A recent study has found that a quarter of teachers surveyed reported that there is no time for free play in their kindergarten classrooms (Miller & Almon, 2009). This sentiment is likely linked to increasing pressure for young children to have a strong foundation in literacy and mathematics in kindergarten and 1st grade, particularly with the implementation of the Common Core State Standards. Consequently, playtime has decreased and has been replaced with academically focused activities and lessons. For instance, one report indicated that for every 30 minutes of free play, many kindergartners are engaged in two to three hours of lessons and test prep (Miller & Almon, 2009). However, time spent learning foundational skills, especially in mathematics, and time spent playing don’t have to be mutually exclusive. Play and games can give young children opportunities to learn and develop foundational math skills that are aligned with Common Core standards.

Play to promote foundational math skills

The time children spend playing with peers, toys, and games can be time to learn new skills, practice their existing abilities, and build their interests, especially in mathematics. The Common Core emphasizes that kindergarten math lessons should focus on two areas: representing, relating, and operating on whole numbers, and describing shapes and space. These areas will lay a strong foundation for 1st through 3rd grade when children perform operations with numbers, discuss place values, and reason about geometric shapes. While many of these math-

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Playing and learning mathematics do not have to be mutually exclusive, especially in kindergarten classrooms.
Mathematics skills need to be explicitly taught, including playful activities and games in the early education curriculum can give children opportunities to practice their numeracy and spatial skills. For example, children can practice counting skills when playing with pretend money, spatial skills when putting together a puzzle, and geometry when building with blocks.

Our own research provides support for the benefits of play for children’s early development in each of these areas. In the area of numeracy, we examined whether playing a linear number-based board game, similar to the bottom row of Chutes and Ladders, could improve the numerical knowledge of preschool children (Ramani & Siegler, 2008; Siegler & Ramani, 2008). The design of this game is ideal because it provides multiple cues to both the order of numbers and numbers’ magnitudes or how big and small numbers are in relation to one another. (See Figure 1.)

In our studies, preschoolers from Head Start classrooms either played the linear numerical board game with squares numbered from 1 to 10 or a color board game that was identical, except for the squares varying in colors rather than numbers. Children were told to say the number (color) on each space as they moved. For example, children who were on 3 and spun a 2 would say, “4, 5” as they moved their token. Children played one of the two games one-on-one with an experimenter for four 15- to 20-minute sessions distributed over a two-week period. After playing the number board game, children showed improvements in their numerical knowledge of the numbers from 1-10, specifically in their verbal counting skills, identification of Arabic numerals, and their understanding of numerical magnitudes. These improvements were stable over time: After nine weeks of not having played the board game, improvements on all four tasks remained stable. Children who played the identical color version of the game did not show comparable improvements. We have found similar results when the game is played with younger preschool children from middle-income backgrounds (Ramani & Siegler, 2011).

Board game activities can be easily used in classroom settings because they’re ideal for math centers or small-group activities. Based on this idea, we trained paraprofessionals (teacher’s assistants) from Head Start children’s classrooms to play the linear number game with small groups of children. During a one-hour training session, paraprofessionals were shown the board game materials, given a booklet with the rules for the games and scripts for how to explain the games, and watched a demonstration video of children playing the board games.

Playing the number board game in a small group supervised by a paraprofessional from the classroom improved children’s numerical knowledge. Observations of the game sessions revealed that board games could be a way for teachers to scaffold and assist children’s learning about numbers. For example, paraprofessionals adapted the feedback they provided to the children based on children’s numerical knowledge (Ramani, Siegler, & Hitti, 2012). Thus, the linear number board game can be used to promote the numerical knowledge of children from a range of knowledge and skill levels and can be used effectively in preschool classrooms.

An ideal play activity for promoting early geometric and spatial sense is block building. Playing with blocks, a popular activity found in most early child-

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**Figure 1.** The number and color linear board games.

