MIND, BRAIN, AND EDUCATION

Guided Play: Where Curricular Goals Meet a Playful Pedagogy

Deena Skolnick Weisberg[1], Kathy Hirsh-Pasek[1], and Roberta Michnick Golinkoff[2]

ABSTRACT— Decades of research demonstrate that a strong curricular approach to preschool education is important for later developmental outcomes. Although these findings have often been used to support the implementation of educational programs based on direct instruction, we argue that *guided play* approaches can be equally effective at delivering content and are more developmentally appropriate in their focus on child-centered exploration. Guided play lies midway between direct instruction and free play, presenting a learning goal, and scaffolding the environment while allowing children to maintain a large degree of control over their learning. The evidence suggests that such approaches often outperform direct-instruction approaches in encouraging a variety of positive academic outcomes. We argue that guided play approaches are effective because they create learning situations that encourage children to become active and engaged partners in the learning process.

> *Although many best practices remain to be elaborated, research demonstrates that [the preschool] years lay a powerful foundation for subsequent learning, and that they should be taken at least as seriously as schooling in later years.*
>
> Hines, McCartney, Mervis, & Wible, 2011, p. 951

A growing body of evidence compellingly supports a strong curricular approach for early education. Numerous scientific studies affirm that academic and social experiences in the preschool years are associated with school readiness and later school outcomes in language and mathematics (Campbell, Pungello, Miller-Johnson, Burchinal, & Ramey, 2001; Campbell & Ramey, 1994; Campbell, Ramey, Pungello, Sparling, & Miller-Johnson, 2002; Reynolds, Ou, & Topitzes, 2004; Schweinhart et al., 2004; Weikart, 1998; Zigler & Bishop-Josef, 2006). The message from this body of research is clear: A strong curricular agenda in preschool fosters academic development, especially for low-income children.

Early education should give children the tools they will need to succeed academically in the later grades. But what is the best way to achieve this goal? Addressing this question requires that we distinguish between curriculum and pedagogy, that is, between *what* is taught and *how* it is taught. The same content can potentially be presented in a variety of different ways, and the most effective strategy for teaching a particular topic or a particular group of children may not work for a different topic or a different group of children. Good teachers recognize these facts and tailor their teaching strategies to the current topic and audience, often combining elements of different methods. Despite the undeniable necessity for this kind of flexibility in the preschool classroom, an unfortunate recent trend is the growing prevalence of preschool curricula and testing materials that are oriented solely toward content-focused education, particularly in reading and math (for review, see Miller & Almon, 2009). The implementation of such curricula often comes at the expense of other types of pedagogical methods. In addition, discussions about preschool pedagogy are often framed as a choice between extremes: The preschool classroom should either present content directly or allow children to play (Chien et al., 2010; Hirsh-Pasek & Golinkoff, in press).

Given these trends, our goal in this article is to carve out a middle ground and to bring *guided play* approaches to the forefront of discussions about preschool education. We first define this concept and distinguish it from other methods of presenting content, then review evidence for its efficacy as a teaching strategy in preschool. In closing, we explore why guided play can be a powerful pedagogical tool.

WHAT IS GUIDED PLAY?

Two pedagogical methods often contrasted in preschool education are *direct instruction* and *free play*. The former, as the name

[1]Temple University
[2]University of Delaware

Address correspondence to Deena Skolnick Weisberg, Department of Psychology, Temple University, 1701 North 13th St., Weiss Hall, Philadelphia, PA 19122; e-mail: deena.weisberg@temple.edu.

implies, involves a teacher playing an active role in imparting information to the students, who themselves are mostly passive recipients. The latter occupies the opposite end of the spectrum, with children retaining the ability to choose their activities and focus without active guidance from a teacher. Each of these methods supports learning within a preschool classroom. For instance, free play is positively associated with socio-emotional development (see Pagani, Fitzpatrick, Archambault, & Janosz, 2010; Romano, Babchishin, Pagani, & Kohen, 2010; Singer & Singer, 1990) and is related to positive outcomes in language and literacy learning (e.g., Lillard et al., 2013; Neuman & Roskos, 1992). And early research on preschool and kindergarten program effectiveness suggests that didactic pedagogies significantly improve academic skills over traditional or "business-as-usual" methods (Carleson & Francis, 2002; Engelmann & Brunner, 1995; Gersten, Darch, & Gleason, 1988; Kamps et al., 2008; Stockard & Engelmann, 2008; Waldron-Soler et al., 2002). Indeed, children who participated in the Didactic Instructional System for Teaching and Reading (DISTAR) curriculum outperformed children in the control and other experimental groups in reading, math, and language, moving from the 20th percentile to near the 50th percentile (Education Commission of the States, 1999; Ellis & Fouts, 1993).

However, when specifically considering academic outcomes, many findings support the claim that preschoolers who engage in playful learning either match or outperform those who learn through direct instruction (for review, see Hirsh-Pasek, Golinkoff, Berk, & Singer, 2009). By way of example, Han, Moore, Vukelich and Buell (2010) found that playful learning enhances vocabulary development in low-income preschoolers relative to more didactic practices. Alfieri, Brooks, Aldrich, and Tenenbaum (2010) reviewed 164 studies comparing discovery-based versus direct instruction approaches to learning and found that assisted discovery approaches trump the kind of learning that emerges from more unassisted pedagogies. Research from our own laboratory suggests that children are better at learning the criterial properties of geometric shapes like squares and triangles and retaining this knowledge when they participate in activities that are playful (Fisher, Hirsh-Pasek, Newcombe, & Golinkoff, in press). In general, the evidence suggests that playful, child-centered approaches that incorporate some degree of adult scaffolding are more effective teaching strategies for achieving academic outcomes with preschoolers than those involving either direct instruction (Stipek, Feiler, Daniels, & Milburn, 1995) or free play in the absence of active adult guidance (Chien et al., 2010; Honomichl & Chen, 2012; Lillard & Else-Quest, 2006; Lillard et al., 2013).

