

Cabinet of Wonder



Reimagining Mother Goose:

How Nursery Rhymes Cultivate Cognitive and Emotional Skills in Young Children

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The authors wish to thank Natalie Merchant for the creative vision, artistry, and dedication to children that led her to create Cabinet of Wonder. As professionals in the early childhood development field, we know that there is nothing more important to the developing brain than exposure to warm, engaging, and interactive language. And we know that parents and educators are hungry for resources that can help them provide that exposure. That is why Cabinet of Wonder is such a gift. Combining timeless nursery rhymes with music from around the world, Ms. Merchant has created a body of art that sparks curiosity, fosters joy and connection, and propels young bodies to move. In other words, art that builds young brains. We express equal gratitude and admiration for Jacqui Russell and her team at the Chicago Children's Theatre for their vital role in bringing Cabinet of Wonder to life; to the musicians of the Chicago Symphony Orchestra for contributing their unparalleled talents; and to all the artists and professionals who played a part in this truly special project. Finally, we'd like to extend a special thank you to Sonja Knight, Bela Moté, and Ashley Nazarak at the Carole Robertson Center for Learning for their thought partnership and helpful feedback on this paper—and for all that they do on behalf of children and families.

Synopsis

This paper presents scientific evidence for the use of Cabinet of Wonder (CW) as a supplemental educational tool in early learning settings (ELS). CW's unique pedagogy integrates nursery rhymes with a holistic, arts-based teaching approach to enhance cognitive, emotional, and social development in young children, drawing upon extensive research in developmental psychology, education, and neuroscience.

The Critical Importance of Early Childhood Education

Early childhood is a pivotal period for brain development, where foundational skills in cognition, language, and socio-emotional regulation are established. Research underscores the long-term benefits of early learning investments that not only aid in the improvement of academic outcomes, but also enhance social and emotional skill development as well. Nevertheless, existing early education programs often fall short in preparing children for the challenges of schooling.

Cabinet of Wonder: An Innovative Educational Tool

Cabinet of Wonder (CW) was developed by artist Natalie Merchant, in collaboration with the TMW Center for Early Learning + Public Health and the Carole Robertson Center for Learning. Inspired by her experience with Head Start, Merchant observed the powerful impact of nursery rhymes on children's engagement and learning. CW is designed to complement existing curricula by integrating three key educational principles:

1. Whole-Child Pedagogy:

Research demonstrates that early education should not be narrowly focused on cognitive outcomes but should also address the social and emotional needs of children as well. Grounded in developmental psychology and education research, CW emphasizes the importance of considering the child's entire developmental context: social, emotional, cognitive, and environmental. Unlike traditional rote-learning approaches, CW supports learning as a dynamic interaction between the child's internal capabilities and external stimuli and recognizes that a child's learning is influenced by multiple layers of their environment, from family and community to broader societal factors. CW's curriculum integrates this understanding by providing activities that encourage children to draw connections across different domains of knowledge, fostering a more robust and adaptable learning experience. This approach is scientifically supported by evidence showing that a holistic focus on development, rather than isolated skill acquisition, leads to better long-term outcomes in both academic achievement and emotional health.



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2. Self-Concept:

