The Littlest Learners

Presenting Coding Concepts for Preschoolers

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The Coding Corner allows children and their parents open access to play with the same toys and robots that they've used in the Coding Concepts program.

Coding is a set of complex skills that combines art, language, and logic. With so much learning and creating happening in digital worlds, there is a strong impetus to figure out how, and how early, to teach coding skills to kids.

However, underlying coding skills are concepts that very early learners can comprehend and practice in preparation to learn coding. These concepts are fundamental to much of the thinking and understanding that happens in STEM subjects. Presenting these concepts in library programming improves digital literacy and bolsters the work we do with early literacy skills. While parents and caregivers play a crucial role in using coding concepts in a child's daily life, librarians can help by embracing the role of media mentors.

At Carnegie Library of Pittsburgh, we are introducing early learners ages three to five and their parents and caregivers to concepts that precede the ability to learn coding skills. Most coding skill learning and practice is aimed at older elementary students, starting around fourth grade, which is when STEM learning gets a boost.

Coding can happen for early learners because this thinking is what we see when we say kids are little scientists. They are exploring and beginning to grasp how the world is organized (sorting), how to talk about a thing without it being present (signs and symbols), how things interact (conditional if-then), and how to predict what will happen next (sequences and patterns). They are even learning what happens when things don't go as expected (testing). And these are the concepts we have built into our program.

How, and How Early?

In "The Roots of STEM Success," the writers convey "what" (thinking dispositions), "when" (infancy onwards), and "who" (anyone who works with families) components for developing STEM skills:

> The STEM disciplines require not only content knowledge but also robust thinking dispositions—such as curiosity and inquiry, questioning and skepticism, assessment and analysis—as well as a strong learning mindset and confidence when encountering new information or challenges. These need to be developed in a child's early education, beginning in infancy and continuing through third grade to lay the roots for STEM success. And where can that happen? Libraries, for one, can address this . . . the lack of developmentally appropriate, strong STEM learning opportunities for families with young children represents a great opportunity for informal education.[1]

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The National Association for the Education of Young Children (NAEYC) also supports the idea that early learners should engage with concepts for future coding success: "Coding can be engaging and fun, but it's only meaningful when there are strong higher order thinking (HOT) foundational skills first put in place, helping young children understand the process of coding. Young children can't create meaningful experiences through coding without these foundational skills and without adults to help support their learning."[2]

At the same time, we want to ensure that how we introduce these concepts, and how we play with them, is developmentally appropriate. That's how we know we are not going to teach coding skills, but instead focus on presenting concepts that are already present in a child's daily life using the methods librarians have already honed.

Little Learners: Coding Concepts

The scene is very familiar. Parents, caregivers, and children gather at the library and sit together in a comfortable, friendly space. The librarian begins the program with a song and a welcome to everyone that includes an explanation that what we learn about today won't be a coding skill. It will be a concept that can be seen happening in coding and one that you can practice no matter where you are.

We present six concepts, each in a different program: (1) Sorting, (2) Sequences, (3) Patterns, (4) Testing and Trying Again, (5) Conditionals, and (6) Signs and Symbols. Each program is designed to define the concept, show how it is used, and show how it happens in a family's daily life, all wrapped up in the structure of a storytime with books, songs, and felt boards.

Librarians often start with Sorting, so here's a look at a program with that concept. After a welcome song, kids and parents hear that sorting is something computers and robots do all the time, but what you might not think about is so do we! Sorting happens when you put your groceries away at home, when you play memory games, when you find all the things in your house that are green, or when you stack blocks from biggest to smallest. That's all sorting!

We read a book like *Sam Sorts* by Martha Jocelyn or *Sort It Out!* by Barbara Mariconda and talk about how the characters use sorting. Then it's time to practice. There are many shapes in many different colors on a felt board. How should we sort them? By color then by shape? Or the other way? Another fun activity is to sort the audience. If you're wearing blue shoes, moo like a cow. If you're wearing white shoes, roar like a dinosaur.

