STEM PATHWAYS

STE(A)m Toolkit

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Introductory note

Purpose of the toolkit

The STE(A)M Toolkit has been developed to support meaningful learning experiences between parents and their daughters aged 8-18 years old, through engaging, practical, and accessible activities that can be carried out at home. It complements the learning modules of the STEM Pathways project and provides families with opportunities to explore science, technology, engineering, arts, and mathematics in ways that are relevant to everyday life.

The toolkit aims to strengthen girls' confidence, curiosity, and interest in STE(A)M by demonstrating that these subjects are not limited to classrooms, laboratories, or specialised equipment. Everyday environments, household materials, family discussions, and shared problem-solving experiences can all become valuable contexts for learning and discovery. Through hands-on activities, participants are encouraged to observe, ask questions, test ideas, reflect on outcomes, and develop a deeper understanding of how STE(A)M connects to the world around them.

A central goal of the toolkit is to support positive family engagement in learning. Parents are invited to act as facilitators and learning partners rather than experts, creating opportunities for exploration, conversation, and shared discovery. The activities promote inquiry, creativity, communication, critical thinking, and decision-making while helping girls recognise their own capabilities and potential within STE(A)M-related fields. The toolkit also embraces principles of inclusion and gender-sensitive education. It encourages the use of supportive language, values effort and persistence, and presents STE(A)M as accessible and relevant to everyone. Activities have been designed to help girls take an active role in investigations, experiments, creative projects, and digital exploration, contributing to a stronger sense of belonging and self-confidence in STE(A)M learning.

Thus, the toolkit seeks to inspire families to view learning as an enjoyable and collaborative journey. Through exploration, experimentation, and reflection, parents and daughters can discover together how STE(A)M shapes everyday experiences, opens pathways to future opportunities, and contributes to understanding and improving the world around us.

How to use this toolkit

This toolkit has been designed to support enjoyable and meaningful STE(A)M learning experiences at home. The activities encourage parents and daughters to explore, discuss, experiment, and learn together through practical tasks that connect STE(A)M concepts to everyday life.

The toolkit is organised into five activity modules, each containing three activities that families can complete at home. The Introductory Module, Parents as Enablers of Girls' STE(A)M Pathways, includes: (1) STE(A)M Hunt at Home: Finding Science in Everyday Activities, (2) Build Your Own Mini Weather Station at Home, and (3) Tracking the Moon: Exploring Phases and Patterns in the Night Sky. Module 1, Curiosity, Inquiry & Critical Thinking through STE(A)M, includes: (1) Melting Race: Which Ice Melts Faster?, (2) Balloon Rocket Challenge: How Can We Make It Go Further?, and (3) Design Your Own Experiment: Test, Compare, Explain. Module 2, Creativity, Design & Problem-Solving in STE(A)M, includes: (1) Build Your Own Spectroscope: Discover Hidden Colours in Light, (2) Paper Rocket Launcher: How Far Can It Fly?, and (3) DIY Hologram Projector: Creating 3D Illusions. Module 3, Communication, Cooperation & Tackling Stereotypes, includes: (1) Build a Pizza Box Solar Oven, (2) Make Your Own Slime, and (3) Make Marbled Cards. Finally, Module 4, Digital & Mathematical Thinking in Everyday Life, includes: (1) Digital Detectives: Exploring Safe and Smart Online Choices, (2) Smart Choices: Spend, Save & Stay Safe, and (3) Where is Math Hiding? Discovering Numbers, Patterns and Logic in Everyday Life.

Most activities use simple, low-cost materials that can be found in many homes. The emphasis is not on producing perfect results or finding the correct answer immediately, but on encouraging curiosity, asking questions, testing ideas, and reflecting on observations and experiences. Parents are not expected to be STE(A)M experts. Their role is to facilitate discussion, encourage exploration, and support their daughter's thinking and decision-making. Many activities include suggested questions and conversation prompts that can help guide learning without requiring specialist knowledge.

Each activity has been developed for a specific age group (8-12 years old or 13-18 years old). The recommended age range is clearly indicated at the beginning of every activity. These recommendations reflect the complexity of the concepts, the level of independence required, and the type of discussion or investigation involved. To support flexibility and inclusion, the activities also include suggestions for adapting the experience for a different age group. For example, activities designed for younger children may include extension ideas for older participants, while activities developed for older girls may offer simplified versions that can be used with younger children. Families are encouraged to adapt activities according to individual interests, abilities, and learning needs.

Each activity contains several features that can help parents facilitate the learning process:

- A clear description of the activity and its learning purpose.
- A list of materials required and estimated duration.
- Step-by-step instructions that guide families through the activity.

- Reflection and discussion questions that encourage critical thinking and deeper understanding.
- Simple explanations for parents, providing background information about the scientific, mathematical, technological, or creative concepts explored during the activity.
- Encouraging language suggestions that promote confidence, participation, and positive attitudes towards STE(A)M.
- Adaptation and extension recommendations that allow activities to be adjusted for different ages and levels of experience.
- References and additional resources that provide further information and inspiration for families who wish to explore a topic in greater depth.

Families are encouraged to approach the activities as opportunities for shared discovery. Questions, observations, unexpected outcomes, and creative ideas are valuable parts of the learning process. The toolkit aims to create a positive environment where girls can develop confidence in their abilities, explore their interests, and recognise that STE(A)M is relevant, accessible, and connected to everyday life.

Inclusion & gender-sensitive guidance

The STEM Pathways project is committed to promoting inclusive, equitable, and positive learning experiences for all participants. This toolkit has been designed to support girls' engagement with STE(A)M by creating opportunities for exploration, creativity, problem-solving, and confidence-building in a supportive family environment. Research shows that children's perceptions of their own abilities can be influenced by the messages they receive from adults, peers, and society (e.g., Barea & Marín, 2020; Biemmi, 2015). Parents therefore play an important role in helping girls develop confidence in their capacity to engage with STE(A)M subjects and activities. Small changes in language, expectations, and encouragement can have a significant impact on motivation, participation, and self-belief.

When facilitating activities, parents are encouraged to use inclusive and supportive language that promotes curiosity, exploration, and collaboration. Statements such as "Let's explore this together", "What do you think?", or "That is an interesting idea" can help create a positive atmosphere where girls feel comfortable sharing their thoughts and testing new ideas. Abilities and interests should not be linked to gender. Girls and boys are equally capable of developing scientific, technological, mathematical, creative, and problem-solving skills. Activities should therefore be presented as opportunities that are open and accessible to everyone, regardless of gender, background, previous experience, or perceived ability.

The focus of the activities should be placed on effort, persistence, creativity, and learning rather than on finding the correct answer immediately. Mistakes, unexpected results, and challenges are natural parts of the learning process and provide valuable opportunities for reflection and growth. Celebrating progress, curiosity, and perseverance can help build

confidence and resilience. Also, parents are encouraged to give girls opportunities to take an active and leading role throughout the activities. This may include making predictions, choosing materials, planning investigations, recording observations, testing ideas, making decisions, explaining findings, or presenting conclusions. Taking ownership of the learning process can strengthen both confidence and engagement.

STE(A)M should be presented as relevant to everyday life and connected to a wide range of interests, careers, and real-world challenges. The activities in this toolkit demonstrate how STE(A)M can be found in homes, communities, nature, technology, art, design, health, environmental sustainability, and many other aspects of daily life. These connections can help girls recognise the value and applicability of STE(A)M beyond school settings. Families are also encouraged to recognise and value different ways of learning and participating. Some girls may enjoy discussing ideas, while others may prefer building, drawing, observing, researching, or experimenting. There is no single way to engage successfully with STE(A)M. Creating space for different perspectives, interests, and learning preferences contributes to a more inclusive and supportive learning experience.

The goal is to create an environment where girls feel respected, capable, and empowered to explore their interests, ask questions, take risks, and develop confidence in their own abilities. Positive experiences with STE(A)M during childhood and adolescence can contribute to greater self-belief, broader aspirations, and a stronger sense of belonging in STE(A)M-related learning and future pathways.

References

Barea, E. M. G., & Marín, Y. R. (2020). Gender stereotypes in childhood. *Pedagogia Social*, (36), 125-138.

Biemmi, I. (2015). Gender stereotypes in childhood: When is difference born?. *Education Sciences & Society*, 127-135.