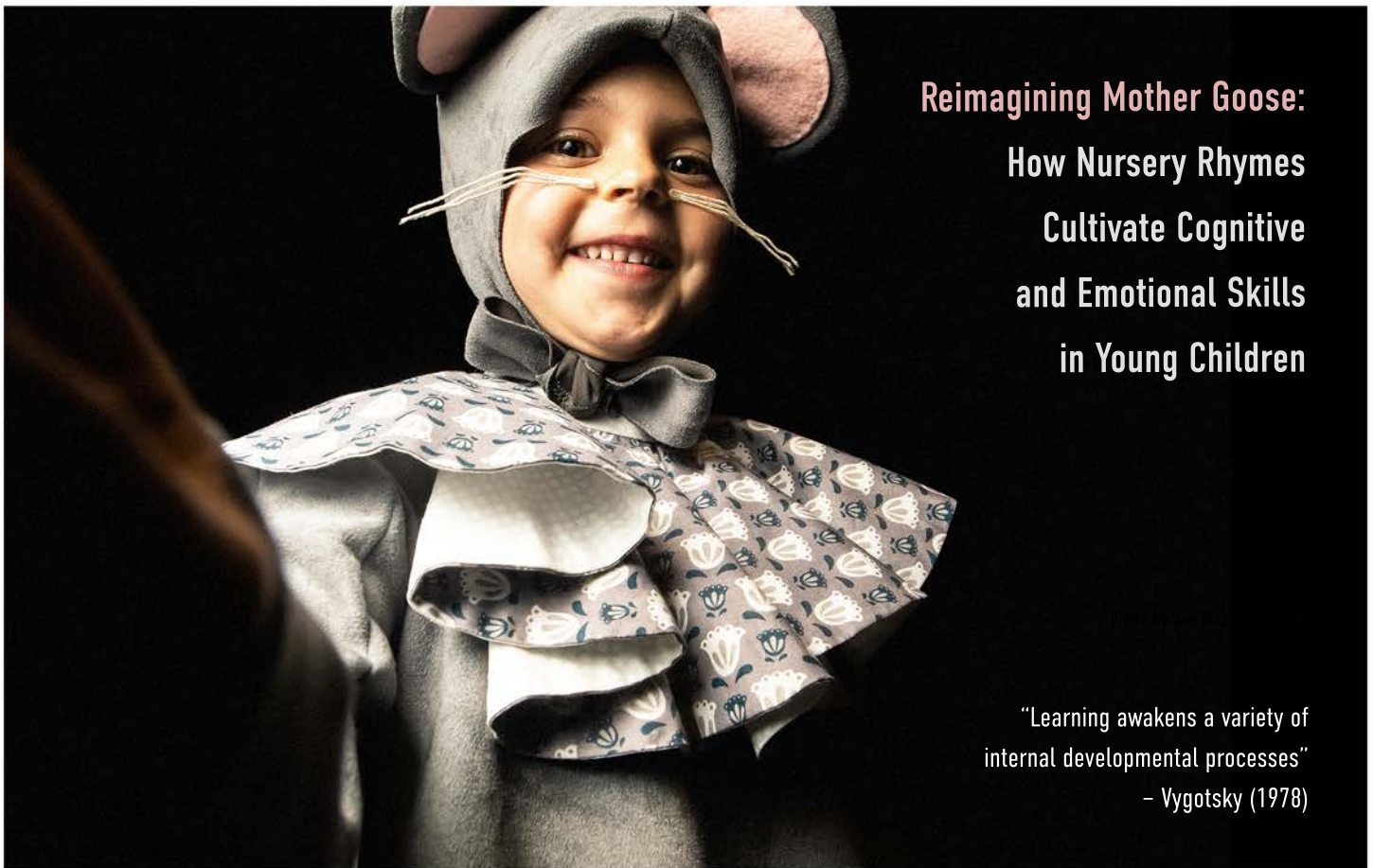
CW is specifically designed to promote children's positive self-concept, or thoughts and feelings about themselves. Self-concept, beginning in infancy, can change over an individual's life course, but the initial experiences and interactions that the child has with their environment strongly informs their resiliency of a positive self-concept. CW recognizes that an arts-based learning approach, such as music and visual arts, is particularly effective for providing children with multiple modalities for expression and understanding, allowing students more agency in building their internal working model of themselves. Studies have shown that Arts integration in education can significantly enhance engagement and reduce stress in children, which helps build self-confidence. CW addresses this need by offering content that appeals to children's varying strengths and interests, utilizing carefully selected nursery rhymes that resonate with contemporary values while also promoting cognitive and emotional development.

3. Arts-Focused Education:

The CW approach is deeply rooted in the growing body of research demonstrating the cognitive and emotional benefits of Arts education. Studies have shown that activities such as music, dance, and visual arts can improve executive functions like emotional regulation, memory, and problem-solving skills, as well as spatial-temporal reasoning. Moreover, evidence suggests that rhythm and beat synchronization, which are central to nursery rhymes, aid in a child's phonological awareness—a critical precursor to reading and writing proficiency, and therefore kindergarten-readiness.

By addressing the whole child, helping build a positive self-concept, and leveraging the cognitive benefits of the Arts, CW offers a comprehensive approach to early childhood learning for educators of all kinds.

The appendix includes supplemental materials and guidelines for educators on how to implement CW in the classroom, with examples of activities across different learning domains—literacy, math, science, and socio-emotional learning.



