

TEACHING PRESCHOOLERS ABOUT 1-TO-1 CORRESPONDENCE

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Numbers are an abstract concept. We use numbers to describe the quantity in a set (e.g., 3 cookies, 5 chairs, 1 dog). Children come to preschool with some understanding of the relationship between numbers and things that can be done with them (i.e., number sense). Their competencies grow as teachers and families model how to work with quantities. This includes describing the process of counting sets of objects, providing guidance in one-to-one correspondence and feedback. A range of opportunities to develop number skills can be provided with consideration for the equipment and materials available in the environment, adult-child and child-child interactions, routines, as well as planned learning activities. Frequency of opportunities a child has to develop number competencies is also a factor. When young children become competent counters, they can automatically use their number skills in everyday situations. Therefore, it's important for teachers to provide children with an abundance of opportunities to experience 1-to-1 correspondence in a variety of situations and with a range of materials.

Preschoolers' 1-to-1 Correspondence Competencies

Before they can become skilled counters, children master several foundational skills called the number core (National Research Council, 2009). These foundational skills include: cardinality, the number word list, 1-to-1 correspondences, and written number symbols. This micro-teach focuses on the foundational skill of 1-to-1 correspondence. (or something like that)

1-to-1 correspondence is the ability to pair each object counted with a number word. Children begin to develop 1-to-1 correspondence when they match one object with another (e.g., each cup with a napkin). As they combine their growing knowledge of the number word list with this ability, they begin to say a number in the number



word list as they touch each object in the set. A sense of rhythm helps a young child move her or his finger through space as they touch one object at a time.

Children's developing competence in these core areas is interrelated. Development in one core area is likely to positively influence development in another area. Experts in the field of early mathematics have described developmental pathways or trajectories for each of the core areas (National Research Council, 2009; Clements & Sarama, 2014). This developmental view of the number core is summarized in Table 1.

Table 1. Steps/Ages in Learning to Think About 1-to-1 Correspondences*

Steps/Ages	Skill	Related Competencies
STEP 1: Beginning Two & Three Year Olds	1.1 Counting	Counts accurately 1 to 3 things with 1-to-1 correspondence in time and space.
STEP 2: Later Two & Three Year Olds	2.1 Generalizing	Continues to generalize to counting new things, including pictures, and to extend accurate correspondences to larger sets (accuracy will vary with effort).
	2.2 Extending	Counts accurately 1 to 6 things.
STEP 3: Four Year Olds	3.1 Generalizing	Continues to generalize to counting new things and to extend accurate correspondences to larger sets (accuracy will vary with effort).
	3.2 Extending	Counts accurately 1 to 15 things in a row.

*Adapted from National Research Council (2009)

Strategies for Helping Preschoolers Learn and Apply 1-to-1 Correspondence

Engaging young children in the following five mathematical processes helps them develop and communicate their thinking about all areas of mathematics, including geometry (National Council of Teachers of Mathematics, 2000). These mathematical processes are: (a) representing, (b) problem solving, (c) reasoning, (d) connecting, and (e) communicating. Educators can teach children to use these five processes to *mathematize* or relate shape concepts to their everyday world. Tables 2 and 3 provide examples of language and materials that teachers can employ to help children use these processes.

Representing. Children may represent their understanding of 1-to-1 correspondence in a variety of ways. For example, a child might put one bear in each of a set of cups, or pass out one napkin to each child for snack. Or, a child might put one stem on each flower he draws. Understanding of one-to-one correspondence can also be represented through auditory and movement channels. A child might hit wooden rhythm sticks together once for each beat of a song, or she might jump once each

time her teacher claps her hands. The more experiences the child has in representing 1-to-1 correspondence in a variety of modalities and with a variety of materials, the firmer the child's mastery of the competency.