Practical activities (introductory module: Parents as enablers of girls' STE(A)M pathways)

Activity 1

Activity title:	STE(A)M hunt at home: finding Science in everyday activities
Related module:	Introductory module
STE(A)M area(s):	☑ Science ☑ Technology ☑ Engineering ☑ Arts ☑ Mathematics
Contributing partner:	
Age range of children:	☑ 8-12 years old ☐ 13-18 years old
Estimated duration:	20-30 minutes

Purpose of the Activity

This activity invites children to explore how STE(A)M appears in everyday life at home. It connects daily activities such as cooking, building, or using technology to simple scientific and problem-solving ideas. It supports girls' confidence and curiosity by showing that STE(A)M is accessible, relevant, and part of their everyday experiences. The activity also helps children understand that science and problem-solving are not limited to laboratories or classrooms. Everyday spaces such as kitchens, bedrooms, gardens, and living rooms can become places for exploration, observation, and discovery.

Skills emphasised

☑ Critical thinking
☑ Creativity
☑ Problem-solving
☑ Communication

Materials needed

Paper and pencil (or notebook)

Household items (e.g. kitchen tools, toys, devices)

Optional: phone or tablet for photos

Step-by-step instructions (for parents)

- Step 1: Explain that you will go on a "STE(A)M hunt" around the home to find examples of science, technology, engineering, arts, and mathematics in everyday activities. You can introduce the activity by saying: "Today we are going to explore how STE(A)M is already part of our everyday life".
- Step 2: Walk around the house together and choose 4-5 activities or objects (e.g. cooking, using a phone, building with toys, watering plants). Examples can include:
    - cooking or baking (science through changes in temperature and texture, mathematics through measuring ingredients, creativity through decorating or presenting food)
    - building a paper bridge or tower (engineering through design and construction, mathematics through balance and measurement, science through testing strength and stability)
    - gardening or caring for plants (science through observing growth and water needs, mathematics through measuring plant height, technology through using weather or plant-care apps)
- Step 3: For each example, ask your daughter what is happening and how it works. Encourage her to describe what she sees and thinks. Questions such as "Why do you think this works?" or "What changes do you notice?" can help support observation and discussion.
- Step 4: Write down or draw each example and label it with the STE(A)M area it relates to (e.g. cooking = science, measuring = mathematics). Some activities may relate to more than one STE(A)M area. For example, cooking can involve science, mathematics, and creativity at the same time.
- Step 5: Talk together about which example she found most interesting and why. Encourage your daughter to think about where else she notices STE(A)M in daily life, such as at school, outdoors, or during hobbies.

Simple explanation for parents

STE(A)M learning happens naturally through everyday experiences. Children develop scientific thinking when they observe changes, ask questions, solve problems, compare ideas, or test different ways of doing something. The goal of this activity is not to teach "correct" scientific answers, but to help children notice that STE(A)M is already part of their world.

Reflection & discussion prompts

- What did you notice during the activity?
- Which example surprised you the most?

- Why do you think this activity is related to STE(A)M?
- Where else do you think we can find STE(A)M in everyday life?

Extension (for older children 13-18)

Encourage the child to go further by analysing and comparing examples. S/he can:

- group activities into different STE(A)M categories and explain her reasoning
- identify more than one STE(A)M area in the same activity
- research how one example connects to real-world careers or professions
- create a simple presentation or short video explaining her findings

Note: For younger children, focus on observation, drawing, and simple discussion. For older children, introduce more explanation, comparison, and connections to real-world applications.

Encouraging language tips (for parents)

- "That's an interesting idea"
- "What do you think is happening here?"
- "Let's explore this together"

Invite the child to choose the activities and lead part of the exploration. Use language that highlights effort and thinking rather than ability. Present STE(A)M as something everyone can engage with and connect activities to real-life situations that feel relevant and meaningful. Older children can also compare how STE(A)M is used in different professions (e.g. chefs, engineers, designers, doctors, architects, programmers).

References

Gong, X. (2016, July). How to "STEAM" children at home? Let children "STEAM" themselves. In 2016 IEEE International Conference on Service Operations and Logistics, and Informatics (SOLI) (pp. 129-132). IEEE.

Activity 2

Activity title:	Build your own mini weather station at home
Related module:	Introductory module
STE(A)M area(s):	☑ Science ☐ Technology ☑ Engineering ☐ Arts ☑ Mathematics
Contributing partner:	
Age range of children:	☑ 8-12 years old ☐ 13-18 years old
Estimated duration:	30-40 minutes (plus short daily observations)

Purpose of the Activity

The activity introduces children to weather observation through simple tools they can build at home. It connects everyday experiences, such as temperature and rain, to basic scientific ideas. Specifically, it introduces children to scientific thinking through prediction, observation, comparison, and discussion. It supports children's curiosity and confidence by showing that they can observe, record, and understand the world around them. Everyday weather changes become opportunities to explore patterns and ask questions about the environment. The activity also encourages families to explore data together through discussion and shared observation. Research shows that connecting weather information to personal experiences and daily routines can make scientific thinking more meaningful and engaging for children and parents alike (e.g., Van Den Bosch, Peeters, & Claes, 2022).

Skills emphasised

☑ Critical thinking
☑ Problem-solving
☑ Communication
☑ Creativity
☑ Observation and pattern recognition

Materials needed

- Empty plastic bottle or jar
- Paper and marker
- Ruler
- Tape
- Optional: phone or tablet for recording observations

- Optional: thermometer
- Optional: graph paper or notebook for recording patterns
- Optional: coloured pencils for weather symbols or charts

Step-by-step instructions (for parents)

- Step 1: Explain that you will create a simple "weather station" to observe and record what happens outside each day. Ask your daughter to predict what the weather might be like over the next few days (e.g. rainy, sunny, warmer, colder). Encourage her to explain why she thinks this might happen. Predictions help children practise scientific thinking and hypothesis formation.
- Step 2: Use a plastic bottle or jar to make a rain collector. Mark lines on the side using a ruler to measure how much water collects. If available, place a thermometer in a shaded outdoor area and record the temperature at different times of the day. Discuss why scientists use measuring tools and why placing the thermometer in the shade may give more accurate results.
- Step 3: Place the container outside in a safe, open area where it can collect rain. Choose a place together and discuss why it is suitable for collecting weather

information. Invite your daughter to take the lead in choosing the observation area and deciding how to organise the recordings.

- Step 4: Each day, look at the container together and record what you see (e.g. water level, temperature feeling, sunny or cloudy weather). Ask your daughter to describe the weather in her own words. Encourage her to compare observations from different days and notice changes or patterns. Drawing weather symbols or creating a simple weather chart can support engagement. You can also connect observations to everyday experiences, such as clothing choices, outdoor activities, or how plants and animals respond to the weather.
- Step 5: After a few days, look at the results together and talk about any patterns or changes you notice. You can also create a simple graph together to compare rainfall or temperature observations over time. Ask your daughter whether the observations matched her original predictions and what new questions she now has about the weather.

Simple explanation for parents

Weather describes what is happening in the air around us, such as temperature, rain, wind, and clouds. Weather observation is one of the ways scientists collect information about the environment. Scientists record patterns over time, compare results, and use evidence to make predictions. This activity introduces children to those same ideas in a simple and familiar way. Research also shows that children become more engaged with scientific information when it connects to their own experiences and family discussions. Observing weather helps children understand patterns and changes in the environment. Weather changes because of factors such as sunlight, clouds, wind, and rain. Through this activity, children practise how scientists observe, measure, and record information to understand patterns in the environment. Talking together about weather, memories, or daily routines can help children develop confidence in scientific thinking. Your role is to support discussion and curiosity rather than provide immediate answers. Questions such as "What do you notice?", "Why do you think that changed?", or "What pattern can you find?" help children think like investigators.

Reflection & discussion prompts

- What do you notice about the weather over several days?
- Which day was different from the others? Why do you think that happened?
- What surprised you during your observations?
- How do you think weather affects our daily activities?
- Did your predictions match what happened? Why or why not?
- What patterns do you notice over several days?

Extension (for older children 13–18)

Encourage deeper exploration through:

- recording data in a table and comparing results over time

- calculating simple averages (e.g. amount of rain over several days)
- linking observations to weather forecasts and checking accuracy
- exploring how weather relates to climate or environmental issues

Note: For younger children, focus on simple observation and description (e.g. sunny, rainy, cloudy). Drawing weather symbols can help engagement. Older children can also investigate how meteorologists collect and analyse weather data and compare their own observations with official weather reports.

