this for the first time?

Tips and Tricks for dealing with stage challenges

- For fast finishers: offer an extra challenge: redesign the filter with one material removed.
- For students who struggle with planning: provide a visual prompt or a "filter sequence" example sheet.
- For dominating team members: assign rotating roles to ensure equal participation.
- For sensitive students: emphasize that no filter is perfect, this is about testing and learning, not competition.
- To keep the classroom clean: use trays or newspapers under each work area and have a cleanup routine planned.

STAGE 3 – Testing and Observation

How does this develop particular SPIRIT skills

- Curiosity, sense of wonder and openness: Students are motivated to explore how each layer affects the water and to ask questions about what they observe.
- Critical thinking: Learners reflect on the effectiveness of their filter designs and consider ways to improve them.
- Problem-solving: They experiment with different combinations of materials and adjust their approach to achieve better results.
- Resilience: Students persist when initial attempts do not produce clean water, revising their filters and testing again.
- Creativity: They try innovative ways to arrange or combine materials to optimize filtration outcomes.

What do we want to achieve regarding SPIRIT skill development (student understanding and/or behaviour)?

- Curiosity: Students explore how different materials affect water clarity and ask questions about the process.
- Critical thinking and Problem-solving: They compare outcomes, reflect on cause-and-effect relationships, and adjust their approach to improve results.
- Resilience: Learners gain confidence in making predictions and learn to persist when initial attempts do not produce the desired results.
- Creativity: They develop imaginative ways to combine materials for better filtration results.
- Connectedness: Through collaborative reflection, students consider how their solutions relate to real-world water challenges and the needs of others.

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Academic/Curriculum Objective connection

- Science: filtering, observation, comparison, and drawing conclusions
- Technology and Engineering: evaluating the performance of a functional design
- Mathematics: comparing quantities (volume of filtered water), simple measurements
- Language development: describing observations and presenting results
- Environmental awareness: understanding how filtering simulates real-life water purification

Materials and tools needed for implementation

- Each group's homemade filter
- Pre-mixed "polluted water" in transparent containers
- Clear cups or jars for collecting filtered water
- Drawing sheets or observation charts
- Markers, pencils for labelling and sketching
- Towels, trays or plastic sheets to manage spills
- Optional: magnifying glass for closer observation

Preparation notes

- Prepare polluted water in advance using safe, natural materials (e.g., soil, coffee grounds, tea leaves, food colouring)
- Label each group's container to track results
- Create a simple observation chart or two-frame drawing sheet: "Before / After"
- Emphasize safety and cleanliness: handwashing before/after, no touching dirty water
- Encourage students to speak respectfully about different results (no "better/worse" filters - only different strategies)

Guided Questions

- What does your filtered water look like compared to the original?
- Which material do you think helped the most? Why?
- Did the water smell different after filtering?
- Was your filter better at catching big pieces or tiny particles?
- What surprised you about what came out?
- Would your filter be safe enough to drink from? Why or why not?

Stage Debriefing Questions (Optional)

- How close was the result to your expectations?
- Did your plan work the way you thought it would?
- What would you change next time?
- Was your filter more about blocking dirt, or slowing the water down?
- Do you think real water filters work the same way?

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Tips and Tricks for dealing with stage challenges

- If a group's filter doesn't work at all: normalize it! Say, "Great! You learned something important, now you get to try again."
- For impatient students: use timers or challenge cards ("Can you test twice in 5 minutes?")
- For messy situations: assign a "clean-up chief" per group to manage water and materials
- To encourage careful observation: have students compare their water to a clean sample under light
- If time is short: skip re-testing and focus on describing the first result thoroughly

STAGE 4 – Reflection and Artistic Processing

How does this develop particular SPIRIT skills

- Creativity: Students explore new ways to represent their scientific and personal observations visually.
- Critical thinking: They reflect on what worked or didn't work in their designs and consider improvements.
- Resilience: Learners gain confidence in trying new ideas and learning from feedback.
- Empathy: Viewing each other's work fosters respect for diverse solutions and collaborative learning.

What do we want to achieve regarding SPIRIT skill development (student understanding and/or behaviour)?

- Creativity: Students creatively express their observations and learning through drawing, labelling, and other visual means.
- Critical thinking: They reflect on what worked or didn't in their experiments and consider ways to improve.
- Resilience: Learners understand that learning comes from both successes and repeated attempts.
- Emotional awareness: They connect their emotional experience with scientific exploration and appreciate the perspectives of peers.
- Empathy: Students observe and value others' approaches and solutions, fostering respect for diverse ideas

Academic/Curriculum Objective connection

- Visual Arts / Creativity: Expressing scientific observations and processes through drawing, design, or other creative media.
- Science / Critical thinking and Problem-solving: Reviewing experimental steps and analysing outcomes.
- Collaboration / Connectedness and Empathy: Working together, sharing materials, and discussing results respectfully.
- Language / Curiosity, sense of wonder and openness and Critical thinking: Using descriptive vocabulary to explain observations and ask questions.

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Materials and tools needed for implementation

- A4 or A3 drawing paper
- Coloured pencils, markers, crayons
- Rulers, stencils (optional)
- Stickers or stamps for feedback
- Simple checklist or reflection prompts for each student
- Wall or board space for displaying final products

Preparation notes

- Prepare example posters or formats (comic strip, step-by-step process drawing, “My filter story” frame)
- Provide both visual and written reflection prompts
- Support different skill levels: allow drawing, writing, or both
- Plan time at the end for a brief “gallery walk” or peer presentations
- Reinforce that all work is valuable - this is about expressing learning, not making perfect art

Guided Questions

- What did your filter look like inside?
- What surprised you the most?
- What would you try differently next time?
- What was the hardest part? What part made you feel proud?
- If you had to explain this to someone else, how would you do it?
- What do you think an engineer does, and did you feel like one today?

Stage Debriefing Questions (Optional)

- What did you learn today that you didn’t know before?
- Did your drawing help you remember the steps?
- Would you like to try this experiment again in a new way?
- What did you enjoy more building the filter or reflecting on it?
- What feedback would you give to your team or yourself?

Tips and Tricks for dealing with stage challenges

- For students with less confidence in drawing: offer templates or allow mixed media (cutouts, stickers, collage)
- For groups that rush: use a timer to slow down stages ("5 more minutes on the drawing", "Now write two labels")
- For more advanced students: challenge them to design a new filter or explain how to improve global water access
- To encourage presentation: give each student a chance to choose how to share (gallery walk, pair share, or mini stage)
- To support deeper reflection: provide sentence starters ("I discovered that...", "Next time I would...", "Our filter was...")

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Annexes

Pilot implementation (detailed example with lesson/activity plan), attachments

1. Storytelling prompt – "Lary/Mary's Adventure"
   - Short illustrated story on A3 cards or digital format
   - Can be performed with puppets
   - Introduces the core problem: water scarcity – polluted water – search for solutions
2. Planning template
   - Blank PET bottle drawing where students can mark filter layers
   - Text box: "Why did we choose this order?"
3. Visual instruction cards
   - Icon-based station instructions (e.g., sand, water, pour) with simple language
   - Designed to be accessible for early readers and emerging readers
4. Experiment observation sheet
   - Drawing sections: "This is what the water looked like before/after," "I observed…"
   - Text-based version for more advanced learners
5. Student reflection and evaluation sheet
   - I observed how the water changed.
   - I participated in the planning.
   - I did a drawing.
   - I helped someone else.
6. Exhibition template – "Explorer Wall"
   - One large A2 or multiple A3 sheets joined together
   - In the centre: "This is how we cleaned the water – We were Eco Engineers!"
7. Teacher's guide:
   - Activity steps (with timing), role cards, differentiation ideas
   - Sample answers, guiding questions, assessment guidelines

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5.6 States of matter in motion

This STEAM challenge is an adapted version of "How Does Precipitation Sound?" designed to explore changes in the states of matter. The structure of the programs is identical. Both combine science and the arts. In both, the first module focuses on exploring artistic concepts. In the first case, the artistic components are sounds and music; in this version, they are, naturally, movement. We look at the material and observe the movement of the particles. This is followed by the natural science stage, when the student becomes familiar with the scientific content itself - which, in the first case, is precipitation, and in this case, the physics of changing states of matter. The final stage is a combination of physics and art (in this case, motion), presented as a unified whole, which comprehensively develops nearly all of the SPIRIT transversal skills. We considered the development of this adaptation particularly important to demonstrate how a well-functioning structure can be creatively filled with content of a specific subject. And since we cannot provide a STEAMified skills development program for every country's curriculum, we believe that the implementation of this structure with specific content is an important task for you.

Basic Information Sheet

Age group	Student number	Duration	Number of stages	Subjects connection and relevance
3rd grade students	Whole class (max. 30 students)	240 minutes	3 stages	Natural Sciences, Expressive Arts: Movement

STEAM Event Summary

This is a four-hour activity for children aged 9–10 that combines knowledge about the aggregation states and phase transitions with movement. Students combine science into art to explore how water freezes, melts, and evaporates in creative ways. The project develops creativity by challenging children to find expressive movements that represent tiny particles in different states of matter. Children improve their critical thinking as they analyse real-life photos and decide how to accurately translate scientific concepts into physical actions. Teamwork and problem-solving grow as small groups collaborate to choreograph and perform their own unique "movement stories" about phase transitions. This movement-based approach sparks a curiosity and sense of wonder, helping students understand and remember complex natural phenomena through active, hands-on play.

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SPIRIT Skill Focus

- Problem-solving
- Curiosity, sense of wonder and openness
- Critical thinking
- Creativity
- Empathy
- Resilience
- Flexibility

National Curriculum Link and Objectives

- Art Objective:
  - When moving, consciously make use of the space they or others occupy.
  - Recognize, imitate, and describe the energy in a movement: explosive or controlled. For example: moving like a raindrop on a window as it makes its way down (controlled)
- Science Objective: To describe some natural phenomena related to temperature: expansion and contraction, melting and solidification, evaporation and condensation.
- Cross-disciplinary Objective: The students can transform a certain concept of phase transitions into a movement story

Real-world STEAM Connection and Problem definition

In everyday life, students experience various changes in the states of matter. Ice cream that melts on a warm day, water that turns into ice cubes in the freezer, or steam that fogs up the bathroom mirror after a hot shower are situations children encounter regularly. Yet, they often do not consciously connect these experiences to the scientific concept of phase transitions. In this activity, students first learn to recognize the different types of phase transitions they can observe in everyday life. The ultimate goal is for them to explain these transitions through movement. This creative approach gives their learning deeper meaning: they are challenged to think more critically, which helps them remember the scientific concepts more effectively. By combining science with everyday experiences and movement, this activity makes natural phenomena both tangible and engaging.

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Materials at a Glance

For the Art Phase:

- Own body

For the Science Phase:

- PowerPoint with current images of everyday phenomena linked to these phase transitions.
- ice cubes, mirror

For the Application Phase:

- Cards with descriptions of phase scenario

Indoor/Outdoor and Classroom layout

Preferably it is an indoor activity. Run it in the classroom, with the possibility of extra space in the corridors or an additional room where students can experiment with/practice the different movements.

Notes on Research-based approach and integration

During the arts-based segment, students engage in open-ended research that stimulates their creativity. They are given the freedom to experiment independently, which sharpens their creative thinking skills. The science segment focuses on scientific concepts, established terminology, and factual knowledge that are systematically taught. This provides a solid knowledge base that students can later draw upon.
The combination of these two approaches – open, creative inquiry and structured scientific knowledge – creates a rich learning process. It culminates in a creative final project where students integrate and apply their knowledge and skills in an original way.

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Lesson Flow Overview (linked to details below)

Stage	Title	Brief Description	SPIRIT Skills	Duration	Link to Details
1st	**Exploring movements (Expressive Arts)**	The lesson begins with an "artistic part: movement." Using four pictures of familiar objects or states (melting ice cream, solidified candles, drawing a heart on a "wet" window, and boiling water with steam), the students come up with various movement-related words. We go through the images one by one: • What do you see? • What is happening in the photo? Where? • How does the event in the photo move or unfold? Together, we come up with definitions for each photo: We create a mind map with movement-related words for each image. **Photo 1** (Evaporation – floating high in the air, lightly jumping, fluttering, little weight, moving very lightly): FLOATING, RISING, BLOWING, SPREADING OUT, HOPPING **Photo 2** (Condensation – small, light, suddenly rolls downward with a lot of energy): FALLING, DESCENDING, SLOWLY SINKING **Photo 3** (Freezing – also involves FORCE, requires a lot of muscle tension, going from something liquid to something very hard, moves slowly): TENSE, STIFFENING, FREEZING, STANDING RIGID, SHRINKING	• Critical thinking • Creativity	90 minutes	STAGE 1 – Exploring movements (Expressive Arts)

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		Photo 4 (Melting – the opposite of freezing): RELAXED OR FLOWING, SOFTENING, SPREADING, LENGTHENING, SINKING Next, the students physically act out all these words with their bodies. The teacher or a student demonstrates a specific movement, and the other students imitate it.			
2nd	**Science –state of matter, phase transitions and particle model**	In the science part, students learn about the three states of matter and the names of the different phase transitions through concrete situations and experiences. (see PowerPoint for the different situations and experiences) Each state of matter is visually represented using the particle model. The learned content is synthesized through a board diagram that the students copy.	• Critical thinking • Curiosity sense of wonder	90 minutes	**STAGE 2 – Science –state of matter, phase transitions and particle model**
3rd	**Creative application phase: Science and art**	Linking the concepts of states of matter to our movement mind map: • Under which category of movements do condensation, evaporation, freezing, and melting belong? • Why? • Are the movement qualities complete? Do we need to remove anything? What fits, and what doesn't? • Can we now move as if we are "freezing"? Returning to the particle model in a circle formation: How should we position ourselves for: • Solid? (in a line, next to each other) • Liquid? (mixed together, close) • Gas? (loose, spread out, apart)	• Problem-solving • Curiosity, sense of wonder and openness • Critical thinking • Creativity • Empathy • Resilience • Flexibility		**STAGE 3 – Creative application phase: Science and art**

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		Now we will practice forming a single solid mass together. We "puzzle" ourselves next to and over each other. Students walk around the classroom; one student stops and forms the solid shape. The others sense that someone has stopped and adjust themselves around that person - without falling, leaning, or supporting each other. Final Phase: The students are divided into groups of four. Each group receives a card showing one of the phase transitions. At first, they are given only the name of the phase transition. (A differentiation option is that they can refer to their own notes, or that the teacher visually presents the corresponding particle models.) The card also includes the substances involved, a depiction of specific states using the particle model, and some movement qualities. The group's task is to turn this card into a movement score, story, or short choreography. The students "read" the information and translate it into movements. They are given 7 minutes to prepare, paying attention to the movement qualities of the state of matter and the particle model. Afterwards, there is a performance moment. Each group presents their movement piece/choreography. The rest of the class tries to guess which substance is being represented and which movement qualities linked to a state of matter they observe.			

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Tips and Tricks for dealing with challenges (for the whole STEAM program)

- This is very grade-dependent. In a 4th-grade class, the starting point may be that students have already learned about the water cycle in 3rd grade and have already encountered evaporation and condensation (with or without these specific terms). They may also have already done the experiment with the kettle and the mirror. In a 3rd-grade class, this will likely not be the case. They may already have some prior knowledge about the melting point of ice (0°C) and the boiling point of water (100°C).
- In this lesson, we build heavily on what children already know from their everyday life (a melting ice cream, boiling water, condensation on a window/shower/mirror, etc.).

Difficulty level tailoring notes

- All the concepts are quite abstract and must be well understood before they can be translated into movement.
- Not all concepts need to be covered in a single lesson (for example, sublimation can be omitted).

STEAM Program Debriefing and Reflection Questions

- Creativity: In what ways did you manage to produce more movements than you initially thought possible?
- Critical thinking: Which movement best or least effectively represented the phase transition, and why?
- Problem-solving: What challenges did you encounter, and how did you deal with them?
- Wondering: At what moment during the lesson were you most surprised?

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5.6.2. Stage details and Activities Flow

STAGE 1 – Exploring movements (Expressive Arts)

How does this develop particular SPIRIT skills

Critical thinking and creativity.

What do we want to achieve regarding SPIRIT skill development (student understanding and/or behaviour)?

Critical Thinking (e.g., "What is happening in the photo? How does it move or unfold?")

Children engage in critical thinking by analysing the images and identifying movement patterns related to each scenario. They focus on interpreting the relationship between the object or state and its associated movement, while formulating definitions for each picture. Behaviour:

- Discussing and comparing with peers to identify key details in the images (e.g., "What does melting ice cream look like when it moves?").
- Listening attentively to the teacher's questions and actively participating in defining the movement words (e.g., "It's floating, but how do we describe it?").
- Thinking critically about the movements and contributing their own ideas to the group's mind map.

Creativity (e.g., "How can we move our bodies to represent this?")

Children use their creativity to translate abstract movement words into physical actions. They experiment with their bodies to find ways to express these movements, showing flexibility in adapting to different concepts. Behaviour:

- Acting out the words in creative and varied ways (e.g., "How does floating feel? Let's hop lightly!").
- Imitating movements demonstrated by peers or the teacher, then modifying them to add their own personal twist.
- Collaborating in pairs or small groups, exploring different ways to embody each movement, showing excitement and energy.

Academic/Curriculum Objective connection

When moving, consciously make use of the space they or others occupy.
Recognize, imitate, and describe the energy in a movement.

Materials and tools needed for implementation

4 pictures (melting ice cream, solidified candles, drawing a heart on a "wet" window, and boiling water with steam. Own body.

Preparation notes

No special preparation is required for this phase

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Guided Questions

- In what way do you see movement in the photo?
- For example, in a photo of a melting ice cube: where is the meltwater going?
- In a photo showing boiling water with steam: where is the 'steam' going?

More specific adapted quided, supportive questions

1. When looking for the smallest, most subtle movement is a challenge:

- Imagine that you are a little drop of water that is just beginning to turn into steam, so slowly and quietly that no one notices! How could you move even more subtly than that—almost invisibly, as if moved by just a tiny breeze?"
- I see that you're moving your whole arm right now. What might it express if, next time, you moved only the fingertips of your little finger very, very slowly?

2. When looking for the biggest, most energetic movement is a challenge:

- How far would you have to stretch, or how would you have to jump, to look like wildly hot, steaming water?"
- If we want to imitate the most intense boiling water, do you think a one-time movement would be enough? What would it mean if we repeated the movement many times with our whole bodies? Let's try it together!"

3. When students don't know how to use their bodies to illustrate the movement of matter

- Let's imagine we're trapped in ice. It's like we're tied up very tightly and can't move at all. How could we become that motionless? How does this tension feel in your body?"
- "Do you think we could also make a wavy, sliding movement on the floor, as if we were liquid water spreading out across the room?"

4. "Who liked this movement?" – Supporting empathy and the expression of emotions

- Let's close our eyes for a moment and imagine this movement again! How did it feel for your bodies to perform it? Was it pleasant, soft, and relaxing, like ice cream slowly melting in the heat, or was it too stiff and tense?
- If this movement were an animal, would it be a cuddly, soft little kitten, or an angry dragon? Ask the person sitting next to you: did they imagine the same animal in their mind, or did this movement bring something completely different to mind for them?

Stage Debriefing Questions (Optional)

Raising Awareness of Critical Thinking and Flexibility

- When you first thought you'd found the subtlest, smallest movement, but then managed to make an even smaller one: how did you figure out the trick?
- What changed in your minds or bodies when you decided to try again instead of giving up after the first solution?

Raising Awareness of Creativity and Resilience:

- I noticed that you tried a wide variety of movements with your bodies until you finally found the state-change movement you were looking for. What did you feel and do when your first movement idea didn't work well? How were you able to come up with a completely new movement?

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Raising Awareness of Empathy:

- How did you notice within your group when someone really liked a movement, or, on the contrary, when it was tiring or uncomfortable for their body? How were you able to understand each other's feelings without words, just by observing each other's body language? How did you feel when your idea wasn't the one that was accepted?

