Create hands-on learning manipulatives to enhance basic skills

“It has been my privilege working with my peers on the CAPS Project. We have formed strong relationships and love helping one another to brainstorm unique activities students can benefit from by using the caps we’ve created. They offer endless opportunities for learning. I have witnessed the positive impact our CAPS Kits have had on students, and see the great interest they have for the caps. It’s amazing that something so small as a bottle cap can make a difference in a student’s interest in learning. The hands-on activities pull students away from paper/pencil/worksheets and allow room for creativity.”

Chelsea Lucas
West Chester University student

As a university professor who helped start a service-learning project called CAPS Kits, this quote was music to my ears. It captures the essence of our work, and I couldn’t be more proud.

The project goal was to teach pre-service college students how to enhance youngsters’ basic literacy and math skills. In brief, the project used homemade learning manipulatives with recycled bottle caps and brought them into local schools and early childhood programs in the greater Philadelphia area. It is a thriving project with many positives for teachers, parents, and students. It has proven to be highly effective and engaging for students, developmentally appropriate, and easy to replicate.

An idea is born...
The idea of using plastic bottle caps to enhance children’s literacy and math skills was introduced in a prekindergarten methods and field class. We wanted an essentially cost-free way to create fun, hands-on, educational games for students to learn basic skills that support the Common Core State Standards adopted by Pennsylvania (and 44 other states (www.corestandards.org/in-the-states). Upon hearing this innovative idea, Lisa McMahon, a student at West Chester University, approached me after class and asked if we could create a formal program that would have university students bringing plastic bottle caps, packaged into kits, into local schools to help children learn.

A year and many planning sessions later, I am proud to say that we not only formalized our CAPS Kits program but also conducted dozens of teacher trainings and parent workshops and gave away hundreds of CAPS Kits that have positively impacted thousands of children. By getting these materials into the hands of children, we are giving them what they need: manipulatives that create meaningful, hands-on, engaging, and fun experiences that are developmentally appropriate and support young children’s learning.

Why hands-on learning?
Looking back into child development research, we see that the literature often cites Dewey, Piaget,
Bruner, Vygotsky, Kolb, and others as the founders of active, hands-on learning. They believed that learning is an active, highly evolving, and complex process.

In my university courses, I continually say to students, “Young children need to learn with their head, heart, and hands.” This means that children need to experience their learning with their mind, heart, and hands all together, simultaneously. They have to become it, use all their senses, and experience first-hand the learning for themselves as it is evolving. This is called active or experiential learning. It is hands-on in nature and it is how young children acquire knowledge.

**YOUNG CHILDREN NEED TO LEARN WITH THEIR HEAD, HEART, AND HANDS.**

When it comes to young children and processing new information, the use of manipulatives is highly recommended and is supported by both learning theory and educational research. In mathematical research in particular, “manipulatives can be important tools in helping students to think and reason in more meaningful ways” (Stein and Bovalino 2001). Manipulatives, such as bottle caps, can help students learn by allowing them to move from concrete experiences to abstract reasoning (Heddens 1986).

It is widely known that children learn best when they are encouraged to explore, interact, create, and play (Thompkins 1991). In fact, research confirms what most early childhood professionals already know—children learn the most when they are actively participating in the learning process (Katz 1994). CAPS Kits offer a variety of learning opportunities through play and hands-on exploration. Children manipulate the game pieces, which helps them remember and retain the information learned. “During play, young children use hands-on exploration and sensory learning in a very important way; they confidently test new knowledge in a relaxed atmosphere, relate it intuitively to existing knowledge, and store that information for future use” (Blaustein 2005). Through the simple act of playing with the caps, either individually, in pairs, or with a group of others, students can use their sense of touch to help them acquire new information and build their basic skills.

**What’s a CAPS Kit?**

A CAPS Kit is a bag of 128 plastic bottle caps from either water bottles or milk containers with upper and lowercase letters, numbers, and numerical symbols written on them. Included are 20 blank caps in case a teacher wants to create more letters or numbers. Instructions on how to make a CAPS Kit appear at the end of this article.

Creating CAPS Kits is a surefire way to increase student interest in learning both literacy and math. When students play with CAPS Kits they are not only having fun, but simultaneously reinforcing their basic skills.

Inexpensive, accessible, and versatile, CAPS Kits:
- are recyclable and promote environmental or green awareness,
- are developmentally appropriate for a variety of age groups and grades,
- can be used at both home and school,
- can be created by both teachers and parents,
- support the Common Core State Standards, and
- are creative and limited only by the imagination.

When we create our CAPS Kits, we also place into each kit an accompanying compact disc for the teacher or parent. This teacher resource CD offers hundreds of different math and literacy games for chil-
dren to play. The games are broken into two different levels: one for prekindergarten through second grade, and one for third through fifth grade. The teacher resource packets can be found on our website, www.thecapcreations.wix.com/capcreations.