Given these findings, we argue that guided play offers an appropriate middle-ground pedagogical approach for preschool education. It allows for teaching rich content in a way that incorporates elements of free play, discovery learning, and traditional pedagogy. As a recent review of the literature on the efficacy of pretend play for learning outcomes puts it,

> . . . the lack of existing evidence that pretend play helps development should not be taken as an allowance for school programs to employ traditional teacher-centered instructional approaches that research has clearly shown are inferior for young children. The hands-on, child-driven educational methods sometimes referred to as 'playful learning' (Hirsh-Pasek et al., 2009) are the most positive means yet known to help young children's development. (Lillard et al., 2013)

So, what is guided play? What form does it take in the classroom? Guided play sits between free play and direct instruction. Although free play is notoriously hard to define (Burghardt, 2011), most scientists agree that it generally subsumes the following qualities: the activities are fun, voluntary, flexible, involve active engagement, have no extrinsic goals, involve active engagement of the child, and often have an element of make-believe (Christie & Johnsen, 1983; Fisher, Hirsh-Pasek, Golinkoff, Singer, & Berk, 2011; Garvey, 1990; Hirsh-Pasek & Golinkoff, 2003; Hirsh-Pasek et al., 2009; Johnson, Christie, & Yawkey, 1999; Pellegrini, 2009; Sutton-Smith, 2001; Sutton-Smith & Kelly-Byrne, 1984). These criteria emphasize those aspects of playful behavior that are distinct from other forms of behavior, such as the fact that it often seems divorced from reality at large. In addition, it is important to note that these criteria are meant to apply to all forms of play, including but not limited to pretend play, construction play, exploratory play, and physical play. What differentiates these forms of play from each other are the different types of activities that children engage in: putting a doll to sleep as opposed to building a block tower.

We further divide the conceptual space between free play and no play by adding guided play, which incorporates adult-scaffolded learning objectives but remains child-directed. In guided play, adults initiate the learning process, constrain the learning goals, and are responsible for maintaining focus on these goals even as the child guides his or her own discovery. This latter point is critical. While adults might initiate the play sequence, children direct their own learning within the play context. Thus, guided play is *child-directed* and can take a number of paths within a play setting. In guided play, teachers might enhance children's exploration and learning by commenting on their discoveries, co-playing along with the children, asking open-ended questions about what children are finding, or exploring the materials in ways that children might not have thought to do (Ash & Wells, 2006; Berk & Winsler, 1995; Callanan & Braswell, 2006; Callanan & Oakes, 1992; Copple, Sigel, & Saunders, 1979; Rogoff, 2003). These kinds of situations embody a social-constructivist or assisted-discovery approach that have proven effective for learning in

both younger and older children (e.g., Chi, 2009; DeVries, Zan, Hildebrandt, Edmiaston, & Sales, 2002; Honomichl & Chen, 2012; Tharp & Gallimore, 1991). Guided play always sees the child as an active collaborator in the process of learning, and not merely as a recipient of information.

Distinguishing guided play pedagogies from those employing direct instruction or free play is thus a matter of identifying the roles of the adult and child in the situations. In direct instruction, the teacher explicitly tells children things or asks them to do things; she is the active agent, telling children what they need to know or illustrating new concepts with little or no room for children's own efficacy. Both free and guided play place the locus of control with the child. Because they are in the lead, children are more likely to be active and engaged with the situation than in a direct-instruction situation. In free play, however, the adult's role is passive, allowing children to do as they would without interference. Although this approach allows children the maximum amount of freedom, it also means that children are likely to have difficulty achieving the learning goal, because they are not being encouraged to focus on the appropriate dimensions.

In contrast, the adult's role in guided play is active, although not dictatorial; the adult in a guided play situation might initiate the play context but does not direct the play within that context. Rather, the adult follows the child's lead and allows the child to engage in discovery within the context of a prepared environment and with subtle scaffolding (see Ash & Wells, 2006; Berk & Winsler, 1995; Callanan & Braswell, 2006; Callanan & Oakes, 1992; Chi, 2009; Christie & Roskos, 2006; Copple, Sigel, & Saunders, 1979; Mayer, 2004; Rogoff, 2003). The focal concepts are more likely to be apparent to children in these situations than in free-play situations, because the adult helps them to zero in on the key variables. The concepts are also more likely to be meaningful to children in these situations than in direct-instruction situations, because they are participating in the discovery process rather than having it dictated by an adult. Children who learn through guided play are thus actively engaged with a meaningful learning goal (Chi, 2009; see also Honomichl & Chen, 2012).

For example, a teacher with the goal of teaching new vocabulary words could take a direct instruction approach, by telling children the meanings of the new words they encounter in a storybook or by showing examples: "This is a *helmet*. A *helmet* goes on your head to stop your head from getting hurt if you fall off your bike." Or, she could take a guided-play approach, introducing the new words in the context of a child's play episode while encouraging children to think broadly about the word's meaning: "She's got a *helmet* on while riding her bike. What do you think would happen if she fell off her bike and wasn't wearing her *helmet*?" The difference between these two approaches is not in the learning goal or even necessarily in whether aspects of playful behavior are included—direct instruction could encourage children to pretend they're wearing a helmet, for example. Rather, the crucial distinction between direct instruction and guided play is in who has control over the situation and who gets to decide on the next step on the path of discovery. In guided play, there is collaboration between the teacher and the child, with the child's interests in the foreground; in direct instruction, the teacher is in charge.

