STEAM APPROACH IN TEACHING FOREIGN LANGUAGES

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Annotation
This article has been written to help teachers to increase the pupils` language skills, STEAM stands for Science, Technology, Engineering, Art, and Math. Each of STEAM's five subjects share a common approach and focus. They require gathering and using evidence to create knowledge or solve problems. STEAM learning happens naturally everyday as children explore, play, and try new things. When young children have the opportunity to investigate the world around them, they learn and experiment with new STEAM skills and theories. Research shows there is a positive relationship between early STEAM experiences and future success in school. It provides an interactive learning experience and is intended as a professional development resource to help supervisors, coordinators, managers, and education staff understand how young children engage with STEAM concepts and ideas. This document will also help adults identify strategies for exploring and developing STEAM in early learning settings.

Key words: Science, technology, engineering, art, mathematics, young learners, critical thinking, explore, practice, investigate

What is STEAM?

Children engage in STEAM everyday STEAM learning begins early. However, STEAM is not about showing an infant or toddler flashcards or teaching equations. Children do the hands-on things every day. STEAM learning includes examining shapes, building forts from cardboard boxes, playing "grocery store," pouring liquids and other materials, filling and emptying containers of different sizes, and mixing paints to create new colors. In addition, these are only a few examples. Many of children's everyday activities use STEAM skills, even if we do not typically think of them in that way. When children play, they explore and build skills and theories about the world. When young children investigate their environment, they experience the satisfaction that can come from investigation, discovery, and solving problems. Adults can foster children's development of STEAM skills by providing learning opportunities and materials that support exploration and discovery. Because STEAM activities are interactive, and exploration based, they provide many opportunities for children who are dual language learners to be actively involved.

S is for Science. Children are natural scientists. They try to figure out just how the world works by engaging in a series of steps called the scientific method. The scientific method includes observing, forming questions, making predictions, designing and carrying out experiments, and discussing. Even infants and toddlers are using a basic form of the scientific method (or performing little experiments) as they explore and discover the world around them! Children find patterns and build theories to explain what they see, and collect "data" to test those theories. A theory is like a guess or possible explanation for something. A toddler makes footprints after she walks through a puddle. She may form a theory based on her observation of her footprints, that the way she walks changes the size and shape of the prints. She then tests her theory by hopping on one foot or walking on her

toes to see if her prints change. Like scientists, children learn from others. They watch what children and adults do and learn from trying to repeat what they have seen or by asking questions and seeing the results.

T is for Technology. When we think of technology, cell phones and computers often come to mind. However, the "T" in technology also stands for any type of fabricated object. Technology includes simple tools such as pulleys, wheels, levers, scissors, and ramps. They support children's cognitive development, because as children play with these tools, they observe and learn from the underlying cause and effect. These simpler technologies allow children to understand how tools help us accomplish tasks. Children can see the cause and effect behind them, like how adding wheels below a large object makes it easier to move, or how raising a ramp makes a ball roll faster.

E is for Engineering. Engineering applies science, math, and technology to solving problems. Engineering is using materials, designing, crafting, and building – it helps us understand how and why things work.

When children design and build with blocks or put together railroad tracks, they are acting as engineers. When children construct a fort of snow, pillows, or cardboard, they are solving structural problems. When they figure out how to pile sticks and rocks to block a stream of water or how objects fit together, they are engineering.

A is for Arts. A creative mindset is critical for STEM subjects. That is why the arts was added to STEM to become STEAM. Scientists, technology developers, engineers, and mathematicians need to innovate and solve problems creatively. The subjects in STEAM are similar in their approach to learning. Active and self-guided discovery is core to the arts and to STEAM learning. Children engage in painting, pretend play, music, and drawing. Art is sensory exploration. Children can feel the paint on their fingers and see colors change the way paper looks. As they grow, children include symbols in their art that represent real objects, events, and feelings. Drawing and play-acting allow them to express what they know and feel, even before they can read or write. Music is also linked to STEAM skills such as pattern recognition and numeration. Research shows that early experience with creative arts supports cognitive development and increases self-esteem.

M is for Math. Math is number and operations, measurement, patterns, geometry and spatial sense. From birth until age five, children explore everyday mathematics, including informal knowledge of "more" and "less," shape, size, sequencing, volume, and distance. Math is a tool children use every day! Babies and toddlers learn early math concepts like geometry and spatial relationships when they explore new objects with their hands and mouths. Teaching staff support math learning with infants and toddlers by intentionally using math language throughout the day. They make math concepts visible when they connect them to objects and actions. Infants begin to understand the math concept "more" early on and often use it to signal they want more food or drink.