**Effectively using a CAPS Kit**

Teachers can use CAPS Kits for several different purposes, such as the following:

- differentiate instruction,
- assist English language learners,
- provide struggling students with extra literacy and math skills,
- provide extra support and reinforcement of skills to above-level students, and
- fill unstructured time.

Teachers can set up the learning activity individually, in pairs, in small groups, as a whole class, as part of a lesson, or as a classroom learning center. Here are a few examples of CAPS Kits games. For a complete list, see the resource packets online.

**Literacy activities.** The CAPS Kit resource packets provide activities that increase children’s literacy skills, such as awareness of language sounds, letter recognition, beginning spelling, and word building.

With a beginning language learner, for example, a teacher can use the caps to display a word family ending such as /ig/. The student is challenged to add different consonant caps to the beginning of the word to build different words in the family. The student learns that words such as big, pig, and dig visually and orally share common letters and sounds and belong in the same word family.

As another example, an English language learner in need of help with alphabet recognition can manipulate the caps into alphabetical order, match the upper and lowercase letters, or find the missing letter in the alphabet. By arranging the letters from A to Z, the child will learn the correct order of the alphabet and practice how to visually discriminate each individual letter.

**Math activities.** Children can use CAPS Kits for building math skills, including number identification, ordering, shape matching, basic number sentences, addition, subtraction, multiplication, sequencing, sorting, and money.

Preschool children, for example, can use CAPS Kits to practice learning the concepts of more than and fewer than. Older children can use the kits to practice skip counting (1, 3, 5, ____ , 9) by completing number patterns with the caps.

Because students can easily manipulate the caps by touching and feeling them, they can take risks, move them around, and easily change their answers, which is unlike using a pencil and paper and having to erase a mistake. The learning seems more like a game, which children experience as a positive, fun feeling as they learn important skills.

**Assessment.** CAPS Kits also work wonderfully when a teacher assesses an individual student. A teacher can set up the caps to assess a student’s recognition and knowledge of math facts, sight words, patterns, and numbers, for example. Students will be more engaged in the activity and less preoccupied with the fact that they are being assessed.

**CAPS Kits: Learning in meaningful and fun ways**

Young children learn through meaningful experiences with materials in their environment. CAPS Kits
provide a developmentally appropriate and unique opportunity for students to construct their own knowledge as they play. These kits are easy to reproduce, cost next to nothing, and can provide many activities to help children learn basic skills in meaningful and fun ways.

With just a little bit of time, a few materials, and a lot of creativity, you can begin creating developmentally appropriate learning materials that will help children practice basic skills all year long while having fun.

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Making a classroom CAPS Kit
CAPS Kits offer unlimited possibilities as sustainable, hands-on, and authentic learning tools. Students will benefit from the engaging and play-based activities that can be created using bottle caps.

Ask families to help you gather plastic caps from milk or water bottles. But feel free to build your collection slowly, marking the caps with letters, numerals, or symbols as children’s interests and skills dictate.

Here’s what you need:
- 128 plastic bottle caps
- white stickers, one for each cap
- Sharpie® permanent marker
- 2 storage bins, one for each set

1. Wash the caps and allow to air dry.
2. Use a permanent marker to write on the stickers, as described here.
   For the alphabet set, you’ll need three caps for each of these frequently used letters: E, T, A, O, I, N, S, H, R, D, L, and U. Draw one capital letter and two lowercase letters for each. For the less frequently used letters C, M, W, F, G, Y, P, B, V, K, X, J, Q, and Z draw one capital and one lowercase for each.
   For the math set, you’ll need three caps for each of these numerals 1, 2, 3, 4, 5, 6, 7, 8, 9, and 0. Use two caps for each of these symbols: + (plus), - (minus), = (equal), < (less than), > (greater than), ≤ (less than or equal), and ≥ (greater than or equal).
3. Affix one sticker to each bottle cap. Leave 20 bottle caps blank to make more letters or numbers as needed.
4. Place the alphabet set in one bin and the number set in the other.

Variations in color: You can request that parents collect only the transparent caps that come on water bottles, or only the red caps from milk bottles, for example. For preschoolers, you might request red caps for the alphabet set and yellow caps for the number set. Collect extra caps of the same color that will stay blank until used at your discretion.

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References

About the author
Donna Sanderson, Ed.D., is an associate professor in the Department of Early and Middle Grades Education at West Chester University in West Chester, Pennsylvania. She has spoken and published widely on a variety of early childhood topics and has many experiences as an elementary teacher.

Lisa McMahon is a senior in the Early Grades Education program, and part of the Honors College at West Chester University. She helped create and design CAPS Kits as her capstone project in the honors program.