**Number board game**

**Color board game**

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*Deepen your understanding of this article with questions and activities in this month’s Kappan Professional Development Discussion Guide by Lois Brown Easton. Download a PDF of the guide at [kappanmagazine.org](http://kappanmagazine.org).*
hood classrooms, can contribute to children’s spatial reasoning, knowledge of geometric shapes, numerical knowledge, and problem-solving skills (Kamii, Miyakawa, & Kato, 2004; Ness & Faranga, 2007; Reifel & Greenfield, 1982). Building with blocks not only engages individual students but also groups of students, especially when block building takes the form of guided play — fun activities structured to provide opportunities for exploration and learning (Weisberg, Hirsh-Pasek, & Golinkoff, 2013). Guided play can be used in early childhood classrooms to engage children in play activities that can connect to the curriculum and promote learning. Studies have found that teaching children through guided play can be more effective than didactic instruction because it encourages children to take on an active role in their exploration (Alfieri, Brooks, Aldrich, & Tenenbaum, 2011; Fisher, Hirsh-Pasek, Newcombe, & Golinkoff, 2013).

In a recent study, we examined 4- and 5-year-old same-age, same-sex pairs of children during a guided play block building activity (Ramani, Zippert, Schweitzer, & Pan, 2014). Children were instructed to build a house with large colorful blocks that included features of a house, such as a door and rooms, but the children were given no specific directions about how to complete it. Children’s communication and building behaviors during the interactions were examined, as well as the role of their coordinated behavior in the structures they built. We found that peers engaged in discussion with one another about the design of the structure, symbolic meanings of the blocks, and the spatial relations of the blocks’ placements. Additionally, children’s spatial talk was associated with the features of a house included in structures. This suggests that encouraging guided, cooperative block play activities in early childhood classrooms gives children opportunities to practice and expand their language, math, and spatial skills.

**Incorporating math play**

Despite the benefits of incorporating play in math lessons, teachers can find this difficult to do because of the numerous concepts and skills they feel pressured to cover during the short time allocated for mathematics. One strategy that can help increase the amount of play incorporated into early childhood math classes is to educate preservice teachers on the merits of using games that align with Common Core standards as a way for children to build their foundational math skills. In the Department of Human Development and Quantitative Methodology at the University of Maryland, College Park, our undergraduate major certifies students to teach in early childhood classrooms (K-3). During the program’s course on mathematics learning and instruc-
tion, we emphasize how teachers can use games as supplements for math lessons and as interventions for struggling students (Taylor-Cox, 2009). Every week, we discuss activities and games that could be used for instruction in different areas of mathematics, such as counting, place value, geometry, and fractions.

One assignment for the course requires preservice teachers to develop a game that would help students gain math knowledge and then implement the game in their internship classrooms. The assignment requires that preservice teachers include specific connections to the Common Core, directions for the games, the name of the game, and the necessary materials for students to play the game in a small group or at a math center. The preservice teachers designed creative, attractive, and engaging games for students to practice a range of skills from counting, identifying numerals, and arithmetic, as well as building conceptual understanding in areas such as place value and numerical magnitude comparisons (i.e., greater than and less than comparisons). For example, in Place Value Detectives (Figure 2), 2nd-grade students were read “clues” about numbers and their values, such as numbers written in their expanded forms (e.g., I have two hundreds, zero tens, and seven ones). Students were then required to cover the corresponding numeral on a mat and shout, “Case solved!” when they had covered all of their numbers.

Many preservice teachers built in ways to differentiate the game for students. In Playground Math (Figure 3), kindergartners practiced their one-to-one correspondence counting skills and their numeral identification skills by drawing cards that had varied numbers of items on them (e.g., 5 ladybugs). Students would then move their piece to the next corresponding space with that numeral. For more advanced students, separate cards depicted arithmetic problems with pictures of items (+4 flowers + 3 flowers). These students would move their game piece to the corresponding spot that had the answer to the arithmetic problem.