Tips and Tricks for dealing with stage challenges

- **Challenge** the students to perform larger movements, to carry out the movements more slowly, and to make the movements more clearly (e.g., when rising, they should really make themselves big).

STAGE 2 – Science –state of matter, phase transitions and particle model

How does this develop particular SPIRIT skills

Wondering (This taps into their sense of wonder; students are amazed that water is not lost, but transformed into another state of matter.)

What do we want to achieve regarding SPIRIT skill development (student understanding and/or behaviour)?

Wondering (e.g., "How do these particles move in different states of matter?")

Children engage in wondering by becoming curious about how particles behave in different states of matter. The concrete experiences and visual representations spark questions about the world around them, which leads them to explore and seek answers. Behaviour:

- Asking questions about the particles, such as "Why do particles move differently in solid, liquid, and gas?" or "What happens to the particles when something melts?"
- Showing curiosity by pointing out examples of different states of matter in their everyday lives (e.g., ice melting into water or water vapor rising from a kettle).
- Expressing surprise or excitement when they see the particle model and realize how it represents real-world phenomena.

Academic/Curriculum Objective connection

To describe some natural phenomena related to temperature: expansion and contraction, melting and solidification, evaporation and condensation. To describe gas, liquid, solid.

Materials and tools needed for implementation

PowerPoint with photos of the different phenomena's ice cubes, mirror, electric kettle, etc.

Preparation notes

PowerPoint and worksheet.

Guided Questions

- Imagine that you are a tiny water particle! How would you feel if you were trapped inside an ice cube? Would you be pressed tightly together with your fellow particles? And what would it be like to flow through warm water, or to float freely through the air as steam? In which state could you run around most freely, and in which would you be completely trapped?
- Did you notice that one of the phase changes (such as melting or freezing) is missing from our worksheet, leaving an empty space? Which phase change is missing an explanation? If you were the teacher, how would you explain the missing phase change to a robot that has never seen ice or water?

Stage Debriefing Questions (Optional)

- When you were filling out the worksheet, how did you know which drawing corresponded to which state? What was your strategy: did you just guess, or did you look at how closely the particles were packed together and rule out the wrong answers step by step?"
- What was the strangest or most surprising thing you learned today about invisible little particles, ice, or steam? What question about freezing, melting, or evaporation interests you even more now than it did at the beginning of today's activity?
- Was there a moment when someone in your group thought a completely different solution was correct on the worksheet about particles or phase changes? How did you manage to discuss this: were you able to convince each other with arguments without arguing, or did you work together to find the right answer?
- Adaptation of the "biggest hailstorm" question: "What do you think happens to particles if we cool them down *incredibly*, to a temperature much colder than our home freezer? Do they ever stop moving completely? Let's look into this together after class."

Tips and Tricks for dealing with stage challenges

- Consider the students' prior knowledge and personal experiences. It is essential to build on these.
- Use concrete materials (e.g., a solidified candle, water vapor and condensation from a kettle) or highly visual materials that clearly show the different states and transitions. You can also use "moving materials" to illustrate the processes, such as a time-lapse of a candle melting and then solidifying.

STAGE 3 – Creative application phase: Science and art

How does this develop particular SPIRIT skills

- Problem-solving: How to represent the concept with your body while considering the other three group members.
- Critical thinking: Does what they show in their movement accurately reflect the correct scientific understanding?
- Creativity: How can you clearly represent the phase transition through body movement.

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What do we want to achieve regarding SPIRIT skill development (student understanding and/or behaviour)?

Problem-Solving:
When children have achieved problem-solving skills, you'll observe them:

- Collaborating effectively in groups, discussing ideas on how to represent the concept using their bodies.
- Coordinating movements with their peers, ensuring everyone is in sync and contributing to the overall representation.
- Adapting their movements when things don't work, making quick decisions to adjust and improve.

Critical Thinking:
When children have reached critical thinking skills, you'll notice them:

- Evaluating whether their movements match the scientific concept (e.g., "Is this how gas particles behave?").
- Revising their actions if they feel something isn't quite right, showing they are considering accuracy.
- Giving thoughtful feedback to their peers, analysing whether their classmates' movements align with the scientific principles.

Creativity
When children have developed creativity, you'll see them:

- Experimenting with different movements to represent the phase transitions, showing enthusiasm for trying out new ideas.
- Expressing themselves imaginatively, using body language to creatively convey scientific concepts (e.g., fluid movements for melting, stiff gestures for freezing).
- Adding flair to their movements, often incorporating dramatic or playful elements into their performance.

Academic/Curriculum Objective connection

Practice of scientific concepts and movement objectives.

Materials and tools needed for implementation

Cards with terms for phase transitions.

Preparation notes

No special preparation is required for this phase

Guided Questions

Critical Thinking: Does the movement you see accurately represent the given phase transition? Could it be improved to show the transition more clearly?

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- Transfering it a supporting question - If I were to watch your movement right now, what do you think - would I really feel as if I were seeing water freeze into a hard ice cube, or does it remind me of something else? How about we try to figure this out together: just one of you performs the movement, while the rest of us describe what we see. Then, based on what's been said, we could make a few adjustments to make the transition even clearer!

Empath: Which movements did you find most effective or expressive? Consider the perspectives of others in the group.

- Transfering it a supporting question - Which movement felt the best in your body and muscles when you performed it? Ask each other in your group: did the others feel the same way, or was a completely different movement—like relaxed, gentle flowing or stiff freezing—the most pleasant for them? What do you think—by understanding how each of us feels during the movement, can we choose the best group choreography more effectively?

Stage Debriefing Questions (Optional)

- How did you use your imagination when you had to recreate the change of states (like turning into gentle steam or freezing into hard ice) using your bodies as if you were tiny, invisible particles? What was the biggest challenge you faced while coming up with these movements, and how did you work together to solve it?
- How did you manage to completely forget how you normally move as humans and think outside the box to move like bouncing or tightly packed, vibrating particles instead?
- How did you feel, and what did you do when the others didn't immediately guess which phase transition (like melting or condensation) you were acting out during your presentation?
- How did you manage to quickly adapt and come up with something new without losing your enthusiasm for the game?
- How helpful was it in preparing and ensuring the success of your presentation to try to see yourselves through the eyes of your classmates, who had to guess the riddle just by watching your movements? How were you able to tune in to what they would see and feel?
- How did you feel when your classmates figured out you're the transition story you performed them? How would you describe the feeling of success?

Tips and Tricks for dealing with stage challenges

Have them use the worksheet as well as the corresponding board diagram/notes sheet.

Practice the different phases with the whole class.

Practicing melting (solid → liquid):

- We return to a solid form, standing still and firm, everyone holding hands.
- We are slowly and gently "flow" open, as far as we can, without letting go.

Practicing evaporation:

- We move further apart, becoming more expansive, adding jumps, floating through the classroom, moving from high to low.
- We feel light, moving slowly and smoothly through the space.

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6. STEAM PROGRAMS AND EVENTS FOR TRANSVERSAL SKILLS DEVELOPMENT

FOURTH GRADE STUDENTS

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6.1 STEAMified Story-based exploration

The experience-based STEAM programme for 4th graders lasts a minimum of 6 hours (maximum 4 full afternoons) and transforms a familiar story/fairy tale into a series of physical, emotional and logical challenges. The journey begins with students immersing themselves in a story through interactive reading, vocabulary-building games, and other tools to build a shared adventure. The storyline then moves outdoors, where teams face a series of challenges - from recognising sounds of nature to solving puzzles - to practice persistent problem solving. The focus then shifts to empathy, as students 'get into the shoes' of the characters through drama-based role-play and trust -building exercises. The experience concludes with a collective creative session where groups visualise the world of the story from the perspective of different creatures. Throughout the day/afternoon based sessions, the constant shift between physical activity, science and art forces students to practice mental resilience and remain flexible when plans change. During the final reflection session, students realise that, like the hero of their story, they have the strength to try again and find many ways to solve problems. It's a comprehensive adventure that turns a simple story into a powerful cross-curricular lesson about self-confidence and teamwork.

Basic Information Sheet

Age group	Student number	Duration	Number of stages	Subjects connection and relevance
4th grade students	One class	4 x 90 minutes	4 stages	grammar and literature, visual arts, environmental studies, mathematics, music, physical education

STEAM Event Summary

During the story-based, experiential STEAM-day, students engage with the narrative through a variety of activities. Throughout the day, movement-based, artistic, drama, and nature-related tasks alternate, providing opportunities for collaboration, creative thinking, and problem-solving. The program places special emphasis on developing resilience and cognitive flexibility: students experience how to adapt, try again, and view the world from different perspectives through challenges and trials.

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SPIRIT Skill Focus

- Valuing people and nature
- Curiosity, sense of wonder and openness,
- Empathy
- Flexibility
- Resilience
- Creativity
- Problem-solving

National curriculum Link and Objectives

The activities of the STEAM day support complex, experiential learning as well as the development of key competencies. The program aims to foster students' problem-solving, creative, and collaborative thinking while also enhancing their language, mathematical, scientific, technical, and social skills. The four phases - story processing, movement and sensory challenges, drama pedagogy activities, and collaborative art creation - address diverse learning styles and promote flexible thinking, resilience, communication, and self-expression. This integrated approach offers opportunities to explore connections between subjects and build knowledge through engaging experiences.
The goals of the activities include developing reading skills, using information and communication technologies, enhancing mathematical abilities, fostering artistic and moral education, improving social competencies such as realistic evaluation of oneself and others and boosting self-confidence, and personal development focusing on speech courage and respect for traditions.

Subject connections:
Language and Literature: Students listen to stories, create narratives, practice dialogues, expand vocabulary, and reflect on characters. Their oral expression, reading comprehension, and storytelling skills improve.

Environmental Studies: Students recognize natural sounds, observe materials, and engage in estimation and measurement tasks, gaining knowledge about the environment. These activities enhance observation skills, organization, and environmental awareness.

Mathematics: Logical, code-breaking, and measurement challenges develop problem-solving skills, estimation abilities, comparison of quantities, and application of measurement units.

Visual Arts: Through collaborative creation, children experience the roles of composition, colour, shape, and perspective in visual expression. Artistic activities nurture aesthetic sensitivity, creativity, and teamwork.

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Music / Physical Education / Drama and Dance: Warm-up singing, movement games, imaginative journeys, and dramatic exercises contribute to rhythm sense, body awareness, improvisation skills, and self-expression.

Ethics: Joint exploration of the story's dilemmas and characters' challenges supports empathy, compassion, social relationships, and discussions on making good decisions. Final reflections provide opportunities for self-awareness and value development.

Real-world STEAM Connection and Problem definition

The STEAM day's complex series of activities – integrating dramatic, scientific, movement-based, and artistic elements within a story – creates an experiential learning environment closely linked to children's everyday lives and real challenges. Throughout the day, students practice essential skills for daily life such as problem-solving, cooperation, creativity, adaptability, and perseverance. The varied tasks – from overcoming obstacles and solving logic puzzles to collaborative art projects and role-playing story characters – offer a safe, supportive space for students to face challenges, make mistakes, rethink strategies, and experience the many paths to success.

Successfully completing these activities requires skills like problem-solving, adaptability, stress management, collaboration, effective communication, learning coping strategies, decision-making, perspective-taking, tolerance, patient teamwork, and careful, focused work. Through these experiences, resilience (emotional strength) and flexibility (mental adaptability) are directly developed. Students learn not to give up in difficult situations but to find new solutions, think differently, and learn from mistakes. Emotional and social safety, creative freedom, and playfulness all help these skills grow naturally and with intrinsic motivation.
By the end of the day, students not only experience personal success as heroes of a story but also recognize their own growth: they become braver, more cooperative, and more flexible thinkers – qualities essential for thriving both at school and at home.

Materials at a Glance

The description of the tools used during the activities can be found at each stage.

Indoor/Outdoor and Classroom layout

Most of the activities can be carried out indoors, in a classroom setting, while the obstacle course can take place outdoors – such as in the schoolyard or a nearby park.

Notes on Research-based approach and integration

The STEAM-day was designed following a research-based pedagogical approach that supports experiential, active learning as well as the emotional and social development of students.

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The program is grounded in the principles of experiential learning, providing opportunities for children to experiment, make mistakes, and seek new solutions within playful and safe settings. The four phases are structured so that the learning process becomes tangible through a story, while various disciplines – science, technology, mathematics, arts, and movement – naturally interconnect. This integrated approach not only imparts subject knowledge but also fosters creativity, problem-solving thinking, collaboration, and flexibility. Drama play, obstacle courses, artistic creation, and story processing all contribute to students discovering the world – and themselves – through shared, reflective, and meaningful experiences.

Lesson Flow Overview (linked to details below)

Stage	Title	Brief Description	SPIRIT Skills	Duration	Link to Details
1st	**At the Gate of the Fairy Tale World – Story Introduction and Engagement**	Getting to Know the Tale – Text Exploration Lesson Students imagine themselves as the heroes of a story and approach the tale through playful and multifaceted methods. They not only get to know the story but also engage with it actively and creatively using images, movement, and words. The teacher prepares the story, which may be a traditional folktale or a modern story. The tale is introduced in an interactive, multisensory way (e.g., images, objects, sounds, movement-based scenes, arranging keywords, etc.). The STEAM day is ideally based on a story that includes the following elements: • a clear main character (preferably a child or young person with whom students can identify), • a goal or challenge the protagonist wants to achieve, • a journey with trials to overcome, • the appearance of helpers (animals, people, magical beings, or in a modern tale: a robot, a friend, an invention), • a conflict or obstacle that can be resolved, • a resolution, transformation, and a moral at the end.	• Valuing people and nature • Curiosity, sense of wonder and openness • Empathy • Flexibility • Resilience	90 minutes.	**STAGE 1 – At the Gate of the Fairy Tale World – Story Introduction and Engagement**

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		Additional selection criteria for the story: • Should connect to local culture and be familiar to students. • Should feature interesting, diverse characters or settings to inspire various tasks. • Should not be too long or complex - easily broken down into parts. • Should contain elements that lend themselves to movement, visualization, or creative expression. Structure of the activity: • Group formation (3–4 students per group), emotional tuning: singing (a song related to the chosen story), vocabulary building with unfamiliar story words (e.g., online activity via WordWall). • Developing linguistic creativity using anagram cards to reveal the story's title. • Storytelling – the teacher reads the story aloud. • Text comprehension – students recall the content using question cards. Each group rolls a die and answers the question corresponding to the number rolled. Correctly answered questions are collected by the group. • BREAK • Vocabulary development – each group draws word or sentence cards related to the story. They keep the cards they can explain; otherwise, they return them. Only one group member at a time may collect a new card. • Reinforcement and practice – online tasks completed in groups on tablets (e.g., quizzes, sequencing events, true/false, multiple choice via LearningApps or WordWall).			

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		• Testing reading comprehension through drama – "Hot Seat" game: a volunteer sits in front of the class, acting as the story's main character. Classmates ask them questions about the events. • Feedback and self-assessment – students use body posture to express how well they understood the story (e.g., a dove for full understanding, a fish for partial clarity, and a fox hiding for confusion). • Assigning homework – students are asked to watch a cartoon version of the chosen story at home.			
2nd	**Obstacle race**	Obstacle course outdoors – journey in the fairy tale world The students complete a "Seven Challenges" obstacle race in teams of 6-7, carrying a route card and a map. Each challenge must be completed at a specific station. Each station refers to the characters, locations, or challenges of the chosen story, but the specific tale can be any selected by the local educator (a folk tale or a modern story). Each station requires different skills: movement, logical thinking, creativity, sensory perception, measurements, and cooperation. Examples of stations that could be set up: Station 1 – Sounds of Nature Recognizing different animal and natural sounds (e.g., bird songs, water flowing, wind noise). • Develop: auditory attention, observation skills, concentration.	• Creativity • Problem-solving • Flexibility • Resilience	90 minutes	**STAGE 2 – Obstacle race**

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		• Flexibility: if they don't recognize a sound at first, they need to try new ideas (e.g., process of elimination). Station 2 – Dexterity Challenge Balancing, target throwing, moving through obstacles, or other physical tasks. • Develop: coordination, quick reaction, perseverance. • Resilience: if they make mistakes, they have to try again. Station 3 – Hidden Message Underwater Solving a puzzle or obtaining hidden information from a "fishing" game (e.g., with a magnetic fishing rod). • Develop: logical thinking, problem-solving. • Flexibility: if they don't succeed immediately, they must adjust their strategy. Station 4 – Hunt for Colores and Shapes The team receives a list (e.g., 5 colours, 5 shapes) and must find all the items in the given area. • Develop: visual perception, teamwork. • Flexibility: trying new searching methods if stuck. Station 5 – Tactile Recognition Identifying objects by touch inside a box or cloth bag. • Develops: tactile perception, memory, descriptive skills. • Resilience: multiple attempts, different ways of thinking. Station 6 – Secrets of Earth and Sky Estimating area and height, examining surfaces, identifying materials (e.g., soil, stone, concrete), and discussing environmental connections.			

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		• Develops: measurement skills, environmental awareness, mathematical thinking. • Flexibility: trying different measurement methods. Station 7 – Code Breaking Deciphering symbols, secret writing, or logical puzzles. • Develops: logical thinking, pattern recognition, creativity. • Resilience: rethinking after unsuccessful attempts. Additional (highly suggested) Station – Celebration A joint closing activity: singing, dancing, or creating together to strengthen team spirit. • Develops: cooperation, community experience. • Flexibility: rotating roles, making decisions together.			
3rd	**Drama pedagogy session**	The order of the tasks is fixed, but tasks 2, 4, and 6 can be omitted. Additional variations: 3/b; 6/b; 6/c. Warm-up: 1. Fantasy Journey – Imaginary entry into the world of the story With relaxing music playing, students are given the opportunity to imagine entering a significant location from the chosen story (e.g., garden, forest, castle, cave). A movement exercise connected to an element of the story, such as a flower, supports relaxation and immersion. For example, bud state: curling up, bending forward, hugging the body with both arms; blooming state: arms rise to a high posture, open sideways, stretching upwards, standing on tiptoes; then the exercise ends with lowering the arms.	• Empathy • Valuing people and nature • Resilience • Flexibility • Emotional awareness, regulation and communication	90 minutes	**STAGE 3 – Drama pedagogy session**

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		Reflection, discussion: Were you able to relax? What images or moods appeared in your imagination? 2. Recalling the tale – Circle storytelling (collective retelling) Passing around an object related to the story, each student adds a sentence to retell the tale. This way, the main events are processed together. Reflection, discussion: Was anything important missing? Which expressions were especially vivid? 3. Main part: 3/a. Voicing – embodying the characters' thoughts Students put themselves in the place of a character and express what they might have felt or thought in the situation. The teacher can provide starting examples but should remain open to students' own ideas. Reflection: Which statements were especially insightful or unique? How well did they reflect the character's personality? 3/b. Depicting the hero's journey – movement-based processing The hero of the chosen story (a selected student) starts walking, and the others follow in a line imitating their movements. Various obstacles are physically represented through movement (e.g., water, dense forest, cave, mountain). For example: small steps, big steps, crouching at the cave, walking while crouched, crossing waist-high water (with resistance), stumbling through dense forest, climbing a mountain, descending into a valley…			

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		4. Group synchronization – Wave – circle game with hand or shoulder hold Students stand in a circle holding hands or shoulders. A “wave” is initiated that moves through the group with movements (e.g., crouching and standing up) more smoothly each time. The task develops group attention, rhythm, and mutual attunement. Reflection, discussion: What helped the group move together? What did it feel like to cooperate? 5. Playful dialogue exercise – role interpretation with voice and intonation practice Students repeat a characteristic recurring dialogue from the story (e.g., request, threat, reply) with different tones and emotional emphasis, passing it around the circle. Variations help deepen role understanding. Reflection, discussion: What traits helped the characters solve their situations? 6/a. Vision game – guided imagination In pairs, one student walks with eyes closed while the partner “guides” their imagination verbally, describing what they would see in an imaginary place related to the story (e.g., garden, palace, forest). 6/b. Tableau creation – forming a living picture Students take turns creating “still images” of locations or characters from the story. They use posture and facial expressions to represent characters, objects, or scenes. A collective composition is formed at the end.			

