



The Case of Brain Science and Guided Play

A Developing Story

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Ms. Elena’s Head Start classroom is filled with eager 3- and 4-year-olds. It’s center time, and the children have split into small groups. At one center, Ms. Elena has carefully selected play materials—including a barn, a chicken coop, and animal figurines—that reflect the story lines and specific vocabulary words from books she read aloud related to farm life as part of the class’s storybook theme of the week. While Ms. Elena looks on, Sara, Javon, and Ashish arrive at the center and immediately pick up the toys. They each choose a figurine and begin playing. Sara says to Javon, “I’ll be the cow!” Javon says, “Okay, then I’ll be the chicken. I’m

going to go sleep in the coop. The cow should go sleep in the barn.” Ashish says, “Then I’ll be the horse, and I’ll go sleep in the barn too.”

Together, the three children move their figurines to the coop and the barn while making mooing, clucking, and neighing sounds. Since *coop* was one of the week’s focus words, Ms. Elena joins in the children’s play, making sure that Sara and Ashish understand the word as well as Javon: “Sleeping in the coop sounds like a great idea, Javon! A coop is a house for chickens. Remember when we saw a coop on our field trip to Maple Farm? Javon, Sara, and Ashish, where do you think the chickens would live if we didn’t have a coop on the farm?” Ashish says, “I think they live in the barn!” Then Sara says, “Yes, they live in the barn, because it’s nice and warm inside there.” Ms. Elena says, “That sounds like a really good place for the chickens to live if we didn’t have a coop!”

At this point, Ms. Elena steps back and the children take up a new direction for the play. She continues to listen for ways to build on the children’s interests and reinforce their weekly focus words during the session without interrupting their play.

Why play?

Monkeys play. Dogs play. Rats play. Even octopuses play. And without any instruction, children of all races and genders, in all cultures of the world, invent and reinvent play in every generation. Something this ubiquitous must provide evolutionary advantages to both animals and humans. Decades of research suggest just that. In particular, free play and guided play—together known as *playful learning*—are pedagogical tools through which children can learn in joyful and conceptually rich ways, as is evident in the opening vignette. Brain science research in animals has left clues along a path that may begin to reveal play’s human biological underpinnings, but more research is needed to investigate *why* play promotes learning and development.



From animal brains to children's behavior

Perhaps the most striking finding about play comes from research with animals in which play—specifically, rough and tumble play—has been shown to promote early brain development. When young rats play, their brains become primed to be more adaptable in later life (Pellis, Pellis, & Himmler 2014), especially with social skills and executive functions (e.g., attention, memory, and planning). Indeed, findings suggest that playful rats act more appropriately in social situations than rats that do not play (Burgdorf, Panksepp, & Moskal 2011). These findings offer a potential model of how play may help develop children's social functioning and brain architecture.

A growing body of behavioral research establishes relationships between children's play and development in several areas, including language (Toub et al. 2016), executive functions (Tominey & McClelland 2011), mathematics and spatial skills (Fisher et al. 2013), scientific thinking (Schulz & Bonawitz 2007), and social and emotional development (Dore, Smith, & Lillard 2015). One reason that play might be such a valuable pedagogical tool is that it features the precise contexts that facilitate learning. An amalgamated research field called the *science of learning* has identified four key ingredients of successful learning: learning occurs best when children are *mentally active* (not passive), *engaged* (not distracted), *socially interactive* (with peers or adults), and building *meaningful connections* to their lives (Hirsh-Pasek et al. 2015). These features are evident in Ms. Elena's classroom:

Javon is mentally active when he thinks about where he learned the name of the place where chickens sleep and then uses the word *coop* appropriately. Sara is engaged when she chooses to be the cow and moves in concert with Javon and Ashish instead of being distracted by other groups at play. Ms. Elena made the word *coop* more meaningful for the children by making a connection to when the children visited Maple Farm. Finally, the children were socially interactive when they built a play scenario that involved all three of them, with Ms. Elena joining in as a scaffolder.

These kinds of playful interactions between children and adults may be essential for creating the kind of

supportive social environments necessary for healthy social and emotional development. Guided play in particular features this type of social interaction and has demonstrated promising outcomes for learning and development.

What is guided play?

Today, most researchers agree that play is fun, flexible, voluntary, and intrinsically motivated; it involves active engagement and often incorporates make-believe (Sutton-Smith 2001; Pellegrini 2009; Fisher et al. 2010; Lillard et al. 2013). Guided play maintains the joyful child-directed aspects of free play but adds an additional focus on learning goals through light adult scaffolding (Weisberg et al. 2016). It offers an opportunity for exploration in a context specifically designed to foster a learning goal. As such, it features two crucial elements: child agency (the child directs the learning) and gentle adult guidance to ensure that the child progresses toward the learning goal. Research suggests that guided play is a successful pedagogical tool for educators in a variety of areas (Weisberg et al. 2016). Here, we outline some examples of how guided play can work in the classroom to build specific language, mathematics, and spatial skills.

Guided play features child agency and gentle adult guidance toward the learning goal.

Language development

Guided play is a model setting for language learning. For example, infusing vocabulary instruction in guided play fosters word learning for preschoolers, especially those from disadvantaged backgrounds (Toub et al. 2016; Han et al. 2010). One study tested the effectiveness of word learning through guided play against a more teacher-directed learning activity (Toub et al. 2016). All children participated in shared book reading and then reviewed half of the vocabulary words through guided play and the other half through a picture card word-recall activity. The guided play resembled the learning taking place in the opening vignette. After play-based word learning, children defined the target words more readily than they did after picture card-based word learning.