Children are motivated and persistent problem solvers

Children are naturally motivated to solve problems. When they have an active role in learning, they decide what they will do and learn from what happens. When children are interested in an outcome, they create theories that they test and modify all on their own. When children work on a task on their own, they experiment, correct mistakes, and develop strategies.

Researchers showed 2- to 4-year-olds a set of nested cups during a free play session. Later, they gave the children a chance to play with a set of separated cups and no instructions. Automatically, the children picked up the cups and worked hard to figure out how to nest them.

Executive function

When children direct their own exploration, they are also exercising other skills, like focusing their attention, motivation, decision making, planning their behavior, and problem solving. These are all

part of a set of skills that form the umbrella term "executive function." Other executive function skills include switching between tasks, organization, self-control (regulating emotions and behavior), and memory.

Logical thinking

There are few instances in children's lives where they see consistently predictable events or interactions. Sometimes the unexpected happens. Flipping a light switch usually results in a light turning on. But if the bulb is burned out, the switch doesn't turn on the light. In fact, most events we observe as adults are somewhat unreliable: Cars don't always start when you turn the key in the ignition, and hitting "send" on an email doesn't always send the message if you've attached a file that is too large. Children, too, must learn how to navigate a world that is not 100% reliable. Luckily, they are quite flexible learners, which equips them with the ability to see patterns in all the "data" they collect about the world — no matter how inconsistent that data may be. As children track these cause-and-effect relationships, they are quietly keeping a type of statistics. And they use this data to form theories about relationships that aren't always reliable.

Supporting STEAM Learning

A great deal of STEAM learning happens during activities like free play, where children are given the opportunity to freely explore materials and make discoveries. Teaching staff can foster STEAM exploration during play and social interactions through the use of scaffolding. Scaffolding means offering the right support and structuring the environment to take a child's knowledge to the next level. Just as a scaffold supports construction, adults can scaffold a child's experience. To scaffold an experience, adults can provide assistance by cuing, prompting, questioning, modeling, discussing, and telling. By observing what children are doing, and then asking questions and working with them as they develop their own understanding of the world, adults can help walk them through increasingly complex ways of thinking. For children with special needs, scaffolding might include simplifying the activity by breaking it into smaller steps or reducing the number of steps in the task. A little guidance can help children reinforce their knowledge, correct misconceptions, and extend their thinking. This helps them figure out even more than they manage to learn on their own. For instance, children may enjoy watching a sand wheel spin as they pour sand through it. Yet they may not notice the connection between the amount of sand they pour and the speed the wheel turns. A question such as "How can you make the wheel go faster?" can help children notice this relationship and prompt further investigation.

Speaking the language

One of the best ways adults can support STEAM learning is with language. The language teaching staff use when they engage with children can encourage creative thinking, reflection, pretend play and problem solving. By observing, listening, and responding to children's interests, adults support their curiosity. When given the chance to communicate their thoughts and ideas, children develop their own thinking. Asking open-ended questions is an important way to guide a child's exploration. This can be useful for children of all ages — even infants can give non-verbal responses. Using props and/or engaging in the process while using new vocabulary helps young children, including those who are dual language learners, see the vocabulary in action. Descriptive observations are a great opportunity for all children to build their vocabulary. For example, "This rock is very hard." or "It feels bumpy." The language of STEAM revolves around problem solving and the scientific method: observing, asking questions, making predictions, experimenting and discussing. It is important for teaching staff to model this process so that children become familiar with the steps involved in solving problems. This includes thinking out loud, and using STEAM language, such as "observe, explore, predict, experiment, etc.

Problem solving

Asking questions helps children reflect on what they are trying to do, whether it worked or not, and how to plan their next move. Listening to a child helps us learn where the child is in her thinking and helps extend her learning. It is helpful to adjust your questions for children who are dual language learners to meet their current levels of receptive and expressive English, and accept responses in the home language. This will support children in engaging and persisting when solving problems. These questions can be used with children of all ages. Here are some useful questions to encourage problem solving:

• What are you working on?
• What do you notice?
• What did you try?
• What happened?
• What will you do next?
• What else could you try?
• What do you think will happen?
• What was different the second time?

Math concepts

Everyday language can make a big difference in a child's understanding of early math concepts. Here are some phrases and questions that help children think about math concepts in any of their activities.

When an adult asks, "Which one is bigger/smaller/heavier?" a child can measure, estimate, and describe.

"You have a big ball, and I have a small ball. Your ball is bigger than mine!" a toddler can analyze.

Other questions to ask:

• How many are there? (to compare or solve a problem)
• Which one is smaller?
• Which one is smallest?
• How often?