Reimagining Mother Goose: How Nursery Rhymes Cultivate Cognitive and Emotional Skills in Young Children

“Learning awakens a variety of
internal developmental processes”
– Vygotsky (1978)

Early childhood is a critical period for learning and brain growth (Heckman & Tremblay, 2006; National Research Council (US) and Institute of Medicine (US) Committee on Integrating the Science of Early Childhood Development, 2000; Suskind, 2015). It is a time when learning gaps begin to emerge and when one can begin predicting later academic and socio-emotional outcomes (Heckman & Tremblay, 2006; Temple et al., 2022). Researchers and policy makers alike tout the advantages that early learning investments make to later academic and social outcomes (Heckman & Tremblay, 2006; Temple et al., 2022), yet early education programs continue to vary in their influence on school-readiness and future socio-emotional and academic success (Cascio, 2021). This report draws upon developmental and educational research to introduce and promote a new supplemental early learning tool, Cabinet of Wonder (CW), that can be used alongside established curricula in early learning settings (ELS). To reduce the burden of learning a new curriculum for early educators, CW was developed to supplement classroom learning objectives, focusing on Arts and classroom discussion as a way to promote a child's learning retention and socio-emotional development. Open discussion, in particular, has been found to advance a child's sense of belonging by giving children the chance to genuinely learn from others' perspectives (Beneke et al.,

2017). CW incorporates three major schemes that are fundamental to early education and classrooms: (a) a whole-child approach to learning (b) a curriculum that supports a child's healthy self-concept, and (c) a focus on Arts as a value-added tool for learning (see Figure 1; Brown et al., 2018; Hannah et al., 2011). This paper provides evidence for the case that all students should be afforded the opportunity to learn and to enlighten others in turn.

The report will proceed with a short history of the conceptualization and background of CW before providing an analytical assessment of kindergarten-preparedness focused curricula in ELS. This discussion will provide context for CW's tri-schematic approach to ELS, especially given evidence emphasizing a need for developing socio-emotional awareness and regulation skills prior to acquiring kindergarten readiness milestones (Fleer & Hammer, 2013; Sawyer et al., 2014). The three schemes of the CW will subsequently be discussed as central attributes to a more current approach to early learning education with a specific focus on the positive relationship between nursery rhyme knowledge and reading and writing outcomes. The conclusion of the report will synthesize the evidence and suggest examples for classroom implementation of CW.

Cabinet of Wonder Background

Cabinet of Wonder was conceptualized and created by singer-songwriter Natalie Merchant during the three years (2018-2020) she volunteered as an artist-in-residence with Head Start in Upstate New York, and is based upon the use of traditional nursery rhymes in her every-day interactions with the children. During these interactions, Miss Natalie (as she is referred to) noticed that while most children were familiar with nursery rhymes, others were not, and a majority were unfamiliar with some of the terms and vocabulary used in the rhymes (e.g., merry, slender, knave, and nimble). Miss Natalie taught the children to recite the rhymes and engaged in lively discussions about the unfamiliar words and idiomatic expressions contained in them. In conversations, she recounted how “the children’s eyes lit up” as they interacted with the rhymes, rhythms, and material in an interdisciplinary way. In developmental and educational science, this holistic approach to teaching is often referred to as the whole child approach (Association for Supervision and Curriculum Development, 2007; ASCD). Whole-child learning, as opposed to domain specific learning, considers the environmental contexts in which a child resides, as well as their individual preferences and experiences, that influence their development (Bronfenbrenner, 1977).



Photo by Christian Laursen

Natalie Merchant’s experience with Head Start in New York led her to Chicago in 2024 for a collaboration with the Chicago Symphony Orchestra (CSO). Together, they recorded fourteen of the songs she had written based on a series of nursery rhymes, including: A Crooked Man, Hey Diddle Diddle, Hickory Dickory Dock, Humpty Dumpty, Little Nut Tree, Jack Be Nimble, Jack Sprat, Little Miss Muffet, Mary Had A Pretty Bird, Old King Cole, Peter Pumpkin Eater, Rub-A-Dub-Dub, The Cuckoo, and The Queen of Hearts. Widely considered to originate from oral traditions, these rhymes were collected and first made available through print in England during the mid-18th century. They have since remained the essential canon of children’s poetry, being passed down from generation to generation.