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		6/c. Blind leading – trust game In pairs, one student moves with closed eyes while the other guides silently through touch (handhold, shoulder tap, finger connection, etc.). Role switching and sharing experiences is important. Reflection, discussion: What did it feel like to lead or follow? How much trust developed? How does this relate to relationships between characters? Closing part: 6. Where is the exit? – communication through eye contact Students stand in a circle holding hands, with one playful student in the middle, eyes closed. The teacher marks the exit (between two students). After opening their eyes, the one in the middle tries to find the correct direction relying only on eye contact. Reflection, discussion: What was it like relying only on eye contact? How clear was the message? Closing circle – What do you take with you? Students place a stone into a basket and briefly share what they learned from the story's characters: which trait or action was most important to them. Reflection, discussion: Which trait was mentioned most? How can these be used in other situations?			

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4th	**Art activity**	On land (forest), in water, and in the air – from the perspective of chosen story characters or creatures • Preparation – Group formation, arranging materials • Recalling the chosen story • Real and imaginary locations: land, water, air • Inspiration and ideas: technical preparation for the creative process • Playful activity to spark imagination • Creative group work • Discussion, reflection, closure. 	• Creativity • Resilience • Flexibility	90 minutes	**STAGE 4 – Art activity**

Tips and Tricks for dealing with challenges (for the whole STEAM program)

- Developing patience with multi-step tasks.
- Sometimes a group may get stuck. It is important to give them time to find their own pace and opportunities for gradual retrying.
- Providing structured support when stuck.
- If a group becomes uncertain, the teacher can assist progress with guiding questions, directed brainstorming, or structured prompts (e.g., sentence starters, visual examples).

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- Preparing for conflict resolution.
- In group work, it is helpful to discuss in advance how to handle differences of opinion and decision-making (e.g., “we decide by voting,” “we try both ideas and then choose,” “we wait a minute and then discuss again”).
- Considering individual sensitivities.
- During intensive, all-day activities, it is important to pay attention to individual needs: allow for short breaks, opportunities to step away, or separate discussions if necessary.
- The teacher as a role model.
- The teacher can model resilience and flexibility: if things don’t go as planned, adapting with humour and creative rethinking serves as an example for the children.
- Maintaining a safe atmosphere continuously.
- Setting ground rules at the start of the day (e.g., respect, listening to each other, it’s okay to make mistakes) helps students feel safe to try new things, thereby supporting the development of their resilience.

Difficulty level tailoring notes

The activities of the STEAM Day can be tried from as early as third grade, with slight modifications.
If necessary, some parts of the tasks can be omitted, and the time allocated to the activities can be shortened, depending on the composition and abilities of the student group.

STEAM Program Debriefing and Reflection Questions

After completing the STEAM activities, it is useful to ask students what kind of experiences the multi-session journey into the world of the chosen story brought them.
You can begin the closing discussion with a "warm-up" activity. The following sentence starters help students reflect and express how they developed personally, socially, and emotionally during the sessions:

- I was the most persistent when...
- I could think flexibly the best when...
- Our group worked really well together when...

You can also encourage students to create their own sentence starters and invite their peers to complete them.
For students who find it difficult to express themselves verbally, you may offer non-verbal options such as hand gestures, movements, or drawings to express their feelings and impressions.

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Suggested Questions:

Personal and Story-Based Reflection:

- What did you learn from the story characters that you can use in your own life?
- How did it feel to "step into their shoes" and feel their struggles?
- Did the characters' examples help you face challenges more bravely?
- What did the characters do when they were in a difficult situation?
- What helped them most when they felt like there was no way out?
- Can you give an example from your own life that is similar to how the characters had to adapt?
- Which part of the sessions did you enjoy the most, and why?
- Which activity should we repeat in the future?
- What was the biggest challenge? Did you solve it on your own or did someone help you?

Questions for developing resilience:

- Was there a task that didn't work out the first time? What did you do then?
- In which situation did you have to be the most persistent?
- What helped you keep going when things were tough?
- How did it feel when you could learn something from a mistake?
- Was there a moment when you had to try something again? How did that feel?

Questions for developing flexibility:

- Was there a moment when you had to change your plan? Why and how did you do it?
- How did you adapt to each other within the group?
- What new ideas were born when a task didn't go as planned?
- When did you have to think differently from what you originally planned?
- What did you learn from letting go of your original idea?

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6.1.2. Stage details and Activities Flow

STAGE 1 – At the Gate of the Fairy Tale World – Story Introduction and Engagement

How does this develop particular SPIRIT skills

As students follow the journey of a storybook hero, they gradually enter an unfamiliar, imaginary world. This transition – during which they take on different roles, perspectives, and situations – both requires and develops mental flexibility. Interpreting the story, reflecting on the actions of various characters, and adapting to new questions all support the development of flexible thinking, especially when the narrative allows for multiple interpretations.

At this stage, resilience is primarily fostered through the learners' engagement with the challenges faced by the protagonist. By identifying with the character, students can safely explore how to overcome difficulties, mistakes, or doubts. In group discussions, they come to realize that the hero also makes mistakes, recalibrates, and still reaches their goal – offering a powerful model for them to relate to.

Creative, dramatic engagement with the story activates students' imagination and emotional involvement, helping them draw on inner resources. In this way, resilience is developed not only cognitively, but emotionally as well.

What do we want to achieve regarding SPIRIT skill development (student understanding and/or behaviour)?

The aim of the activity is to develop students' flexibility and coping skills in the following areas:

- The student is able to accept and interpret the story character's mistakes and failures, and based on these, identify their own coping strategies.
- They recognize that a difficult situation may have more than one possible response and are able to reflect on a character's decision from at least two different perspectives.
- They can emotionally identify with the story characters and articulate how they would act in a similar situation.
- They are able to participate in shared story work with openness and cooperation, adapting to others' thoughts and interpretations.
- They are capable of giving feedback on their own experiences, emotions, and insights, and expressing them reflectively.

Academic/Curriculum Objective connection

- Retelling the story using guiding questions.
- Explaining vocabulary, expressions, and word combinations.
- Acquiring and practicing knowledge through ICT tools.
- Developing communication skills through dramatic play.

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Materials and tools needed for implementation

Teaching aids: printed version of the story, worksheet, projector, laptop.
Depending on class size and number of groups: tablets, vocabulary cards, question cards, dice, and other supporting materials.

Preparation notes

- The teacher selects the story in advance, which will serve as the central element of the STEAM-day. It is advisable to choose a story that is visually rich and offers multiple opportunities for interpretation and creative activities.
- In addition to knowing the story, it is recommended to prepare or print the related question cards, vocabulary explanation cards, and anagram game cards ahead of time.
- For the online tasks (WordWall, LearningApps, etc.), tablets or other digital devices and internet access may be required.
- To enhance the storytelling atmosphere, the teacher can prepare images, sounds, musical excerpts, or symbolic props and decorative elements.
- It is worth setting up a quiet, structured environment that supports sustained attention and emotional engagement. The teachers should also be prepared to activate the students' imagination and prior experiences (e.g., have they ever seen a hot air balloon, visited a museum, or what "old painting" means to them).

Guided Questions

- What could you have done in the hero's place when they faced a difficulty?
- Why didn't the character give up when something didn't work out the first time?
- How did the hero's experiences along the way change their way of thinking?
- Was there a moment when they had to come up with a new solution? How did their thinking help them with that?
- What helped the hero move forward when it seemed like there was no way out?

Stage Debriefing Questions (Optional)

- What did you learn from the characters in the story? What qualities helped the hero overcome challenges?
- How did this lesson help you connect with your classmates?
- What difficulties did you face during the lesson? How did you overcome them?
- What went really well? Can you use the knowledge or experience you gained in other situations too?
- What was the biggest challenge for the story's hero? How did they solve it?
- Was there a part where you think the hero showed flexible thinking?
- In what way does the hero remind you of yourself? Have you ever been in a similar situation?
- What did this story teach you about perseverance or trying again?

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Tips and Tricks for dealing with stage challenges

- Challenges in engaging with the world of the story: Engagement can be supported by consciously arranging the learning environment – lighting, space, and atmosphere should enhance the storytelling experience. Soft background music, visual aids or symbolic objects can stimulate the imagination and help students immerse themselves in the narrative.
- Difficulties in group work: When forming groups, it's helpful to consider students' diverse strengths. Including a confident speaker, a cooperative peer, or a tech-savvy student in each group can foster collaboration. Positive feedback and clearly defined group roles also contribute to more effective teamwork.
- Struggles with a task: If students get stuck, offering opportunities to try again or suggesting alternative ways of thinking can be useful. Encouraging phrases such as "Try a different approach" or "Look at it from another point of view" may help them move past the difficulty.
- Decreasing motivation or attention: It's important to spark curiosity early in the session - for example, by introducing exciting tasks to come or playing music from a film adaptation of the story. A variety of playful, visually appealing activities can help maintain focus. Creating cooperative competition, such as completing a task within a time limit, may also boost motivation.

STAGE 2 – Obstacle race

How does this develop particular SPIRIT skills

During the Seven Challenges, students continuously encounter new situations and various types of tasks that present both physical and mental challenges. The diverse stations require different skills, so participants must quickly adapt to different task types and working methods.

- Resilience: Children learn that making mistakes is natural and that they can try again after failure. At every station, they have the opportunity to try multiple approaches and attempt tasks again. This develops perseverance and stress tolerance.
- Flexibility: Quickly understanding the types and rules of tasks and responding immediately helps adaptability. Children experience how to think from different perspectives and find creative solutions if the first idea doesn't work.
- Teamwork: Since the stations require cooperation, students develop communication skills, listen to each other's ideas, and switch roles during tasks. This supports the development of social flexibility.
- Positive self-assessment: Successful task completion increases self-confidence, and students receive reinforcement that they are capable of coping with changing situations.

The Seven Challenges thus provide a safe, playful framework in which children can become aware of and practice strategies that help them overcome difficulties and adapt flexibly to new situations.

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What do we want to achieve regarding SPIRIT skill development (student understanding and/or behaviour)?

The aim of the activity is for students to practice overcoming difficulties and adapting to new situations in a safe, playful environment:

- They are able to recognize that failure or making mistakes is part of the learning process, and that results can be improved through repeated attempts.
- They approach tasks openly, even when these differ from the usual classroom activities.
- They can switch strategies if one method does not lead to success and are able to seek alternative solutions.
- They are flexible in changing roles, task distribution, and working methods within the group.
- They can motivate themselves and their peers to complete the task, even if the solution requires more time or multiple attempts.
- They positively evaluate their own and their peers' efforts, not just the final outcome.

Academic/Curriculum Objective connection

- Developing interest in nature, observation skills, and auditory attention through recognizing bird songs and other environmental sounds, as well as observing their characteristics. (Stations: 1, 5)
- Strengthening gross motor skills, coordination, and sense of balance through agility and movement challenges, and coordinating the movements of team members. (Stations: 2, 4, 8)
- Recognizing part-whole relationships, developing visual perception, fine motor skills, and creativity through puzzles, tactile recognition, and codebreaking activities. (Stations: 3, 5, 7)
- Developing mathematical thinking through estimation, measurement, comparison, use of units, as well as examining environmental materials and understanding environmental protection aspects. (Station: 6)
- Developing language and logical skills through letter arrangement, codebreaking, and tasks requiring creative thinking. (Stations: 3, 7)
- Developing musical hearing, sense of rhythm, and movement culture through singing, dancing, and collective movement; learning about cultural traditions. (Station: 8)

Materials and tools needed for implementation

Station 1 – Sounds of Nature
Task: Recognize animal and natural sounds (e.g., bird songs, water flowing, wind noise).
Materials:

- Sound recordings (playable via phone, tablet, or speaker)
- Playback device and speaker
- Worksheet for identifying sounds (with pictures or written)
- Pens, pencils

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Station 2 – Agility Challenge
Task: Balancing, target throwing, moving through obstacles.
Materials:

- Small cones or markers to set up obstacle course
- Balls, beanbags, or rings for target throwing
- Balancing equipment (e.g., bench, thick rope on the ground)
- Timer (stopwatch, phone)

Station 3 – Hidden Message Underwater
Task: Assemble a puzzle or obtain information from a magnetic “fishing” game.

Materials:

- Magnetic fishing rods
- “Fish” or objects with magnets, marked with numbers, letters, or image pieces
- Puzzle (printed and cut picture, e.g., palace or another scene)
- Plastic tub or bucket to represent “water”

Station 4 – Hunting Colores and Shapes
Task: Find and document a given list of colours and shapes.

Materials:

- List of elements to find (colours, shapes) with pictures
- Tablet or camera for documentation
- Marker pen to tick off found items

Station 5 – Tactile Recognition
Task: Identify objects inside a box or cloth bag by touch.

Materials:

- Cloth bags or boxes with covered openings
- Objects of various materials and shapes (e.g., sponge, stone, wood, metal, plush toy, toy car, pencil)
- List of possible objects for checking

Station 6 – Secrets of Earth and Sky
Task: Estimate area and height, examine materials.

Materials:

- Measuring tape, measuring wheel, or string
- Notebook and pencil for estimates
- Material samples for identification (if needed)
- For measuring tree height: measuring tape plus helper tool (e.g., triangle template or app)

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Station 7 – Codebreaking
Task: Solve symbols, secret writing, or logic puzzles.

Materials:

- Printed puzzles/code sheets
- Pens, pencils
- Answer key for teacher's reference

+1 Station – Celebration
Task: Joint closing activity (singing, dancing, creating).

Materials:

- Speaker and music player
- Simple instruments (e.g., shaker, drum) or creative tools (drawing paper, markers)
- Enough space for movement.

Preparation notes

- Location selection: Choose a safe, easily walkable area with varied terrain features (e.g., trees, shaded spots, grassy areas). Scout the route in advance.
- Marking stations: Number each station and mark them clearly with visible signs (flags, boards). Make sure the direction of progression is clear.
- Time frame: Allocate about 8–10 minutes per station plus transition time between them.
- Helpers: Assign one adult or older student to each station who knows the task and monitors the rules.
- Route sheets and team identifiers: Prepare simple route sheets with spaces for stamps or signatures. Differentiate teams by colour, bandanas, or badges.
- Flexibility in equipment use: Have alternative tasks ready in case of weather or technical difficulties (e.g., live sound imitation instead of recorded sound recognition).
- Preparing for closure: Ensure the space and materials needed for the final group activity. Allow time for short feedback or reflection (e.g., sitting in a circle and sharing "What was your favourite station?").

Guided Questions

- What did you do when something didn't work out the first time?
- How did you feel during the challenges?
- Where did you find the strength to keep trying?
- Who or what helped you not to give up?
- What did you learn from your mistakes in these playful situations?
- What changed during the game, and how did you react to it?
- How did you adjust your plan if something didn't go as you expected?
- What else did you try when your first idea didn't work?
- Were you able to switch roles or cooperate differently to improve?
- Can you remember a time when you faced a similar challenge? What helped you then?

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Stage Debriefing Questions (Optional)

- Was there a task that you found difficult? What did you do when you got stuck?
- When did you have to change your plan? Why did the new idea work better?
- What helped you not to give up during a tough moment?
- In what ways were you flexible as a team? How did you make decisions together?
- What did you learn today about yourself or your team that you can use in other situations?

Tips and Tricks for dealing with stage challenges

- Time management: If a team gets stuck or spends too much time at a station, gently signal that it's time to move on, or support progress with guiding questions.
- Maintaining motivation: Praise effort, cooperation, and perseverance, not just the solution. Reinforce that making mistakes is part of learning and every attempt is valuable.
- Supporting flexibility: Encourage teams to try different approaches - like switching roles, changing the order of tasks, or using new strategies - if the first attempt doesn't work.
- In case of equipment shortage or technical issues: Have simplified or alternative solutions ready (e.g., live sound imitation for sound recognition, estimation instead of measurements). Keeping the experience playful and positive remains important.
- Managing group dynamics: If tension or conflict arises in the team, redirect attention to the common goal and remind them that cooperation is key to success.
- Fatigue or loss of focus: A short physical warm-up, a group cheer, or a humorous refreshment activity can help regain energy and focus.
- Weather difficulties: Plan ahead for indoor or shortened versions to quickly adapt the activity if needed.
- Memorable closing: The final station (celebration) provides an opportunity to share experiences and emotionally close the activity. It's worth keeping this even if time becomes tight.

STAGE 3 – Drama pedagogy session

How does this develop particular SPIRIT skills

Drama sessions provide an experience-based learning framework that promotes the development of students' emotional, social, and cognitive flexibility. The exercises focus on processing a story, offering students the opportunity to explore different situations and roles in a safe, creative environment.

Activities that expose students to coping situations – whether through movement, emotional expression, or symbolic forms – support the development of resilience. Expressing the characters' thoughts, overcoming obstacles, and engaging in trust- and cooperation-based games all contribute to strengthening emotional self-regulation, problem-solving skills, and self-confidence. Students experience that difficulties have solutions and that these situations hold potential for growth.

The development of flexibility is fostered by experiential pedagogical elements and diverse activity formats. Students try out various roles, postures, movement forms, and modes of communication, continuously adapting to the situation and to each other. Role changes, variation in emotional expression, and tasks that require attunement to one another enhance adaptability, openness, and flexible thinking.

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The complexity of the session allows students to independently process their experiences and acquire fundamental skills and attitudes that form the basis for resilient and flexible functioning in future school, social, and life situations.

What do we want to achieve regarding SPIRIT skill development (student understanding and/or behaviour)?

As a result of the activities, students:

- Develop their ability to recognize and name emotions, especially in situations that are unexpected, uncertain, or challenging (e.g., role changes, unfamiliar tasks, new group dynamics).
  This supports the development of emotional regulation and helps establish effective coping strategies - fundamental elements of resilience.
- Become capable of accepting different perspectives and stepping into various roles, which allows them to interpret stories and human behaviours with greater nuance.
  This fosters flexible thinking and strengthens the ability to adapt to changing circumstances (flexibility).
- Gain experience in teamwork and social coping mechanisms while cooperating, negotiating, and making joint decisions during the processing of dramatic situations.
  Such collaborative experiences build social resilience - the ability to rely on others, offer help, and accept assistance.
- Increase their openness to creative thinking and learn that uncertainty, mistakes, or unknown situations are not threats but opportunities for growth.
  Open-ended, free play and decision-making scenarios develop risk management and problem-solving skills, contributing to the strengthening of inner flexibility.
- Learn to appreciate their own and their peers' efforts, gradually building an internal reinforcement system that does not rely solely on external recognition.
  This process supports the development of self-confidence and intrinsic motivation, which form the basis for sustained resilient and adaptable behaviour.

Academic/Curriculum Objective connection

The activities of the session are closely connected to 21st-century educational goals. The drama pedagogy approach comprehensively supports students' emotional and social development, creativity, collaboration skills, and communication abilities.

Warm up:

1. Fantasy Journey – Imaginary entry into the world of the story: Development of bodily and mental awareness, emotional attunement, activation of visual and bodily imagination.
2. Recalling the tale – Circle storytelling: Oral text creation, listening comprehension, creative storytelling.

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Main part

1/a Voicing – embodying the characters' thoughts: Empathy, text interpretation, role interpretation, expression of emotions.

1/b Depicting the hero's journey – movement-based processing: Body awareness, movement coordination, symbolic thinking, creative expression.

2. Group synchronization – Wave game: Group cooperation, sense of rhythm, shared attention.

3. Playful dialogue exercise – role interpretation with voice and intonation practice: Expression of emotions, variation in tone of voice, role-play communication.

4/a Vision game – guided imagination: Spatial orientation, acceptance of different viewpoints, verbal expression.