THE EFFECTIVENESS OF LEARNING FROM GUIDED PLAY

When considering the preschool environment, research from the science of learning suggests that guided play approaches provide a developmentally appropriate pedagogy that offers children a focused approach to learning (e.g., Burts, Hart, Charlesworth, & Kirk, 1990; Burts et al., 1992; Hirsh-Pasek, 1991; Love, Ryer, & Faddis, 1992; Marcon, 1993, 1999; Schweinhart, Barnes, & Weikart, 1993; for reviews, see Alfieri et al., 2010; Hirsh-Pasek et al., 2009; Lillard & Else-Quest, 2006). More specifically, pedagogical techniques involving child-centered playful learning have been shown to boost young children's academic development, leading to improvements in reading and math scores, and these advantages last into the primary grades (e.g., Marcon, 1999, 2002; Stipek et al., 1998). Children exposed to guided play pedagogies also have increased motivation for school (Hirsh-Pasek, 1991; Stipek et al., 1995). There is even some evidence that children in programs using a playful pedagogical approach show better executive function skills, such as inhibitory control, working memory, and cognitive flexibility (Diamond, Barnett, Thomas, & Munro, 2007), although these findings have recently been challenged (Farran, Wilson, Lipsey, & Turner, 2012).

Most importantly for the current purposes, guided play has been shown to lead to better academic outcomes. In the Han, Moore, Vukelich, and Buell (2010) study mentioned above, a guided play intervention increased vocabulary scores in an at-risk population. Two groups of preschoolers participated in an interactive book reading activity that was designed to teach new words. In both cases, the intervention lasted for 30 minutes and was performed twice per week for two months. One group of children received the teaching protocol for the entire 30 minutes. The other group received the protocol for 20 minutes, followed by 10 minutes in which they engaged in guided play about the new words. Children in both groups made gains in their expressive vocabulary, but the group who had received the play intervention gained significantly more than children in the no-play group (see also Bellin & Singer, 2006; Christie & Enz, 1992; Dickinson & Tabors, 2001; Pellegrini & Galda, 1990; Roskos, Tabors, & Lenhart, 2009). These results are notable for two reasons: First, this study was done with at-risk children, for whom learning new vocabulary is a particularly important challenge (Hart & Risley, 1995;

Walker, Greenwood, Hart, & Carta, 1994). Second, the play group outperformed the no-play group despite having had *less* overall instruction about the new words. This latter point strongly implies that taking time to include guided play in preschool classrooms can have positive effects on academic outcomes.

Guided play can also encourage learning of mathematical and spatial skills (Ferrara, Hirsh-Pasek, Newcombe, Golinkoff, & Lam, 2011; Fisher, Hirsh-Pasek et al., in press; Levine, Ratliff, Huttenlocher, & Cannon, 2012; Ramani & Siegler, 2008). For example, playing board games that have a numerical element positively impacts young children's mathematical knowledge (Ramani & Siegler, 2008; Siegler & Ramani, 2008), especially when these games are constructed in a linear fashion, so as to highlight parallels with the number line (Siegler & Ramani, 2009). In another study, parents who engaged in a guided play intervention with their children while constructing with blocks used significantly more spatial language (e.g., words like "over" and "between") than parents who played with pre-assembled block structures with their children or who played freely with their children and the same materials (Ferrara et al., 2011).

In addition to encouraging positive outcomes in young children's academic skills, pedagogies based on guided play have positive impacts on their socio-emotional development, leading to better emotion regulation and less stress (Burts et al., 1992), as well as to decreases in problem behaviors (Marcon, 1994, 1999, 2003). For example, a random assignment study with children in a head start program found that children's ability to improve their self-regulation and related skills was advantaged when they engaged in a playful pedagogy as opposed to direct instruction (Ogan & Berk, 2009). Children assigned to a supported play intervention showed clear post-test advantages over children in a directed training intervention in their planning skills and in tasks that required suppressing, initiating, and controlling their behavior. In addition, during free play, children in the supported play group spent more time engaged in make-believe and less time unoccupied, compared to children in the directed training group. Because scores on tests of self-regulation at 3–5 years predict reading and math achievement from kindergarten through high school (Blair & Razza, 2007; Duncan et al., 2007; Gathercole, Tiffany, Briscoe, & Thorn, 2005), the group differences reflected here are particularly impressive and important.

Some recent work suggests that a playful learning approach can additionally boost creative thinking and problem-solving abilities (Fisher, Glazek et al., in preparation). In this study, 4–6-year-olds interacted with household objects (e.g., pieces of aluminum foil, pipe cleaners) and a play mat depicting a river and a forest in three conditions. In the free play condition, the experimenter encouraged children to interact with these materials in any way they wished. In the guided play condition, the experimenter asked open-ended questions to facilitate children's explorations of the properties of the materials (e.g., "What can we do with this?", "How are these different?") and introduced a problem to be solved ("How can the bear get across the river to see his friend?"), but without providing answers or problem solutions. In the explicit instruction condition, the experimenter described the properties of the materials (e.g., "These are different because . . . ") and demonstrated how to use them to solve the problem (getting the bear across the river).

All children then participated in two tests. The first, designed to be a near-transfer task, provided children with a new set of objects and an analogous problem: A turtle needs to get over the forest to see a friend on the other side. The second test gave children yet another set of objects and asked them to provide as many uses as they could think of for each one (a version of the creative uses task). Fisher, Glazek et al. (in preparation) found that children in the guided play condition provided more and more flexible solutions in the near-transfer task than children in the other two conditions. They also provided more uses in the creative uses task than children in the other two conditions. These results indicate that guided play can encourage children to have flexible and creative interactions with objects, and is superior at setting the stage for these kinds of interactions than either explicit instruction or free play.

