

Building Communication with STEM

The title page appears on screen. Upbeat music plays in the background throughout the video.

Text on screen: Ontario Science Centre; An Agency of the Government of Ontario

Animated graphics swipe away the title page and are replaced with small, colourful shapes on a light background. The shapes twist and pulse in place.

Text on screen: Building Communication with STEM

Animated graphics sweep away again to reveal Jessica. She is standing in a craft room. There is a whiteboard on an easel beside her. On the whiteboard is a drawing of a plant, showing it both above and below ground, with the sun shining in one corner and a bee flying towards the plant.

Jessica: Hello, I'm Jessica, Early Childhood Programming Specialist at the Ontario Science Centre.

Overlaid text on screen: Jessica (she/her); Early Childhood Programming Specialist, Ontario Science Centre.

Jessica: In our previous video, we learned about Ask, Test, Repeat and the importance of inquiry, exploration and iteration to learning. In this video, we'll focus on communication, looking at how STEM and student-centred play- and inquiry-based learning can foster the development of communication skills for all students.

Communication is a focus in Kindergarten as young students develop their vocabulary, question-making and problem-solving skills, all while making sense of the world around them. Communication is not just *part* of the foundations of language, but also a *key* attribute within math processes and inquiry.

Animated graphics sweep away to reveal small, colourful shapes on a light background.

Text on screen: Minds-on/guiding questions

Animated graphics sweep away to reveal a split screen with Jessica, and text on screen appearing as she reads it.

Jessica: Take a minute to pause and think about what communication looks, sounds and feels like in your classroom. What opportunities do you create to support *all* students in developing their oral and non-verbal communication skills? How do you leverage STEM, play and inquiry in your classroom to develop communication skills?

Split screen shows text, and an educator having a conversation with her students while sharing lunch time together.

Jessica: Questions like these can help us as educators think of intentional moves when creating our classroom environments, routines, instruction and assessment practices.

Animated graphics sweep away to reveal text.

Text on screen: Action

Animated graphics sweep away to reveal Jessica.

Jessica: The learning space is a third teacher. Creating a learning space that centres on STEM, play and inquiry has a positive impact on students' communication skills. The best way to create that supportive learning environment? With intention!

Overlaid text on screen: Choice of texts and materials; open-ended invitations to learning

Jessica: The intentional choice of texts and materials is critical to language development in Kindergarten. Texts that spark interest and curiosity also encourage reflection and expression. When choosing texts to promote STEM, play and inquiry, consider who the students are in front of you.

An educator holds up a child-like drawing to a diverse group of children. She points to an image in the drawing and asks the children a question. One child raises their hand, answers correctly, and gets acknowledged enthusiastically. The educator then points to another image in the drawing.

Jessica: Selecting culturally relevant and responsive texts affirms student identities and a sense of belonging.

An educator holds up a picture book to a diverse group of children seated on the floor in front of her. She asks the children to raise their hands by raising hers first.

Jessica: We know, when students see themselves represented, they are more willing to engage in learning and to share their feelings, thoughts and ideas. Selecting texts that enrich students' imaginations and provide the initial engagement of inquiry is pivotal to inspiring students to demonstrate their creativity and problem-solving skills.

Jessica appears full screen.

Jessica: One way to encourage communication is to model think-alouds. Read the text and stop at the problem of the story. Share your own wondering with a sentence starter that students can mimic:

Split screen shows text and Jessica.

Text on screen: I wonder...

I can/could...

I would try/use...

Jessica: "I wonder how we could help with this problem? I can. . ." or "I would. . ."

Split screen shows text, as above, and children at a play table examining ice cubes with a magnifying glass.

Overlaid text on screen: A3.4 express personal thoughts and feelings about texts

Jessica: Give time for students to think about possible solutions they might have, pair with a partner to discuss and then share with the whole class

Split screen shows text, and Jessica.

Text on screen: Modelling sentence structures

Providing sentence starters

Think-Pair-Share

Jessica: Think-pair-share gives students an opportunity to build the comfort and confidence needed to share in larger group settings as they first consider and ideate on their own, then engage in a partnered experience before sharing with the larger group.

A group of children experiment together at a play table. Each team of children is equipped with a large tray, ice cubes, a measuring cup, a clear plastic cup, a funnel, and a magnifying glass.

Jessica: This strategy also provides students with an opportunity to question and explore different perspectives from their peers. To further develop problem-solving skills and communication, provide an invitation to learning at a centre or makerspace that students can explore through questions.

Split screen shows Jessica, and text as read by Jessica.