Problem solving. Problem solving and reasoning are the heart of mathematics (NAEYC, 2010). Young children learn by engaging with and solving meaningful problems in their everyday environments. Early educators can create developmentally appropriate situations in which children solve problems of 1-to-1 correspondence in the classroom environment. The following are examples of materials a teacher might provide to support 1-1 correspondence: one paintbrush for each paint pot in the art area; doll accessories such as socks and mittens in the dramatic play area so that children can match one sock with each foot, etc; accessories in the block area that include items that can be put together in 1-to-1 correspondence (e.g., one car for each garage, one baby cow for each adult cow); or knob puzzles in the manipulative area in which one shape fits in each hole. Routines also provide many opportunities for 1-to-1 correspondence. For example, one child's job might be to set the table for snack with one cup and one nap-

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kin, while another child's job is to pass out one carpet square to each child for circle time. Teacher-planned games also can provide an excellent opportunity to engage the whole child in 1-to-1 correspondence. For example, *Musical Chairs* requires one child to sit on one chair, and *Duck-Duck-Goose* requires the child who is "it" to touch each child's head once. Teachers can also support children's ability to solve problems of one-to-one correspondence in counting by demonstrating and describing how to line objects up in a row so that they can be counted, or by taking each item counted and removing it from the pile.

Teachers can support children's growing ability to use 1-to-1 correspondence by posing them questions that cause children to engage in putting objects in 1-to-1 correspondence (e.g., "Can you give each of your friends just one?"; "Do you think you can put one teddy bear in each muffin tin?"; "can you touch a new block when you say the next number?"). Acknowledging children's successes is also a powerful teaching tool (e.g., "Wow! You are touching each one just one time!").

Reasoning and proof. Teachers can challenge preschool children's reasoning by conversing with them about their work and asking them to explain the decisions they make as they work with 1-to-1 correspondences (e.g., "Why did you put one teddy bear in each muffin tin?"; "How many do you have? How do you know?").

Young children are better able to explore and reason about 1-to-1 correspondence when they work with objects they can manipulate. These might be commercially produced sets of objects for counting, or they might be objects found in the child's everyday environment or in nature (e.g., shells, buttons, cups).

Connecting. At the preschool level teachers can help children to see the relationship of 1-to-1 correspondences to their everyday world (e.g., "Look, there my glove has one finger for each finger on my hand," "there is one puzzle for each shelf"). Teachers can also help children begin to see the relationship between 1-to-1 correspondence and quantity (e.g., "How will we know how many apples are in the basket? Let's count them together"). Teachers can help children begin working



on 1-to-1 correspondence by starting with small groups of objects and pairing that group with practice on the number word list.

Communicating. Verbalizing, drawing, writing, gesturing, and using concrete objects or symbols can help children share their ideas about 1-to-1 correspondence with other children and adults. As children learn to use 1-to-1 correspondence they can begin to verbally count quantities of objects as they touch each one. Teachers can take advantage of opportunities that occur naturally to model and encourage touching each object as they touch it.

Strategies for Supporting Dual Language Learners

Teachers can use several strategies to help Dual Language Learners (DLLs) learn 1-to-1 correspondence. They can design classroom-based opportunities, in which children practice using 1-to-1 correspondence in their home language, while teachers provide a bridge to the English language by repeating the mathematical process in English. It is helpful for a teacher to become familiar with the home life of each DLL in her class, so that she can engage in informal conversations in which she refers to examples of potential 1-to-1 correspondence in the child's home setting. Gestures and modeling can be especially useful when helping a DLL learn 1-to-1 correspondence. For example, if a child brings a set of objects to a teacher, the teacher can say, "Let's count them." She can then exaggerate the process of rhythmically touching and saying the number name for each object in the child's home language.

Visual representations of sets of objects that go together also can be used to prompt discussions about 1-to-1 correspondence. For example, a teacher might display pic-

tures of five dogs and five dog bowls in two corresponding columns so that children and adults, including young DLLs and their families, can refer to these images when discussing 1-to-1 correspondence at school. Additionally, the teacher can provide small cut-out picture sets of the five dogs and five bowls, so that the child can physically match them. The younger the child, the more important it is that the materials used are less abstract. Therefore, the teacher would provide five toy dogs (i.e., stuffed animals or plastic toys) and five toy dog bowls for very young children. It is also useful to have available storybooks that incorporate 1-to-1 correspondence in both English and the child's home language. For example, *Mouse Count: Cuenta de Ratón* by Ellen Stoll Walsh (1991) could be read repeatedly to deepen the DLLs understanding of 1-to-1 correspondence. For further information, see the microteach guide, *Supporting Mathematical Learning of Young Dual Language Learners* (Beneke, 2016).

