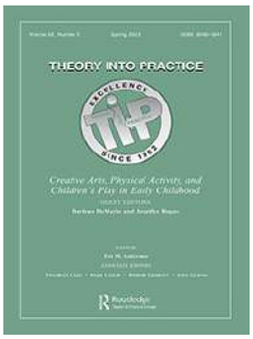

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Making schools work: An equation for active playful learning

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ABSTRACT

Research from the interdisciplinary *science of learning* indicates that children learn best when they are actively engaged in learning that is meaningful, socially interactive, iterative, and joyful. These principles coalesce in active playful learning, especially *guided play*. This active, playful pedagogy enhances learning through intentional instruction that activates students' autonomy and intrinsic motivation while teachers guide them toward a learning goal. In this paper, we provide a framework for facilitating guided play through a 3-part equation of incorporation of cultural values, the science of how children learn, and the science of what children need to learn to thrive in school and beyond. A summary of the research supporting the efficacy of this approach is provided, as are recommendations for how to implement the equation through guided play in our schools.

Reimagining education

The publication of *A Nation at Risk* by the United States National Commission on Excellence in Education (1983) set off a chain reaction. The U.S. attempted decades of large-scale education reforms (Vinovskis, 2009), including the passage and implementation of the No Child Left Behind Act, (2002), the 2010 release of Common Core standards (Porter et al., 2011), and adoption of the Every Student Succeeds Act, (2015). Yet, the desired gains in math and reading central to these efforts were not achieved (e.g., Darling-Hammond, 2007; Dee & Jacob, 2011; Ladd, 2017), but concerning effects on the classroom learning environment were identified. Curricula narrowed to focus on math and reading with instruction guided by assessments (Berliner, 2011). School became stressful for teachers (Reback et al., 2014) and less engaging for students (Markowitz, 2018).

While large-scale education reforms aim to reduce opportunity gaps associated with income, race, and ethnicity in the United States, low-income and minority students in the United States still score lower on assessments of math and reading compared to their peers,

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differences present at the onset of kindergarten (Reardon & Portilla, 2016). These opportunity gaps widened in face of the pandemic with the first full-scale school shutdown in the history of modern schooling (e.g., Kuhfeld et al., 2022; U.S. Department of Education. Institute of Education Sciences, National Center for Education Statistics, 2022).

Declines in academic achievement, compounded by parallel declines in psychological well-being, (e.g., Hamilton & Gross, 2021; Kush et al., 2022), indicate a need to intensify and accelerate learning by reengaging students and teachers. One solution proposed to overcome the learning loss experienced by students is tutoring in literacy and math remediation (e.g., Oreopoulos, 2020). While tutoring is an effective strategy for supporting constrained literacy and math skills when done in small groups, there is need for a more comprehensive response (e.g., Hirsh-Pasek et al., 2020). What is needed is a *strengths-based, student-centered approach to education in the post-COVID-19 era, rather than deficit-oriented remediation* (Darling-Hammond, Schachner, et al., 2020).

Education is at a crossroads. We have the opportunity to reimagine and remake an education system informed by the best available science. Research from the science of learning can be applied to the classroom in ways that create joyous teaching and deeper learning (Hirsh-Pasek et al., 2022). This can be achieved in partnership with educators and implemented in a culturally responsive and inclusive way.

Here we offer a 3-part equation to create joyful teaching and deeper learning through guided play, a student-led, but teacher-facilitated pedagogy (e.g., Weisberg et al., 2013). If we add inclusion of a community's cultural values, the principles how children learn, and the science of what children need to learn, we create a balanced equation for optimal educational environments that are evidence-based.

Part 1: The inclusion of cultural values

A considerable body of knowledge demonstrates the value of bridging between home and school by considering the funds of knowledge that students bring to their education (e.g., Moll et al., 1992). These funds include beliefs, values and practices that can travel easily between contexts, thereby strengthening the learning that happens at school and within the home (Hogg, 2011). For example, the program *Food for Thought* positively impacted Latine children's vocabulary and approaches to learning skills, such as executive function skills of attention and impulse control, through discussion and writing related to food routines (Leyva et al., 2022). When community voices are respected and validated through their representation in classroom curricula, children feel included and thrive.