4/b Tableau creation – forming a living picture: Role awareness, body awareness, artistic self-expression.

4/c Blind leading – trust game: Building trust, sense of responsibility, nonverbal communication.

Closing and check-out part

- Where is the exit? – communication through eye contact: Development of concentration, interpretation of nonverbal signals, and attention to others.
- Closing circle – What do you take with you? Self-reflection, processing experiences, and concluding the learning process.

Materials and tools needed for implementation

Most activities can be carried out in a safe, calm environment without the need for special equipment. Primarily, a space suitable for movement and a disturbance-free setting are required. The following props may be optionally used for certain exercises:

- 1. Fantasy Journey – Imaginary entry into the world of the story
  Relaxation music and a device to play it (e.g., speaker, phone, media player)
  Device suitable for playing relaxation music (e.g., speaker, phone, media player)
- 2. Recalling the tale – Circle storytelling
  A small object related to the story world (e.g., flower, ornament) to pass around during the story
- 6/a Vision Game – Guided Imagination
  Blindfold or scarf to cover the eyes (optional)
- 6/b Tableau creation – forming a living picture
  A device for taking photos, such as a phone or camera (optional)
- 6/c Blind leading – trust game
  Blindfold or scarf to cover the eyes (optional)
- 8. Closing circle – What do you take with you?
  Small stones or other tiny objects
  A basket or box to collect the objects.

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Preparation notes

- Preparing the space:
- It is important that the venue for the session is safe, organized, and spacious enough for movement-based activities. A circular or semi-circular arrangement is ideal for group tasks.
- Preparing the materials:
- Any necessary props (e.g., relaxation music, objects, pebbles, scarves) should be prepared in advance and placed in an easily accessible location.
- Choosing the music:
- For relaxation, calm, instrumental music – preferably without vocals – is recommended, as it supports the emergence of inner imagery and promotes relaxation.
- Group dynamics considerations:
- Trust-based games (e.g., blind guidance, eye contact game) should only be introduced once a sense of openness and an accepting atmosphere has developed among the group members.
- Intentional preparation for reflection:
- At the end of the session, it is important to allow time for sharing experiences and discussing insights. Support students in expressing their inner experiences and thoughts in their own words during the reflection.

Guided Questions

Warm up:

1. Fantasy Journey (Relaxation, activating imagination):
    - Were you able to relax?
    - What images or feelings did you imagine?
    - How did you feel while doing the flower-related movements?
2. Recalling the tale – Circle storytelling
    - Which part of the story did you like the most?
    - Was there anything you missed from the story?
    - Why do you think this story is important?

Main part

1/a Voicing – embodying the characters' thoughts

- How do you think the character felt in that situation?
- What was the most interesting thing you said or heard?

1/b Depicting the hero's journey – movement-based processing

- What obstacles did the hero have to overcome?
- Was there any part that was difficult for you? How did you deal with it?
- What did you learn about adapting while moving?

2. Wave game (Coordination, cooperation):

- What helped you move in sync with the group?
- How did it feel to pay attention to others and be in harmony with them?

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- Did you need to change your movement to work better with the group?

3. Playful dialogue exercise (Roles, practicing vocal expression):

- How did it feel to speak with different tones or emphasis?
- What did you learn about the characters through their voices?
- Was there a time you had to change how you spoke to better understand the role?

4/a Vision game – guided imagination (Guided imagination, trust):

- What was it like to move with your eyes closed?
- How did you feel when your partner guided your imagination?
- Was there a moment when you had to trust your partner? How did that feel?

4/b Tableau creation – forming a living picture (Living statues, cooperation):

- What character or situation did you represent with your body?
- How did you work together with others to create a shared scene?
- Did you have an idea that surprised the others?

4/c Blind leading – trust game (Trust, nonverbal communication):

- How did it feel to lead or follow your partner?
- How much did you trust your partner?
- What did you learn about paying attention to each other without speaking?

Closing and check-out part

1. Where is the exit? – (Eye contact communication):

- What was it like to communicate only with your eyes?
- Was it easy to figure out which way to go?
- Why do you think attention and eye contact are important?

2. Closing circle – What do you take with you? (Reflection, lessons learned):

- What quality did you learn from the characters in the story?
- How can you use that quality in your own life?
- Was there an activity you would like to try again?

Stage Debriefing Questions (Optional)

- What was the most important thing you learned during the drama-based session?
- Was there a moment when something felt difficult, but you managed to solve it? Tell us about it!
- When did you have to be flexible or change your original plan?
- What did you do to help your partner?
- How did it feel to work together with the group?
- How do you think these games could help you if you face a difficult situation in the future?
- What personal qualities did you use today that help you be brave, persistent, and adaptable?

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Tips and Tricks for dealing with stage challenges

- Fantasy Journey – Imaginary entry into the world of the story: Possible challenge: difficulty relaxing or focusing. Tip: Darken the room, turn off the lights, and invite students to close their eyes. Use calm, slow-paced instructions to guide them into their inner imaginative world.
- Recalling the tale – Circle storytelling: Possible challenge: Hesitation to speak or forgetting parts of the story. Tip: Allow students to pass if they feel unsure. You can prompt with a starting word, or briefly summarize the key points of the story before beginning.
- Voicing – embodying the characters' thoughts: Possible challenge: students don't volunteer or struggle to articulate feelings. Tip: start with a model example from the teacher. Provide supportive guiding questions like, "What do you think the character felt when…?"
- Depicting the hero's journey – movement-based processing: Possible challenge: The group is noisy or unfocused. Tip: Use clear cue words (e.g., "Cave!", "Water!") to refocus and structure the activity. Demonstrate the obstacles together first before individual improvisation.
- Group synchronization – Wave – circle game with hand or shoulder hold: Possible challenge: the movement is uncoordinated, lacking rhythm. Tip: practice the movement slowly, like in slow motion. Adjust the pacing to match the group's tempo to support flow.
- Playful dialogue exercise – role interpretation with voice and intonation practice. Possible challenge: Quiet, monotonous speech. Tip: provide vocal examples expressing different emotions (e.g., fear, anger, joy). Positive feedback builds students' confidence to experiment.
- Vision game – guided imagination: Possible challenge: the "guide" doesn't know what to say; the "walker" feels unsure. Tip: Use starter questions like, "Can you see something in the grass?" Short demos or examples can help before the task.
- Tableau creation – forming a living picture: Possible challenge: Few ideas or hesitance in role expression. Tip: Brainstorm ideas as a group, then select roles. Presenting together reduces individual pressure and builds confidence.
- Blind leading – trust game: Possible challenge: Students fear closing their eyes or feel unsure about leading. Tip: Demonstrate different leading methods (e.g., holding hands, touching shoulders). Role reversal helps establish mutual trust.
- Where is the exit? – communication through eye contact: Possible challenge: The student in the centre cannot decide; eye cues are unclear. Tip: Encourage focusing on the eyes that appear most inviting. Emphasize silence and concentrated attention during the game.
- Closing circle – What do you take with you? Possible challenge: Hesitation to share, shyness. Tip: The teacher can go first and share an example. Verbal sharing should not be mandatory, but symbolic participation (like placing a pebble in a basket) should still be included.

STAGE 4 – Art activity

How does this develop particular SPIRIT skills

Collaborative artistic creation – based on the perspectives of story characters chosen by the students – offers children the opportunity to imagine new situations, view familiar stories from different angles, and adapt flexibly to a creative challenge. This directly supports the development of flexibility, as students must adapt to each other's ideas, a shared group concept, and any changes that arise during the creative process.

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Resilience – the ability to cope with challenges – also develops on multiple levels during the activity. Re-immersing in the story world, tackling unfamiliar situations (e.g., "How does a bird or a fish see the forest?"), and managing disagreements during group work all help strengthen internal flexibility, emotional regulation, and problem-solving thinking.

Throughout the task, students:

- Step into the perspective of different creatures, enhancing empathy and mental flexibility;
- Adapt to a shared creative space and group dynamics, developing flexibility through real-life cooperation;
- Seek creative solutions to both technical and interpersonal challenges;
- Practice perseverance, learning how to keep going even when something doesn't work out immediately.

Visual and spatial creation is a particularly effective tool for stimulating flexible thinking and inner resources at this age. It allows for playful, symbolic, and free expression, while also supporting the emotional and cognitive processing of experiences.
The final group discussion and reflection further reinforce self-awareness and self-regulation, as students share their experiences and insights from the creative process.

What do we want to achieve regarding SPIRIT skill development (student understanding and/or behaviour)?

The goal of this activity is for students to develop their adaptability and emotional resilience through collaborative creative work based on a story. During the group task, they are encouraged to explore different perspectives, cooperate with one another, seek solutions, and respond creatively to emerging challenges. Through this engaging, experience-based activity, children can discover how to activate their inner resources when facing new situations:

- Students will be able to adapt to group dynamics and respond flexibly to differing ideas and viewpoints during the creative process.
- They will experience that making mistakes or changing a previously chosen solution is a natural part of collaboration and creation.
- They will learn to accept others' perspectives and make shared decisions within the group while working toward a common creative goal.
- Students will practice handling difficulties (e.g. lack of ideas, differing opinions) with calmness and patience.
- They will recognize the value of their own contributions, which will strengthen their self-confidence and inner stability.
- Students will understand that differing solutions can enrich the final outcome, and that flexibility can be a valuable resource in the creative process.
- By stepping into the shoes of a chosen story character, students will learn to see problems from new perspectives, helping them develop a more flexible attitude in their own real-life situations.

Academic/Curriculum Objective connection

- Development of visual perception and creative skills
- Understanding the meaning and aesthetic message of visual imagery
- Familiarization with visual expression methods and illustration techniques

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- Practice in visual representation of both imaginary (fairy tale) and real spaces and environments
- Observation and use of the visual characteristics of nature (earth, water, air), where relevant
- Visual interpretation of the story's plot and characters
- Strengthening interest in and appreciation for cultural values (if applicable)
- Development of empathy, imagination, and visual thinking
- Enhancing cooperation skills through group creation.

Materials and tools needed for implementation

- Large sheets of wrapping paper, drawing paper, or cardboard (one per group)
- Coloured pencils, felt-tip pens, wax crayons, oil pastels
- Tempera or watercolour paints (optional), brushes, water containers, cloth or paper towels
- Glue, scissors (if collage or cut-and-paste work is included)
- Pre-cut templates, textures, images (e.g., animals, landscape elements – as needed)
- Newspapers or plastic sheets to protect the floor (if students are working on the ground)
- Floor space or tables large enough to comfortably accommodate the groups
- Text of the fairy tale (or visual aids representing story elements – optional)
- Illustrative images of natural environments: forest, water, sky (e.g., cards, posters, or digital projections – as needed)
- Time-keeping device (clock, bell, etc.)

Preparation notes

- Pre-planning group formation helps ensure smooth work and harmonious collaboration. It is advisable to mix students with different abilities and temperaments in each group.
- Prepare all necessary materials and tools in advance and arrange them in an easily accessible place so students can reach them without difficulty.
- Provide an appropriate workspace; for artwork done on the floor, it is recommended to protect the floor with newspaper or plastic sheeting.
- Keep the recall of the chosen story brief and focused so that students' memories of the plot and characters remain fresh.
- Prepare visualization aids (pictures, cards, templates) to support imagination and perspective-taking.
- Plan and time the instructions and imagination-stimulating playful exercises that support group work, to maintain motivation throughout the activity.
- Consider that students work at different paces; allow enough time not only for the creative process but also for sharing and group reflection.
- Maintain a positive atmosphere; encourage students to realize their ideas and engage in open communication.
- Be prepared for possible technical issues and have backup materials ready (e.g., pencils, paper.)

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Guided Questions

- How can you imagine and represent the different settings of the story (land, water, air) from your own perspective?
- What creatures or characters might live in each environment? What qualities help them survive or go on adventures?
- How can you share your ideas together as a team so that everyone contributes to the creation?
- What happens if an idea doesn't work out or the group's work turns out differently than expected? How can you handle this?
- How can you adapt if someone else imagines the scene or viewpoint differently?
- What do you do if difficulties or conflicts arise within the group? How can you support each other?
- What was it like to see the story from a different perspective? Did it help you understand the characters or situations better?

Stage Debriefing Questions (Optional)

- What challenges did you encounter during the creative work, and how did you manage to solve them?
- How did you manage to adapt to your group members' ideas or changes?
- Did you feel that despite the difficulties, you were able to work together and realize your ideas?
- What did you learn about how to respond flexibly to an unexpected situation or change?
- From what new perspective were you able to see the story's world and characters? Did this help you understand the story better?
- What was your favourite part of the creative process, and why?
- What would you take with you from this collaborative work to help you solve future situations or work in groups?

Tips and Tricks for dealing with stage challenges

- Group members cannot agree. Careful planning is needed before the activity. It is important to select the appropriate paper size and consider the composition and size of the groups. Appointing group leaders can help facilitate cooperation.
- No ideas. Creating a storytelling, inspiring atmosphere can help spark imagination more easily. During preparation, showing examples and highlighting creative solutions is recommended. If necessary, individual support can be provided to specific groups.
- Too many ideas. It is advisable to set a time limit for deciding which idea to implement. Valuable ideas that cannot be completed due to time constraints can be realized at a later occasion.
- The group is too loud. Playing relaxing music can help promote focused, calm work and maintain concentration.
- Uncertainty in using tools. Only use tools that students are already confident with to avoid uncertainty and tension.
- Problems with representation. Maintaining a relaxed, accepting atmosphere is important, where attempts are supported and there is room for restarting. Using templates or examples can make the task easier and boost self-confidence.

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6.2 Soap Bubbles challenge

In this multi-week project, 4th graders act as "community scientists" to solve the challenge of creating long-lasting bubbles. Students develop critical thinking by following the scientific method to test how changing different ingredients affects their results. Teams practice problem-solving and creativity by designing various wands and fixing designs when bubbles pop too early. The project strengthens connectedness and responsibility as students plan a safe and sustainable bubble event for their school community. By analysing their data and trying again, students build resilience and learn that every failed test provides important evidence for improvement.

Basic Information Sheet

Age group	Student number	Duration	Number of stages	Subjects connection and relevance
4th-6th grade students	Whole class (max. 30 students) working in teams	8 sessions of ~45–60 minutes each (over ~3–4 weeks) + community bubble event	8 stages	Science (scientific method, materials, mixtures, variables, data, conclusions) + community/civic engagement (embedded)

STEAM Event Summary

SPIRIT Skill Focus

- Problem-solving
- Curiosity, sense of wonder and openness
- Critical thinking
- Valuing people and nature

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National curriculum Link and Objectives

- Understand and apply the scientific method: observation → question → hypothesis → experiment → analysis → conclusion → iteration.
- Identify and control variables in fair tests (change one thing at a time).
- Collect, record, and interpret empirical data (bubble size, longevity, quality notes, environmental conditions).
- Make evidence-based decisions using comparisons and patterns.
- Plan and implement a real-world outcome for a real audience (school community), including safety and sustainability choices.

Real-world STEAM Connection and Problem definition

Real-world connection (students' perspective):
Scientists don't just "learn facts" - they test ideas, improve designs, and use evidence to make something work better in real life. Bubble makers, engineers, and scientists all need to understand mixtures, materials, and conditions to create strong bubbles that last.

Problem definition (students' perspective, age-specific):
"How can we, as a team of young scientists and community builders, create the best bubble solution and wand to make big, strong bubbles - and share that joy safely and responsibly with our school?"

Materials at a Glance

- Bubble ingredients: dish soap, water (tap or distilled), glycerin and/or corn syrup
- (optional enhancers: cornstarch, gelatin, guar gum - teacher choice)
- Measuring cups/spoons, mixing containers, stirrers
- Wand-making materials: sticks/dowels, wire, straws, string/cotton loops, clothespins, weights
- Data sheets/notebooks (tables + observation notes), clipboards (helpful outdoors)
- Timers/stopwatches; simple "size reference" tools (string circles, meter sticks, chalk circles)
- Safety: goggles, aprons, towels, non-slip mats (if needed)
- Posters/chart paper: hypothesis board, variables board, team roles, timeline, event plan
- Event supplies: signage, distribution trays, cleanup materials, feedback slips/cards.

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Indoor/Outdoor and Classroom layout

Indoor:

- Team tables for planning/research/data work
- Central wall/board: “Science Board” (questions, hypotheses, variables, timeline, roles)

Outdoor (preferred for testing/event):

- Marked “test lanes” or zones (safe spacing, non-slippery surface)
- One station per team: solution container + wand + data recorder spot
- One “wash/cleanup” station

Circle area:

- Quick debrief circles at the end of each session (skills labelling + next steps).

Notes on Research-based approach and integration

In this activity, children are encouraged to explore a familiar, playful phenomenon - soap bubbles - through the lens of real scientific research and a real community purpose. They begin by observing bubbles and wondering why some pop quickly while others float longer, using their own experiences to generate meaningful questions. Then, they apply those ideas to design and test bubble recipes and wands that can create “the best bubbles” for a school event.

This process mirrors a basic research cycle: students observe bubble behaviour, define questions, and create hypotheses about what might improve size and durability (ingredients, ratios, wand shapes, technique, wind/shade). They then test fairly by changing one variable at a time, collect evidence, and analyse patterns before choosing a final solution and design. Finally, they extend their learning by planning and hosting a real bubble event - where they must consider people, nature, safety, and sustainability while adapting in real time.

Because the outcome is joyful and shared with others, the learning becomes more meaningful: students experience that careful thinking, teamwork, and responsibility can create something that benefits their community - not just their own group.

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Lesson Flow Overview (linked to details below)

Stage	Title	Brief Description	SPIRIT Skills	Duration	Link to Details
1st	**Team Building and Framing**	Students play short team challenges to practice cooperation and strategy, then connect these habits to their new mission: becoming "community scientists" who will bring bubble joy to the school	• Connectedness • Problem-solving • Critical thinking • Valuing people Sense of wonder	1 session (45–60 min)	**STAGE 1 – Team Building and Framing**
2nd	**Scientific Method and Research**	Students learn/review the scientific method, explore kid-friendly bubble research, and choose a few testable variables. They write simple hypotheses and agree on fair testing rules.	• Sense of wonder • Critical thinking • Problem-solving • Connectedness • Valuing people and nature	1 session	**STAGE 2 – Scientific Method and Research**
3rd	**Prototyping Solutions and Wands**	Teams mix first recipes and build first wands. They label everything clearly and prepare for fair testing, practicing safe and responsible material use.	• Problem-solving • Critical thinking • Valuing people and nature • Connectedness	1 session	**STAGE 3 – Prototyping Solutions and Wands**
4th	**Testing and Data Collection**	Teams run fair tests outdoors, record bubble size and longevity, and note conditions (wind/shade). They repeat trials and keep roles rotating for accuracy.	• Critical thinking • Problem-solving • Resilience • Connectedness • Sense of wonder	1 – 2 session	**STAGE 4 – Testing and Data Collection**
5th	**Evidence-Based Selection and Planning**	Teams compare results, choose a "final" recipe and wand, and design their bubble booth for the community event with roles, safety, and sustainability in mind	• Critical thinking • Problem-solving • Connectedness • Valuing people and nature	1 session	**STAGE 5 – Evidence-Based Selection and Planning**

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6th	**Rehearsal and Preparation**	Students do a full practice run of the bubble stations, rehearse welcoming visitors and explaining the science, and improve the plan using feedback from the rehearsal.	• Connectedness • Problem-solving • Resilience • Valuing people	1 session	**STAGE 6 – Rehearsal and Preparation**
7th	**Community Bubble Event**	Students host the bubble event for peers/teachers/guests. They manage flow, support visitors, solve problems in real time, and gather feedback respectfully	• Connectedness • Valuing people and nature • Problem-solving • Critical thinking	1 event session	**STAGE 7 – Community Bubble Event**
8th	**Reflection and Celebration**	Students analyse feedback and results, reflect on skills and community impact, and celebrate growth. They identify what they would improve next time and why.	• Critical thinking • Connectedness • Resilience • Sense of wonder • Valuing people and nature	1 session	**STAGE 8 – Reflection and Celebration**

Tips and Tricks for dealing with challenges (for the whole STEAM program)

- **Challenge:** Too many variables at once → results are confusing.
  Tip: Use a class rule: change ONE thing per test; keep a "variables board" visible.
- **Challenge:** Unequal participation in teams.
  Tip: Use rotating roles (Mixer / Wand Builder / Bubble Blower / Data Recorder / Safety Monitor).
- **Challenge:** Weather (wind/rain) affects testing or event.
  Tip: Have an indoor backup: smaller bubbles with trays + technique testing near open windows, or a sheltered area.
- **Challenge:** Slippery surfaces and safety concerns.
  Tip: Test on safe ground, set boundaries, add cleanup station, and use a "slow walking zone."
- **Challenge:** Teams get disappointed when bubbles fail.
  Tip: Normalize iteration: "failed test = useful evidence." Track "What we learned" each session.