Encouraging language tips (for parents)

- What do you notice today?
- That is an interesting pattern
- What do you think will happen tomorrow?
- Why do you think the weather changed?
- How could we record this differently?

Prompt your child to take responsibility for checking and recording the weather each day. Use language that highlights effort and curiosity. Present the activity as something meaningful and connected to real life, showing that understanding the world is something everyone can do.

References

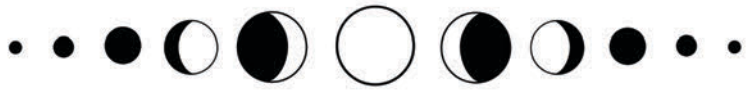
Van Den Bosch, C., Peeters, N., & Claes, S. (2022, June). More weather tomorrow. engaging families with data through a personalised weather forecast. In *Proceedings of the 2022 ACM International Conference on Interactive Media Experiences* (pp. 1-10).

Activity 3

Activity title:	Tracking the moon: exploring phases and patterns in the night sky
Related module:	Introductory module
STE(A)M area(s):	☑ Science ☐ Technology ☐ Engineering ☑ Arts ☑ Mathematics
Contributing partner:	
Age range of children:	☐ 8-12 years old ☑ 13-18 years old
Estimated duration:	20-30 minutes (plus short daily observations over several days)

Purpose of the Activity

This activity invites youth (aged 13-18 years old) to observe and record the phases of the Moon over time. It connects everyday observation of the night sky to patterns, scientific thinking, and careful observation. The activity supports youth's confidence and curiosity by showing that science can begin with simple questions and regular observation of the world around us. It also introduces the idea that scientists look for patterns, compare evidence, and develop explanations based on observations collected over time.



Skills emphasised

☑ Critical thinking
☑ Problem-solving
☑ Communication
☑ Creativity
☑ Observation and pattern recognition

Materials needed

- Notebook or paper
- Pencil or pen
- Optional: phone for photos
- Optional: internet access (to compare with moon phase calendars)

- Optional: printed Moon observation worksheet
- Optional: torch and ball (for demonstrating Moon phases indoors)

Step-by-step instructions (for parents)

- Step 1: Explain that you will observe the Moon over several days to notice how its shape changes over time. Ask your daughter what she already knows or has noticed about the Moon. Encourage predictions before observations begin, such as "Do you think the Moon will look the same tomorrow?" or "What changes do you expect to notice?"
- Step 2: Go outside together in the evening and look carefully at the Moon. Ask your daughter to describe what she sees, including the shape, brightness, position in the sky, or any visible patterns. If the moon is not visible, discuss possible reasons such as clouds, weather conditions, or the moon's position relative to Earth.
- Step 3: Ask her to draw the shape of the Moon or take a photo. Record the date, time, weather conditions, and observations in a notebook or worksheet. Encourage detailed observations rather than "correct answers". Scientists often begin by carefully describing what they notice.
- Step 4: Repeat the observation over several days and compare how the moon changes. Invite your daughter to look for patterns between one observation and the next. Ask questions such as "What stayed the same?" and "What changed?" to support comparison and reasoning.
- Step 5: Discuss the pattern together and ask what might be causing these changes. If helpful, use a torch and a ball indoors to model how sunlight lights up different parts of the moon as it moves around Earth. This simple model helps children/youth understand that the moon does not change shape itself; we see different illuminated parts depending on its position relative to Earth and the Sun.

Simple explanation for parents

The Moon does not produce its own light. The light we see comes from the Sun reflecting on the moon's surface. As the moon moves around Earth, different portions of its illuminated side become visible to us. These changing views are called Moon phases. This activity follows an inquiry-based approach inspired by physics education research, where children build understanding through observation, prediction, discussion, and reflection rather than memorising explanations. Parents support learning by asking questions, encouraging comparison, and helping children notice patterns. Young people often think scientific observation requires expensive equipment or expert knowledge. Activities such as this show that careful observation, curiosity, and discussion are important scientific practices that anyone can develop.

Reflection & discussion prompts

- What changes do you notice in the Moon over time?

- What patterns can you identify?
- Why do you think the Moon appears different each night?
- How does observing the Moon help us understand patterns in nature?
- Did anything surprise you during the observations?
- What questions do you still have about the Moon?
- How do scientists use repeated observations to understand space and nature?

Moon observation worksheets

Worksheet 1: Moon observation log

Date	Time	Weather conditions	Shape of the Moon	Drawing/photo	What did I notice?

Worksheet 2: Looking for patterns

Observation	What changed?	What stayed the same?	My explanation
Day 1 vs Day 2			
Day 2 vs Day 3			
Day 3 vs Day 4			

Worksheet 3: My moon predictions

Before observing:

- What do you think the Moon will look like tomorrow?
- Do you think it changes slowly or quickly?
- Why do you think the Moon changes shape?

After observing:

- Was your prediction correct?
- What new idea did you develop?
- What would you like to investigate next?

Suggested extension activity (optional)

Families can use a torch and a ball indoors to model moon phases:

- The torch represents the Sun
- The ball represents the Moon
- The child represents Earth

Ask the child to move the "Moon" around "Earth" and observe which part of the ball appears illuminated from different positions. This helps connect direct observation to scientific explanation through modelling and visualisation.

Examples: https://thestemlaboratory.com/oreo-moon-phases/

Simplification (for 8–12 years old)

Focus on simple observation and drawing rather than patterns over time. Observe the Moon once or twice and ask the child to describe or draw its shape. Use simple terms such as "full", "half", or "crescent" instead of detailed explanations. Younger children can also use colouring activities or moon phase cards to sequence different Moon shapes.

Encouraging language tips (for parents)

- "What do you notice tonight?"
- "That's an interesting pattern"
- "What do you think is causing this change?"

Invite the child to lead the observation process and make decisions about how to record the Moon. Use language that values curiosity and thinking. Present science as something that is accessible and connected to everyday life, helping build confidence and interest.

References

McDermott, L. C. (1995). *Physics by Inquiry: An Introduction to Physics and the Physical Sciences, Volume 2*. John Wiley & Sons.

McDermott, L. C., Shaffer, P. S., & Constantinou, C. P. (2000). Preparing teachers to teach physics and physical science by inquiry. *Physics Education*, *35*(6), 411-416.

NASA. (n.d.). *Moon phases*. https://science.nasa.gov/moon/

The STEM Laboratory. (n.d.). *Oreo moon phases*. https://thestemlaboratory.com/oreo-moon-phases/

Practical activities (module 1: Curiosity, inquiry & critical thinking through STE(A)M)

Activity 1

Activity title:	Melting race: which ice melts faster?
Related module:	Module 1
STE(A)M area(s):	☑ Science ☐ Technology ☐ Engineering ☐ Arts ☑ Mathematics
Contributing partner:	Inquiry Fuse
Age range of children:	☑ 8-12 years old ☐ 13-18 years old
Estimated duration:	20-30 minutes

Purpose of the Activity

This activity invites children to explore how ice melts under different conditions. It connects everyday experiences, such as temperature and sunlight, to simple scientific thinking. It supports girls' curiosity and confidence by encouraging them to ask questions, make predictions, and explain what they observe. The activity also introduces children to experimentation and comparison through a hands-on investigation. Children explore how different materials and environments affect melting, helping them connect scientific ideas to real-life experiences.

Skills emphasised

☑ Critical thinking
☑ Problem-solving
☑ Communication
☑ Creativity
☑ Observation and investigation skills

Materials needed

- 3-4 ice cubes
- Small plates or bowls
- Timer or clock (optional)
- Different locations (e.g. sunlight, shade, indoors)

Optional extension materials:

- metal spoon or tray
- plastic container
- glass plate or cup
- fabric or paper towel
- observation sheet or notebook

Step-by-step instructions (for parents)

- Step 1: Begin with a simple question to spark curiosity, such as: 'Have you ever noticed that some things feel colder than others, even in the same room?'. Then explain that you will explore how ice melts under different conditions.
- Step 2: Place ice cubes on different plates or surfaces. Put each plate in a different location (e.g. near a window, in the shade, indoors), or use different materials such as metal, plastic, or glass. Try to keep everything else the same (same size ice cubes, similar containers, same starting time) so the comparison is fair. You can use the worksheet template provided below for facilitating the observation phase.
- Step 3: Ask your daughter: 'What do you think will happen? Which ice will melt faster?' Encourage her to explain her reasoning before the experiment begins.
- Step 4: Observe the ice together over time. Encourage her to describe what she sees. Every 5 minutes, compare the ice cubes and record observations, such as: Which ice cube changed the most? Which one melted the fastest? Where is there more water?
- Step 4: Compare the results. Ask which ice melted faster and what differences she notices.
- Step 5: Compare the results. Ask which ice melted faster and what differences she notices. Discuss why some materials or locations affected melting differently. Ask what could be tested next (e.g. different surfaces, containers, or temperatures).