Discussing how to use games and play in class is not only beneficial for young students but also beneficial for many of the preservice teachers. Preservice teachers were required to discuss how each game aligned with a Common Core math standard, reflect on the success of the implementation of the game in a classroom, and discuss which aspects of the game they would change when they use them again. Further, demonstrating to preservice teachers that math can include engaging games and activities may reduce their anxiety and get them excited to teach the subject. In general, many of the preservice teachers began the semester feeling very anxious about teaching math to students because of their own previous negative experiences with math. At the end of the semester, one preservice teacher said, “I don’t feel like it [math] is a scary subject to teach anymore. The word math means creativity, fun, and exploration!”

**Recommendations for teachers**

How can teachers bring more playful math activities into their classrooms? We outline five suggestions:

**#1. Seek out playful curricula.**

In addition to incorporating individual play activities in the classroom, more comprehensive curricula for improving preschoolers’ and kindergartners’ mathematical knowledge that include play have also shown positive effects. Many of these programs integrate informal learning activities and play with direct classroom instruction. One such curriculum is Building...
likely to want to participate in math activities when they see that it’s meaningful for what they are engaged in (Sarama & Clements, 2008). Set up some centers during free play to elicit math and number talk. One possibility could be to add extra materials to existing activities and centers during free play to elicit math and number talk. For instance, when setting up a pretend grocery store, go beyond just having a cash register and pretend food, and include items such as a balance scale and price tags to put on the food. Teachers also can integrate mathematics into language arts class by discussing and building on the math content in many children’s books. For example, the popular book *Caps for Sale* by Esphyr Slobodkina could be extended to a math lesson on money that involves discussing the values of the hats or a lesson about sorting and creating graphs based on the characteristics of the hats.

**#2. Think outside the (game) box.**

As described above, games provide excellent opportunities for children to practice their newly acquired or developing math skills. While some teachers may easily find some creative inspiration for developing their own games, it is not necessary to reinvent the wheel. Many existing board games and card games have the potential to tie into math concepts. We encourage teachers to think about how they can adapt familiar games to emphasize the Common Core math standards. For example, when playing the popular game Candyland, children could use dice, instead of the colored cards typically used, to move their token around the board. Using dice can help children practice their counting skills and build their understanding of the relations between numbers and quantities.

**#3. What happens in math class . . . doesn’t have to stay in math class.**

While there may be a time in the school day carved out to focus on math, there is no reason math activities have to end there. Teachers can encourage math talk and mathematical thinking during play as well as during lessons in other domains. Children are more likely to want to participate in math activities when they see that it’s meaningful for what they are engaged in (Sarama & Clements, 2008). Set up some centers during free play to elicit math and number talk. One possibility could be to add extra materials to existing activities and centers during free play to elicit math and number talk. For instance, when setting up a pretend grocery store, go beyond just having a cash register and pretend food, and include items such as a balance scale and price tags to put on the food. Teachers also can integrate mathematics into language arts class by discussing and building on the math content in many children’s books. For example, the popular book *Caps for Sale* by Esphyr Slobodkina could be extended to a math lesson on money that involves discussing the values of the hats or a lesson about sorting and creating graphs based on the characteristics of the hats.

**#4. Peers are a valuable resource.**

During games or free play, children also have opportunities to be exposed to math through their classmates. Teachers can help enable this by identifying cooperative activities where there is motivation for children to think and talk about math, such as asking students to figure out how to equally allocate supplies for an art project among all children at a table. Teachers also can be mindful about pairing students: If you observe some children who tend to engage in more math talk or demonstrate more advanced math skills, pairing them with children who are less advanced in their mathematical understanding gives a less-advanced child an opportunity to learn through observations and interactions with a more advanced partner (Tudge, Winterhoff, & Hogan, 1996).
#5. Engage parents, and make connections between the classroom and home.

The home numeracy environment is a significant contributor to children’s early math skills (Niklas & Schneider, 2014), and teachers can help parents find ways to engage children in playful math activities that complement the classroom curriculum. Teachers could include parents in a family game night at school and provide guidance for how parents can talk about math while playing games. Another possibility would be to send children home with a mathematical scavenger hunt to complete with a family member, based on everyday applications of topics being covered in math at school, such as comparing the cost of items at the grocery store or measuring the length of different pieces of furniture at home.

References