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Difficulty level tailoring notes

- **Beginner learners:** limit to 2–3 recipe options; provide sentence starters for hypotheses and conclusions; teacher provides wand base, students modify.
- **Intermediate:** teams test 1 ingredient variable + 1 wand variable; full data tables; compare patterns.
- **Advanced learners:** add environmental variables (shade/wind) or sustainability focus (eco-friendlier choices, minimal waste plan); create a short "teaching guide" for visitors.

STEAM Program Debriefing and Reflection Questions

- Where did you use critical thinking - what evidence helped you decide?
- When did you need problem-solving, and what strategy worked best?
- How did you show connectedness as a team and as a class community?
- In what ways did you practice valuing people and nature (safety, fairness, care for the space)?
- What gave you the biggest sense of wonder, and what new question do you still have?

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6.2.2. Stage details and Activities Flow

STAGE 1 – Coordinate Plot and Shape Discovery

How does this develop particular SPIRIT skills

- Builds connectedness by creating shared success through teamwork, listening, and trust
- Develops problem-solving as students coordinate actions, plan moves, and adjust strategies together
- Strengthens critical thinking through noticing patterns, predicting outcomes, and reflecting on what caused success
- Reinforces valuing people through respectful turn-taking, encouraging teammates, and fair participation
- Sparks sense of wonder by showing what groups can achieve when everyone contributes.

What do we want to achieve regarding SPIRIT skill development (student understanding and/or behaviour)?

As a result of this activity, students will be able to:

- Connectedness: describe how teamwork helped the group succeed and name one supportive behaviour they used (listening, taking turns, encouraging).
- Problem-solving: use a simple strategy (plan → try → adjust) during a team challenge and explain what they changed and why.
- Critical thinking: notice a pattern or “rule” in a game and use it to make a better decision in the next round.
- Valuing people: demonstrate fair participation by sharing roles and speaking respectfully during team decisions.
- Sense of wonder: express curiosity about how these teamwork habits will help them succeed in the bubble mission for the community.

Academic/Curriculum Objective connection

Foundations for scientific method habits: observation, planning, teamwork, recording patterns.

Materials and tools needed for implementation

Elastic-band cup pyramid set, cups, nim counters, simple observation sheets.

Preparation notes

Prepare team sets; model rules quickly; keep rounds short; assign rotating roles.

Guided Questions

- “What did your team try first - and what did you change?”
- “What helped everyone stay included?”
- “What patterns did you notice that helped you win?”

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Stage Debriefing Questions (Optional)

- “What made teamwork easier?” “What made it harder?”

Tips and Tricks for dealing with stage challenges

- **Challenge:** One student dominates.
  Tip: role cards + timer turns.
- **Challenge:** Some students stay quiet.
  Tip: sentence starters (“I noticed…”, “I suggest…”) + assign a “voice-caller” role.

STAGE 2 – Measure and Calculate Lengths (Scale Plan)

How does this develop particular SPIRIT skills

- Strengthens sense of wonder by turning curiosity (“Why do bubbles pop?”) into testable questions
- Builds critical thinking by comparing sources/recipes and deciding what seems most reliable or logical
- Develops problem-solving as teams choose a fair test plan and select variables that can actually be tested
- Builds connectedness through shared discussion, negotiation, and joint decision-making
- Supports valuing people & nature by considering safety, cleanliness, and responsible ingredient use.)

What do we want to achieve regarding SPIRIT skill development (student understanding and/or behaviour)?

As a result of this activity, students will be able to:

- Sense of wonder: generate at least one “I wonder…” bubble question and turn it into a testable question.
- Critical thinking: compare two recipe ideas and explain which seems more promising and why (based on reasons, not guessing).
- Problem-solving: choose one variable to change and one thing to keep the same for a fair test.
- Connectedness: reach a group agreement by listening, voting, or combining ideas respectfully.
- Valuing people and nature: identify at least one safety/sustainability rule for ingredients and cleanup.

Academic/Curriculum Objective connection

Scientific method: question, hypothesis, variable identification; research literacy.

Materials and tools needed for implementation

Devices/printouts, scientific method poster, hypothesis worksheets, “variables board.”

Preparation notes

Curate kid-friendly sources; provide a comparison template; set a time limit for research.

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Guided Questions

- "What do you think makes bubbles stronger?"
- "Which ingredient or wand feature will you test first - and why?"
- "How will you make sure your test is fair?"

Stage Debriefing Questions (Optional)

- Which hypothesis are you most excited to test?"

Tips and Tricks for dealing with stage challenges

- **Challenge:** Too many ideas at once.
  Tip: limit to 1–2 variables per team.
- **Challenge:** Copying random online recipes.
  Tip: require a "because..." reason for each choice.

STAGE 3 – Prototype Solutions and Wands

How does this develop particular SPIRIT skills

- Develops problem-solving through careful measuring, mixing, labelling, and building workable tools
- Strengthens critical thinking as students connect hypotheses to specific design/ingredient choices
- Reinforces valuing people & nature through safe handling, minimizing waste, and choosing materials responsibly
- Builds connectedness through shared roles and coordinated teamwork.

What do we want to achieve regarding SPIRIT skill development (student understanding and/or behaviour)?

As a result of this activity, students will be able to:

- Problem-solving: follow a step-by-step mixing plan and correct mistakes (wrong amount, missing label) using checks.
- Critical thinking: explain how their recipe/wand choice matches their hypothesis ("We chose X because we think it will...").
- Valuing people and nature: demonstrate safe, careful use of materials and follow cleanup rules to protect people and the environment.
- Connectedness: collaborate in roles so the team completes a prototype with shared contribution.

Academic/Curriculum Objective connection

Experiment setup: controlled mixtures, tool design, preparation for fair testing.

Materials and tools needed for implementation

Ingredients, measuring tools, containers, wand supplies, labels, aprons/goggles.

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Preparation notes

Safety briefing; label stations; provide a "standard solution" backup.

Guided Questions

- "How will you measure accurately?"
- "How will you label your recipe so it's repeatable?"
- "What part of the wand might affect bubble size?"

Stage Debriefing Questions (Optional)

- "What surprised you while making your prototype?

Tips and Tricks for dealing with stage challenges

- **Challenge:** Messy stations and wasted materials.
  Tip: a "materials monitor" role + measured ingredient trays.
- **Challenge:** Wands don't hold film.
  Tip: add string loop / adjust shape / slow dip technique.

STAGE 4 – Testing and Data Collection (1–2 sessions)

How does this develop particular SPIRIT skills

- Strengthens critical thinking by collecting evidence, spotting patterns, and comparing results fairly
- Develops problem-solving through controlled changes and improvements based on data
- Builds resilience by normalizing failed trials and encouraging calm iteration
- Reinforces connectedness through shared roles, shared sense-making, and respectful disagreement
- Keeps sense of wonder alive through direct observation of surprising results and "What if?" questions.

What do we want to achieve regarding SPIRIT skill development (student understanding and/or behaviour)?

As a result of this activity, students will be able to:

- Critical thinking: record consistent data across repeated trials and identify at least one pattern from results.
- Problem-solving: change one variable at a time and use results to decide the next test.
- Resilience: respond to failed bubbles by trying again with a new strategy (technique, wand adjustment, or recipe tweak).
- Connectedness: rotate roles and collaborate to keep testing fair and organized.
- Sense of wonder: ask at least one new question based on what they observe during testing.

Academic/Curriculum Objective connection

Analysis phase: evidence-based reasoning, fair testing, repeated trials.

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Materials and tools needed for implementation

Data charts, timers, size reference circles, wind/shade log, clipboards.

Preparation notes

Mark test zones; demonstrate "one variable rule"; model one clean data entry.

Guided Questions

- "What variable are you changing today?"
- "What stayed the same to keep the test fair?"
- "What does your data suggest you should try next?"

Stage Debriefing Questions (Optional)

- "Did your evidence match your hypothesis? What might explain it?"

Tips and Tricks for dealing with stage challenges

- **Challenge:** Students change multiple variables.
  Tip: a "fair test checker" role + checklist before each trial.
- **Challenge:** Data gets inconsistent.
  Tip: standardize: same blower, same dip time, same count method.

STAGE 5 – Selection and Project Planning

How does this develop particular SPIRIT skills

- Builds critical thinking by choosing final designs based on evidence (not favourites)
- Develops problem-solving through logistical planning, prioritizing resources, and anticipating problems
- Strengthens connectedness by coordinating roles and aligning the team around a shared community goal
- Reinforces valuing people and nature by planning for visitor needs, safety, inclusion, and cleanup.

What do we want to achieve regarding SPIRIT skill development (student understanding and/or behaviour)?

As a result of this activity, students will be able to:

- Critical thinking: justify their final choice using evidence from data ("We chose this because…").
- Problem-solving: create a realistic event plan with roles, materials list, and simple timeline.
- Connectedness: assign roles fairly and describe how teamwork will help the event run smoothly.
- Valuing people and nature: include at least two safety/sustainability actions in the plan (e.g., safe zones, cleanup, minimal waste).

Academic/Curriculum Objective connection

Conclusion + application: using evidence to decide and planning for real-world implementation.

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Materials and tools needed for implementation

Planning templates, poster paper, markers, role cards, checklist.

Preparation notes

Provide example booth layout; prompt "audience empathy" (younger kids, adults, accessibility).

Guided Questions

- "What does your evidence say is best?"
- "Who is your audience and what do they need?"
- "What could go wrong - and what's your backup plan?"

Stage Debriefing Questions (Optional)

- "Does everyone understand their role and why it matters?"

Tips and Tricks for dealing with stage challenges

- **Challenge:** Arguments over "best."
  Tip: use a data rule: choose based on agreed criteria (size + longevity + ease + safety).
- **Challenge:** Over-ambitious plans.
  Tip: "Must-have / nice-to-have" planning.

STAGE 6 – Rehearsal and Preparation

How does this develop particular SPIRIT skills

- Builds resilience by using rehearsal feedback to improve rather than feeling discouraged
- Strengthens connectedness through coordinated practice and support for anxious teammates
- Develops problem-solving by finding fixes for setup issues, timing, and visitor flow
- Reinforces valuing people through practicing welcoming language and inclusive facilitation

What do we want to achieve regarding SPIRIT skill development (student understanding and/or behaviour)?

As a result of this activity, students will be able to:

- Resilience: accept feedback and make at least one improvement to their setup or plan.
- Connectedness: support teammates through role practice and shared responsibility during the dry run.
- Problem-solving: identify one likely event problem (spills, crowding, wand breaks) and practice a solution.
- Valuing people: rehearse respectful welcoming and clear instructions so visitors feel safe and included.

Academic/Curriculum Objective connection

Preparation + reflection: applying learning, improving communication and procedures.

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Materials and tools needed for implementation

Final recipe cards, station signs, visitor script cards, feedback slips, “fix kit.”

Preparation notes

Simulate challenges intentionally (wind, too many visitors, spilled tray) to practice responses.

Guided Questions

- “What will you say to visitors first?”
- “How will you keep the area safe?”
- “What will you do if something breaks or spills?”

Stage Debriefing Questions (Optional)

- “What did you change after rehearsal - and why?”

Tips and Tricks for dealing with stage challenges

- **Challenge:** Students feel shy.
  Tip: pair ambassadors; allow a “co-speaker” role; use sentence starters.
- **Challenge:** Setup takes too long.
  Tip: timed practice + simplified layout.

STAGE 7 – Community Bubble Event

How does this develop particular SPIRIT skills

- Strengthens connectedness by creating shared joy and positive relationships across the school
- Reinforces valuing people and nature through safe hosting, fairness, care for space, and respectful interaction
- Develops problem-solving through real-time adaptation (wind, crowds, spills, tired arms)
- Builds critical thinking by reading audience needs and adjusting instructions and flow appropriately.

What do we want to achieve regarding SPIRIT skill development (student understanding and/or behaviour)?

As a result of this activity, students will be able to:

- Connectedness: welcome visitors and create a cooperative, joyful experience that feels shared and inclusive.
- Valuing people & nature: demonstrate safety, fairness, and responsibility for the environment during the event.
- Problem-solving: handle at least one unexpected issue calmly using a planned strategy.
- Critical thinking: adjust the booth experience based on visitor feedback or observations (pace, explanation, setup).

Academic/Curriculum Objective connection

Real-world application: science + civic engagement + responsible practice.

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Materials and tools needed for implementation

Event-ready solutions, wands, signage, feedback tools, cleanup supplies.

Preparation notes

Coordinate schedule; have a weather plan; assign "floaters" to help any booth.

Guided Questions

- "How will you welcome and guide visitors?"
- "How will you keep the space safe?"
- "What feedback are you hearing?"

Stage Debriefing Questions (Optional)

- "What went well - and what did you solve in the moment?"

Tips and Tricks for dealing with stage challenges

- **Challenge:** Crowd control.
  Tip: simple queue system + roles (welcomer, helper, safety monitor).
- **Challenge:** Wind ruins bubbles.
  Tip: move to sheltered spot + adjust technique/wand.

STAGE 8 – Reflection and Celebration

How does this develop particular SPIRIT skills

- Strengthens critical thinking by reflecting on evidence, feedback, and what caused success
- Builds resilience by framing mistakes and changes as growth and learning
- Deepens connectedness by telling the shared story and appreciating contributions
- Reinforces valuing people & nature by reflecting on responsibility and impact
- Revives sense of wonder by recognizing how science + teamwork created something meaningful.

What do we want to achieve regarding SPIRIT skill development (student understanding and/or behaviour)?

As a result of this activity, students will be able to:

- Critical thinking: explain what worked best and why, using both data and event feedback.
- Resilience: identify one challenge they faced and describe how they improved or adapted over time.
- Connectedness: recognize and appreciate at least one contribution from a teammate or another group.
- Valuing people and nature: describe how they kept others safe and cared for the environment during the project.
- Sense of wonder: share one new science question they want to explore next about bubbles, mixtures, or materials.

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Academic/Curriculum Objective connection

Completes the scientific cycle: conclusions, reflection, and “further investigation.”

Materials and tools needed for implementation

Feedback summaries, reflection prompts, celebration tokens/badges, class “lessons learned” poster.

Preparation notes

Compile visitor feedback; prepare sentence stems; celebrate both results and skills growth.

Guided Questions

- “What surprised you most?”
- “What did your evidence and feedback teach you?”
- “How did your team support others - and the school community?”

Stage Debriefing Questions (Optional)

- “What would you change next time, and what would you keep?”

Tips and Tricks for dealing with stage challenges

- **Challenge:** Only a few students share.
  Tip: think–pair–share first; allow written reflections.
- **Challenge:** Reflections stay “surface level.”
  Tip: require one skill word in every answer (connectedness, valuing, critical thinking, problem-solving, wonder).

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6.3 Lemonade Stories: From Family Tradition to School Community

This transdisciplinary project for 4th graders turns a simple drink into a meaningful exploration of family traditional knowledge of food science and sustainability. The journey begins with students connecting lemonade to personal memories, using "taste-linked" emotions to build a shared collection of cultural stories. Children then step into researchers' shoes, interviewing families for recipes and conducting mindful taste tests to compare homemade versions with store-bought options. The core of the program features a "Recipe Experiment Lab," where teams apply the scientific inquiry cycle to test ratios of acid, water, and sweetness.

Beyond the science, students practice "Story telling" and "Science Communication" drafting respectful messages for their community that explain both the chemistry and the history of their blend. The project culminates in a student-run, eco-friendly lemonade stand that prioritizes waste reduction through composting peels and using reusable cups. By serving their own creations to the school, students practice high-level social-emotional skills like welcoming diverse preferences and working as a coordinated team. It is a multi-week adventure that proves how a small choice - like an ingredient or a cup - can impact both people and the planet.

Basic Information Sheet

Age group	Student number	Duration	Number of stages	Subjects connection and relevance
3rd and 4th grade students (joint effort)	12-24 students	Multiple sessions over 2–4 weeks (depth adjustable)	6 stages (session blocks)	Transdisciplinary with a focus on Science + Literacy + SEL (and light numeracy through measuring/pricing)

STEAM Event Summary

SPIRIT Skill Focus

- Valuing people and nature
- Connectedness
- Empathy
- Emotional awareness regulation and communication

Complementary/Secondary SPIRIT Skill(s)

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- Problem-solving

National curriculum Link and Objectives

- Apply a simple inquiry cycle in food science (observe, ask, test, record, compare, improve).
- Use measurement tools to follow and adjust a recipe (ratios in practical form).
- Develop narrative literacy: sharing and writing personal/cultural stories with a clear audience and respectful tone.
- Compare ingredients and packaging choices through a health and sustainability lens (age-appropriate).
- Collaborate in teams with roles and shared responsibility to deliver a real school-community outcome.

Real-world STEAM Connection and Problem definition

Connection (student perspective):

Lemonade is something families make in different ways. It tastes different depending on ingredients and choices. When we make it for other people, we have to think about what they like, what is healthy, and how to avoid waste.

Problem definition (student perspective, age-specific):

"How can we create a lemonade that tells our family stories, tastes good to many people, uses ingredients thoughtfully, and brings our school together - without making unnecessary waste?"

Materials at a Glance

- Fresh lemons (ideally from school trees if available), water
- Sugar and/or honey (optional), optional flavourings (mint, berries)
- Juicers (manual/electric), pitchers, stirring spoons
- Measuring cups/spoons, recipe recording sheets
- Tasting cups/spoons, water for rinsing, napkins
- (Optional) pH strips for simple acidity comparison
- Chart paper, markers, clipboards
- Story prompts, drafting paper, sentence stems, word banks

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- Allergy/sensitivity checklist
- Stand materials: flyers, menus, signage, role badges
- Sustainability supplies: reusable cups, if possible, compost bin for peels, recycling bin, cleanup kit

Indoor/Outdoor and Classroom layout

- Storytelling corner (circle seating + drafting materials)
- Research station (tablets/books + recipe worksheets)
- Taste-test station (small sample cups + observation charts; supervised)
- Recipe lab station (juicers, measuring tools, mixing area; hygiene setup)
- Event planning/design station (posters, pricing sheets, role charts)
- Final stand location (outdoor shaded area or cafeteria) with a clear flow line and cleanup area

Notes on Research-based approach and integration

Students begin with lived experience and meaning - family traditions and memories - then move into structured exploration. They collect recipes through home interviews, compare options through guided tasting, and test ingredient ratios through hands-on mixing. This mirrors a child-friendly inquiry cycle: notice → compare → try → improve.

The project integrates science (ingredients and change), literacy (storytelling and persuasive communication), and sustainability (packaging choices, waste reduction) into one coherent purpose: serving the school community. Throughout, students practice communicating feelings and preferences respectfully, listening to others' perspectives, and making decisions together. The real audience (the school) keeps motivation high and makes learning feel relevant and shared.