Simple explanation for parents

Ice melts when it gains heat from the environment around it. Some materials transfer heat more quickly than others. Metals, for example, are good conductors of heat, which means they can make ice melt faster than materials such as plastic or fabric.

This activity introduces children to scientific investigation through prediction, observation, comparison, and explanation. The goal is not to find the "correct" answer immediately, but to encourage children to think carefully, test ideas, and discuss what they observe.

Parents support learning best through open-ended questions such as "What do you notice?" or "Why do you think this happened?" rather than giving explanations too quickly.

Reflection & discussion prompts

- What did you notice about how the ice melted?
- Which ice melted the fastest? Why do you think that happened?
- What surprised you during the activity?
- What could we try differently next time?
- Why do you think we used ice cubes of the same size?
- Why is it important to change only one thing at a time during an experiment?
- Where do we use materials that transfer heat in everyday life?

Observation template for children

Ice melting investigation sheet

Location/material	My prediction	What happened after 5 min?	What happened after 10 min?	Which melted fastest?
Sunlight				
Shade				
Metal surface				
Plastic surface				

My conclusions

• Which ice cube melted the fastest? Why?

_____

• What surprised me?

_____

• What would I test next time?

_____

Extension (for older children 13–18)

Encourage deeper investigation:

- measure time taken for each ice cube to melt
- test additional variables (e.g. different materials like metal, plastic, fabric)
- record results in a table and compare
- explain results using ideas about heat and temperature
- create graphs to compare melting times
- investigate which materials act as better conductors or insulators

Note: For younger children, focus on simple observation and comparison (fast/slow, more/less). For older children, introduce measuring, recording results, and explaining causes in more detail. Children can also connect the activity to everyday experiences, such as why metal spoons feel colder than wooden ones or why some cups keep drinks colder for longer.

Encouraging language tips (for parents)

- "What do you think will happen?"
- "That's an interesting observation"
- "Why do you think this is different?"
- "What evidence supports your idea?"
- "What could we test next?"

Invite the child to take the lead in making predictions and observing results. Use language that highlights thinking and effort. Present the activity as exploration rather than a test, helping build confidence and interest in STE(A)M. Girls should be encouraged to explain ideas, make decisions about the investigation, and discuss conclusions confidently. All children should have equal opportunities to participate in scientific exploration and problem-solving.

References

Cary Area Public Library (2024). *Melting ice experiment | Science & STEAM for kids* [Video]. YouTube. https://www.youtube.com/watch?v=OlxDxOla_zo

Activity 2

Activity title:	Balloon rocket challenge: How can we make it go further?
Related module:	Module 1
STE(A)M area(s):	☑ Science ☐ Technology ☑ Engineering ☐ Arts ☑ Mathematics
Contributing partner:	Inquiry Fuse
Age range of children:	☑ 8-12 years old ☐ 13-18 years old
Estimated duration:	20-30 minutes

Purpose of the Activity

This activity invites children to explore movement and forces through a simple balloon rocket experiment. It connects everyday play with scientific thinking about motion and cause-effect relationships. It supports children's' confidence and curiosity by encouraging them to test ideas, make changes, and explain results. The activity also introduces children to experimentation through prediction, testing, observation, and comparison. Children explore how changing different conditions affects movement and learn that scientific investigation often involves trying, adjusting, and improving ideas.

Skills emphasised

☑ Critical thinking
☑ Problem-solving
☑ Creativity
☑ Communication
☑ Observation and investigation skills

Materials needed

- Balloon(s)
- String (2-3 metres)
- Straw
- Tape
- Two chairs or fixed points

Optional extension materials:

- different balloon sizes
- measuring tape or ruler
- stopwatch or phone timer
- observation sheet or notebook

Step-by-step instructions (for parents)

- Step 1: Tie a piece of string tightly between two chairs (or two fixed points). Thread the string through a straw before tying it, so the straw can slide along the string. Discuss why the string needs to stay tight and straight for the balloon rocket to move smoothly.
- Step 2: Blow up the balloon without tying it. Hold the end closed. Tape the balloon to the straw, making sure it is secure and pointing along the string. Encourage your daughter to observe how the balloon changes shape as it fills with air.
- Step 3: Ask your daughter: 'What do you think will happen when we let go?' and 'How far do you think it will go?'. Invite her to explain her prediction and discuss what might affect how far the balloon travels.
- Step 4: Release the balloon and observe how it moves along the string. Watch carefully what happens. Encourage observation and comparison by asking questions such as: Did the balloon move quickly or slowly? Did it travel in a straight line? What happened when the air escaped?
- Step 5: Repeat the activity and test different ideas together, such as: using more or less air in the ballon; hanging the angle or tension of the string; trying different balloon sizes. Discuss what changes and why. Encourage your daughter to test one change at a time so she can compare results more clearly.

Simple explanation for parents

When air escapes from the balloon, it pushes backwards. This creates a force that moves the balloon forward along the string. This is an example of action and reaction: movement happens because of a push in the opposite direction. The amount of air, the size of the balloon, and the tension of the string can all affect how the balloon moves. Children begin to understand that changing one condition can influence the outcome of an experiment. The purpose is not to memorise scientific terms, but to help children ask questions, test ideas, and explain what they notice. Open-ended questions such as 'Why do you think this happened?' or 'What could we change next?' support inquiry-based learning.

Reflection & discussion prompts

- What happened when you released the balloon?
- Which change made the biggest difference?
- Why do you think the balloon moved in that way?
- What could we try next to make it go even further?
- What happened when more air was added to the balloon?
- Why is it important to change only one thing at a time during testing?
- Where do we see similar movement in everyday life?

Balloon rocket investigation sheet

My predictions

What will I change?	What do I think will happen?
More air	
Less air	
Bigger balloon	
Tighter string	

My observations

Test	What changed?	How far did the balloon travel?	What did I notice?
Test 1			
Test 2			
Test 3			
Test 4			

My conclusions

• Which setup worked best? Why?

_____

• What surprised me?

_____

• What would I change next time?

_____

Extension (for older children 13–18)

Encourage deeper investigation:

- measure the distance travelled and compare results
- test one variable at a time (e.g. amount of air, string length)
- record results in a table and identify patterns
- explain results using ideas about force, motion, and resistance
- calculate average distances from repeated tests
- compare which setup produces the greatest movement efficiency

Note: For younger children, focus on observing movement and simple comparisons (further/shorter, faster/slower). For older children, introduce measuring distance, testing variables, and explaining results in more detail. Children can also connect the activity to

real-world examples such as rockets, aeroplanes, or movement caused by pushing and releasing air.

Encouraging language tips (for parents)

- “What do you think will happen?”
- “Let’s try and see”
- “Why do you think this worked differently?”
- “What evidence supports your idea?”
- “What could we test next?”

Invite the child to lead the design and testing process. Encourage trying different ideas and highlight that changes and mistakes are part of learning. Present the activity as playful exploration, helping build confidence and interest in STE(A)M.

References

Gillman, J. (2013). Straw Rockets Are Out of This World: STEM Activities for Upper Elementary Students. *Science and Children*, *51*(2), 44-49.

Hurd, K. (2018). Three possible STEM lessons for K-6 teachers to use. *Science Education News*, *67*(4), 50-55.

Activity 3

Activity title:	Design your own experiment: test, compare, explain
Related module:	Module 1
STE(A)M area(s):	☑ Science ☐ Technology ☑ Engineering ☐ Arts ☑ Mathematics
Contributing partner:	Inquiry Fuse
Age range of children:	☐ 8-12 years old ☑ 13-18 years old
Estimated duration:	30-40 minutes

Purpose of the Activity

This activity invites youth aged 13-18 years old, to design and carry out their own simple experiment. It connects everyday questions to scientific thinking through testing and comparison. The activity also introduces young people to inquiry-based learning through questioning, prediction, observation, testing, and reflection. It highlights that scientific investigation begins with curiosity and that experiments help us explore and explain how things work in everyday life. It supports girls' confidence and independence by giving them control over the process and valuing their ideas and explanations.