The original musical adaptations written by Merchant and orchestrated by Megan Gould were recorded with the CSO. These songs contain elements of repetition, call-and-response, and are accompanied by a chorus of children. Merchant, the CSO and the Chicago Children’s Theatre (CCT) have produced an hour-long video program, in which Miss Natalie and a group of children transition back and forth from rhyme teaching sessions in a classroom-like setting to musical performances with members of the CSO in elaborate costumes on whimsical theatre sets. When presenting the music, Miss Natalie becomes Mother Goose and the children, the various characters in her rhymes. The aim of the video is to provide a supplemental teaching aid and interactive media tool that is rich in artistic content for educators in ELS. In maintaining with early educational goals, Miss Natalie, in collaboration with the TMW Center for Early Learning + Public Health, the Carole Robertson Center for Learning, and CSO for Kids, conceptualized supplemental curricula to accompany each song that targets literacy and math development, scientific exploration, and early inferential and critical thinking, as well as facilitating socio-emotional understanding and regulation. These skills will be further explained as they pertain to CW’s tri-fold schematic core.

A Critical Analysis of Kindergarten-readiness Objectives in Early Learning Settings

One of the most well-known academic contributions to the importance of early childhood is displayed by the Heckman Curve, demonstrating the relationship between delayed early investments in disadvantaged youth and diminishing rates of public return (Heckman, 2006). The theory has been used to support the importance of early learning environments, and the notion that “skills beget skills” in developmental processes (Heckman, 2006). While science thrives on dissent and critique, there is universal consensus that learning begins in infancy. Nonetheless, child environments are disparate, and structural boundaries inhibit learning opportunities for certain demographic groups (Baydar et al., 1993; Coleman, 1995; Hart & Risley, 1995; Maloney et al., 2015; Rothstein, 2015). Calls-to-action have urged policy makers, institutional organizations, communities, and individuals alike to focus resources on curricula that help mitigate disparities in education (ASCD, 2007; Heckman, 2006). Subsequently, extensive resources have been targeted towards increasing a child’s kindergarten-readiness as a means to address this.

In Illinois, the State Board of Education provides early learning standards in ELS (Illinois State Board of Education, 2013) that serve to inform instruction and universalize educational trajectories (Baucom et al., 2023). These early academic objectives have become established markers to determine a

child's kindergarten-readiness (Baucom et al., 2023; Miller & Kehl, 2019). It is worth noting, that no formal definition of kindergarten-readiness exists, nor is there clear consensus among educational leaders and parents on what skills are crucial for learning in kindergarten (Baucom et al., 2023; Litkowski & Cale Kruger, 2017). Therefore, varying early learning pedagogies exist that lack any substantive framework (Jenkins et al., 2018), and have become "moving targets" for stakeholders interested in preparing children for their first year of school (Baucom et al., 2023). Despite this variation, many early learning educators are faced with learning objectives to increase early literacy and pre-academic skills (Bencke et al., 2017), a pressure that, in many cases, leads curriculum developers to treat certain learning strategies as better than others (Raz & Beatty, 2018). This approach can, unfortunately, have an adverse effect on learning for some students.

CW serves to support early childhood educators by providing a tool that is grounded in current research, makes the classroom a fun and engaging learning environment, while also addressing the challenges posed by policymakers' over-reliance on kindergarten-readiness metrics. Rather than prepare children for kindergarten using rote learning, CW engages children in learning through their entire body (Brown, 2020) using Arts education to aid in the development of both cognitive and noncognitive skill formation (Brown, 2020; Brown et al., 2018; Winsler et al., 2011). Developing socio-emotional skills have continually been shown to play a significant role in later academic outcomes, suggesting that objectives in early learning should consider the whole-child's development rather than focus purely on achieving academic milestones (Chafouleas & Lovino, 2021; Comer, 2005; Ricciardi et al., 2021). This holistic and integrated approach best supports classrooms and allows children to build learning skills that will help them in the long term (Chafouleas & Lovino, 2021). Mounting evidence shows that Arts programming provides optimal resources for this endeavor, as it addresses learning in an accessible and interactive way (Brown et al., 2010; Lobo & Winsler, 2006). CW offers ELS an evidence-based educational tool that, grounded in the Arts, can speak to a child's sense of self-concept. In the following sections, these schematic themes will be discussed.