Jessica: For example, “What is the problem? How would you solve this problem? What could you create to solve the problem?” Open-ended questions provide multiple entry points and limitless possibilities, creating a safe engagement opportunity for students.

A group of children play together with toy dump trucks while an educator takes more toys for them out of a clear plastic bin.

Overlaid text on screen: B12.1 state problems and pose questions

Jessica: STEM tasks with open-ended invitations to learning also provide a chance for students to problem-solve, create, discuss, test, iterate and re-discuss their thinking –

The children have made little vehicles with sails from building blocks, wooden wheels, sticks, and construction paper. Each child blows on their sail to race their vehicle across the floor.

Jessica: – all steps that help reinforce a growth-mindset, as discussed in the second video.

Jessica appears full screen.

Jessica: A growth mindset is important for students developing STEM skills, as it can help them persevere through problem-solving challenges. Careful consideration of materials is equally

important when creating invitations to learning, working through the inquiry process or stimulating discussion. Math manipulatives, loose parts and natural materials encourage students to explore and engage in play and inquiry while representing their thinking in a hands-on experience. When creating STEM tasks and inquiries, think about which materials can create sensory experiences for students who may have limited or non-verbal communication.

A group of children are grouped together with a pile of toy building components, like wheels, gears, blocks, and sticks. Each child is creating their own object from the materials provided.

Jessica: Encouraging students to self-select materials for their STEM tasks or inquiry promotes engagement and the flexibility to explore. It's also a great opening for discussion: "Why did you choose to use the wooden sticks? What will you use the sticks for?"

An educator joins the children in scooping up colourful beads and putting them into their own clear plastic cup.

Jessica: When you're conferencing, take part in play, too! When you take part in play and inquiry, it's a chance for students to see you create, struggle and model your growth mindset and language.

An educator displays a toy air-powered car. She blows up a balloon attached to the car.

Jessica: It's an entry point to name and label materials, actions and processes so students can echo or mimic, broadening their vocabulary, deepening meaning and illustrating ways they can express their knowledge and understanding.

Animated graphics sweep away to reveal Jessica full screen.

Overlaid text on screen: The Power of the Arts

Jessica: Communication is not just expressed orally: it is also non-verbal. Remember, not every student is ready to communicate orally . . . yet. That's why giving students the chance to express their thoughts and ideas in a variety of ways is crucial.

Split screen shows text, and Jessica. The Word "Arts" is inserted in red as Jessica talks.

Text on screen: Science

Technology

Engineering

Arts

Mathematics

Jessica: While STEM provides students with hands-on experiences to express their feelings, thoughts and ideas, STEAM reminds us of the importance of the arts in the process.

Split screen shows text, as above, and a child creating a happy face and flowers from modelling clay.

Jessica: Think about ways to incorporate visual arts, drama, dance and music so students have many ways to communicate.

Jessica appears full screen.

Overlaid text on screen: D24.3 express their responses to music by moving, by making connections to their own experiences, or by talking about the musical form

Jessica: For instance, after reading texts about celebrating uniqueness through song, begin an inquiry about musical instruments. Include parents, guardians and caregivers in this inquiry by asking them to share cultural music and instruments.

Listen to this music and encourage students to respond by dancing. Discussions about instruments, music and feelings can be interwoven.

A diverse group of children make instruments from cardboard boxes and tubes, pipe cleaners, and tape.

Overlaid text on screen: B12.5 design, build, and test models and structures

Jessica: With this knowledge, students can then engage in a STEAM activity by creating an instrument from recycled materials. Students can draw plans prior to building or after they have created their instrument.

Jessica appears full screen.

Jessica: Once the instrument is built, students can “compose” their own song with their instrument. Celebrate by having a class performance of songs.

Animated graphics sweep away to reveal small, colourful shapes on a light background.

Text on screen: Assessment

Animated graphics sweep away to reveal Jessica full screen.

Jessica: Capturing moments, like a STEAM inquiry learning journey or a conference with students, is important not only to make the learning visible for students and their parents and guardians, but also to support on-going assessment to guide instruction and next steps for students.

Split screen shows Jessica and text appearing as she reads it.

Jessica: Pause to reflect on your assessment practices. Ask yourself, “How do I document learning, especially when focusing on communication? How are students included in the assessment process, such as self-documenting? Are there digital tools that could be used to foster or assess communication?”

In the Kindergarten curriculum, pedagogical documentation refers to the process of gathering and analyzing a wide range of documentation of a student's thinking and learning over time, often in collaboration with the student and their parents or other family members.

Split screen shows text, and an educator sitting on the floor with her students. One is wearing a chef's hat; another has a stethoscope.