Skills emphasised

☑ Critical thinking
☑ Problem-solving
☑ Creativity
☑ Communication
☑ Investigation and reasoning skills

Materials needed

- Everyday household items (depending on chosen experiment)
- Paper and pen (for planning and recording)

Optional materials depending on the experiment:

- measuring tape or ruler
- timer or stopwatch
- cups, containers, spoons, water, ice, paper, fabric, toy cars, balls, etc.
- phone or tablet for photos or notes

Note: Materials will vary depending on the chosen idea

Step-by-step instructions (for parents)

- Step 1: Start with a question. Ask your daughter what she is curious about. Support her in turning it into a simple question, such as:
    - "Which material keeps water warmer for longer?"
    - "Does the amount of water affect how fast something dissolves?"
    - "Which surface makes a ball roll faster?"
    - "Which material absorbs the most water?"
    - "Does sunlight affect how quickly ice melts?"
- Step 2: Ask her to make a prediction: "What do you think will happen?" Encourage her to explain her thinking. Discuss why scientists make predictions before testing ideas. Remind her that predictions do not need to be 'correct'; they help us think about possibilities before collecting evidence.
- Step 3: Plan the experiment together. Decide what to change (one thing at a time) and what to keep the same. Help her organise simple steps. Discuss the importance of a 'fair test'. For example, if testing different materials, other conditions such as amount of water, timing, or size should remain the same. Encourage your daughter to record:
    - what she will change
    - what she will observe or measure
    - what she predicts will happen
- Step 4: Carry out the experiment. Observe carefully, take notes, draw, or record results. Repeat if needed. Encourage detailed observation and comparison. Taking photos, drawing diagrams, or recording measurements can help identify patterns more clearly. If results are unexpected, discuss why this might have happened and whether the experiment should be repeated or adjusted.
- Step 5: Compare results and discuss. Ask what happened, whether it matched the prediction, and what could be improved or tested next. Encourage reflection by asking:
    - "What evidence supports your conclusion?"
    - "What would you change next time?"
    - "What new questions do you have now?"

Simple explanation for parents

Scientific experiments help us investigate questions through observation and testing. Inquiry-based learning encourages children and young people to build understanding by asking questions, making predictions, testing ideas, and discussing results. An experiment is a way of testing an idea. It involves:

asking a question
making a prediction
changing one thing at a time
observing what happens

Young people do not need perfect experiments or 'correct' answers. The focus is on reasoning, investigation, and explanation. Unexpected results are valuable because they create opportunities for reflection and new questions. Parents support learning most effectively through discussion and encouragement rather than giving explanations immediately. Open-ended questions such as 'Why do you think this happened?' or 'How could we test that idea?' help strengthen scientific thinking.

Example experiment ideas

Melting: Which material melts ice faster (metal, plastic, fabric)?
Dissolving: Does sugar dissolve faster in hot or cold water?
Movement: Which surface makes a toy car move faster?
Absorption: Which material absorbs more water (paper towel, cloth, sponge)?
Plants: Do plants grow better in sunlight or shade?

Experiment planning template

My investigation plan

My question	My prediction	What will I change?	What will stay the same?

My observations

Test	What happened?	Measurements/observations	What did I notice?
Test 1			
Test 2			
Test 3			

My conclusions

- What did I discover?

- Did my results match my prediction?

- What would I investigate next?

Reflection & discussion prompts

- What was your question and what did you discover?
- Did the results match your prediction? Why or why not?
- What would you change if you did this again?
- What new questions do you have now?
- Which part of the experiment was most challenging?
- What evidence helped you reach your conclusion?
- How do scientists use experiments to solve real-world problems?

Simplification (for 8–12 years old)

Offer a simple experiment instead of asking the child to design one from scratch. Provide clear choices (e.g. "Let's test which melts faster"). Focus on observing and describing what happens rather than planning and comparing multiple variables. Younger children can also use drawings, symbols, or simple comparison words (faster/slower, more/less) instead of detailed measurements.

Extension ideas for deeper investigation

Encourage deeper investigation through:

- measuring results and comparing data
- testing one variable at a time
- recording results in tables or graphs
- identifying patterns and trends
- explaining results using scientific reasoning
- repeating tests to check whether results stay consistent
- comparing observations with online information or scientific sources

Encouraging language tips (for parents)

- "That's an interesting question"

- “What do you think will happen?”
- “How could we test that idea?”
- “What evidence supports your thinking?”
- “What could we investigate next?”

Encourage the young person to take ownership of the experiment, including choosing the question and making decisions. Use language that values ideas and effort. Present experimentation as a process of exploration, helping build confidence and a sense of capability in STE(A)M.

References

National Research Council. (2000). *Inquiry and the National Science Education Standards*. National Academies Press.

Practical activities (module 2: Creativity, design & problem-solving in STE(A)M)

Activity 1

Activity title:	Build your own spectroscope: discover hidden colors in light
Related module:	Module 2
STE(A)M area(s):	☑ Science ☐ Technology ☑ Engineering ☐ Arts ☑ Mathematics
Contributing partner:	KAIROS
Age range of children:	☐ 8-12 years old ☑ 13-18 years old
Estimated duration:	30–40 minutes

Purpose of the Activity

This activity invites young people to explore how light is made of colors by building a simple spectroscope. It connects everyday light sources to scientific observation. It supports girls' confidence and curiosity by encouraging them to investigate, ask questions, and interpret what they see.

Skills emphasised

Select 3-5:

☑ Critical thinking
☑ Creativity
☑ Problem-solving
☑ Communication
☐ Collaboration
☐ Digital skills

Materials needed

- Cardboard tube (kitchen roll or toilet paper rolls)

- Black cardstock
- Transparent tape and electrical tape
- Old CD
- Scissors
- Craft knife (adult use only)
- Pencil

Step-by-step instructions (for parents)

1. Step 1: Cut two black cardstock circles slightly larger than the ends of the tube and add small tabs.
2. Step 2: With adult supervision, remove the reflective layer from part of the CD using tape until it becomes transparent.
3. Step 3: Cut a small rectangle from the transparent CD and tape it over a window cut into one of the circles.
4. Step 4: Make a small viewing hole in the center of the second circle using a pencil.
5. Step 5: Attach the two circles to the ends of the tube, making sure no extra light enters.
6. Step 6: Point the CD side toward a light source and look through the hole to observe colored stripes. Never look directly at the sun.

Simple explanation for parents

White light (like sunlight or a lamp) is actually made of many different colors. The transparent piece of the CD acts like a prism, separating the light into its component colors. This is why your child can see a small "rainbow" inside the spectroscope

Reflection & discussion prompts

- What colors do you observe?
- Do different light sources produce different patterns?
- Why do you think the light separates into colors?
- What surprised you during the activity?
- How does this connect to real life?

Simplification (for 8–12 years old)

- Prepare some parts in advance (e.g. pre-cut shapes and CD piece)
- Assist with delicate steps such as using the craft knife
- Focus on observing colors rather than building accuracy
- Compare only a few light sources
- Ask simple questions like "What colors do you see?"

Encouraging language tips (for parents)

- "Let's look closely together and see what changes"
- "I wonder what we will discover this time"
- "You noticed something really interesting there"

Try to give space for your child's interpretation before explaining the science. Often their first ideas are the most valuable starting point for discussion.

Encourage a sense of shared discovery rather than instruction. Let your child experiment freely and avoid stepping in too quickly with corrections. Emphasise that observation and curiosity are enough to engage with science, regardless of prior experience.

Activity 2

Activity title:	Paper rocket launcher: how far can it fly?
Related module:	Module 2
STE(A)M area(s):	☑ Science ☐ Technology ☑ Engineering ☑ Arts ☐ Mathematics
Contributing partner:	KAIROS
Age range of children:	☑ 8-12 years old ☐ 13-18 years old
Estimated duration:	25–30 minutes

Purpose of the Activity

This activity invites children to explore motion and forces by building and launching a paper rocket. It connects play with scientific thinking about movement. It supports girls' confidence by encouraging experimentation and testing ideas.