The Three Schemes of Cabinet of Wonder

1. Whole-child Pedagogy

The quote at the beginning of this report is written by psychologist, Lev Vygotsky (1978) in a book chapter titled, "Interaction between learning and development." Vygotsky considers both learning and development as

distinct operations, however related; whereas learning involves absorbing information in one's environment and from one's experiences, development is best described as maturation (Vygotsky, 1978). As an individual develops, their environment and experiences inform their developmental evolution, not unlike Heckman's (2006) notion that "skills beget skills." The interaction between learning and development is termed an individual's "zone of proximal development" (Vygotsky, 1978), otherwise conceptualized as a child's learning aptitude. This idea that learning and development are distinct yet related informs a whole-child approach to learning because it acknowledges that any learning objective is dependent on the prior knowledge that a child brings into the classroom, regardless of their background or their parent's background (Vygotsky, 1978).

Critics of the whole-child approach have argued that whole-child focused classrooms lack structure and clear learning goals (Jenkins et al., 2018; Maier et al., 2022). During the 2000s, the "No Child Left Behind Act" (NCLB) shifted early learning educational goals from a whole-child approach to one that emphasized cognitive training (Zigler & Bishop-Josef, 2006). This was in part due to findings showing that many American children were under-performing their international counterparts (Elkind, 2001; as cited in Zigler & Bishop-Josef, 2006) as well as the existing achievement gaps within the U.S. (Raver & Zigler, 2004; as cited in Zigler & Bishop-Josef, 2006). Though these statistics are troubling and should be addressed, many scholars believe that a focus on cognitive training and rote learning in early education leads to more of the same problem (Zigler & Bishop-Josef, 2006). To highlight the contrasting impacts of programs using a whole-child pedagogy, the Montessori Method, which has a tradition of curriculum focused on the whole child (American Montessori Society, 2024), has continued to show drastic benefits in both cognitive and non-cognitive measures in comparison to schools that have appealed to the goals aligned with NCLB (Farayadi, 2017; Lillard et al., 2017; Mix et al., 2016).

Research attributes this to a lack of understanding for how educators can target specific learning skills in a holistic way, rather than the whole-child approach itself (Early et al., 2010; Fuligni et al., 2012). This disconnect is evident in Maier et al. (2022), who contend that "content rich instruction" (i.e., classroom activities that are connected to topical themes) provides foundational knowledge for a child's comprehension and future skill use. However, in an article criticizing whole-child approaches to learning, Maier et al. (2022) conflate content-rich instruction with domain-focused. In other words, evidence suggests that educators should not narrow instruction for optimal learning, but rather allow children to infer meaning from the instruction and build comprehensive associations with material that

can be utilized across many learning domains. CW accomplishes this by inviting children to employ thought experiments and infer meaning from nursery songs and texts, that each topically relate to skills that address literacy, math, science, social studies, and physical education. The whole child approach is implemented by acknowledging that each child brings their own background knowledge to the conversation and lessons, as well as providing children access to a variety of perspectives and thought. Pragmatically, CW balances experimentation in play and thought with structured pedagogy that is developed by the teacher to better prepare children for kindergarten (Fuligni et al., 2012).

Support for whole-child pedagogy has footing in Bronfenbrenner's Ecological Systems Model (1977), which has inspired successful educational curricula including Zigler's Head Start program (Zigler & Steitz, 1982) and James Comer's School Development Program (Comer et al., 2004). The fundamental component in both models is that learning doesn't happen in a vacuum, but is rather a process influenced by the child's various environments and experiences (Bronfenbrenner, 1977). This idea is also evident in Vygotsky's zone of proximal development; rather than using cut-off criteria in ELS that box children within achievement categories, possibly limiting their exposure to material that challenges their comprehension, the zone of proximal development acknowledges that learning is a progressive and successive process (Vygotsky, 1978). It is a theoretical perspective that affords educators in ELS more flexibility in the classroom because they are not fettered to teaching to the lowest levels of achievement but can rather use activities that stretch the skills of children at different levels in the classroom.

Take, for example, evidence showing that early phonological awareness aids in later reading, writing, and spelling (Bradley & Bryant, 1983). McLean et al. (1987) found that learning nursery rhymes predicted the development of phonological skills above and beyond pure rhyme detection, suggesting that an important aspect in phonological mastery is understanding the poetic content as opposed to purely learning the grammatical concepts (e.g., rhyming and alliteration). This is an example of how a whole-child approach can possibly exceed domain specific instruction. Using the evidence explained above, CW engages children in the stories and the poetic content, stretching their understanding of the text, and allowing them to acquire a deeper understanding of the material and its interdisciplinary application. Furthermore, CW uses inferential thinking tasks that focus on content (i.e., providing engaging conversation and follow-up questions), bringing these rhymes, often thought of as antiquated into contemporary society while also promoting a child's active involvement in the classroom (Beneke et al., 2017; Maier et al., 2022).