Interestingly, the converse also seems to be true: The use of direct instruction in the face of a novel toy or problem can limit exploration and learning (Bonawitz et al., 2011). In this study, preschoolers saw a new toy that had four hidden functions, and were then given the opportunity to explore the toy freely. What differed across conditions was the way in which the toy was first introduced to the child. In the pedagogical condition, an experimenter demonstrated one of the object's hidden functions. In the interrupted condition, the experimenter also demonstrated a single function but then excused herself to go write something down, implying that the object had more functions. In the naïve condition, the experimenter pretended that she didn't know anything about the object and then accidentally discovered one of its functions. In the baseline condition, the experimenter looked at the object but did not interact with it all. Results from this study show that children in the pedagogical condition explored less, made fewer different kinds of actions, and spent more time on the demonstrated function than children in the other three conditions, which didn't differ from each other. More importantly, children in the pedagogical condition discovered fewer of the objects' other hidden functions than did children in the other three conditions. These differences lead the researchers to conclude that pedagogy is effective, but can also limit exploration by sending the message that the only thing that can be done with this object is what the instructor demonstrated. Although this study did not explicitly include a guided condition, these results strongly imply that direct

instruction is, in the words of these researchers, a "double-edged sword" (see also Gopnik, 2012).

Further, some evidence suggests that children participating in curricula that are based on principles of direct instruction show more inattention and stress behaviors, less confidence in their own abilities, less enjoyment of challenging tasks, and less end-of-year progress in motor, language, and social skills when compared with peers in playful-learning classrooms. And these disadvantages last through elementary school, leading these children to have poorer study habits, lower degrees of academic achievement, and greater levels of distractibility, hyperactivity, and peer aggression (e.g., Burts et al., 1992; Hart et al., 1998; Hirsh-Pasek & Golinkoff, 2003; Singer & Singer, 2005).

These results do not imply that there is never a time or place for direct instruction. But they do encourage us to consider why guided play is such an effective pedagogical method for preschool-aged children, and how it is able to achieve the benefits outlined above. We take up this issue in the next section.

WHY AND HOW DOES IT WORK?

Children learn best in active, engaged, constructive and interactive environments (e.g., Chi, 2009), when the material they are learning is meaningful to them (Hirsh-Pasek et al., 2009), and when they receive consequential feedback and probing questions (Honomichl & Chen, 2012). By putting their interests and needs at the forefront of the learning process, by giving some feedback and direction toward the relevant dimensions, and by allowing children to be active partners, guided play is able to keep children engaged. As Diamond and Lee (2011) write in their review of education programs which successfully train executive function skills, programs that focus on content with an eye toward a more playful pedagogy "tend to reduce stress in the classroom; cultivate joy, pride, and self-confidence; and foster social bonding; all of which support efforts to improve [executive function skills] and academic achievement" (p. 963).

In addition, guided play contributes to children's self-efficacy as learners by letting them direct the learning within the play context and by presenting opportunities that invite active participation and engagement. This is unlike direct instruction, in which children's attention is manipulated by a teacher and does not emerge from their own interests. It is also unlike free play, in which the learning goals may be not be clear enough to the child to limit his or her exploratory behavior in effective ways. Essentially, learning is a case of narrowing the parameters to which one should pay attention. By creating environments that help children to focus on those elements that are relevant to the learning goal, guided play reduces distraction, which has been shown to hinder learning (Barr, Shuck, Salerno, Atkinson, & Linebarger, 2010; Chiong & DeLoache, in press; Parish-Morris, Hirsh-Pasek, Golinkoff, Collins, & Mahajan, under review ; Uttal, Scudder, & DeLoache, 1997). What guided play does, ultimately, is to organically encourage children to focus on the dimensions of relevance to the current learning goal.

We offer the term *mise en place*, borrowed from the French culinary tradition, to capture this aspect of guided play. Literally translated, this phrase means "to put in place," but has come to mean something closer to "everything in its place." When applied to the kitchen, it refers to the way in which cooks organize all of their ingredients and tools into their proper places before starting a dish, so that they have everything on hand and at the ready for whatever they are planning to make. The kitchen *mise en place* in some ways determines what a cook can make at any given time and also how well and easily it can be made. When applied to human contexts in general, we mean the term to describe the properties of the total environment that simultaneously enable certain kinds of events to occur and constrain actors' available options for what to do next.

A particular *mise* consists of the set of abstract features of the environment that create a mindset in the actors within that environment. These abstract features can be any number of things, including the physical properties of the environment, the way in which people interact with and react to each other, and, of course, the interplay between these features. These environmental features combine to constrain people's actions within the setting, enabling certain sorts of attitudes and reactive strategies to come to the fore (for related concepts, see broken windows theory, Kelling & Wilson, 1982; niche construction in human cognitive evolution, Sterelny, 2012; the Lucifer effect, Zimbardo, 2007).

Using this theoretical framework, we posit that what makes guided play effective is the *mise* that it creates, which affects children's mindsets for the better and encourages them to bring the right kinds of cognitive tools to the situation. In guided play, the adult sets the *mise* for a particular play context, and the child then directs his or her learning within that context with adult support. By making children feel comfortable enough to explore and to spontaneously ask questions, while simultaneously limiting their options in service of a learning goal, guided play takes advantage of children's natural response tendencies to successfully scaffold their learning. By contrast, environments in which direct instruction dominates set up a different *mise* for preschoolers, one that implicitly encourages children not venture to far from the specific learning goal at hand (e.g., Bonawitz et al., 2011).