Part 2: How we learn

With community values in place, we can then overlay the science of how children learn, regardless of content area. After investigating the science of learning and development for over 50 years (e.g., Bransford et al., 2000; Darling-Hammond, Flook, et al., 2020; Meltzoff et al., 2009), researchers are reaching some consensus about the experiences, strategies, and features of effective environments and interactions that promote transferable learning. Humans learn best when they can be active and engaged in learning that is meaningful, socially interactive, iterative, and joyful. This holds in a mathematics class, in reading projects, and in science and social studies. The principles of learning remain constant across subject areas.

Active playful learning

The characteristics that dominate the literature on how children learn coalesce in what we term *active, playful learning* (Hirsh-Pasek et al., 2020; Yannier et al., 2021; Zosh et al., 2018, Zosh, Gaudreau, et al., 2022). Play is foundational in the lives of children and provides an invaluable opportunity for them to explore, practice basic skills, and experience joy. Play contributes to positive cognitive and physical development and social, and emotional well-being and supports academic skills (e.g., Ginsburg & Committee on Psychosocial Aspects of Child and Family Health, 2007; Hirsh-Pasek et al., 2022; Yogman et al., 2018).

The active, playful learning approach provides a framework to understand how we can learn through play, with or without adult facilitation, and with varying levels of structure (Hirsh-Pasek et al., 2020; Zosh et al., 2018, Zosh, Gaudreau, et al., 2022). We conceptualize this as a continuum from *free play* to *guided play* to *playful instruction*. The distinction between these 3 levels of playful learning is determined by whether an experience or activity: (1) has an explicit learning goal, (2) is initiated by children or an adult, and (3) is directed by children or an adult (Zosh et al., 2018). Free play child-initiated and child-directed—like building a fort from pillows. No explicit learning goal is set and children play without constraints. Guided play occurs when the adult involved has a clear learning goal that they support the child to achieve. This adult facilitation can apply across a range of settings—from a well curated classroom, to a children's museum, to any place that adults accompany children and want to help them learn something (Pyle & Danniels, 2016; Weisberg et al., 2013; Weisberg et al., 2016). The experience of guided play is unique from other activities with an explicit learning goal, in that children's interests provide the lead. In guided play, children have agency, or freedom to construct their understanding, rather than being expected to achieve a given result in a particular way as directed by an adult.

Guided play encapsulates the science of how human brains learn: When the experience is active, engaging, meaningful, socially interactive, iterative, and joyful rather than passive, distracting and non-meaningful, children can best achieve a breadth of outcomes. A growing body of research offers evidence for a guided or active playful pedagogical approach (Alfieri et al., 2011; Hirsh-Pasek et al., 2022; Skene et al., 2022). Benefits of guided play, compared to traditional direct instruction, have been found across subject areas, including mathematics (Fisher et al., 2013) literacy (Han et al., 2010; Toub et al., 2018), and executive functioning skills (Schmitt et al., 2018; see, Zosh, Hassinger-Das, et al., 2022, for a review). Guided play is also superior to free play if there is a curricular goal in mind (K. Fisher et al., 2010).

Learning is *active*, by which we mean "minds-on" (Zosh et al., 2018). Deep, transferable understanding develops through an active process of inquiry (e.g., Cantor et al., 2019; Yannier et al., 2021) when we are the agents of our learning. Practice, application, and discussion of what we learn, questioning, exploring, elaboration, and reflection develop the capacity to not only recall what we learn but to also *transfer* this learning to novel contexts. When adults ask questions during a book reading (Whitehurst et al., 1994), when students can explore math problems before instruction (DeCaro & Rittle-Johnson, 2012), students remember more and think more deeply than when they are read to or given worksheets.

Learning also relies on *engagement* or focus. As early as prekindergarten, children's level of engagement is related to learning and achievement (e.g., Nesbitt et al., 2015; Portilla et al.,

2014; Robinson & Mueller, 2014). Engagement in learning is supported through the modeling of learning by teachers, providing regular opportunities for active learning, and supporting students through positive feedback (Harbour et al., 2015). Engagement is supported by reducing distractions such as background noise (Ribner et al., 2021; Schmidt et al., 2008) and classroom clutter (Fisher et al., 2014). Engaging learning experiences, with the right amount of challenge and support, build persistence and deep understanding.