Jessica: The insights gained form the basis for determining next steps in a student's learning. You want to capture progress throughout the STEAM learning journey, especially as students communicate their thinking in a variety of evolving ways.

Jessica appears full screen.

Jessica: Pedagogical documentation needs broad examples over time to ensure you can show growth, even small steps, in a range of ways.

Split screen shows a diagram, and Jessica. The diagram, titled "Fayer Model", consists of a large square divided into four equal, smaller squares, with a small oval in the middle. Each smaller square and the oval are labelled, as below.

Text on screen:

Fayer Model

Definition	Characteristics
-------------------	------------------------

Word	
-------------	--

Examples	Non-Examples
-----------------	---------------------

Jessica: For example, this could mean capturing how students have defined what a word means to them through scribed thoughts on a Frayer Model, a loose parts representation, drawings, acting it out or words at the start of a discussion.

Jessica appears full screen.

Jessica: If scribing or making anecdotal observations, you can use different colours to indicate different moments in the learning journey. For instance, blue could represent initial communication with subsequent ideas represented in green. This strategy helps to show strengths and areas of growth, creating insights for possible next steps.

A group of children draw with different colours of chalk on a chalkboard wall decorated with painted-on stylised flowers and leafy vines.

Jessica: You can make learning visible for students by having a growing learning wall with inquiry process headings or a more organic mind map of the learning.

An educator leans in to discuss with a child what she is drawing on a whiteboard.

Jessica: Invite students into the documentation process. This helps to mitigate biases you might have as a documenter.

Jessica appears full screen.

Jessica: It also honours students' identities and voices as they share their joys, what they're proud of and even what they're trying to problem-solve; all this fosters meta-cognition as they

self-reflect.

You can also leverage digital tools to support both student communication and pedagogical documentation.

An educator sits on the floor and shows a child with a bandaged eye a computer tablet. The child interacts with the tablet and smiles.

Jessica: Check with your school board to see which digital tools are supported. When introducing digital tools to document learning, remember to integrate digital literacy lessons and to co-create learning goals and success criteria for safely using digital tools. Assistive technology supports, such as Boardmaker, are another thing to consider.

Jessica appears full screen.

Jessica: These can be used to create visuals and interactive digital stories or games students can engage in. Assistive technology helps make a more inclusive learning space, one where English or French Language Learners, minimally verbal and non-verbal students can participate.

Animated graphics sweep away to reveal small, colourful shapes on a light background.

Text on screen: Educator Considerations and Consolidation

Animated graphics sweep away to reveal an educator leaning in to assist children sorting colourful foam shapes and then shows a group of children stacking wooden blocks vertically.

Jessica: Throughout this video, we've explored how STEM, play and inquiry support communication. Here are some educator considerations to think about when planning instruction as well as collaborative and independent learning opportunities to support students with communication:

Split screen with text, as read by Jessica, and educators reading to a diverse group of children.

Jessica: Number one: Intentionally choose Culturally Relevant and Responsive Pedagogy texts where you can model, label and name to build vocabulary of all students, including English or French Language Learners. These texts can be a springboard for STEM activities.

Split screen with text as read by Jessica and children creating a poster together with brightly coloured markers then a child using scissors and construction paper to cut out shapes.

Jessica: Number two: Purposefully choose materials that provide a variety of opportunities for students to communicate their feelings and ideas. Loose part representation, hands-on learning experiences and incorporation of the arts enrich both STEM and communication skills development.

Split screen with text as read by Jessica and an educator admires the objects his students have made.

Jessica: Number three: Make learning accessible through multimodal pedagogy and diversified strategies, like pointing to visuals and assistive technology.

Split screen with text as read by Jessica and an educator demonstrates a learning game on a computer tablet to a diverse group of children. Each child leans in to react to the game on screen and laughs as they take their turn.

Jessica: Finally, Document and make learning visible in a variety of ways, including digital tools, and use methods like conferencing or small group activities and discussions.

Jessica appears full screen.

Jessica: Communication is essential to student success across the curriculum. By exploring a variety of means of communication, building language foundations and engaging in intentional play, inquiry and STEM, students accumulate fundamental tools that will support them throughout--and beyond--their academic lives.

Animated graphics sweep away to reveal text.

Text on screen: We hope you enjoyed this video, which is part of a series developed to support Ontario's kindergarten teachers in STEM education.

Be sure to check out other videos in this series along with additional classroom-ready resources and professional learning resources at OntarioScienceCentre.ca.

Animated graphics sweep away to reveal text.

Text on screen: Ontario Science Centre; An Agency of the Government of Ontario