The *mise en place* concept can thus help us to understand why and how pedagogical strategies or combinations of strategies work effectively under certain circumstances. When considering preschool education, we believe guided play presents a superior teaching method, for the reasons outlined above. But a more directly instructional approach has been shown to trump free play and exploration for some learning outcomes, such as

science learning in older children (e.g., Chen & Klahr, 1999; Klahr & Nigam, 2004; Klahr, Zimmerman, & Jirout, 2011; Lorch et al., 2010). Why? We argue that what is needed in any learning situation is the ability of the learner to focus on the dimensions of interest to the current learning goal and to extract the relevant information from the environment. While guided play sets up the right *mise* for allowing preschool children to do so, direct instruction can be more effective at establishing these constraints for those children who are accustomed to schooling or who have already established a suite of "learning to learn" tools (see also Fuson & Burghardt, 2003; Marulis & Neuman, 2010).

So our answer to the question of why guided play works, perhaps surprisingly, is that there isn't anything necessarily special about either play in general or guided play in particular that does the work of conveying the academic and cognitive benefits reviewed above. Rather, guided play can be thought of as a metaphor for any type of learning that encourages a learner to be an active and engaged partner in the learning process and that provides a constrained way for helping children focus on the outcomes of interest. It is effective because it invites the learner in, implicitly asking for his or her engagement in a way that directly imparting the same information does not. It is a format that utilizes the best practices of the science of learning to date by offering a context in which active, engaged, interactive, and meaningful experiences coalesce, thus providing a fertile pedagogy for optimizing learning. Guided play may be the most common or easiest way to achieve this format in preschool, but we are not committed to it being the only way to do so.

CONCLUSION

The evidence suggests that preschool children benefit from a curriculum that is structured and rich in cognitive stimulation. Such an approach leads not only to gains in content knowledge and school readiness skills, but also to gains in some of the less obvious areas of development such as self-regulation, motivation, and creativity. As Kagan and Lowenstein (2004) argue, "The literature is clear: Diverse strategies that combine play and more structured efforts are effective accelerators of children's readiness for school and long term development" (p. 72). We humbly submit that guided play, with its focus on children's own efficacy and exploration, provides the model for precisely this kind of pedagogy, making it uniquely well suited to conferring academic benefits to preschool children.

Acknowledgments—The authors would like to thank Jerome Bruner, three anonymous reviewers, and all of the members of the Temple Infant and Child Lab for their helpful comments. This work was supported by the Institute of Education Sciences (R305A110128).

REFERENCES

Alfieri, L., Brooks, P. J., Aldrich, N. J., & Tenenbaum, H. R. (2010). Does discovery-based instruction enhance learning? *Journal of Educational Psychology*, *103*, 1–18.

Ash, D., & Wells, G. (2006). Dialogic inquiry in classroom and museum: Action, tools, and talk. In Z. Bekerman, N. Burbules, & D. Silberman-Keller (Eds.), *Learning in places: The informal education reader* (pp. 35–54). New York, NY: Peter Lang.

Barr, R., Shuck, L., Salerno, K., Atkinson, E., & Linebarger, D. L. (2010). Music interferes with learning from television during infancy. *Infant and Child Development*, *19*, 313–331.

Bellin, H. F., & Singer, D. G. (2006). My magic story car: Video-based play intervention to strengthen emergent literacy of at-risk preschoolers. In D. G. Singer, R. M. Golinkoff, & K. Hirsh-Pasek (Eds.), *Play = learning: How play motivates and enhances children's cognitive and social-emotional growth* (pp. 101–123). New York, NY: Oxford University Press.

Berk, L. E., & Winsler, A. (1995). *Scaffolding children's learning: Vygotsky and early childhood education*. Washington, DC: NAEYC Press.

Blair, C., & Razza, R. P. (2007). Relating effortful control, executive function, and false belief understanding to emerging math and literacy ability in kindergarten. *Child Development*, *78*, 647–663.

Bonawitz, E., Shafto, P., Gweon, H., Goodman, N. D., Spelke, E., & Schulz, L. (2011). The double-edged sword of pedagogy: Instruction limits spontaneous exploration and discovery. *Cognition*, *120*, 322–330.

Burghardt, G. M. (2011). Defining and recognizing play. In A. Pellegrini (Ed.), *Oxford handbook of the development of play* (pp. 9–18). New York, NY: Oxford University Press.

Burts, D. C., Hart, C. H., Charlesworth, R., Fleege, P., Mosley, J., & Thomasson, R. H. (1992). Observed activities and stress behaviors of children in developmentally appropriate and inappropriate kindergarten classrooms. *Early Childhood Research Quarterly*, *7*, 297–318.

Burts, D. C., Hart, C. H., Charlesworth, R., & Kirk, L. (1990). A comparison of frequencies of stress behaviors observed in kindergarten in classrooms with developmentally appropriate versus inappropriate instructional practices. *Early Childhood Research Quarterly*, *5*, 407–423.

Callanan, M. A., & Braswell, G. (2006). Parent–child conversations about science and literacy: Links between formal and informal learning. In Z. Bekerman, N. Burbules, & D. Silberman-Keller (Eds.), *Learning in places: The informal education reader*. New York, NY: Peter Lang.

Callanan, M. A., & Oakes, L. (1992). Preschoolers' questions and parents' explanations: Causal thinking in everyday activity. *Cognitive Development*, *7*, 213–233.

Campbell, F. A., Pungello, E. P., Miller-Johnson, S., Burchinal, M., & Ramey, C. T. (2001). The development of cognitive and academic abilities: Growth curves from an early childhood educational experiment. *Developmental Psychology*, *37*, 231–242.