Mathematics and spatial skills

Guided play is also effective for fostering spatial skills—important in and of themselves and also tied to later mathematics success (Verdine et al., forthcoming). For example, a study with preschoolers (Fisher et al. 2013) compared children’s ability to learn about geometry and shapes through guided play, free play, and direct instruction. In the guided play condition, the adult followed the children’s lead and scaffolded the interaction. Children learned more about geometry and shapes than those participating in either the direct instruction condition, where the children listened passively while the adult delivered the content in a fun way, or the free play condition, where children interacted with the shapes in whatever way they wished.

To envision how a similar effect might occur in the classroom, imagine a different center in Ms. Elena’s room:

Pablo, Keisha, and Nari arrive at a table filled with tiles of different shapes. They all pick up pieces and begin snapping Magna-Tiles together. Nari says, “I’m going to build a tower! I can’t get these pieces to fit.” Ms. Elena is observing the children and chooses this moment to join in and say, “What shapes do you have, Nari?” Pablo says, “Nari has a square.” “That’s right, Pablo. Nari has a square. Nari, can you find another square?” Nari holds up a square. Ms. Elena says, “What makes that a square?” She pauses to let the children think about it, then continues, “It has four sides that are all the same length.” She then says, “I wonder if it’s possible to make a bigger square using the pieces you are holding up.” Keisha says, “Hmmm ... I want to try!” The children look at each other and lay the pieces down—eventually discovering that by putting all four of the squares together, they create a larger square. Ms. Elena notices their discovery, and says, “Wow! You made a bigger square! It still has four sides, and all of the sides are the same length.”

Ms. Elena wove the definition of a square into the children’s play without taking over, but she also encouraged the children to push themselves to make an important discovery about the shape tiles. Guided play allows teachers to piggyback on children’s joy and engagement to reinforce important skills.

Why does guided play work? Fledgling evidence from brain science

Guided play represents an *enhanced discovery* approach to learning that increases children’s knowledge through opportunities to receive immediate, meaningful adult feedback (Alfieri et al. 2011). It is also an ideal example of an active, engaged, meaningful, and socially interactive learning context (Hirsh-Pasek et al. 2015). Consider, for instance, children playing with a shape sorter. The children discuss how to insert the shapes so that the sorter lights up. They keep inserting shapes and notice that sometimes the sorter lights up and sometimes it doesn’t, but they can’t figure out why. Their teacher joins in and makes some gentle guiding suggestions to help them by asking what the children have already tried and what they could try next. As children incorporate this feedback while continuing to experiment, they generate hypotheses and draw causal connections, becoming little scientists. Play helps children discover causal relationships through this type of informal experimentation (Schulz & Bonawitz 2007; Gopnik 2012). And light scaffolding, when needed, prevents frustration and enables the children to engage in longer periods of playful experimentation.

Adult-scaffolded play experiences might be particularly important because they help children develop what scientists call *proactive control*: neural mechanisms in the brain’s prefrontal cortex that use clues from the environment to help the brain figure out what might happen next (Weisberg et al. 2014). Guided play might support the development of proactive control by fostering a *mise en place*—a term (derived from the culinary world meaning “everything in its place”) suggested by the famed psychology professor Jerome Bruner (2013, personal communication with Brenna Hassinger-Das):

Think about preparing to make a pizza. You gather the dough, sauce, cheese, and toppings. You also get out the required tools: rolling pin, pizza stone, and pizza cutter. In this way, you have prepared yourself and your workspace for the task at hand.

Similarly, a psychological *mise en place*—a readiness to anticipate events and explore an activity (Weisberg et al. 2014)—helps children prepare their minds to embrace learning experiences in a positive way. Ms. Elena cultivated such a *mise en place* through her inclusion

of farm-focused play activities. By preparing the play environment in service of her pedagogical goal—the children learning the focus words—Ms. Elena allowed children to work toward this goal in their own playful way. This type of gently scaffolded, playful learning fosters children’s desire to seek out similar meaningful learning opportunities (Weisberg et al. 2014).

Guided play increases children’s knowledge through immediate, meaningful adult feedback.

Imagine a different week in Ms. Elena’s classroom. She sets up one center with a castle play set that mirrors a book read during that week’s storybook theme of knights and dragons. The prepared play set encourages children’s organic use of the theme’s vocabulary words while playing—words like *talons* and *nostrils*. Ms. Elena can then draw attention to these words and help children make meaningful connections to them. This type of adult support during guided play may be the mechanism through which children’s fledgling proactive control mechanisms emerge (Weisberg et al. 2014).

Looking forward

The bottom line is that play is ubiquitous across species, and it likely has a significant role in many aspects of human development. Though behavioral research is still unfolding (Lillard et al. 2013; for a rebuttal, see Weisberg et al. 2013), evidence is mounting that guided play scaffolds young children’s development and that it might prime critical neural mechanisms to make healthy adaptations (Weisberg et al. 2014). It also helps children develop an understanding of how the world works (Gopnik 2012). To deepen our understanding, research investigating play’s biological foundation in children is urgently needed. This research could prove particularly important for developing interventions to assist children from vulnerable populations, such as those from low socioeconomic-status backgrounds, children with disabilities, or children experiencing stress or trauma.

As we await new discoveries from brain science, one finding is already clear: Play is a wonderful metaphor



Using a prepared play environment to foster a *mise en place*—a readiness to anticipate events and explore an activity.

for active, engaged, meaningful, and socially interactive learning. And, as two of the authors of this piece described in their book, *Becoming Brilliant: What Science Tells Us About Raising Successful Children*, play also prepares children to become social, caring, thinking, and creative citizens (Golinkoff & Hirsh-Pasek 2016). In fact, many researchers and teachers now concur that the “child-driven educational methods sometimes referred to as ‘playful learning’ are the most positive means yet known to help young children’s development” (Lillard et al. 2013, 28).

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