2. Promoting a Healthy Self-Concept

Children are not born with the ability to recognize themselves as distinct from their primary caretaker; in fact, this crucial awareness develops and matures throughout the early months of a child's life (Siegler et al., 2017). As a child develops self-awareness, they simultaneously begin to build their self-concept, or thoughts and feelings about themselves. By experimenting and interacting with their environments, they develop their own feelings and preferences, a crucial step in their developmental journey (Siegler et al., 2017). Fostering a healthy self-concept is a powerful mechanism for preparing a child for a lifetime of learning. After all, it is our attitudes and thoughts about ourselves that determine who we want to be. The messages that we get from our environment informs how we see ourselves and how we engage with learning. For instance, a teacher who tells a child, "Wow, you're really good at counting" is directly influencing that child's self-concept by instilling in them the notion that they are someone who is good at math (Siegler et al., 2017). Indirect messages involve how children are treated by others – whether they feel included, valued, and supported (Siegler et al., 2017). In both cases, children are constantly internalizing and updating their self-concepts by the evaluations they receive and observations they make in their environments (Siegler et al., 2017). While the prospect of prioritizing self-concept may seem daunting to an industry that is already overburdened and under-staffed (Childcare Education Institute, 2022; National Head Start Association, 2023), instruction that is more comprehensive rather than task-specific is a promising way to expand the many ways students can receive messages that will affect their self-concept without overtaxing early educators (Collins, 2016; Maier et al., 2022).

Research suggests that Arts education can provide a variety of opportunities for all children to engage with and optimize their own learning (Brown, 2020). Music and dance provide non-English speaking children with the capacity to learn using their whole body rather than relying purely on language, broadening the avenues in which information is acquired and retained (Brown et al., 2010). For instance, one activity suggested for children to learn the rhyme "Jack Be Nimble" involves the children lining up and jumping over a candle stick without knocking it over. During prior experiences using this task, non-English speaking children were able to observe and follow the native English-speaking children as they performed the task (N. Merchant, personal communication, June 20, 2024), suggesting that performing tasks that allow children to associate novel words with action may help language acquisition above and beyond pure instruction.

Learning through the Arts has also been shown to provide children an avenue of emotional expression and a way to disseminate their own experiential knowledge, a skill associated with building a healthy self-concept through the development of emotion regulation (Denham & Liverette, 2019). Research shows that Arts programming can reduce cortisol levels associated with adverse childhood circumstances through creative avenues of emotional training (Brown et al., 2018). One suggested mechanism for this relationship is the process of directing children in their movement experiences (i.e., stop and start or loud and soft; Brown et al., 2018; Lobo & Winsler, 2006), helping children learn agency and control over their own bodies.

How Traditional Nursery Rhymes Can Facilitate a Healthy Self-Concept

CW also expressly addresses the relevance of literary content for children to learn about and understand their current world and their place in it. While more traditional nursery rhymes have been criticized for their antiquated origins (Prošić-Santovac, 2004; Schellenberger, 1996), scholars and researchers suggest ways that traditional texts can become a tool for creating holistically experienced classroom environments (Prošić-Santovac, 2004); specifically, by engaging directly with the content through guided and scaffolded classroom discussion. The rhymes chosen for CW align with what Prošić-Santovac (2004) considers the necessary criteria for choosing historical poetry for modern instruction.

VISUAL REPRESENTATIONS

According to Prošić-Santovac (2004), accompanying illustrations and media that are world-representative promote pragmatic learning in classrooms. This is because visual representations aid in how children think about the world (Stephens, 2011). With this evidence in mind, CW created supplemental video clips in collaboration with the CCT to accompany each rhyme and song for early educators to use in their classrooms. In these music videos, the portrayal of Mother Goose (played by Natalie Merchant) was deliberately constructed to “open up a wider range of role-identities” (p. 13, Lemish & Muhlbauer, 2012) that children can identify with and implement into their social cognitive formations. CW’s Mother Goose represents a strong, however soft and warm, caretaker-like figure that interacts with a group of children by answering questions, singing, and playing games. Care was also taken by recruiting a group of children for the videos that children in the classrooms would be able to identify with.