Lesson Flow Overview (linked to details below)

Stage	Title	Brief Description	SPIRIT Skills	Duration	Link to Details
1st	**Stories and Taste Memories**	Students connect lemonade to memories and emotions through teacher modelling and student sharing, then begin a class "Lemonade Stories" collection	• Emotional awareness/communication • Empathy • Connectedness	45-60 minutes.	**STAGE 1 – Stories and Taste Memories**

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2nd	**Family Recipe Research and Respectful Comparing**	Students share family recipes and compare homemade vs store-bought through a guided tasting and observation chart, focusing on respectful language and mindful choices.	• Empathy • Valuing people and nature • Emotional awareness/communication	45-60 minutes	**STAGE 2 – Family Recipe Research and Respectful Comparing**
3rd	**Recipe Experiment Lab**	Teams test lemon/sweetener/water ratios and record results, then solve problems by improving their recipe for taste, balance, and inclusivity	• Problem-solving • Connectedness • Valuing people and nature	1–2 sessions × 40–60 minutes	**STAGE 3 – Recipe Experiment Lab**
4th	**Story + Science Communication**	Teams finalize a short “recipe story card” explaining their lemonade and what it represents, using clear and kind communication.	• Emotional awareness/communication • Empathy	40-60 minutes	**STAGE 4 – Story + Science Communication**
5th	**Event Planning and Sustainability Design Observations**	Students plan roles, signage, pricing (optional), and eco-friendly serving routines to run a school lemonade event.	• Connectedness • Valuing people and nature • Problem-solving	40-60 minutes	**STAGE 5 – Event Planning and Sustainability Design Observations**
6th	**Lemonade Stand + Reflection**	Students run the stand, welcome visitors, share stories/science, gather feedback, and reflect on what they learned about people, nature, and teamwork.	• Connectedness • Empathy • Valuing people and nature • Emotional awareness and communication	Event day + 40–60 min reflection	**STAGE 6 – Lemonade Stand + Reflection**

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Tips and Tricks for dealing with challenges (for the whole STEAM program)

- Taste disagreements: Normalize differences (“Different tongues, different preferences”) and use respectful sentence stems.
- Too many ideas: Limit teams to 1–2 variables per test round (e.g., sweetener amount + one add-in).
- Allergies/dietary needs: Use a checklist early; keep flavourings optional and clearly labelled.
- Time drift over weeks: Use a visible timeline board: “This week we research; next we test; then we plan; then we host.”
- Hygiene + safety: Clear routines: wash hands, use clean cups, no sharing cups, teacher manages knives if any are used

Difficulty level tailoring notes

- **Beginner learners:** Focus on storytelling + simple tasting language + one class recipe (teacher-led mixing)
- **Intermediate:** Teams run 2–3 test batches using measuring tools and record simple results.
- **Advanced learners:** Add pricing/costing, packaging comparison, visitor feedback forms, and a “sustainability pledge” component.

STEAM Program Debriefing and Reflection Questions

- What did you learn about how ingredients change taste?
- What did you learn about speaking respectfully when people disagree?
- How did your team make decisions together?
- What choices helped us reduce waste?
- What would you improve next time - for taste, teamwork, or sustainability?

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6.3.2. Stage details and Activities Flow

STAGE 1 – Stories and Taste Memories

How does this develop particular SPIRIT skills

- Builds emotional awareness and communication by linking taste to feelings and learning to describe emotions with appropriate words
- Strengthens empathy by listening to classmates' memories and respecting differences in experiences
- Supports connectedness by creating a shared class story-bank that values everyone's voice

What do we want to achieve regarding SPIRIT skill development (student understanding and/or behaviour)?

As a result of this activity, students will be able to:

- Use at least two feeling words to describe a taste-linked memory (e.g., proud, comforted, excited).
- Listen without interrupting and respond with a respectful comment or question.
- Share one tradition or family connection and notice similarities/differences across the group.

Academic/Curriculum Objective connection

Narrative literacy + oral communication; using descriptive vocabulary and respectful listening.

Materials and tools needed for implementation

Teacher story/read-aloud, story prompts, emotion word bank, drawing/writing sheets.

Preparation notes

Prepare sentence stems: "I remember when...", "It made me feel...", "I noticed..."

Guided Questions

- "What does lemonade remind you of?"
- "How did that moment feel inside?"
- "What did you learn about your classmates from their stories?"

Stage Debriefing Questions (Optional)

- "How can words help someone feel included when they share a memory?"

Tips and Tricks for dealing with stage challenges

- **Challenge:** Some students struggle to share personal stories.
  Tip: Offer choice: draw it, write one sentence, or share with a partner only.
- **Challenge:** Students react negatively to others' traditions.
  Tip: Use a class norm: "Different is interesting," and provide respectful response frames.

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STAGE 2 – Family Recipe Research and Respectful Comparing

How does this develop particular SPIRIT skills

- Strengthens empathy by honouring different family/cultural recipes and taste preferences without judgment
- Develops valuing people and nature by noticing ingredient lists and discussing packaging waste in a concrete way
- Builds emotional awareness and communication by practicing respectful taste-language ("I prefer…", "I notice…") instead of rude reactions.

What do we want to achieve regarding SPIRIT skill development (student understanding and/or behaviour)?

As a result of this activity, students will be able to:

- Record at least three observations comparing homemade and store-bought (taste, sweetness, ingredients, packaging).
- Use respectful language to express preferences and respond to others' preferences calmly.
- Identify one sustainability choice (e.g., fewer bottles, compost peels, reusable cups).

Academic/Curriculum Objective connection

Observation + simple data recording; early health and sustainability reasoning.

Materials and tools needed for implementation

Homemade + store-bought samples (pre-checked), tasting cups, observation charts, allergy list.

Preparation notes

No blindfolding required - safe tasting routines matter more than "game effects." Provide rinse water.

Guided Questions

- "What do you notice about the ingredients?"
- "How can we talk kindly if we don't like something?"
- "What happens to the bottle or carton after we drink it?"

Stage Debriefing Questions (Optional)

- What did you learn about preferences and respect today?"

Tips and Tricks for dealing with stage challenges

- **Challenge:** Students make dramatic "yuck" reactions.
  Tip: Use a taste-language protocol: "I notice… / I prefer… / I wonder…"
- **Challenge:** Data recording becomes messy.
  Tip: Keep the chart simple: 3 columns (taste / ingredients / packaging).

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STAGE 3 – Recipe Experiment Lab

How does this develop particular SPIRIT skills

- Builds problem-solving by testing ratios, noticing results, and making a clear plan for what to change next
- Strengthens connectedness through shared roles and collaborative decision-making under real constraints
- Develops valuing people and nature by making mindful ingredient choices (balance, not excess) and reducing waste during testing.

What do we want to achieve regarding SPIRIT skill development (student understanding and/or behaviour)?

As a result of this activity, students will be able to:

- Measure ingredients accurately for at least two test batches and record what they did.
- Identify one "recipe problem" (too sour/sweet/weak) and propose a reasonable change.
- Work as a team using roles (measurer, mixer, recorder, taster/communicator) and resolve disagreements respectfully.

Academic/Curriculum Objective connection

Practical measurement + inquiry cycle; cause-effect in ingredients and taste outcomes.

Materials and tools needed for implementation

Lemons, water, sweeteners, pitchers, measuring tools, data logs (optional pH strips).

Preparation notes

Limit trials: 2–3 maximum per session. Use a "one change at a time" rule to keep results understandable.

Guided Questions

- "What is the problem with this batch?"
- "What is one change we can try next?"
- "How do we decide fairly when people disagree?"

Stage Debriefing Questions (Optional)

- "Which change helped most, and how do you know?"

Tips and Tricks for dealing with stage challenges

- **Challenge:** Teams keep changing too many things.
  Tip: Use a team "change ticket": only one variable per trial.
- **Challenge:** Strong personalities dominate decisions.
  Tip: Use a quick vote + require one reason per person before deciding.

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STAGE 4 – Story + Science Communication

How does this develop particular SPIRIT skills

- Develops emotional awareness and communication by shaping a message with tone, clarity, and intention
- Strengthens empathy by writing for a real audience (customers) and considering what will make them feel welcomed and respected

What do we want to achieve regarding SPIRIT skill development (student understanding and/or behaviour)?

As a result of this activity, students will be able to:

- Write a short “recipe story” that includes: a gratitude/tradition link, one feeling word, and one clear message to the reader.
- Create one simple science explanation line (e.g., “Lemon makes it sour because it is acidic.”).
- Practice saying their story aloud in a respectful, friendly voice.

Academic/Curriculum Objective connection

Narrative writing, audience awareness, oral presentation practice.

Materials and tools needed for implementation

Story templates, word banks, sample texts, drafting paper, poster cards for the stand.

Preparation notes

Model a short example: “This recipe reminds me of…, it makes me feel…, we chose… because…”

Guided Questions

- “What do you want people to feel when they read this?”
- “What story are you proud to share?”
- “How can we explain our lemonade simply and kindly?”

Stage Debriefing Questions (Optional)

- “Which words made your message feel most genuine?”

Tips and Tricks for dealing with stage challenges

- **Challenge:** Students write too long or too vague.
  Tip: Use a 3-sentence structure: Story → Feeling → Choice.
- **Challenge:** Some students feel shy presenting.
  Tip: Pair presenters; allow shared reading.”

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STAGE 5 – Event Planning and Sustainability Design

How does this develop particular SPIRIT skills

- Strengthens connectedness through planning roles, timelines, and shared responsibility for a real community moment
- Develops valuing people and nature through concrete sustainability decisions (cups, waste, peels, cleanup)
- Builds problem-solving by anticipating challenges (crowds, refills, spills) and creating simple solutions

What do we want to achieve regarding SPIRIT skill development (student understanding and/or behaviour)?

As a result of this activity, students will be able to:

- Choose and describe one role and how it helps the team succeed (server, greeter, cleanup lead, story speaker, feedback collector).
- Identify at least two sustainability practices the stand will follow.
- Make a simple plan for one likely problem ("If we run out of ice…", "If there's a spill…")

Academic/Curriculum Objective connection

Planning, persuasive writing (flyers/menus), practical numeracy (optional pricing).

Materials and tools needed for implementation

Flyer/menu templates, role chart, sustainability checklist, signage supplies.

Preparation notes

Keep it realistic: fewer menu options, clear station flow, visible cleanup plan.

Guided Questions

- "How will we welcome everyone?"
- "How will we reduce waste today?"
- "What could go wrong - and what's our plan?"

Stage Debriefing Questions (Optional)

- "Does everyone feel clear and included in the plan?"

Tips and Tricks for dealing with stage challenges

- **Challenge:** Planning becomes chaotic.
  Tip: Use a simple stand map and a role rotation schedule.
- **Challenge:** Sustainability ideas stay abstract.
  Tip: Make it visible: bins labelled + peel bucket + reusable cup reminder sign.

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STAGE 6 – Lemonade Stand + Reflection

How does this develop particular SPIRIT skills

- Builds connectedness by engaging with the wider school community and working as a coordinated team
- Strengthens empathy through welcoming language, active listening, and respectful customer interaction
- Develops valuing people and nature by practicing sustainable serving habits and sharing why they matter
- Deepens emotional awareness and communication through reflection on pride, nervousness, teamwork feelings, and impact

What do we want to achieve regarding SPIRIT skill development (student understanding and/or behaviour)?

As a result of this activity, students will be able to:

- Welcome visitors using a respectful greeting and explain one part of their story or science.
- Demonstrate one sustainability action during service (sorting waste, composting peels, encouraging reusables).
- Reflect using feeling vocabulary on how it felt to serve the community and work as a team.

Academic/Curriculum Objective connection

Real-world application + consolidation; oral communication and civic engagement.

Materials and tools needed for implementation

Stand setup, feedback slips (simple), reflection sheets, cleanup kit.

Preparation notes

Keep feedback simple: smiley faces or “Loved it / It was okay / Not for me” with one optional comment.

Guided Questions

- “What did you notice about how people reacted?”
- “How did you handle differences in taste preferences?”
- “What did we do today that helped people and helped Earth?”

Stage Debriefing Questions (Optional)

- “What is one thing you feel proud of - and why?”

Tips and Tricks for dealing with stage challenges

- **Challenge:** Students get overwhelmed by crowds.
  Tip: Use short shifts and a quiet break spot; rotate roles.
- **Challenge:** Cleanup gets rushed.
  Tip: Assign a final “Earth check” role - no one leaves until bins are correct.

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6.4 Team Mission: Planet Rescue

This 6-hour outdoor adventure turns 4rd graders into "rescue astronauts" tasked with saving a damaged planet by solving real-world environmental crises. The journey follows 6 stages, where teams must build functional water filters, cross "lava fields" with sturdy bridges, and engineer wind-resistant shelters. Using a mix of natural and recycled materials, students apply scientific and design thinking cycles to protect their mission from simulated "alien winds" and pollution. A unique focus on "SPIRIT skills" integrates emotional feedbacks after every challenge, helping students name their feelings by using weather icons like "sunny" or "stormy." The mission concludes with a Reflective walk with emotional prompts, where teams celebrate both their engineering triumphs and their growth in empathy and resilience.

Basic Information Sheet

Age group	Student number	Duration	Number of stages	Subjects connection and relevance
4th, 5th grades students	Whole class (Teams of 5–6 students)	6h	6 stages	Science art

STEAM Event Summary

SPIRIT Skill Focus

- Valuing people and nature
- Resilience
- Problem-solving
- Emotional awareness, regulation and communication
- Empathy
- Creativity

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National curriculum Link and Objectives

- Apply scientific thinking to real-world challenges (environmental science, engineering).
- Use creativity and design to build and test prototypes.
- Develop collaboration and problem-solving skills under constraints.

Real-world STEAM Connection and Problem definition

Children take on the urgent role of young astronauts sent to rescue a damaged planet - echoing real environmental crises like pollution, natural disasters, and climate change. The activity mirrors real-life needs for clean water, stable infrastructure, and protection from extreme weather. These are challenges children have likely seen in news stories, local discussions, or experienced during family hikes or city flooding. They must work together to solve practical survival problems, making the learning deeply relevant and memorable.

Materials at a Glance

- Natural/recycled materials (leaves, cardboard, string, plastic bottles, sticks)
- Water, sand, cloth, small containers
- Fans or cardboard for wind simulation
- Mission folders with role instructions
- Emotion/weather cards, clipboards (optional), timers

Indoor/Outdoor and Classroom layout

Setting: Outdoor space, preferably in a natural environment such as a park, schoolyard with trees, or open field.
Layout Description:

- Mission Base: Central area with all materials prepared (natural and recycled items).
- Challenge Zones: Three clearly marked areas (e.g., cones, signs, chalk) for each mission (Water Filter, Lava Bridge, Alien Wind Shelter).

Reflection Trail: A short walking path or space with cards/posts for guided reflection.

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Notes on Research-based approach and integration

The activity is grounded in inquiry-based and experiential learning. Children formulate questions (“How can we clean dirty water?” “What materials will hold up to wind?”), test hypotheses through construction, and revise their solutions based on trial outcomes. They also draw from their own observations - perhaps remembering a family camping trip, storm, or a news clip - bringing life relevance to each problem. The emotional check-ins add a socio-emotional lens, fostering metacognition and reflective learning.

Lesson Flow Overview (linked to details below)

Stage	Title	Brief Description	SPIRIT Skills	Duration	Link to Details
1st	**Cooperative Team Role Assignment + Story-Based Introduction**	Students are introduced to a fictional scenario: they are astronauts landing on a damaged planet and must complete three survival missions. The story creates a sense of urgency and engagement. This stage builds curiosity and sets expectations. Students work in teams of 4–5, read their mission briefing, and assign roles such as: • Mission Leader • Materials Manager • Emotional Reporter • Timekeeper	• Emotional awareness, regulation and communication • Empathy • Valuing people and nature	30 minutes	**STAGE 1 – Cooperative Team Role Assignment + Story-Based Introduction**
2nd	**Clean Water Challenge + Team Emotional Check-in**	After landing on the planet, teams must ensure access to clean water. Their task is to build a simple filter using natural/recycled materials. Afterwards, they check in emotionally as a team.	• Emotional awareness, regulation and communication • Empathy • Resilience • Problem-solving	90 minutes (70 min + 20min)	**STAGE 2 – Clean Water Challenge + Team Emotional Check-in**

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3rd	**Lava Bridge Challenge + Team Emotional Check-in**	Teams must build a bridge over a “lava field” (area marked on ground) using limited materials. Then, they pause for emotional reflection and share how the challenge made them feel and how they supported each other.	• Emotional awareness, regulation and communication • Empathy • Resilience • Problem-solving	90 minutes (70 min. challenge + 20 min. reflection)	[**STAGE 3 – Lava Bridge Challenge + Team Emotional Check-in**]
4th	**Building a Wind-Resistant Shelter**	Teams are challenged to build a shelter using natural or recycled materials that can protect from strong “alien winds” (simulated by a fan or cardboard flapping). The structure must stay upright and shelter a small object (e.g., a cup or a plastic figure).	• Emotional awareness, regulation and communication • Empathy • Resilience • Problem-solving	60 minutes	[**STAGE 4 – Building a Wind-Resistant Shelter**]
5th	**Reflective walk with emotional prompts**	Students go on a short walk (in a hallway, schoolyard, or designated space) with their group and emotional reporter. Along the path, they encounter reflection prompts that guide them to discuss both the technical and emotional aspects of their missions.	• Emotional awareness, regulation and communication • Empathy	30 minutes	[**STAGE 5 – Reflective walk with emotional prompts**]
6th	**Whole-class reflection and sharing circle**	After completing all missions and the reflection walk, the whole group gathers in a circle. Each team is invited to share one technical learning (from the challenges) and one emotional insight (from teamwork or check-ins). The teacher gently facilitates the conversation, celebrating both engineering effort and emotional growth.	• Emotional awareness, regulation and communication • Empathy • Valuing people and nature	25-30 minutes	[**STAGE 6 – Whole-class reflection and sharing circle**]

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Tips and Tricks for dealing with challenges (for the whole STEAM program)

- Model emotional regulation early - for example, demonstrate how to name a feeling and take a breath before solving a problem.
- Provide supportive scripts for the emotional reporter (e.g., “I noticed we started rushing - can we slow down?”).
- Encourage small wins: praise moments like tying a knot well or showing calm teamwork.
- Have one adult circulate among teams to model resilience and calm problem-solving when frustration arises.

Difficulty level tailoring notes

- **Beginner learners:** For students with lower emotional regulation, keep roles consistent and assign a calm peer as co-leader. Give extra structure to the emotional reporter’s role (e.g., check-in checklist).
- **Advanced learners:** Use checklists with more subtle emotions, both pleasant and unpleasant (envy, guilt, satisfaction, etc.). Remember to always celebrate their efforts!
- **Expert learners:** For more emotionally mature groups, encourage deeper peer feedback after each mission (“What did we do well? What can we improve emotionally?”).

STEAM Program Debriefing and Reflection Questions

- What emotion came up most during the mission?
- How did your team help each other when things got stressful?
- What was your proudest moment - emotionally and technically?
- If you could do one thing differently, what would it be?
- When something didn’t work on the first try (water filter, bridge, shelter), how did you react and what helped you try again?
- Which moment of the mission made you feel discouraged, and how did your team help you regain calm and motivation?
- What strategy did you use to stay focused even when the construction seemed difficult or the time was running out?
- What did you learn about yourself when you had to adapt or change your idea during the mission?
- Which information or observations guided your team in deciding which materials to use to solve each challenge (dirty water, lava, wind)?
- How did you choose between different ideas within your team? What decision-making process did you use?
- What did your first test (of the filter, bridge or shelter) show you, and how did you improve the design after seeing the result?
- In what way did communication among team members improve - or complicate - the search for a solution?

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6.4.2. Stage details and Activities Flow

STAGE 1 – Cooperative Team Role Assignment + Story-Based Introduction

How does this develop particular SPIRIT skills

This stage supports:

- Cooperation and role clarity within a team
- Active listening and shared decision-making
- Emotional awareness through the introduction of the Emotional Reporter role

What do we want to achieve regarding SPIRIT skill development (student understanding and/or behaviour)?