Children use math concepts frequently while they play. And it turns out that the more "math language" children hear daily, the greater the growth of their math knowledge. Adults can increase math talk even in activities that aren't math-specific. During clean up time, model and encourage children to sort toys back into the correct bins. This supports classification skills. During snack or lunch, support geometry thinking by talking about the shapes of foods, such as, "If I cut the sandwich like this, it will make two triangles."

• Other simple concepts include speed: "How fast will it go?"
• Distance: "How far is it?"
• Measurement: "Who stacked the most blocks?"

Creativity

Children come to the world with an open mind and may be more likely to think outside the box. A child's drawing might be a bird or a superhero or something else entirely. Respond to children's work in a way that is not judgmental (e.g., "Nice work!"), but is objective and encourages children to describe what they've done:

• Tell me what you are working on.
• You made some interesting sounds with your shakers.
• Tell me about your drawing.
• I notice you used four different colors and filled the entire page.

This helps us learn what a child is thinking without making any judgment or assumption about her work. Answering open-ended questions also gives a child important practice communicating ideas through reflection, using narrative and descriptions. Ask children scientific process or math questions to help them think creatively:

• What happens if you combine the two colors?
• How did you make that shape with your clay?
• What happens if you move your shaker really fast/really slow?
• How did you make that stand up?

Individualizing Instruction

A culture of inquiry includes all learners. In order to scaffold learning, first observe individual children. Next assess their understanding of concepts and ability to use materials. Then change your instruction or environment to meet their individual needs. Children who are dual language learners may understand STEAM concepts but need help developing the English vocabulary to talk about what they know. It can be helpful to pre-teach vocabulary using the STEAM tools and materials for exploration. This helps children to make connections between the objects and the English labels for those objects. Allow children to speak in the language(s) in which they feel most comfortable to support curiosity and questioning. Also, visual supports can give children another way to communicate, instead of relying solely on verbal communication. This approach is appropriate for working with all children, including those learning more than one language or those who may have a language delay. Additionally, it is important to adapt materials when necessary, to make sure that all children can participate as independently as possible. Some possible modifications include: reducing the number of steps in a task, placing the materials in positions that make them easier to access and use, providing adaptations to make tools easier to grasp, and making materials larger or brighter.

Activities to foster STEAM learning

STEAM really is all around us, ready to be discovered by our willing young explorers. We can:

• Be active and hands-on to encourage STEAM learning
• Learn about STEAM with our colleagues
• Help children learn and explore STEAM concepts

Creative thinking

Children come to the world with an open mind — their brains are primed to explore and learn. They naturally "think outside the box" because their thinking hasn't been "boxed" by experience yet.

1. For this activity, on separate pieces of paper, write down four or five everyday objects you might find in a classroom (such as small paper cups, pencils, craft sticks, poem, and spoons).
2. Divide into small groups of two or three.

Make sure each small group has one piece of paper with one object written on it.

3. In two minutes, think of as many creative uses for the object as you can.
4. Then share the different uses for each object with the larger group, and together select the most creative uses for one of the objects.

Instructions for trainers

After the teams are done, ask the groups:

• How many of you only listed ways that you have actually used the object?
• How many listed ways to use the items that you have never used before?
• How many of you were surprised by the creativity?

• How many ideas were truly "out of the box?"
• How many other ways do you think preschool children might come up with to use your object?
• With less background knowledge, preschool children seem to have limitless ideas and will think of dozens of other ways to use the objects.
• As adults it is important to take care and try not to impose too many of your own ideas before children have had the chance to explore.

Conclusion

STEAM is all around us

Nature provides one of the best environments for spontaneous exploration, play, and learning. A park, a field, the sidewalk outside your building — any outdoor space works! Unstructured playtime in the natural world contributes to STEAM learning in many ways. Direct experience with the natural world provides opportunities for problem solving and observation. The outdoors provides a wide variety of sensory experiences. This encourages informal learning as children explore and make discoveries.

• Observe different textures, smells, and sounds.
• Compare living and non-living things.

The diverse materials found outdoors can facilitate imaginative play. Gardening indoors or outdoors helps children learn about the natural world, and lets children practice math, science, and engineering in a hands-on way.

• Bringing natural materials inside allows for continued exploration and discovery.
• Plants, stones, and sticks can be used to count, build, and create.

List of used literature

1) EN.Oxforddictionaries.cpm.WWW.
2) Learning to Teach integration in the Secondary School: A Companion to School ExperienceBy Jon Davison; Jane Dowson
3) Teaching Language items in Middle Schools: Connecting and CommunicatingBy Sharon Kingen
4) Teaching Secondary English: Readings and ApplicationsBy Daniel Sheridan