PROBLEM SOLVING SKILLS

Prošić-Santovac (2004) also contend that traditional texts should present situations where children can practice problem-solving skills. As children grow, their sense of self takes on higher order concepts, allowing them to develop more holistic evaluations of themselves as individuals within the broader world (Siegler et al., 2017). This more balanced view of the Self results from gaining more cognitive capacity to entertain opposing self-representations (Siegler et al., 2017). One way to exercise this skill is by taking Walker and Nyhout’s (2020) approach of using open-ended questions (e.g., “why?” and “why else?”) to influence a child’s ability to reason, infer, and hold multiple explanations. Evidence suggests that individuals who can consider a range of possibilities display attenuated biases in prediction, explanation, and hypothesis-testing (Walker & Nyhout, 2020). Similarly, entertaining counterfactual questions (e.g., “what if?”) in early childhood is positively associated with earlier abilities in deductive reasoning (Walker & Nyhout, 2020). Based on the scientific evidence, CW suggests the use of open-ended questions in group activities to aid children in developing inferential thinking, moral reasoning, and hypothesis formation and testing skills—all of which can contribute to a child’s healthy self-concept.

One example for this approach comes from the nursery rhyme, The Queen of Hearts. In this rhyme, the Queen of Hearts makes some tarts that are stolen by the Knave. After the King of Hearts orders them to be returned, the Knave vows never to steal again. Psychologist Lawrence Kohlberg also conceptualized a story about stealing (the Heinz dilemma) to assess moral reasoning and development throughout the life course (for a review, see Reimer, 1977). Kohlberg’s theory on moral development (see Kohlberg & Hersh, 1977) is a stage-theory of moral reasoning that is believed to follow brain maturation and executive functioning. Children’s reasoning about their answers to the Heinz dilemma reflect their moral reasoning level classified as either preconventional, conventional, or post conventional (Kohlberg & Hersh, 1977). While pre-conventional children see stealing as inexcusable, conventional and post-conventional individuals tend to entertain nuance in actions and behavior, perceiving justice and ethics as concepts that are fluid rather than fixed (Kohlberg, 1975). Combining this evidence with the advice from Kohlberg (1975) and Vygotsky (1978) on socialization and education, children are capable and willing to entertain cognitive processes outside their zone of actual development yet within their zone of proximal development.



Cabinet of Wonder adopts this scientific evidence and theory by offering early educators ways to engage children in thoughtful discussions on complex topics (e.g., stealing): “Why (why else) do you think the Knave stole the tarts?” “Should the Knave get in trouble, or does the King of Hearts forgive him?” “What if the Knave steals again?” These open-ended questions allow educators to scaffold a child’s problem-solving skills as well as their cognitive and moral development, by challenging a child’s pre-conventional understanding of the world (Kohlberg & Hersh, 1977) and introducing them to new vocabulary (e.g., tart and Knave), items (e.g., cards), and shapes (e.g., hearts, clubs, diamonds, spades). In other words, CW allows educators to address various learning domains holistically within a single Arts based curricular tool that supports the development of a healthy self-concept.

Photo by Joe Mazza / Brave Lux

3. Arts Focused Education

The idea of implementing the Arts into an educational curriculum is well supported in the developmental and educational literature. Some examples of this display the association between Arts curricula and stress level reductions for economically disadvantaged children in early education (Brown et al., 2018). Rauscher et al. (1997) showed that listening to music aids the firing of neural pathways that are responsible for spatial-temporal reasoning, a theory termed “the Mozart Effect” (Hetland, 2000). Other investigations that examine the relationship between the Arts and learning consider the importance of non-cognitive skill development, like Drake and Winner (2023), who found that drawing pictures helps children regulate their emotions. Brown et al. (2010) point-out the many ways that Arts education aids development and learning including strengthening emotional regulation, reflecting cultural relevance, and expanding the channels for which children acquire information. As experts of Arts curricula, Hetland and Winner (2002) have repeatedly discussed the importance of Arts as a pedagogical vessel that aids learning above and beyond traditional instructional methods, a suggestion heeded by the U.S. Department of Health and Human Services in a national research agenda that took place in 2011, promoting the Arts in education (National Endowment for the Arts, 2011).