Campbell, F. A., & Ramey, C. T. (1994). Effects of early intervention on intellectual and academic achievement: A follow-up study of children from low-income families. *Child Development*, *65*, 684–698.

Campbell, F. A., Ramey, C. T., Pungello, E., Sparling, J., & Miller-Johnson, S. (2002). Early childhood education: Young adult outcomes from the Abecedarian Project. *Applied Developmental Science*, *6*, 42–57.

Carleson, C., & Francis, D. (2002). Increasing the reading achievement of at-risk children through Direct Instruction: Evaluation of the Rodeo Institute for Teacher Excellence (RITE). *Journal of Education for Students Placed At Risk*, *7*, 141–166.

Chen, Z., & Klahr, D. (1999). All other things being equal: Children's acquisition of the control of variables strategy. *Child Development*, *70*, 1098–1120.

Chi, M. T. H. (2009). Active-constructive-interactive: A conceptual framework for differentiating learning activities. *Topics in Cognitive Science*, *1*, 73–105.

Chien, N., Howes, C., Burchinal, M., Pianta, R., Ritchie, S., Bryant, D. M. Barbarin, O. A. (2010). Children's classroom engagement and school readiness gains in pre-kindergarten. *Child Development*, *81*, 1534–1549.

Chiong,C. & DeLoache, J. S. (in press). Learning the ABC's: What kinds of picture books facilitate young children's learning? *Journal of Early Childhood Literacy*.

Christie, J. F., & Enz, B. (1992). The effects of literacy play interventions on preschoolers' play patterns and literacy development. *Early Education and Development*, *3*, 205–20.

Christie, J. F., & Johnsen, E. P. (1983). The role of play in social-intellectual development. *Review of Educational Research*, *53*, 93–115.

Christie, J. F., & Roskos, K. A. (2006). Standards, science, and the role of play in early literacy education. In D. G. Singer, R. M. Golinkoff, & K. Hirsh-Pasek (Eds.), *Play = learning: How play motivates and enhances children's cognitive and social-emotional growth* (pp. 57–73). New York, NY: Oxford University Press.

Copple, C., Sigel, I. E., & Saunders, R. (1979). *Educating the young thinker: Classroom strategies for cognitive growth.* New York, NY: D. Van Nostrand.

DeVries, R., Zan, B., Hildebrandt, C., Edmiaston, R., & Sales, C. (2002). *Developing constructivist early childhood curriculum: Practical principles and activities*. Williston, VT: Teachers College Press.

Diamond, A., Barnett, W. S., Thomas, J., & Munro, S. (2007). Preschool program improves cognitive control. *Science*, *318*, 1387–1388.

Diamond, A., & Lee, K. (2011). Interventions shown to aid executive function development in children 4 to 12 years old. *Science*, *333*, 959–964.

Dickinson, D. K., & Tabors, P. O. (2001). *Beginning literacy with language: Young children learning at home and school*. Baltimore, MD: Paul H. Brookes.

Duncan, G. J., Dowsett, C. J., Claessens, A., Magnuson, K., Huston, A. C., Klebanov, P., Japel, C. (2007). School readiness and later achievement. *Developmental Psychology*, *43*, 1428–1446.

Education Commission of the States. (1999). *Direct instruction.* Denver, CO: ECS.

Ellis, A. K., & Fouts, J. T. (1993). *Research on educational innovations*. Princeton Junction, NJ: Eye on Education.

Engelmann, S., & Brunner, E. (1995). *Reading mastery*. Worthington, OH: McGraw Hill.

Farran, D., Wilson, S. J., Lipsey, M., & Turner, K. (2012, June). *The effect of Tools of the Mind curriculum on children's achievement and self-regulation.* Paper presented at the Head Start Research Conference, Washington, DC.

Ferrara, K., Hirsh-Pasek, K., Newcombe, N. S., Golinkoff, R. M., & Lam, W. S. (2011). Block talk: Spatial language during block play. *Mind, Brain, and Education*, *5*, 143–151.

Fisher, K., Glazek, K., Schol, E., Rouse, C., Hirsh-Pasek, K., & Golinkoff, R. (in preparation). Pedagogical constraints on children's creative problem-solving skills.

Fisher, K., Hirsh-Pasek, K., Golinkoff, R. M., Singer, D., & Berk, L. E. (2011). Playing around in school: Implications for learning and educational policy. In A. Pellegrini (Ed.), *The Oxford handbook of play* (pp. 341–363). New York, NY: Oxford University Press.

Fisher, K. R., Hirsh-Pasek, K., Newcombe, N., & Golinkoff, R. M. (in press). Taking shape: Supporting preschoolers' acquisition of geometric knowledge through guided play. *Child Development*.

Fuson, K. C., & Burghardt, B. H. (2003). Multidigit addition and subtraction methods invented in small groups and teacher support of problem solving and reflection. In A. J. Baroody & A. Dowker (Eds.), *The development of arithmetic concepts and skills* (pp. 267–304). Mahwah, NJ: Lawrence Erlbaum.

Garvey, C. (1990). *Play* (2nd ed.). Cambridge, MA: Harvard University Press.

Gathercole, S., Tiffany, C., Briscoe, J., & Thorn, A. (2005). ALSPAC team: Developmental consequences of phonological loop deficits during early childhood: A longitudinal study. *Journal of Child Psychology and Psychiatry*, *46*, 598–611.

Gersten, R., Darch, C., & Gleason, M. (1988). Effectiveness of a direct-instruction academic kindergarten for low-income students. *Elementary School Journal*, *89*, 227–240.