- Foster collaborative mindset.
- Develop imagination and problem-solving in a cooperative setting.
- Begin awareness of roles and emotional dynamics within a group.

Academic/Curriculum Objectives Connection

Science (Earth and Environmental Science)

- Understand the importance of clean water for ecosystems and human survival.
- Explore basic water filtration techniques using natural materials.
- Investigate properties of materials (absorption, filtration, permeability).

Geography

- Recognize the role of water in sustaining life on planets.
- Consider environmental challenges in extreme habitats (e.g., arid or polluted areas, extraterrestrial environments).

Engineering

- Apply problem-solving and design thinking to create a functional filtration system.
- Use iterative testing and improvement to refine solutions.

Materials and tools needed for implementation

- Mission folders (with printed storylines and objectives)
- Role badges or cards (Leader, Materials Manager, Emotional Reporter, Timekeeper)

Preparation notes

- Prepare classroom space with themed posters or props.
- Create and print mission folders and role cards in advance.

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Guided Questions

- What kind of problems do you think we might face on this planet?
- How do you think your role can help your team succeed?
- What does it mean to be a good teammate?

Stage Debriefing Questions (Optional)

- How did you feel being assigned a role?
- What are you excited or nervous about in this mission?

Tips and Tricks for dealing with stage challenges

- Ensure students understand their roles clearly.
- If some students are disengaged, use dramatic storytelling or space-themed visuals to captivate them.
- Offer flexibility for students to switch roles later if needed.

STAGE 2 – Clean Water Challenge + Team Emotional Check-in

How does this develop particular SPIRIT skills

Enhances emotional awareness by pausing for a shared emotional check-in, using metaphors and symbols to identify group feelings.

What do we want to achieve regarding SPIRIT skill development (student understanding and/or behaviour)?

- Students apply hands-on problem-solving to simulate survival thinking.
- They identify and name their emotional state using symbolic tools.
- They listen actively to teammates and begin building emotional language together.
- They experience the link between teamwork, stress, and emotional regulation.

Academic/Curriculum Objective connection

Science (Earth and Environmental Science):

- Understand basic filtration and the role of clean water in ecosystems and survival.

Geography:

- Explore resource challenges in different environments.

Engineering:

- Practice design thinking and material testing.

Materials and tools needed for implementation

- Dirty water (pre-prepared by teacher)
- Natural materials: sand, gravel, fabric, cotton, coffee filters, plastic bottles, cups
- Clear containers
- Emotional check-in cards (emoji, weather icons).

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Preparation notes

- Prepare dirty water safely (e.g., add soil, food colouring).
- Print visual cards for emotion check-in.
- Ensure equal access to materials for all groups.

Guided Questions

- What strategy did your team use to filter the water?
- What materials worked best? Why?
- How did your team communicate during the challenge?
- What feeling best describes your team right now?
- What made you feel included or excluded during the challenge?

Stage Debriefing Questions (Optional)

- What would you improve if you had to filter water again?
- Did anyone's emotion change during the activity? Why?

Tips and Tricks for dealing with stage challenges

- If emotions are hard to identify, offer simple prompts: “Are we sunny or cloudy today?”
- If groups struggle with the filter design, encourage peer advice across teams.
- Keep the check-in short but sincere; use it to build team trust, not perfection.

STAGE 3 – Lava Bridge Challenge + Team Emotional Check-in

How does this develop particular SPIRIT skills

- Encourages empathy by having team members notice stress or frustration in others and support them.
- Builds resilience and emotional regulation when parts fail or designs don’t work.
- Promotes collaborative problem-solving, where success depends on listening and adapting.

What do we want to achieve regarding SPIRIT skill development (student understanding and/or behaviour)?

- Students learn to handle frustration and regroup collaboratively.
- They build sensitivity toward teammates’ emotional states.
- They practice balancing technical demands with emotional awareness.
- They articulate emotional coping strategies in real time.

Academic/Curriculum Objective connection

- Mathematics / Physics: force, tension, load distribution
- Engineering / STEM: prototype design, material constraints
- Science / Earth: thinking about structural solutions in nature or other worlds.

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Materials and tools needed for implementation

- Sticks, cardboard, tape, string
- Small object (rock, bottle) for testing
- Emotional check-in cards (emoji, weather icons).

Preparation notes

- Define the "lava gap" clearly with tape or markers
- Ensure each group has same material set
- Remind students that partial failures are opportunities to iterate.

Guided Questions

- Which part of your bridge is the strongest? Which is weakest?
- How did your team react when a piece failed?
- What emotion are you feeling right now?
- What could someone in your team say or do to help at this moment?

Stage Debriefing Questions (Optional)

- If you built this again, what changes would you make?
- Did your emotional check-in help your team stay focused or calm?

Tips and Tricks for dealing with stage challenges

- If a team can't complete a full bridge, encourage them to test smaller spans
- Remind them to pause and breathe if frustration levels rise
- Encourage cross-team sharing of small tips when stuck.

STAGE 4 – Building a Wind-Resistant Shelter

How does this develop particular SPIRIT skills

- Promotes problem-solving and resilience in the face of failure.
- Fosters collaboration as students must combine ideas and adapt.
- Encourages emotional regulation when projects don't work initially.
- Creates opportunities for empathy, as students support teammates who may feel discouraged.

What do we want to achieve regarding SPIRIT skill development (student understanding and/or behaviour)?

- Students practice staying calm and thinking constructively when facing obstacles.
- They develop patience and perseverance.
- They learn to encourage and validate each other's contributions.
- They understand the value of testing, feedback, and redesign.

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Academic/Curriculum Objective connection

- Science: properties of materials, weather/wind resistance
- Engineering / Technology: design, build, and test cycles
- Mathematics: structure dimensions, balance, and proportion.

Materials and tools needed for implementation

- Recycled and natural materials: cardboard, sticks, cloth, string, tape
- Small test object (e.g., plastic figure or paper cup)
- Fan or large piece of cardboard (for wind simulation).

Preparation notes

- Set clear size limits for the shelter (e.g., must fit on a desk)
- Prepare testing area and fan in advance
- Remind students that testing is part of the design, not a final judgment.

Guided Questions

- What shape is most stable in the wind?
- What did you learn from your first test?
- How are you deciding who does what in your team?
- How does your team support each other when things go wrong?

Stage Debriefing Questions (Optional)

- What was your team's biggest challenge? How did you overcome it?
- What role did emotions play in your problem-solving?

Tips and Tricks for dealing with stage challenges

- Encourage iteration: redesign is part of the learning
- Remind students that strong wind might knock down any shelter - it's about learning, not perfection
- Offer positive reinforcement for collaboration, not just final structure.

STAGE 5 – Reflective walk with emotional prompts

How does this develop particular SPIRIT skills

- Supports emotional awareness by inviting reflection on feelings and team dynamics
- Strengthens empathy through shared stories and active listening
- Encourages collaboration through group discussion
- Builds resilience by normalizing challenges and celebrating growth.

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What do we want to achieve regarding SPIRIT skill development (student understanding and/or behaviour)?

- Students learn to talk about emotions using constructive language
- They reflect on how teamwork made a difference
- They normalize emotional ups and downs in group tasks
- They practice deep listening and support for peers.

Academic/Curriculum Objective connection

- Physical Education: structured movement and spatial awareness
- Citizenship Education: emotional literacy and group communication.

Materials and tools needed for implementation

- Reflection cards or printed prompts
- Signs, cones, string, or tape to mark the path
- Optional: clipboards and pens for note-taking.

Preparation notes

- Select a safe, quiet route
- Place 4–6 prompt cards at visible intervals
- Prepare one student per group (emotional reporter) to guide the conversation.

Guided Questions

- When did your team feel most connected?
- Which mission was the hardest emotionally?
- How did someone in your group support you today?
- What's one thing you learned about emotions during the missions??

Stage Debriefing Questions (Optional)

- What did you notice during the walk that you hadn't thought about before?
- How can we use these reflections in our everyday school life?

Tips and Tricks for dealing with stage challenges

- Keep the atmosphere calm and respectful
- Encourage each student to speak at least once
- Allow flexibility in how students express themselves (words, drawings, gestures).

STAGE 6 – Whole-class reflection and sharing circle

How does this develop particular SPIRIT skills

- Develops self-awareness through emotional expression
- Builds empathy by listening to peers' experiences
- Encourages communication skills in a respectful group setting
- Fosters a sense of community and shared purpose.

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What do we want to achieve regarding SPIRIT skill development (student understanding and/or behaviour)?

- Students articulate their emotional learning and team challenges
- They validate one another's efforts and feelings
- They practice turn-taking and active listening
- They leave the experience with a sense of shared achievement.

Academic/Curriculum Objective connection

- Citizenship Education: group dialogue, emotional literacy
- Oral Communication (language): structured sharing and vocabulary building.

Materials and tools needed for implementation

- A talking object (optional, to take turns)
- Emotion cards or anchor prompts (if needed)
- A soft bell or chime to close the session.

Preparation notes

- Prepare 1–2 prompts for each group to choose from
- Set up a quiet, inclusive space
- Remind students of respectful discussion norms.

Guided Questions

- What was one thing your group did well?
- What emotion surprised you today?
- What helped you stay focused during the missions?
- What would you do differently next time??

Stage Debriefing Questions (Optional)

- How can we bring what we learned today into other lessons?
- What emotion are you feeling as we end?

Tips and Tricks for dealing with stage challenges

- Use a talking object to help manage turns
- Allow shy students to speak in pairs or write their reflections
- Keep the pace gentle, but don't let one group dominate
- Acknowledge all contributions warmly and briefly.

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6.5 Da Vinci Bridge Explore, Design, and Build: From Models to a Real Self-Supporting Bridge

In this all-day STEAM activity, 4th graders will step into Leonardo da Vinci's shoes and solve a classic engineering challenge: build a bridge without glue, nails or rope. The journey takes students through 6 exciting stages, where they go from studying historical sketches and the physics of friction to building their own functional model. Teams will work through a design thinking engineering cycle - research, conceptual design, modelling, prototyping in pencil and load testing their designs - to see how much weight their structure can support. In this challenge, students work in teams and have specific roles, where the designer leads the design, the builder assembles the structure, the tester measures the load capacity, the documenter documents the data, and the safety manager ensures that all materials are used responsibly. In a unique "knowledge exchange", the original teams are reorganised into new teams, encouraging students to share their experiences of success and failure with their peers, and the new teams use this information to build a second improved version of their prototype. The adventure culminates outdoors, where the students build a large wooden bridge based on the prototype models, with one and/or more teams.

Basic Information Sheet

Age group	Student number	Duration	Number of stages	Subjects connection and relevance
4th grade students	Whole class (approx. 20–28 students), teams of 4–5	6 x 45 minutes	6 stages	Science, Technology, Engineering, Arts, Mathematics

STEAM Event Summary

In this full-day STEAM program, teachers guide Grade 4 students through an authentic engineering challenge inspired by Leonardo da Vinci. Students begin by exploring da Vinci as an inventor and artist, then move into a structured engineering process:
problem definition → planning → prototyping → testing → redesign → real-world outdoor build.
They construct a tabletop bridge model (e.g., pencils/rods), test load capacity, analyse what makes structures stable, and finally build a larger outdoor version using wooden pieces (where conditions allow). The STEAM-day emphasizes engineering design thinking (iterate, test, improve), scientific reasoning (forces, friction, balance, stability), mathematical measurement (length, symmetry, simple load comparisons), creative communication (sketches, posters, presentations), collaboration and resilience (team roles, learning from failure).

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SPIRIT Skill Focus

- Creativity
- Curiosity, sense of wonder and openness
- Valuing people and nature
- Resilience
- Connectedness
- Critical thinking
- Problem-solving

National curriculum Link and Objectives

- Science: Understand basic principles of forces and stability (balance, friction, tension/compression in simple terms). Make predictions and test hypotheses through experimentation
- Technology and Engineering: Use materials intentionally; plan, build, test, improve a functional model. Apply the engineering cycle (define → design → build → test → improve).
- Mathematics: Measure and compare lengths; recognize symmetry and patterns. Estimate and compare loads/weights during testing.
- Arts / Literacy / History integration: Interpret da Vinci sketches; create design drawings. Communicate process through posters, diagrams, and short presentations.

Real-world STEAM Connection and Problem definition

Imagine your team is exploring nature and you reach a stream or gap. There is no bridge, and it is not safe to cross. You cannot use glue, nails, or tape only the materials you can carry. Challenge question: How can we build a bridge that holds itself together using only smart structure and careful design? Leonardo da Vinci designed a bridge based on a clever interlocking pattern. Today, students will act as engineers: they will plan, prototype, test, and improve, then try a larger outdoor build to see how design choices work in real conditions.

Materials at a Glance

Indoor Prototyping Materials (per team)

- 9–12 unsharpened pencils or wooden rods/dowels (same size works best)
- Optional stabilization elements for extensions only (rubber bands, clips) used after the “pure structure” attempt

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- Printed bridge images/sketches (da Vinci draft + real bridge photos)
- Rulers / measuring tape
- Planning sheets (bridge sketch + materials list + predicted load)
- Observation sheet (attempt 1 / attempt 2 comparison)

Testing Materials (indoor)

- Standardized test weights: small books, water bottles, identical blocks/containers
- Timer (optional), simple scorecard for load/time

Outdoor Build Materials (class set)

- Wooden slats/long sticks (pre-checked, no splinters)
- Work gloves (recommended)
- Cones/rope to mark safe boundary
- First-aid kit on site
- Clipboards / camera for documentation

Teacher / Classroom Setup

- Projector/slides for da Vinci intro (optional)
- Stations / trays for materials
- Labels for team roles (Engineer, Builder, Tester, Recorder, Safety Lead).

Indoor/Outdoor and Classroom layout

Phase A – Indoor (Classroom / Makerspace):

- Research and inspiration: Exploring Leonardo da Vinci's ideas, historical bridges, and the core engineering problem through discussion, images, and short videos.
- Concept building and initial design: Identifying key principles of self-supporting structures and planning first solutions in teams
- Tabletop prototyping (Round 1): Building small-scale models using pencils/rods
- Testing, observation and reflection: Evaluating stability, identifying problems, and documenting findings
- Peer regrouping and knowledge exchange: Teams are intentionally reshuffled after the first prototype, so students share insights, explain solutions, and learn from each other (connectedness, peer learning)

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- Tabletop prototyping (Round 2): Applying newly acquired ideas to improved designs
- Documentation and reflection: Recording design decisions, challenges, and learning outcomes

Phase B – Outdoor (Schoolyard / Park area, if available):

- Real-world context (gap/stream simulation)
- Large-scale build using wooden pieces
- Outdoor testing, observation, photo documentation
- Safety-first procedures and clear boundaries
- This layout mirrors the template logic: introduction → making → testing → reflection, expanded into a full-day arc).

Notes on Research-based approach and integration

This STEAM-day is built on inquiry-based learning and engineering design. Students do not receive a single "correct" method immediately; instead they are guided to explore, notice patterns, test ideas, and improve solutions. The teacher acts as a facilitator using structured questions rather than direct fixing. STEAM integration is explicit: science (forces, stability, friction, load testing), technology (using tools safely; documenting results: timer/camera optional), engineering (design cycle; constraints; prototyping; redesign), arts (da Vinci-inspired sketching, visual presentation), mathematics (measuring, comparing, recording, simple data tables; working with scale, ratios, and proportional reasoning when translating tabletop models into a larger real-world structure.

Lesson Flow Overview (linked to details below)

Stage	Title	Brief Description	SPIRIT Skills	Duration	Link to Details
1st	**Spark and Context**	Students are introduced to STEAM-day through playful curiosity-building activities. They explore everyday objects by guessing their possible functions, then discover Leonardo da Vinci as an inventor, engineer, and artist. Through visual examples and storytelling, the bridge challenge is presented as a real-world problem. This stage builds motivation, activates prior knowledge, and frames the day's central engineering task.	• Curiosity, sense of wonder and openness • Creativity	45 minutes	**STAGE 1 – Spark and Context**
2nd	**Science of Stability**	Through short, hands-on mini-investigations and guided observation, students explore key scientific concepts related to structures:	• Critical thinking	45 minutes	**STAGE 2 – Science of**

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		balance, friction, load, and stability. They repeatedly watch and analyse short reference videos of self-supporting bridges, collecting observations and informal data about how elements interact, where forces act, and what contributes to stability. Using simple materials, students test what causes objects to tip, slide, or collapse, and compare their findings with what they observed in the videos. Based on this evidence, they synthesize insights and develop their own design ideas, rather than copying a single solution. This stage develops a shared scientific vocabulary and a research-based conceptual foundation for later bridge design.			Stability
3rd	**Plan Like an Engineer**	Working in teams, students take on defined engineering roles and analyse the design constraints of the bridge challenge (no glue, self-supporting structure, limited materials). They create planning sketches, discuss possible solutions, and predict which designs might work best. Emphasis is placed on teamwork, decision-making, and justifying ideas before building begins.	• Problem-solving	45 minutes	STAGE 3 – Plan Like an Engineer
4th	**Build Prototype**	Teams build their first indoor bridge prototype using simple materials, focusing on structure rather than fixings. Students test ideas in practice, observe where designs fail, and adjust their approach. The teacher supports learning through guiding questions rather than direct solutions. This stage highlights experimentation, creativity, and learning through trial and error.	• Resilience • Creativity	45 minutes	STAGE 4 – Build Prototype v1
5th	**Test, Improve, and Knowledge Exchange**	Students systematically test their bridge prototypes by adding load and observing performance. Based on test results, they redesign and improve their structures, creating a second version. After the first testing round, teams are intentionally reorganized. Students explain their designs, testing outcomes, and improvements to new teammates, allowing ideas and strategies to circulate across the group. This peer exchange strengthens evidence-based reasoning,	• Critical thinking • Flexibility	45 minutes	STAGE 5 – Test, Improve, and Knowledge Exchange

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		communication skills, and flexible problem-solving.			
6th	**Outdoor Build and Showcase**	Students transfer their indoor learning to a real-world context by building a larger bridge outdoors using wooden elements. They adapt designs to new conditions such as uneven ground and scale. The STEAM-day concludes with a reflection gallery, where teams showcase their work, discuss challenges and successes, and reflect on collaboration, engineering thinking, and the connection between design and nature.	• Connectedness • Valuing nature and people	45 minutes	**STAGE 6 – Outdoor Build and Showcase**

Tips and Tricks for dealing with challenges (for the whole STEAM program)

- Focus on process, not perfection: Emphasize planning, testing, and redesign rather than the final product.
- Treat failure as learning: Frame collapses or weak structures as valuable information for improvement.
- Use guiding questions instead of solutions: Support thinking with prompts (e.g., "What could you change first?").
- Manage time visually: Display the STEAM-day stages so students see the learning journey.
- Define and rotate team roles: Clear roles ensure balanced participation and reduce conflict.
- Prepare extra materials: Expect breakage and redesign; spares keep momentum.
- Ensure safety indoors and outdoors: Set clear boundaries, use a stop signal, and supervise tool handling.
- Differentiate through challenge level: Allow teams to focus on stability, load, or redesign based on readiness.
- Value teamwork and creativity: Recognize collaboration, persistence, and innovative thinking.
- Close with reflection: End the day with sharing, a gallery walks, or short group reflections to consolidate learning.

Difficulty level tailoring notes

Throughout the STEAM-day, differentiation is embedded in the learning process so that all students can participate meaningfully, regardless of prior experience or confidence level. Rather than separating learners by ability, the activity offers flexible entry points and varying depths of engagement, allowing students to progress at their own pace within mixed-ability teams. Students may move between levels depending on the task, their role within the group, or their growing confidence.

- **Beginner learners:** Students receive structured support to understand the core idea of stability and self-supporting structures. Visual cues and simplified planning aids guide their thinking. Roles such as observer, recorder, or safety lead allow meaningful participation without the

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pressure of leading construction. The focus is on exploring one clear improvement at a time, supporting success through small, manageable design changes.