There are different books and activities for each of the six concepts, too. For instance, during the Sequences session, we can

Making a pizza is an example of using a sequence, as is coding the Bee-Bot to go pick it up.

make a Sequence Symphony by handing out musical instruments and arranging pictures of the instruments on the felt board. Playing the instruments in order of the pictures demonstrates the idea of a sequence. Then you can change the order and make a new one!
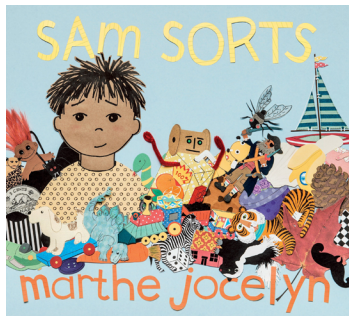
In Testing and Trying Again, try throwing a balloon into a bucket. In Signs and Symbols, code the librarian by making a sequence of arrows that the librarian follows. The arrows

Cubetto lends itself very well to parents and children playing together and telling stories with coding.

are the sign for which way to go. One common question here—what's the difference between sequences and patterns? A sequence is a set of things or events that happen in order. A pattern emerges when a sequence repeats.

When coding is mentioned, a quick mental image usually includes computers and screens, and that's fair. But coding, which really is just giving something instructions, can happen in many offline, screen-free ways.

After the storytime elements, we encourage parents and caregivers to play with their kids to practice the concept of the day. The main go-to is to reuse or expand on the activities already presented. Go back to the felt board, or pick up the instruments again, or try a new challenge with the balloon. During this guided play, kids and parents practice how they can use these concepts at home.

Books like *Sam Sorts* show how coding concepts can happen anywhere.

Some tools to help kids grasp concepts.

Digital Literacy and Media Mentorship

Many people associate coding with technology, and with that comes thoughts about how to use it, especially with young children. An important part of Little Learners: Coding Concepts is digital literacy and media mentorship.

Between the books and activities of the storytime, find a quick moment to speak to parents and caregivers with tips about media mentorship—something like "consider giving your devices a bedtime an hour before your child's bedtime" or "when selecting apps, look for ones that offer your child choices, rather than just expecting them to push buttons." Digital literacy is another area where we want to support parents and caregivers.

Digital literacy mirrors other kinds of literacy, such as developing a vocabulary, fluency, and mastery over the subject. These tips are meant to help adults looking for guidance about how to understand and talk about the myriad of forms information takes in a digital setting.

Librarians are already excellent at this. Some parents of early learners may not know about board books in just the same way that some parents might not know about good technology to use with early learners. They might think that the only way to go is through an iPad, just as they might want to start their kids on old classics that may or may not be suitable.

Librarians have a chance to show parents more options, to help them develop skills in finding reliable information online and to help them become more digitally literate.

Media mentorship is about guiding parents and caregivers to information about useful and healthy ways to use technology. "What apps are best? How much screen time should I allow? What could happen if I don't do this right?" These are questions that may arise, and libraries, as a platform for trusted information and informal learning, can answer them.

Accessing resources like the Fred Rogers Center or NAEYC are great ways to get ideas to help parents feel more confident in their choices about using technology. What we need to remember is that we have a chance to help parents and caregivers make informed choices about the role technology will have in how their child is experiencing the world.

Guided Play

Mr. Rogers put it like this, "Play is often talked about as if it were a relief from serious learning, but for children, play is serious learning."[3]

The real key to success in this program, or any other early learning program, relies on parents and caregivers using the ideas after they leave the library. For example, it's helping parents realize that sorting can happen at the grocery store, signs and symbols are on telephone poles and doorways, testing is a way we can deal with an unexpected outcome. We can help caring adults feel like they understand the concepts and can see how they apply to the everyday life they have with their child through play.

Guided play is also when we have time to use some coding toys. Our typical picks are Bee-Bots, Code-a-Pillar, and Cubetto because these toys are intuitive, robust, and fun, and they have a clear connection to the coding concepts. Not every family will be able to have these toys at home, which makes the library a special place and helps us fulfill our role as providers of access to technology. **&**

REFERENCES

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