Skills emphasised

Select 3-5:

☑ Critical thinking
☑ Creativity
☑ Problem-solving
☑ Communication
☐ Collaboration
☐ Digital skills

Materials needed

- 2 A4 cardstock
- Scissors
- Elastic band
- Tape or stapler

Step-by-step instructions (for parents)

1. Take one piece of cardboard and cut it into a square shape.
2. Fold one corner until the short side matches the long side. Cut off the excess paper to create a triangle. Open it again to get a square.
3. Fold the square in half to make two rectangles. Then fold one rectangle outward in half. Repeat on the other side until it forms an "M" shape.
4. Fold the outer flaps of the "M" upward in half again.
5. Attach a rubber band to one end of the center fold using tape or a stapler. Make sure the rubber band stays inside the "V" shape of the launcher. Mark the front with a small drawing.
6. To launch, place the rubber band forward and underneath the structure. Pull it to the other end while keeping the wings spread outward so the rocket can fly.

Not sure how to build it?

Scan the QR Code and follow the video guide!

Simple explanation for parents

When you stretch the elastic band, you store energy. When you release it, that energy turns into motion, pushing the rocket forward. The shape and weight of the rocket affect how it moves through the air.

Reflection & discussion prompts

- What happened when you launched the rocket?
- Which rocket went further?
- What could you change to improve it?
- Why do you think that happened?

Extension (for 13–18 years old)

- measure and compare flight distances
- test different designs systematically
- analyse variables such as force, shape, and stability
- record results and identify patterns
- explain outcomes using physics concepts

Encouraging language tips (for parents)

- “Try it your way and let’s see what happens.”
- “I like how you’re testing different ideas.”
- “Even small changes can lead to new discoveries.”

Encourage experimentation over perfect results and support children in refining ideas through trial and exploration. Let your child lead the process and make design decisions, treating unexpected outcomes as part of the learning process. Use positive language that values effort and creativity, helping girls build confidence and feel more capable and included in STE(A)M.

Activity 3

Activity title:	DIY hologram projector: creating 3D illusions
Related module:	Module 2
STE(A)M area(s):	☑ Science ☐ Technology ☑ Engineering ☐ Arts ☑ Mathematics
Contributing partner:	KAIROS
Age range of children:	☑ 8-12 years old ☐ 13-18 years old
Estimated duration:	20–30 minutes

Purpose of the Activity

This activity invites children to explore light and reflection by creating a simple hologram projector. It connects digital devices to scientific ideas. It supports girls' curiosity and confidence through hands-on creation and exploration.

Skills emphasised

Select 3-5:

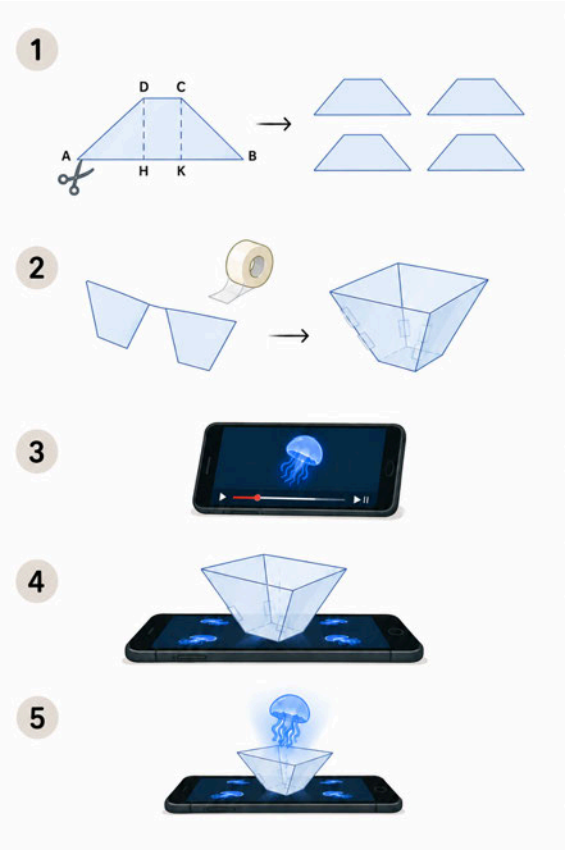
☑ Critical thinking
☑ Creativity
☐ Problem-solving
☐ Communication
☑ Collaboration
☑ Digital skills

Materials needed

- Transparent acetate sheet
- Scissors
- Tape
- Paper
- Smartphone or tablet

Step-by-step instructions (for parents)

1. Cut out the isosceles trapezoid shown on the next page
   (Dimensions: DC = 1 cm; AB = 7 cm; CB = AD = 5 cm; DH = CK = 4 cm) and use it as a template on the acetate sheet to make 4 identical isosceles trapezoids.
2. Attach them together along the slanted sides using adhesive tape until you obtain a square-based truncated pyramid.
3. At this point, go to a dark place with your phone and search on YouTube for one of the videos titled "Hologram".
4. Start the video and place the projector at the center of the
   4 images, with the larger base facing upward.
5. Position your eyes at the same height as the projector... You will then see a single 3D image that appears to float above your phone!



Simple explanation for parents

The pyramid reflects the light from the screen in a specific way. Each side shows a part of the image, and together they create the illusion of a floating 3D object. It is not a real hologram, but a clever use of reflection.

Reflection & discussion prompts

- What do you notice about the image?
- Why do you think it appears to float?
- What differences do you see depending on lighting?

- How could this effect be improved or changed?

Extension (for older children 13–18)

- experiment with different pyramid sizes and angles
- compare results under different lighting conditions
- create or edit their own hologram videos
- research together how optical illusions are created
- connect observations to basic principles of reflection and optics

Encouraging language tips (for parents)

- “Let’s compare what happens if we change this.”
- “It’s interesting to see how different lighting changes the effect.”
- “Tell me what you think is happening here.”

Encourage conversation rather than explanation. Exploring ideas together helps build understanding and keeps curiosity active.

Invite joint exploration and research, especially when discussing how the illusion works. Looking up explanations together can help show that learning is a shared process, not something one person already knows.

Practical activities (module 3: Communication, cooperation & tackling stereotypes)

Activity 1

Activity title:	Built a Pizza Box Solar Oven
Related module:	Module 3
STE(A)M area(s):	☑ Science ☐ Technology ☑ Engineering ☐ Arts ☐ Mathematics
Contributing partner:	Symplexis
Age range of children:	☐ 8-12 years old ☑ 13-18 years old
Estimated duration:	30-45 minutes

Purpose of the Activity

By building a pizza box solar oven, girls will explore how sunlight can turn into heat and cook a tasty treat with a simple solar oven made from everyday materials. The activity connects to real life by introducing renewable energy and exploring how the sun's rays can be used for cooking and warming.

It encourages girls to experiment, explore eco-friendly technology, ask questions, engage in hands-on science, and eat yummy snacks.

Skills emphasised

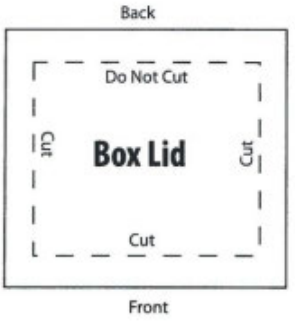
☑ Critical thinking
☑ Creativity
☑ Problem-solving
☑ Communication
☑ Collaboration
☐ Digital skills

Materials needed

- Empty cardboard pizza box
- Plastic wrap or transparent food wrap
- Aluminium foil
- A sheet of black paper
- Tape & scissors
- Wooden stick/skewer or pencil
- Small food item to warm or melt (you can try to make s'mores, for which you will need marshmallows, a chocolate bar, and biscuits)
- You will also need direct sunlight for the experiment to work successfully, and a warm temperature outside (above 24 degrees Celsius is recommended, and the hotter it is, the better)

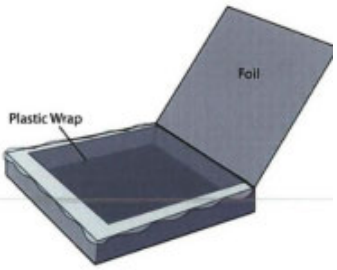
Adult assistance is recommended for using the utility knife. Use caution also when cooking with the solar oven, as it can get quite hot!

Step-by-step instructions



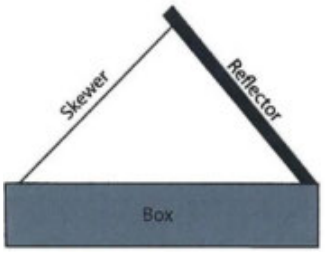
- Step 1: Using the utility knife, cut along three sides to make a flap in the lid of the pizza box.
- Step 2: Cover the inside of the flap with aluminium foil and smoothly tape it in place. This will help reflect sunlight.