- **Advanced learners:** Students take an active role in building and redesigning the bridge. They typically create an initial prototype and a revised version, using observations and simple measurements to explain why certain elements worked or failed. Learners articulate cause–effect relationships in their own words and make collaborative decisions based on evidence gathered during testing.
- **Expert learners:** Students engage in deeper exploration by proposing alternative design variations and testing changes systematically, keeping some variables constant while modifying others. They compare results, identify patterns, and connect their designs to real-world bridges or historical structures inspired by Leonardo da Vinci. During the outdoor build, they also consider scale and environmental conditions, demonstrating the ability to transfer learning from classroom models to real-life contexts.

Across all levels, participation is equally valued. The emphasis remains on thoughtful engagement, collaboration, and learning through experimentation rather than on achieving a single “advanced” outcome.

STEAM Program Debriefing and Reflection Questions

- What was your first idea about the bridge, and how did it change during the day?
- What helped your bridge stand without glue or nails?
- What was the biggest challenge, and how did your team try to solve it?
- What did you learn about balance, weight, or stability?
- How did your team work together, and what was your role?
- What are you most proud of from today’s work?
- Where could a bridge like this be useful in real life?
- If you had more time, what would you improve next?

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6.5.2. Stage details and Activities Flow

STAGE 1 – SPARK AND CONTEXT

How does this develop particular SPIRIT skills

This opening stage primarily develops curiosity, creativity, and openness, while also laying the foundations for critical thinking and connectedness. Through playful exploration and discussion, students are encouraged to look at familiar objects in unfamiliar ways, which supports flexible thinking and imagination. By listening to peers' ideas and responding respectfully, students practice openness to different perspectives and learn that there can be multiple possible solutions to the same problem. The introduction of Leonardo da Vinci as both an artist and an inventor helps students see that creativity and problem-solving are closely connected, reinforcing a STEAM mindset from the very beginning of the day.

What do we want to achieve regarding SPIRIT skill development (student understanding and/or behaviour)?

By the end of this stage, students are expected to confidently share ideas in a group setting and to generate more than one possible explanation or function for an unfamiliar object. They begin to understand that inventions are created to respond to human needs or challenges, rather than appearing by chance. Students also practice explaining their thinking using simple reasoning (for example, linking an idea to a visible clue such as shape or material). Behaviourally, the goal is to establish a classroom culture in which curiosity is valued, ideas are shared without fear of being "wrong," and respectful listening becomes the norm for the rest of the STEAM-day.

Academic/Curriculum Objective connection

- From a language and literacy perspective, this stage supports oral communication, vocabulary development, and basic argumentation skills. Students practice forming complete sentences such as "I think this could be used for..., because..."and responding to others' ideas.
- From a history and arts perspective, students are introduced to Leonardo da Vinci as a historical figure who combined observation, artistic skill, and inventive thinking. They begin to understand drawing and sketching as tools for thinking and planning, not only as artistic expression.
- This stage also supports cross-curricular STEAM readiness, as it prepares students for later scientific observation and engineering design by emphasizing careful looking, questioning, and idea generation.

Materials and tools needed for implementation

- Mystery Objects Box containing 6-8 common object or unusual objects that can be interpreted in multiple ways
- Visual materials introducing Leonardo da Vinci, such as a short slideshow or presentation, or printed images of selected inventions (e.g. bridge sketches, mechanical designs), and one or two artworks to highlight the artist–inventor connection
- Board, flipchart, or large paper for collecting key ideas, vocabulary, and emerging questions during discussion

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- Markers or chalk for recording student responses
- Sticky notes for students to add ideas or questions visually (optional)

Preparation notes

- Select 6–8 safe, tactile, and visually interesting mystery objects that do not have one obvious single function
- Prepare the Mystery Objects Box in advance so objects can be revealed one by one
- Choose 4–6 Leonardo da Vinci invention visuals that clearly show structure, mechanism, or problem-solving intent
- Select 1–2 artworks by da Vinci to highlight the connection between art and invention
- Test the slideshow or printed visuals in advance to ensure visibility for all students
- Plan the flow and timing of the stage to keep a lively pace and avoid overly long discussions
- Prepare open-ended guiding questions that encourage reasoning rather than correct answers
- Decide how key ideas and vocabulary will be recorded (board, flipchart, or large paper)
- Arrange classroom seating (circle or semi-circle) to support visibility, interaction, and discussion

Guided Questions

Observation and Curiosity (warm-up questions):

- What do you notice about this object?
- What clues do you see (shape, material, size)?
- What do you think this object might be used for?

Reasoning and Explanation:

- Why do you think someone would invent something like this?
- What problem could this object help to solve?
- How does its shape or material support your idea?

Inventor Thinking and Creativity

- Why do inventors draw or sketch their ideas?
- How might an inventor improve this object?
- What could this object be used for in a different situation?

Connection to the Bridge Challenge:

- Why do people need bridges?
- What problems do bridges help us solve?
- What do you think makes a bridge strong or useful?

Stage Debriefing Questions (Optional)

- What did we learn today about how inventors think?
- What idea surprised you the most?
- Did you hear an idea that made you change your mind?
- What helped you come up with new ideas?
- How did listening to others help your thinking?

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Tips and Tricks for dealing with stage challenges

- Keep the pace lively and limit discussion time per object to maintain engagement. Encourage both imaginative ("wild") ideas and evidence-based ideas, clearly valuing each type.
- If a few students dominate the discussion, intentionally invite quieter students to share or allow them to point out visual clues instead of speaking. Reframe off-topic ideas by asking follow-up questions that reconnect them to observation or problem-solving.
- Avoid judging ideas as right or wrong; use neutral responses such as "That's an interesting possibility" or "Tell us what made you think that."
- Use the board or flipchart to visually organize ideas, helping students see patterns and connections.
- If students struggle to generate ideas, model one example aloud and then step back. Reinforce respectful listening and turn-taking to set expectations for collaboration throughout the STEAM-day.

STAGE 2 – Science of Stability

How does this develop particular SPIRIT skills

This stage primarily develops critical thinking, curiosity, and problem-solving, while also strengthening openness and resilience. Through hands-on mini-investigations, students observe cause–effect relationships and begin to reason about why structures behave the way they do. They learn to question first impressions, test ideas, and revise their thinking based on evidence. Working together during investigations also supports respectful collaboration and shared sense-making.

What do we want to achieve regarding SPIRIT skill development (student understanding and/or behaviour)?

- Students recognize that stability depends on balance, contact points, friction, and load distribution.
- Students describe observations using simple scientific language (e.g. stable, unstable, heavier, slips, balanced).
- Students make predictions before testing and reflect on results after testing.
- Students demonstrate patience and persistence when outcomes differ from expectations.
- Students listen to others' explanations and build on shared observations.

Academic/Curriculum Objective connection

- Science: Understanding basic concepts of forces, balance, friction, and stability through observation and experimentation. Developing early scientific reasoning by predicting, testing, observing, and explaining outcomes.
- Mathematics: Comparing quantities (more/less, heavier/lighter). Recognizing simple patterns related to structure and support.
- Language and Literacy: Using descriptive and explanatory language to communicate observations and ideas.

Materials and tools needed for implementation

- Unsharpened pencils, wooden sticks, or rulers (for balance and structure tests)
- Small weights (erasers, blocks, identical small books, or containers)
- Different surfaces for friction tests (smooth table, paper, fabric, sandpaper)
- Rulers or measuring tape
- Simple investigation cards or visual instructions (optional)
- Board, flipchart, or large paper for collecting observations and key terms

Preparation notes

- Prepare 2–3 simple mini-investigation setups in advance (balance, friction, load).
- Test each activity beforehand to ensure it works within a few minutes.
- Decide whether investigations will be done as whole-class demonstrations or small-group rotations.
- Prepare key vocabulary to introduce or collect during discussion (e.g. balance, stable, slip, weight).
- Ensure materials are safe and easy to handle for all students.

Guided Questions

Prediction and Observation:

- What do you think will happen if we add weight here?
- Which structure do you think will stand longer? Why?
- What do you notice when it starts to fall or slide?

Reasoning and Explanation:

- Why do you think this structure is more stable than the other one?
- How does the surface change what happens?
- Where do you see balance or imbalance?

Connection to Bridge Building:

- How could this idea help us when we build our bridge?
- What should we remember when we want something to stay standing?

Stage Debriefing Questions (Optional)

- What did we discover about what makes a structure stable?
- Which test surprised you the most?
- Did any prediction turn out differently than you expected?
- What idea do you think will be most important for building our bridge?

Tips and Tricks for dealing with stage challenges

- If students rush to conclusions, slow down the process by asking them to describe what they see before explaining why. Use comparisons (this vs. that) to support clearer thinking.
- If attention drops, turn an investigation into a quick challenge (e.g. “Can you make it stand longer?”). Reinforce that this stage is about exploring and understanding, not about being correct.

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- Clearly connect discoveries back to the upcoming engineering task to maintain relevance and motivation.

STAGE 3 – Plan Like an Engineer

How does this develop particular SPIRIT skills

This stage strongly develops problem-solving, collaboration, critical thinking, and responsibility. Students learn to slow down before acting, analyse constraints, and make intentional decisions as a team. By discussing ideas, negotiating roles, and justifying design choices, they practice respectful communication and shared ownership of the task. Planning before building also supports resilience, as students understand that redesign is part of an expected process rather than a sign of failure.

What do we want to achieve regarding SPIRIT skill development (student understanding and/or behaviour)?

- Students understand that engineering begins with planning, not immediate construction.
- Students identify and respect design constraints (self-supporting structure, no glue or nails, limited materials).
- Students generate and discuss multiple design ideas before selecting one.
- Students justify design choices using simple reasoning and evidence from Stage 2 discoveries.
- Students take responsibility for a specific role within their team and collaborate effectively.

Academic/Curriculum Objective connection

- Technology and Engineering: Applying the engineering design process: define the problem, plan a solution, and prepare for testing. Understanding the role of constraints and criteria in engineering challenges.
- Mathematics: Measuring and estimating distances (bridge span, gap width). Comparing quantities (number of pieces used, planned height or width).
- Arts / Visual Literacy: Creating clear planning sketches and diagrams to communicate ideas visually.
- Language and Literacy: Using structured oral language to explain plans, roles, and decisions.

Materials and tools needed for implementation

- Planning sheets with space for bridge sketch, list of materials, predicted strengths and weak points
- Unsharpened pencils, wooden rods, or sticks (for testing ideas while planning)
- Rulers or measuring tape
- Images of Leonardo da Vinci bridge sketches and real bridge examples (for inspiration)
- Role cards or labels (Engineer, Builder, Tester, Recorder, Safety Lead)
- Board or flipchart for recording shared constraints and success criteria.

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Preparation notes

- Decide on the standard gap size that all teams will plan for.
- Prepare and copy planning sheets in advance.
- Create clear role descriptions so students understand expectations.
- Review Stage 2 findings and select 2–3 key ideas to remind students of (e.g. balance, contact points).
- Prepare example sketches only as inspiration, not as models to copy exactly.

Guided Questions

- Understanding the Challenge: What exactly is our problem to solve today? What are the rules and limits we must follow
- Planning and Design: How will the pieces hold together without glue or tape? Where might the bridge be weakest? How can we use balance or shape to make it stronger?
- Teamwork and Roles: Who will focus on which task in your team? How will you make decisions if you disagree?
- Prediction: What do you think will work best in your design? Why?

Stage Debriefing Questions (Optional)

- What was the most important decision your team made during planning?
- Did everyone have a role? How did that help?
- What part of your plan are you most confident about?
- What do you think might be challenging when you start building?

Tips and Tricks for dealing with stage challenges

- If students want to start building immediately, remind them that engineers always plan first. Encourage teams to keep plans simple rather than complex.
- If disagreements arise, suggest testing ideas later instead of arguing now. Support students who struggle with drawing by allowing symbols or labels instead of detailed sketches.
- Reinforce that plans can change; planning is a guide, not a final answer.
- Keep time visible and give a 5-minute warning before moving to the next stage.

STAGE 4 – Build Prototype

How does this develop particular SPIRIT skills

- Develops resilience by allowing students to experience failure and learn from it.
- Strengthens creativity through hands-on experimentation with structure and form.
- Encourages problem-solving as students adapt plans when ideas do not work as expected.
- Supports collaboration and responsibility through role-based teamwork.
- Reinforces openness to change and flexibility in thinking.

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What do we want to achieve regarding SPIRIT skill development (student understanding and/or behaviour)?

- Students translate a drawn plan into a physical structure.
- Students test ideas in practice and observe what works and what does not.
- Students remain engaged even when the structure collapses or fails.
- Students suggest at least one possible improvement based on observation.
- Students cooperate respectfully and follow agreed team roles.

Academic/Curriculum Objective connection

- Technology and Engineering: Building a functional prototype under given constraints. Understanding that engineering solutions require testing and revision.
- Science: Observing stability, balance, and force effects during construction.
- Mathematics: Measuring span, height, or alignment during building.
- Language and Literacy: Using descriptive language to explain problems and ideas within the team.

Materials and tools needed for implementation

- Unsharpened pencils, wooden rods, or dowels (one set per team)
- Planning sheets from Stage 3
- Rulers or measuring tape
- Flat working surface (table or floor space)
- Optional: camera or tablet for documenting attempts
- Board or flipchart for recording common challenges or discoveries

Preparation notes

- Ensure all teams have equal quantities of materials.
- Prepare a standard testing gap (e.g. two chairs or marked floor space).
- Review safety rules for handling long objects.
- Decide in advance that no fixings (glue, tape, rubber bands) are allowed during this first build.
- Plan to circulate and observe rather than intervene directly.

Guided Questions

Observation and Reflection:

- What is happening as you place this piece?
- Where does the structure start to wobble or collapse?

Problem-Solving:

- What could you change without starting over?
- How might adjusting the angle or position help?

Connection to Planning:

- How does this compare to your original plan?
- What part of the plan worked better than expected?

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Stage Debriefing Questions (Optional)

- What was the biggest challenge during building?
- Did anything surprise you when you started constructing the bridge?
- What would you like to change in the next version?
- What did you learn from something that did not work?

Tips and Tricks for dealing with stage challenges

- Remind students that collapse is part of the learning process, not a mistake.
- Encourage small adjustments instead of complete rebuilds when possible.
- If frustration rises, pause the group briefly and refocus on observation.
- Avoid giving direct solutions, guide students with questions instead.
- Highlight examples of persistence and teamwork during the activity.
- Give a clear time warning (e.g. “10 minutes left”) to support pacing.

STAGE 5 – Test, Improve, Document

How does this develop particular SPIRIT skills

- Develops critical thinking by encouraging evidence-based evaluation of designs.
- Strengthens flexibility as students modify ideas based on test results.
- Reinforces problem-solving through iterative redesign.
- Supports resilience by framing failure as useful feedback.
- Encourages communication and connectedness through sharing results and explanations.

What do we want to achieve regarding SPIRIT skill development (student understanding and/or behaviour)?

- Students test their bridge prototype using a clear and fair method.
- Students observe and describe how the structure reacts to added load.
- Students identify at least one weakness in their first design.
- Students redesign and build an improved second version of the bridge.
- Students explain what they changed and why, using observations as evidence.
- Students document their process through sketches, notes, or simple data.

Academic/Curriculum Objective connection

- Science: Observing cause–effect relationships between structure and load. Understanding stability through testing and comparison.
- Mathematics: Measuring span and counting or comparing weights added. Recording results in simple tables or diagrams.
- Technology and Engineering: Applying the engineering design cycle: test → analyse → improve.
- Language and Literacy: Using explanatory language to describe results and justify decisions.

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Materials and tools needed for implementation

- Completed bridge prototypes from Stage 4
- Standardized test weights (small books, identical blocks, water bottles)
- Containers or markers to count added load
- Rulers or measuring tape
- Observation and redesign sheets
- Pencils or markers
- Board or flipchart for collecting class-wide observations

Preparation notes

- Decide on a standard testing protocol for all teams (same gap, same type of weight).
- Prepare enough identical weights to ensure fairness.
- Review safety rules, emphasizing that weights, not students, test the bridge.
- Prepare documentation sheets with clear sections: test results, changes made, why it improved.
- Plan time for both testing and redesign within the 45-minute block.

Guided Questions

Testing and Observation:

- What happens when we add weight here?
- Where does the bridge start to change or fail?

Analysis and Improvement:

- Why do you think it failed at this point?
- What is one small change that could make it stronger?
- How can we test whether that change really helps?

Documentation and Communication:

- How will you show what you changed?
- What evidence do you have that your design improved?

Stage Debriefing Questions (Optional)

- What change made the biggest difference in your bridge?
- How did testing help you decide what to improve?
- Did your second version work better than the first? Why?
- What did you learn from another team's design?

Tips and Tricks for dealing with stage challenges

- Emphasize slow, careful testing rather than rushing to add weight.
- If teams feel discouraged, highlight partial success (e.g. "It held one more block"). Encourage teams to change one variable at a time for clearer results.

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- Support students who struggle with writing by allowing diagrams or labelled sketches.
- Keep sharing brief and focused to leave time for redesign.
- Reinforce that improvement, not maximum load, is the key success indicator.

STAGE 6 – Outdoor Build and Showcase

How does this develop particular SPIRIT skills

- Develops connectedness by placing learning into a real-world, outdoor context.
- Strengthens valuing people and nature through responsible material use and safe cooperation outdoors.
- Reinforces collaboration as teams coordinate actions in a larger space with real constraints.
- Supports resilience and flexibility as students adapt indoor designs to outdoor conditions.
- Encourages reflection and self-awareness by looking back on the full STEAM-day journey.

What do we want to achieve regarding SPIRIT skill development (student understanding and/or behaviour)?

- Students transfer design principles from indoor prototypes to a larger-scale outdoor structure.
- Students adapt plans in response to environmental factors such as uneven ground or wind.
- Students demonstrate safe and responsible tool and material handling.
- Students communicate effectively within their teams during construction.
- Students reflect on both the process and the outcome of their work.
- Students recognize their role in a collaborative engineering achievement.

Academic/Curriculum Objective connection

- Technology and Engineering: Applying engineering design thinking in a real-world context. Understanding scale and material constraints in construction.
- Science: Observing how external factors affect stability and structure.
- Mathematics: Estimating distances and comparing sizes between indoor and outdoor builds.
- Arts and Communication: Presenting work visually and orally through a showcase or gallery.
- Environmental Awareness: Practicing responsible interaction with the outdoor environment.

Materials and tools needed for implementation

- Wooden slats, long sticks, or pre-cut wooden elements (checked for safety)
- Work gloves (recommended)
- Cones, ropes, or markers to define safe working boundaries
- Clipboards, cameras, or tablets for documentation
- Reflection cards or sticky notes
- First-aid kit available on site

Preparation notes

- Inspect the outdoor area in advance for safety and suitability.
- Decide on a clear build zone and observation zone.
- Prepare a contingency plan for bad weather (large indoor space or simplified build).

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- Review safety rules with students before starting outdoor construction.
- Prepare reflection prompts or display space for the showcase.

Guided Questions

During Building:

- What is different about building outdoors compared to indoors?
- How does the ground or space affect your structure?

During Observation:

- Which parts of the bridge seem most stable?
- Where do you see challenges caused by scale or environment?

During Reflection:

- What helped your team work well together?
- How did today's testing help you think like an engineer?

Stage Debriefing Questions (Optional)

- What was the biggest difference between your indoor and outdoor bridge?
- What did you have to change when you moved outside?
- What are you most proud of from today's STEAM-day?
- What did you learn about working as a team?

Tips and Tricks for dealing with stage challenges

- Keep safety the top priority; pause construction if conditions become unsafe.
- Assign clear roles again to avoid crowding and confusion outdoors.
- If time is limited, focus on one successful outdoor build per team rather than perfection.
- Encourage observation and discussion even if the outdoor build is partial.
- Emphasize reflection and learning over final appearance or strength.
- Capture photos or short notes to help students remember and share their experience later.

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