Learning is accelerated when it is *meaningful* and considers our prior knowledge and cultural experiences (e.g., Gay, 2000; Ladson-Billings, 2021). When we connect new information to what we already know and our past experiences (Novak, 2002; Willingham, 2021), we achieve deep conceptual understanding that can be applied to novel contexts and used in novel ways.

Learning flourishes through *social interaction*, learning from others and others learning from us. Social learning facilitated by supportive relationships in our learning communities are the bedrock for learning and development in school and beyond. When children are provided opportunities to engage in collaboration with peers and teachers, they are more likely to engage in greater experimentation, resulting in greater learning, a finding that has been found across grades and content (e.g., Christopher & Farran, 2020; Hargrave & Sénéchal, 2000; Montroy et al., 2014; Ramani et al., 2012).

Learning is also an *iterative* process, where new topics are encountered more than once so that children can construct the meaning of what they are learning through ongoing inquiry and experimentation. Higher-order thinking and deep expertise flow when we engage in hypothesis testing and investigations, including applying our knowledge to novel problems and developing creative solutions (Pellegrino & Hilton, 2012; Ruggeri, 2022; Xu, 2019). Learning experiences that are well-scaffolded to help us make, recognize, and resolve errors are associated with greater learning and understanding (Metcalfe & Kornell, 2007; Pan et al., 2020).

Learning is also more likely to stick when it is *joyful*. The emotional climate of our classrooms is associated with how much students learn (e.g., O'Connor, 2010). Positive emotional techniques to engage students are associated with greater learning gains across elementary school for both math and literacy (Pianta et al., 2008). When learning is fun, we are more motivated and less stressed (Bisson & Luckner, 1996; Zosh et al., 2018). Positive emotional states are related to better cognitive performance across our lifespan (e.g., Blair, 2002). Research suggests that positive emotions foster flexible thinking which in turn contributes to creative thinking and discovery (Fredrickson, 2013). Together, these characteristics form the basis for what we call active, playful learning.

Part 3: What we need to learn—The 6 Cs

The acquisition of traditional academic content knowledge (e.g., mathematics, literacy, social studies, and science) is central to how we define success. But so too, is the acquisition of a breadth of unconstrained skills that portend success in school and life (McCormick et al., 2021). Thus, addition to developing *content expertise*, we must consider the development of characteristics like *collaboration* and *communication* with others, *critical thinking* and *creative innovation*, and building *confidence* to take calculated risks. These skills, grounded in science, are what Golinkoff and Hirsh-Pasek (2016, 2020) call the *6 Cs*. The 6 Cs are skills that are sharpened

throughout the lifespan. Knowledge of content per se is necessary, but cannot be guaranteed to provide personal or professional success. Children need to acquire this full suite of skills and adults can assist them with effective scaffolding and guidance (Bailey et al., 2020).

Collaboration starts in infancy, when babies recognize they need to appeal to others for what they want (Golinkoff, 1981). Social interaction blossoms into a tool for learning as children play with peers and do tasks together. It begins with contingent interactions, when caregivers respond to infants' behaviors in alignment with infants' intentions (Golinkoff, 1981; Masek et al., 2020). These interactions lay the foundation for children's eventual collaboration between equals (Masek et al., 2022). Throughout school, our understanding of joint goals develops (Young et al., 2019) and with experience, we can learn to effectively build relationships and cooperate with others to meet joint goals (Hertz-Lazarowitz et al., 2013).

To collaborate effectively, we must *communicate* effectively. Serve-and-return conversations between adults and children, also called "conversational duets" (Hirsh-Pasek et al., 2015), are essential for developing communication and language skills. Then at home and especially in school, we build our vocabularies, syntactic knowledge, and expressive language skills, and learn to communicate through speaking and writing (Cunningham & Stanovich, 1997; Dickinson & Porche, 2011). With the ability to talk, read, and write, we can communicate our thinking to others, understand others' thinking, and engage in dynamic interactions with others that can lead to novel discoveries and produce greater understanding.