Ask your daughter, What role do you think the foil plays in the activity?



- Step 3: Seal the opening under the flap with plastic wrap to create a clear "window". Tape it tightly and make sure there are no holes in it.
- Step 4: Use aluminium foil to line the inside of the box as well, so that when you shut it, the entire interior is coated with foil.
- Step 5: Glue or tape the black paper to the bottom of the box to act as your solar oven's heat sink.

Ask your daughter, How do you think the black paper will help cook your food?



- Step 6: Use a wooden skewer or pencil and some tape to prop the solar oven's lid up at about a 90-degree angle.
- Step 7: Your solar oven is ready, you can now start cooking! If you want to cook s'mores, place a marshmallow and a small piece of chocolate between two biscuits. Place it on a small square of aluminium foil and put it on the black paper in your solar oven. Put your solar oven outside in direct sunlight for

at least 30 minutes, and when the marshmallow is soft, your s'more should be ready to eat and enjoy!

Reflection & discussion prompts

- What do you notice happening inside the box?
- Why do you think the food became warmer?
- What could we try differently to make the oven better?
- Where could people use solar energy in their everyday lives?

What happened?

In this activity, you built a simple solar oven made out of a pizza box that could have been able to cook a s'more in sunny, warm conditions. The flap that you cut out of the lid of the pizza box and lined with aluminium foil was used to reflect sunlight into the box. Sealing the opening with plastic wrap created a "window" that worked like a greenhouse roof, allowing direct and reflected sunlight to pass into the box while retaining heat. At the bottom of the box, you placed a black paper to create a 'heat sink'. This works by absorbing direct and reflected sunlight, becoming warm and then heating food placed on top of it.

Encouraging language tips (for parents)

If something doesn't work out as planned, it is okay, you can try again - scientists try many times too.

Encourage your daughter to lead parts of the activity, for example, choosing where to place the oven so it gets the most sun. Avoid suggesting that science is difficult or for 'certain people'. Reinforce the idea that mistakes, experimenting, and trying again are all natural parts of learning.

Connect the experiment to real-world examples like solar panels, devices that use sunlight for energy, or solar-powered homes. Using everyday materials available at home, this activity shows that STE(A)M learning is accessible and does not require expensive equipment but can be explored by having fun and experimenting at home.

Simplification (for 8–12 years old)

- Focus on observation and discussion, and not so much on the scientific details behind it.
- Help with cutting the necessary parts and assembling the solar oven.

References

Rowland, T. (2015). Build A Pizza Box Solar Oven. Science Buddies. Available at: https://www.sciencebuddies.org/stem-activities/solar-oven#reviews

Related YouTube Video, with step-by-step instructions, available here: https://www.youtube.com/watch?v=nhgNh3BdMsc

Activity 2

Activity title:	Make Your Own Slime
Related module:	Module 3
STE(A)M area(s):	☑ Science ☐ Technology ☐ Engineering ☑ Arts ☐ Mathematics
Contributing partner:	Symplexis
Age range of children:	☑ 8-12 years old ☐ 13-18 years old
Estimated duration:	10-20 minutes

Purpose of the Activity

Children will have the opportunity to create their own homemade slime by exploring how combining different materials can create a new texture. This activity connects to everyday life through cooking, where mixing different ingredients creates new ones with different textures and consistencies, as well as through chemistry concepts found in products like shampoo, glue, and gels. The activity encourages girls to experiment, make predictions, and build their confidence through creative STE(A)M learning.

Skills emphasised

☑ Critical thinking
☑ Creativity
☑ Problem-solving
☑ Communication
☑ Collaboration
☐ Digital skills

Materials needed

- Washable PVA school glue (commonly known as wood glue)
- Baking soda
- Contact lens solution (must contain both boric acid and sodium borate in ingredients)
- Food colouring or glitter (optional)
- Mixing bowl, measuring spoons & cup
- Spatula

Step-by-step instructions (for parents)

- Step 1: In the mixing bowl, mix ½ cup of water, ½ cup of glue, and a few drops of food colouring.
- Step 2: Add ½ tsp of baking soda and mix until completely combined.
- Step 3: Add 2 tbsp contact lens solution and stir vigorously until the mixture starts pulling away from the edges of the bowl.

Ask your daughter to observe how the thickness of the slime changes as she stirs.

- Step 4: Knead the slime with your hands for 5-10 minutes, until its texture stops changing. Do not worry if the slime is very runny and sticks to your hands at first. It will get easier to peel it off your hands as it gets thicker.

Ask your daughter to observe how the slime's texture changes as she kneads it.

- Step 5: Enjoy playing with your slime!
- Step 6: After playing, store your slime in an airtight container to prevent it from drying out. Any excess bits of slime should be disposed of in the trash.

Adult supervision is required for small children; the slime is not edible.

Reflection & discussion prompts

- What changes did you notice while mixing the ingredients?
- What happens when you stretch your slime? Squish it? Roll it into a ball and bounce it?
- Where could we see similar materials or textures in real life?

What could we try differently?

- Use glitter to make sparkly slime
- Use glow-in-the-dark paint to make a slime that glows in the dark
- If you want to make “fluffy” slime, you can use 3 cups of foam shaving cream instead of water in your recipe.

What happened?

In this activity, you made your own slime, but how? Glue is very runny. When you mix contact solution with glue, a chemical reaction occurs that causes the glue to get thicker. This reaction takes some time, which is why you have to stir and knead the slime. Eventually the slime will become rubbery and stretchy instead of "liquidy". You can dig deeper if you want to learn the science behind it.

Encouraging language tips (for parents)

You are thinking like a scientist by experimenting and observing changes.

Encourage your daughter to make choices during the activity, like selecting the colour of the slime, the texture, and testing different amounts of the ingredients. Avoid suggesting that chemistry and experimenting are difficult or for 'certain people'. Reinforce the idea that mistakes, creativity, and curiosity are all natural and important parts of learning, especially of STE(A)M learning.

Connect this experiment to real-world examples like everyday products around the house, including cosmetics, cleaning products, gels, etc. You can explain how scientists often try mixing different materials to test them and create the products we use. Using simple materials available at home, this activity shows that STE(A)M learning is accessible, creative, and fun.

Extension (for older children 13–18)

- Explore the chemistry behind it.
- Determine the best recipe for your own slime by changing the amount of contact lens solution and observing physical properties.
- You can find a more advanced experimental procedure here.

References

Finio, B. (n.d.). How to Make Slime. Science Buddies. Available at:

https://www.sciencebuddies.org/stem-activities/how-to-make-slime#exploremore

For a more advanced experiment: Agee, S., Finio, B. & Lohner, S. (n.d.). Slime Chemistry. Science Buddies. Available at:

https://www.sciencebuddies.org/science-fair-projects/project-ideas/Chem_p012/chemistry/make-slime

Activity 3

Activity title:	Make Marbled Cards
Related module:	Module 3
STE(A)M area(s):	☑ Science ☐ Technology ☐ Engineering ☑ Arts ☐ Mathematics
Contributing partner:	Symplexis
Age range of children:	☑ 8-12 years old ☐ 13-18 years old
Estimated duration:	20-30 minutes

Purpose of the Activity

Children will have the opportunity to create marbled paper cards while practising science. This is a very fun and easy sensory STE(A)M project. This activity connects to everyday life through art, printing, and design and supports girls' curiosity, creativity, self-expression and need to experiment through hands-on STE(A)M learning.

Skills emphasised

☑ Critical thinking
☑ Creativity
☑ Problem-solving
☑ Communication
☑ Collaboration
☐ Digital skills

Materials needed

- Shaving cream (not gel)
- Liquid food colouring or washable paint such as liquid watercolour or tempera paint (at least two different colours)
- Paper, start with heavier paper like cardstock or construction paper
- Toothpicks
- Popsticle stick, scraper or ruler

Food colouring can stain! If you are worried, use washable paint and wear mess-friendly clothes.

Step-by-step instructions (for parents)

- Step 1: Spray some shaving cream onto a protected work surface.
- Step 2: Spread the cream to a thickness of about 1.5cm thick.
- Step 3: Add a few drops of the food colouring on top of the shaving cream but make sure you leave some space between the drops.
- Step 4: Use the toothpicks to drag the food colouring around, creating a pattern.
- Step 5: When you are happy with the result, place the paper carefully on top and gently press it. Let it sit for about 5-10 seconds.
- Step 6: Lift the paper, carefully remove excess shaving cream with a scraper or ruler, and let your artwork dry.
- Step 7: Your card is now ready!