Gopnik, A. (2012). Scientific thinking in young children: Theoretical advances, empirical research, and policy implications. *Science*, *337*, 1623–1627.

Han, M., Moore, N., Vukelich, C., & Buell, M. (2010). Does play make a difference? Effects of play intervention on at-risk preschoolers' vocabulary learning. *American Journal of Play*, *3*, 82–105.

Hart, B., & Risley, T. (1995). *Meaningful differences in the everyday lives of American children*. Baltimore, MD: Paul H. Brookes.

Hart, C. H., Burts, D. C., Durland, M. A., Charlesworth, R., DeWolf, M., & Fleege, P. O. (1998). Stress behaviors and activity type participation of preschoolers in more and less developmentally appropriate classrooms: SES and sex differences. *Journal of Research in Childhood Education*, *12*, 176–196.

Hines, P., McCartney, M., Mervis, J., & Wible, B. (2011). Laying the foundation for lifetime learning. *Science*, *333*, 951.

Hirsh-Pasek, K. (1991). *Pressure or challenge in preschool? How academic environments affect children.* In L. Rescorla, M. C. Hyson, & K. Hirsh-Pasek (Eds.), *New directions in child development. Academic instruction in early childhood: Challenge or pressure?* (39–46). San Francisco, CA: Jossey-Bass.

Hirsh-Pasek, K., & Golinkoff, R. (2003). *Einstein never used flashcards: How our children really learn and why they need to play more and memorize less*. Emmaus, PA: Rodale Press.

Hirsh-Pasek, K., & Golinkoff, R. M. (in press). The great balancing act: Optimizing core curricula through playful learning. In E. Zigler, S. Barnett, & W. Gilliam (Eds.), *The preschool education debates*. Baltimore, MD: Paul H. Brookes.

Hirsh-Pasek, K., Golinkoff, R., Berk, L., & Singer, D. (2009). *A mandate for playful learning in preschool: Presenting the evidence*. New York, NY: Oxford University Press.

Honomichl, R. D., & Chen, Z. (2012). The role of guidance in children's discovery learning. *Wiley Interdisciplinary Reviews: Cognitive Science*, *6*, 615–622.

Johnson, J. E., Christie, J. F., & Yawkey, T. D. (1999). *Play and early childhood development* (2nd ed.). New York, NY: Longman.

Kagan, S., & Lowenstein, A. (2004). School readiness and children's play: Contemporary oxymoron or compatible option?. In E. Zigler, D. Singer, & S. Bishop-Josef (Eds.), *Children's play: The*

roots of reading (pp. 59–76). Washington, DC: Zero to Three Press.

Kamps, D., Abbott, M., Greenwood, C., Wills, H., Veerkamp, M., & Kaufman, J. (2008). Effects of small-group reading instruction and curriculum differences for students most at risk in kindergarten: Two-year results for secondary- and tertiary-level interventions. *Journal of Learning Disabilities*, *41*, 101–114.

Kelling, G. L., & Wilson, J. Q. (1982, March). Broken windows: The police and neighborhood safety. *The Atlantic*, *249*, 29–38.

Klahr, D., & Nigam, M. (2004). The equivalence of learning paths in early science education: Effects of direct instruction and discovery learning. *Psychological Science*, *15*, 661–667.

Klahr, D., Zimmerman, C., & Jirout, J. (2011). Educational interventions to advance children's scientific thinking. *Science*, *333*, 971–975.

Levine, S. C., Ratliff, K. R., Huttenlocher, J., & Cannon, J. (2012). Early puzzle play: A predictor of preschoolers' spatial transformation skill. *Developmental Psychology*, *48*, 530–542.

Lillard, A. S., & Else-Quest, N. (2006). Evaluating Montessori education. *Science*, *313*, 1893–1894.

Lillard, A. S., Lerner, M. D., Hopkins, E. J., Dore, R. A., Smith, E. D., & Palmquist, C. M. (2013). The impact of pretend play on children's development: A review of the evidence. *Psychological Bulletin*, *139*, 1–34.

Lorch, R., Jr., Lorch, E. P., Calderhead, W. J., Dunlap, E. E., Hodell, E. C., & Freer, B. (2010). Learning the control of variables strategy in higher and lower achieving classrooms: Contributions of explicit instruction and experimentation. *Journal of Educational Psychology*, *102*, 90–101.

Love, J., Ryer, P., & Faddis, B. (1992). *Caring environments: Program quality in California's publicly funded child development programs*. Portsmouth, NH: RMC Research.

Marcon, R. (1993). Socioemotional versus academic emphasis: Impact on kindergartners' development and achievement. *Early Child Development and Care*, *96*, 81–91.

Marcon, R. (1994). *Early learning and early identification follow-up study: Transition from the early to the later childhood grades 1990–93*. Washington, DC: District of Columbia Public Schools.

Marcon, R. (1999). Differential impact of preschool models on development and early learning of inner-city children: A three-cohort study. *Developmental Psychology*, *35*, 358–375.

Marcon, R. (2002). Moving up the grades: Relationships between preschool model and later school success. *Early Childhood Research and Practice*, *4*, 517–530.

Marcon, R. (2003). Growing children: The physical side of development. *Young Children*, *58*, 80–87.

Marulis, L. M., & Neuman, S. B. (2010). The effects of vocabulary intervention on young children's word learning: A meta-analysis. *Review of Educational Research*, *80*, 300–335.

Mayer, R. E. (2004). Should there be a three-strikes rule against pure discovery learning? The case for guided methods of instruction. *American Psychologist*, *59*, 14–19.

Miller, E., & Almon, J. (2009). *Crisis in the kindergarten: Why children need to play in school*. College Park, MD: Alliance for Childhood Press.