Content is learned through collaboration and communication. Content includes the core academic subject areas of literacy, science, mathematics, and social studies. The 6 Cs framework highlights the need to not only to teach content, but for students to go beyond superficial understanding and continue to refine the meaning and depth of their content knowledge. (Golinkoff & Hirsh-Pasek, 2016). Consider an example from language. To a child, the word "justice" might mean sharing in equal parts; however, by adolescence, children recognize that a concept like justice is nuanced and has a deeper meaning (Hadley et al., 2016). As content increases in breadth and depth, children are empowered to find, analyze, synthesize, and apply their expertise to solve new problems.

Critical thinking is built on content. The ability to evaluate information is an essential skill for success in school and life. We develop critical thinking by encouraging ourselves and others to ask questions, be curious and engage in inquiry in which we develop and test hypotheses to solve problems and synthesize, generate, and communicate explanations (Ennis, 2015; Facione & Gittens, 2016). As with all the 6 Cs, these skills are used in all contexts—from school to home to the playground.

Creative innovation also requires content expertise. Only when we understand how something works, can we start to think of how we might improve it. Consider the history of any modern household appliance as a story of creative innovation. Critical thinking and creative innovation are nurtured by supporting curiosity (Jirout, 2020). Building on our interests and experiences can lead to exploration that brings about a deeper understanding and new creative outcomes (Gopnik & Wellman, 2012; Stricker & Sobel, 2020).

Finally, we must have the *confidence* to keep going when we fail. Stopping after a first unsuccessful attempt will not promote effective problem-solving. Confidence allows us to take calculated risks, to cultivate a *growth mind-set* (Claro et al., 2016; Haimovitz & Dweck, 2017) and *grit* (Duckworth et al., 2007) to persist despite failure.

Recommendations

Based on the science of how we learn and what we need to learn to thrive in school and life, we recommend that educators use the three-part equation of (1) cultural values, (2) the science of *how* children learn, and (3) the knowledge of *what* children need to learn to succeed in life when planning and facilitating instruction. This will require professional development and classroom design that reinforces:

- Cultural values—Learn about your community, asking students, families, and community members what information *they* value.
- The science of how children learn—Study the science of learning and guided play.
- The translation of scientific findings into classroom practice—Ask how each lesson plan incorporates active, engaged, meaningful, socially interactive, iterative, and joyful experiences (Figure 1).
- The science of what children need to know—Ask which skills students are developing while engaged in classroom activities. This requires attending to the whole child and using the 6 Cs grid checklist (Figure 2).

Simple steps educators can take to get started include:

(1) Check your classroom to see if it gives opportunities for guided play.
(2) Can you give more agency to the children?
(3) Are you asking open-ended questions and promoting discussion?
(4) Are you making the learning visible? Are you documenting students' learning and communicating their growth to them and to their families?
(5) Are you inviting children's families to share what matters to them and what they want for their children? Are you sharing what goes on in school with families and bringing in family values?
(6) Do your lessons fuel development of the 6 Cs? Which ones?

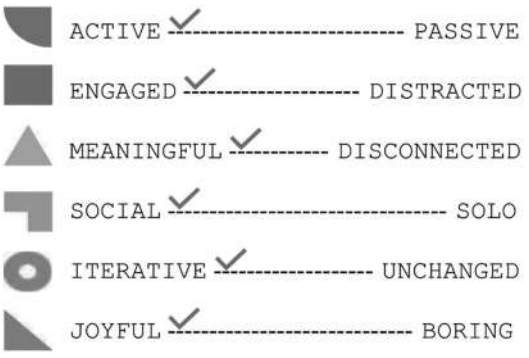

Figure 1. Active playful learning checklist.
Educators should seek to create lessons and experiences aimed to support a specific learning goal that are active, engaging, meaningful, social, iterative, and joyful (Hirsh-Pasek et al., 2020).