Table 2. Examples of teacher language that supports children’s mathematical processes* with 1-to-1 correspondence

Representing
<p>How many napkins should we put on each placemat?</p> <p>Let’s take turns bouncing the ball and saying the next number.</p> <p>You jumped every time I clapped my hands!</p> <p>Can you hold up a finger for each swing on the swingset?</p> <p>Wow, you counted five bears? If I give you more, can you count them?</p>
Problem-Solving
<p>How can you arrange this pile, so you can count them?</p> <p>How many teddy bears are in this pile? How can we find out?</p> <p>Why do you touch each shell as you count it?</p> <p>Can you show me how to count these?</p> <p>Look at all these trucks! Can you drive them into their garages?</p>
Reasoning & Proof
<p>Why did you put one teddy bear into each section of the muffin tin?</p> <p>Why doesn’t this car have a garage?</p> <p>How do you know when to jump (as the teacher beats a steady rhythm on her drum)?</p> <p>How bears do you have? How do you know?</p> <p>What makes you think there are 6 bears? How did you figure that out?</p> <p>I think there are 6 bears in this pile. Am I right or wrong?</p>
Connecting
<p>How can we tell how many cups we will need to set the table for snack?</p> <p>How many arms does Mr. Potato Head need? How many do you have?</p> <p>Ben, Zelda, Peter, and Marcus all want to ride bikes at recess. How many trikes will I need to get out?</p>
Communicating
<p>I’m going to try and trick you. Can you tell me when I make a mistake?</p> <p>Can you explain how you arranged the teddy bears so you could count them?</p> <p>What am I doing (while touching each object and counting it out loud)?</p> <p>How should I put these bears and their chairs together?</p> <p>Can you make a mark for each bear in your pile?</p>

Table 3. Examples of useful materials for teaching and learning about 1-to-1 correspondence in preschool

Blocks
<p>Unit blocks</p> <p>Cars and garages</p> <p>Families of animals & fencing</p>
Table Toys
<p>Tangrams</p> <p>Geoboards</p> <p>Assorted shape manipulatives</p> <p>Feely box</p>
Table Toys
<p>Pegboards</p> <p>Commercial and natural objects for counting (e.g., teddy bear counters, shells)</p> <p>Sorting tray</p> <p>Mr. or Mrs. Potato Head</p>
Games & Puzzles
<p>Knob puzzles with shapes that fit in only one place</p> <p>Foam insert puzzles with non-connecting pieces</p> <p>Shape sorter</p> <p>Board games where game piece moves one space for each number counted</p> <p>Rhythm instruments</p>
Books
<p><i>Hand Rhymes</i> by Marc Brown</p> <p><i>Mouse Count</i> by Ellen Walsh</p> <p><i>How Many Snails?</i> by Donald Crews</p> <p><i>Anno’s Counting Book</i> by Mitsumasa Anno</p>

*Mathematical processes described by the National Research Council (2009).

Instructions for Doing the Microteach

- 1 This microteach is to take place with a group of at least 3 children, ideally of diverse abilities.
- 2 Assess the children in advance to determine what step they are on, on the pathway for mastery of 1-to-1 correspondence (see Table 1).
- 3 Select one mathematical process you will emphasize in your lesson (i.e., communicating, connecting, reasoning and proof, problem-solving, or representing).
- 4 Use the *Lesson Plan Template* to plan a lesson on 1-to-1 correspondence that will support the learning of the children you will be teaching. Consider how you will individualize for the children in your small group.
- 5 Videotape yourself implementing the lesson with the children.
- 6 Follow the *Procedure for Microteach* handout.

References

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