What happened?

In this activity, you made your own marbled cards. You used shaving cream, which is made of a mixture of soap and water with a gas that can turn liquid into foam when you spray it out of the bottle. Soap is a surfactant, which means its molecule has a hydrophilic (water-loving) and hydrophobic (water-repelling) end. Liquid food colouring is a mixture of dye in water or alcohol, and therefore is hydrophilic. When you drop the food colouring on the shaving cream, it won't get soaked in, as it can only interact with the hydrophilic parts of the soap molecules and is repelled by the hydrophobic parts. Even if you swirl the colours with a toothpick, you still see a distinct separation between the colours and the shaving cream.

When you put the paper on top of the colour pattern, the food dye gets soaked into the paper, transferring the whole pattern onto its surface. This is because paper is made from wood pulp, which mainly consists of cellulose found in cell walls of green plants: a hydrophilic molecule. The hydrophilic food dye can spread easily across the paper, creating a beautiful marbled pattern (Lohner, n.d.).

Reflection & discussion prompts

- What happens when you mix the colours? Do they mix with shaving cream, or do they stay separate?
- What would happen if we used more colours or moved them differently?
- Where might we see marbled designs in everyday life?

Encouraging language tips (for parents)

There is no right or wrong design; what matters most is your creativity.

Let your daughter create her own patterns and encourage her by mentioning the interesting patterns she created. Allow her to lead the artistic process and avoid suggesting that art or science activities are difficult or for 'certain people'. Parents can explain how artists experiment

with textures, colours, and materials to create patterns used in everyday objects like fabrics, wallpapers, and greeting cards.

References

Lohner, S. (n.d.). Make Marbled Cards Using Science! Science Buddies. Available at: https://www.sciencebuddies.org/stem-activities/paper-marbling

Practical activities (module 4: Digital & mathematical thinking in everyday life)

Activity 1

Activity title:	Digital detectives: Exploring safe and smart online choices
Related module:	Module 4
STE(A)M area(s):	☐ Science ☑Technology ☐ Engineering ☐ Arts ☑Mathematics
Contributing partner:	HIP, Romania
Age range of children:	☐ 8-12 years old ☑ 13-18 years old
Estimated duration:	30-40 min

Purpose of the Activity

This activity helps your daughter explore how to use the internet in a safe and smart way. Together, you will look at apps she uses and reflect on what is safe to share and how to recognise trustworthy content. It connects to everyday online behaviour and supports confidence, critical thinking, and responsible participation in the digital world.

Skills emphasised

☑ Critical thinking
☐ Creativity
☑ Problem-solving
☑ Communication
☐ Collaboration
☑ Digital skills

Materials needed

- A smartphone, tablet, or computer
- Internet access
- Pen and paper (optional)

Step-by-step instructions (for parents)

- Ask your daughter to choose one app or platform she uses often
- Explore together what information is visible on her profile and who can see it
- Review privacy and safety settings and discuss how they can be adjusted
- Look at posts or videos and discuss what seems reliable, exaggerated, or misleading
- Talk about online risks such as oversharing, scams, or interacting with strangers
- Agree together on 2–3 personal "smart online rules" she wants to follow

Tips: Encourage your daughter to lead the activity by choosing the platform and sharing her perspective. Avoid criticising her current online behaviour and focus on open discussion. Reinforce that digital skills can be learned by everyone and that making mistakes is part of becoming more confident and informed online.

Reflection & discussion prompts

During the activity or after, ask your daughter the following questions:

- What do you notice about how people present themselves online?
- What surprised you while checking the settings?
- Why do you think some content can be misleading?
- How can you protect your information online?

Simplification (for 8–12 years old)

- Focus on basic ideas such as what is safe or not safe to share online. Use simple examples or stories and create a short "internet safety list" together (e.g. do not share personal information, ask before clicking or downloading).

Encouraging language tips (for parents)

Use encouraging language, such as:

- "That's an interesting point. I hadn't thought about it that way."
- "What do you think is the safest option here?"
- "Let's check this together and see what we find."

Activity 2

Activity title:	Smart choices: Spend, save & stay safe
Related module:	Module 4
STE(A)M area(s):	☐ Science ☑ Technology ☐ Engineering ☐ Arts ☑ Mathematics
Contributing partner:	HIP, Romania
Age range of children:	☑ 8-12 years old ☐ 13-18 years old
Estimated duration:	30-40 min

Purpose of the Activity

This activity helps your daughter understand how to make simple decisions about money in everyday life. Together, you will explore spending, saving, and safe buying habits. It builds confidence, responsibility, and shows how math and digital skills are useful in real situations.

Skills emphasised

☑ Critical thinking
☐ Creativity
☑ Problem-solving
☑ Communication
☐ Collaboration
☑ Digital skills

Materials needed

- Paper and pen
- A phone, tablet, or computer with internet access (optional)
- Real or imaginary prices (e.g. from a shop or website)

Step-by-step instructions (for parents)

- Ask your daughter to choose something she would like to buy (a toy, game, or outing)
- Set a simple budget together (real or imaginary)
- Look at 2–3 options and compare prices or features

- Talk about “need” vs “want” and what makes something worth buying
- Decide together whether to spend now or save for later
- Discuss basic safe buying habits (ask before buying, use trusted websites)

Tips: Encourage your daughter to take the lead in making the decision and explaining her reasoning. Avoid suggesting that managing money is difficult or not for everyone. Emphasise that learning to make choices takes practice and that mistakes are part of learning. Connect the activity to real-life situations she cares about.

Reflection & discussion prompts

During the activity or after, ask your daughter the following questions:

- What helped you decide which option to choose?
- What surprised you when comparing prices?
- Why did you decide to spend or save?
- How can you make safe choices when buying online?

Extension (for older children 13-18)

Encourage creating a simple monthly budget (income, spending, saving). Compare prices across different websites, including discounts and reviews. Discuss topics such as online payments, advertising influence, and how to recognise unreliable offers or scams.

Encouraging language tips (for parents)

Use encouraging language, such as:

- “That’s a great idea. How did you decide that?”
- “What do you think is the best option for you?”
- “Let’s look at this together and compare.”

Activity 3

Activity title:	Where is math hiding? Discovering numbers, patterns and logic in everyday life
Related module:	Module 4
STE(A)M area(s):	☐ Science ☑ Technology ☐ Engineering ☐ Arts ☑ Mathematics
Contributing partner:	HIP, Romania
Age range of children:	☑ 8-12 years old ☐ 13-18 years old
Estimated duration:	20-30 min

Purpose of the Activity

This activity helps your daughter discover how math is part of everyday life. Together, you will explore numbers, patterns, and simple problem-solving in daily situations. It builds curiosity, confidence, and shows that math is useful, creative, and all around us.

Skills emphasised

☑ Critical thinking
☑ Creativity
☑ Problem-solving
☑ Communication
☐ Collaboration
☐ Digital skills

Materials needed

- Everyday household items (food, clothes, objects)
- Paper and pen (optional)
- Measuring tools (optional – cup, spoon, ruler)

Step-by-step instructions (for parents)

- Tell your daughter you will go on a “math hunt” together
- Look around the house or outside and find numbers, shapes, or patterns
- Ask simple questions (how many? which is bigger? what comes next?)
- Use a daily activity (cooking, shopping, planning time) to spot math

- Try a small challenge (count, compare, estimate, measure)
- Reflect together on where math appeared during the activity

Tips: Encourage your daughter to lead the exploration by choosing where to look and what to observe. Avoid presenting math as difficult or something only some people are good at. Emphasise that everyone can develop math skills through practice and curiosity, and that mistakes are part of learning.

Reflection & discussion prompts

During the activity or after, ask your daughter the following questions:

- What do you notice around you that uses math?
- What place where you found math surprised you the most?
- Why do you think math is useful in daily life?
- Where else could we find math?

Encouraging language tips (for parents)

Use encouraging language, such as:

- “That’s an interesting idea, let’s try it.”
- “What do you think will happen?”
- “I like how you noticed that pattern.”

Extension (for older children 13-18)

Encourage estimating and calculating real-life costs (shopping, outings), tracking time or daily habits, and comparing different options using numbers. Ask for explanations and reasoning behind decisions to deepen understanding.