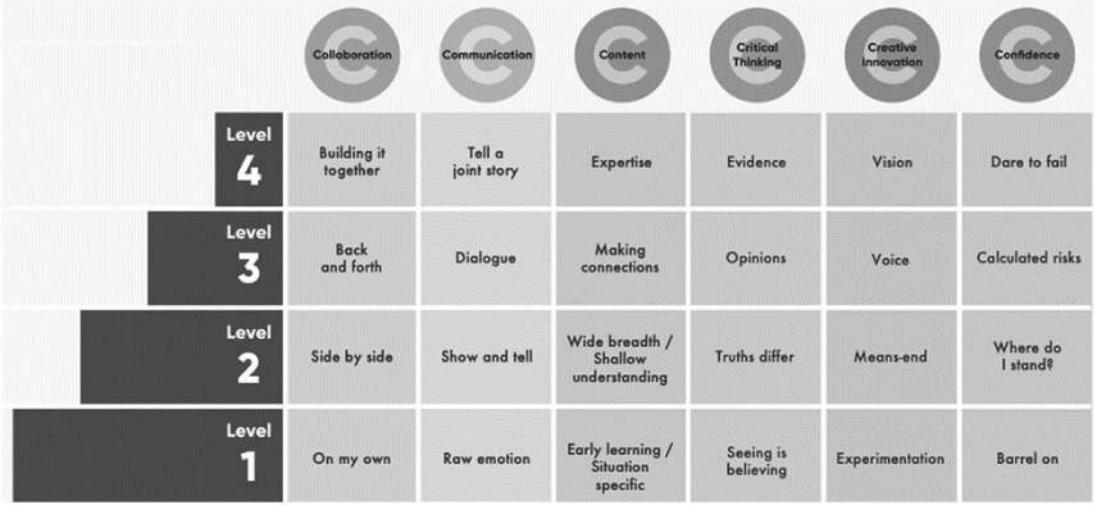

Figure 2. 6 Cs checklist.
For each of the 6 Cs, collaboration, communication, content, critical thinking, creative innovation, and confidence, progress can be categorized within 4 distinct levels, with level 4 as the most advanced. The 6 Cs represent a dynamic system that permits students to exhibit different levels of skills in different learning environments (Golinkoff & Hirsh-Pasek, 2016).

Changing classroom practices is difficult. It requires a commitment from teachers, educational administrators and policymakers to support developmentally appropriate guided play. As researchers, we are the ambassadors, the professionals who can inform policies and decisions even at the state level. In 2018, this is precisely what happened in the State of New Hampshire when they enacted legislation to require play-based learning in kindergarten (RSA§193-E:2-a, 2018) in response to the expansion of state funding for full-day kindergarten. Growing evidence that learning practices centered on play, exploration, and social interactions in kindergarten are being replaced with prescriptive academic curricula (Bassok et al., 2016) sparked this change and educators and scientists were at the forefront. Turning kindergartens into first grades, for example, did not serve the interests of teachers or students.

The pandemic offered us a rare moment of opportunity to consider how best to prepare our students. Education has been struggling to meet the needs of students for decades. With the science in hand, we have the ability to *make schools work* (Hirsh-Pasek et al., 2022). We must seize this moment so that educators can reclaim their profession and all children and teachers can thrive.

Disclosure statement

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Additional Resources

1. Hirsh-Pasek, K., Golinkoff, R. M., Nesbitt, K., Lautenbach, C., Blinkoff, E., & Fifer, G. (2022). ***Making schools work: Bringing the science of learning to joyful classroom practice.*** **Teachers College Press.**

Making Schools Work: Bringing the Science of Learning to Joyful Classroom Practice was written by teachers, school administrators, and scientists to create a model for active, playful learning that would work in classrooms. Grounded in insights into how human brains learn, the book examines how to co-construct and reimagine an optimal educational system for all children that is culturally responsive, inclusive, effective, and fun.

2. The Brookings Institution Playful Learning Series website. https://www.brookings.edu/series/playful-learning/

The Brookings Institution Playful Learning series is a collection of resources (articles, posts, and discussions) on how learning through play can help give children the full breadth of skills to thrive in the 21st century. The collection provides information on how learning through play can harness the power of children's imaginations and inspire active engagement and learning. Resources are updated to reflect the changing context of our education systems.

3. The LEGO Foundation Learning Through Play website. https://learningthroughplay.com/

The LEGO Foundation Learning Through Play website provides a wide array of resources for families, educators, administrators, and policymakers wanting to learn more about the value of playful learning and how to make playful learning a reality for all children. Resources include summaries of the latest research on learning through play and ideas for guided play activities that can be delivered in homes and schools.