Neuman, S. B., & Roskos, K. (1992). Literacy objects as cultural tools: Effects on children's literacy behaviors in play. *Reading Research Quarterly*, *27*, 202–225.

Ogan, A., & Berk, L. E. (2009, April). *Effects of two approaches to make-believe play training on development of self-regulation in Head Start children*. Paper presented at the biennial meeting of the Society for Research in Child Development, Denver, CO.

Pagani, L. S., Fitzpatrick, C., Archambault, I., & Janosz, M. (2010). School readiness and later achievement: A French Canadian replication and extension. *Developmental Psychology*, *46*, 984–994.

Parish-Morris, J., Hirsh-Pasek, K., Golinkoff, R. M., Collins, M., & Mahajan, N. (under review). Once upon a time: Preschoolers and storybook reading in the electronic era.

Pellegrini, A. D. (2009). *The role of play in human development*. New York, NY: Oxford University Press.

Pellegrini, A. D., & Galda, L. (1990). Children's play, language, and early literacy. *Topics in Language Disorders*, *10*, 76–88.

Ramani, G. B., & Siegler, R. S. (2008). Promoting broad and stable improvements in low-income children's numerical knowledge through playing number board games. *Child Development*, *79*, 375–394.

Reynolds, A. J., Ou, S.-R., & Topitzes, J. W. (2004). Paths of effects of early childhood intervention on educational attainment and delinquency: A confirmatory analysis of the Chicago Child–Parent Centers. *Child Development*, *75*, 1299–1328.

Rogoff, B. (2003). *The cultural nature of human development*. New York, NY: Oxford University Press.

Romano, E., Babchishin, L., Pagani, L. S., & Kohen, D. (2010). School readiness and later achievement: Replication and extension using a nationwide Canadian survey. *Developmental Psychology*, *46*, 995–1007.

Roskos, K. A., Tabors, P. O., & Lenhart, L. A. (2009). *Oral language and early literacy in preschool: Talking, reading, and writing*. Newark, DE: International Reading Association.

Schweinhart, L. J., Barnes, H. V., & Weikart, D. (1993). Significant benefits: The High/Scope Perry preschool study through age 27. *Monographs of the High/Scope Educational Research Foundation*, *10*.

Schweinhart, L. J., Montie, J., Xiang, Z., Barnett, W. S., Belfield, C. R., & Nores, M. (2004). *Lifetime effects: The High/Scope Perry Preschool Study through age 40*. Ypsilanti, MI: High/Scope Press.

Siegler, R. S., & Ramani, G. B. (2008). Playing linear numerical board games promotes low-income children's numerical development. *Developmental Science*, *11*, 655–661.

Siegler, R. S., & Ramani, G. B. (2009). Playing linear number board games — but not circular ones — improves low-income preschoolers' numerical understanding. *Journal of Educational Psychology*, *101*, 545–560.

Singer, D. G., & Singer, J. L. (1990). *The house of make-believe: Children's play and the developing imagination*. Cambridge, MA: Harvard University Press.

Singer, D. G., & Singer, J. L. (2005). *Imagination and play in the electronic age*. Cambridge, MA: Harvard University Press.

Sterelny, K. (2012). *The evolved apprentice: How evolution made humans unique*. Cambridge, MA: MIT Press.

Stipek, D. J., Feiler, R., Byler, P., Ryan, R., Milburn, S., & Salmon, J. M. (1998). Good beginnings: What difference does the program make in preparing young children for school? *Journal of Applied Developmental Psychology*, *19*, 41–66.

Stipek, D. J., Feiler, R., Daniels, D., & Milburn, S. (1995). Effects of different instructional approaches on young children's achievement and motivation. *Child Development*, *66*, 209–223.

Stockard, J. & Engelmann, K. (2008). *Academic kindergarten and later academic success: The impact of direct instruction* (Technical Report 2008-7). Eugene, OR: National Institute for Direct Instruction.

Sutton-Smith, B. (2001). *The ambiguity of play*. Cambridge, MA: Harvard University Press.

Sutton-Smith, B., & Kelly-Byrne, D. (1984). The idealization of play. In P. K. Smith (Ed.), *Play in animals and humans*. Oxford, England: Basil Blackwell.

Tharp, R. G., & Gallimore, R. (1991). *Rousing minds to life: Teaching, learning and schooling in social context*. Cambridge, England: Cambridge University Press.

Uttal, D. H., Scudder, K. V., & DeLoache, J. S. (1997). Manipulatives as symbols: A new perspective on the use of concrete objects to teach mathematics. *Journal of Applied Developmental Psychology*, *18*, 37–54.

Waldron-Soler, K., Martella, R., Marchand-Martella, N., Tso, M., Warner, D., & Miller, D. (2002). Effect of a 15-week Language for Learning implementation with children in an integrated school. *Journal of Direct Instruction*, *2*, 75–86.

Walker, D., Greenwood, C., Hart, B., & Carta, J. (1994). Prediction of school outcomes based on early language production and socioeconomic factors. *Child Development*, *65*, 606–621.

Weikart, D. P. (1998). Changing early childhood development through educational intervention. *Preventive Medicine*, *27*, 233–237.

Zigler, E. F., & Bishop-Josef, S. J. (2006). The cognitive child versus the whole child: Lessons from 40 years of Head Start. In D. Singer, R. M. Golinkoff, & K. Hirsh-Pasek (Eds.), *Play = Learning: How play motivates and enhances children's cognitive and social-emotional growth* (pp. 15–35). New York, NY: Oxford University Press.

Zimbardo, P. G. (2007). *The Lucifer effect: Understanding how good people turn evil*. New York, NY: Random House.