The Effect of Arts on Non-cognitive Skill Development

One important way that Art pedagogy aids learning is in its ability to enhance certain executive functioning skills like emotional regulation (Harrington et al., 2020). This skill is considered vitally important for determining school-readiness, as the ability to regulate one’s emotions affects whether children can sit still, follow directions, mitigate classroom conflicts, navigate new relationships and environments, etc. (Duncan et al., 2017; Harrington et al., 2020). Brown and Sax (2013) found that compared to children in a traditional preschool setting, teachers reported greater growth of both positive and negative emotion regulation for children in an Arts integrated preschool setting. These results hold greater implications considering that the study was focused on children from economically disadvantaged backgrounds. Because less-advantaged children may be exposed to environments that challenge executive functioning processes responsible for emotional regulation (Szydlo & Farnsworth, 2023), Arts programming may not only aid in school-readiness overall but address the gaps in school-readiness that exist along socio-economic lines. The latter statement is supported by research that has looked at the effect of Arts on reducing salivary cortisol levels (Brown et al., 2016; Lindblad et al., 2006).

The idea of implementing the Arts into an educational curriculum is well supported in the developmental and educational literature.



Evidence suggests that certain disadvantaged or high-emotional environments can raise cortisol levels that are associated with increased stress (Brown et al., 2016). Higher cortisol levels that persist are linked with increases in externalizing and internalizing behaviors and put a child at risk for later negative developmental outcomes (Brown et al., 2016). Exposure to the Arts, including music, visual arts, dance, and acting/pretend play, have been shown to reduce cortisol levels by helping children identify emotions and navigate emotional arousal in safe controlled settings (Brown et al., 2016; Drake & Winner, 2023; Lindblad et al., 2006). Fler and Hammer (2013) also discuss how Arts programming impacts socio-emotional concepts such as coeffect and affective imagination, which have been shown to aid a child's Theory of Mind, or their ability to see and experience things from various perspectives. With this evidence in mind, CW has specifically developed curricular activities that engage children with the nursery stories and songs. While the digital supplemental tools, developed in collaboration with Natalie Merchant, the Chicago Children's Theatre, and the Chicago Symphony Orchestra, provide visual representations of the nursery rhymes, educators are also recommended by CW to act out and express the rhymes in ways other than passive listening. In this vein, CW is specifically designed as an interactive educational tool, allowing children to engage with their education in ways that will promote information retention and recall.

The Effect of Arts on Cognitive Skill Development

In recent decades, scholars have begun to investigate the specific effects of an Arts pedagogy on various learning domains. In a meta-analysis, Podlozny (2000 as cited in Hetland & Winner, 2002) found that classroom drama (i.e., acting out an imaginary situation) resulted in improved verbal outcomes, irrespective of child's age and SES, and whether the child had a learning disability or not. In the same paper, Keinanen et al. (2000 as cited in Hetman & Winner, 2002) reported finding a significant effect of dance instruction on non-verbal spatial reasoning skills, while Vaughn (2000 as cited in Hetman & Winner, 2002) found a significant effect of music instruction on mathematic outcomes. There is also evidence that rhythm detection is associated with reading ability and its substrate skills (Bonacina et al., 2021). While the mechanistic determinants for these associations remain somewhat unclear, evidence does suggest that Arts programming aids the development of a number of cognitive skills. In their extensive work investigating the effects of the Arts on non-art related skill development, Winner and Hetland (2007) identified eight areas that indirectly affect academic achievement. Some of these areas include persistence, bridging formal education with real-world experiences, observing, and hypothesis testing.

In line with Heckman (2006), Winner and Hartman (2007) acknowledge the importance of certain skill acquisition early on as foundational for enhancing later academic achievement and socio-emotional wellbeing. The Arts as an indirect predictor for cognitive skill development is evident in work by Neville et al. (2008) who found that music training led to increases in non-verbal IQ scores, numeracy, and spatial cognition, mediated by the music training program's ability to influence focused attention during tasks. In a quasi-experimental design, Brown et al. (2010) found that an Arts integrated enrichment program predicted greater gains in language, literacy, math, and science as compared to a non-Arts integrated program, and that this gain was similar across children from different racial/ethnic minority groups.

The fact that the Arts continually finds footing in successful early education curriculum (Comer et al., 2004; Head Start ECLK, 2024; Teaching Strategies, 2024) is a testament to why it is considered optimal in preparing children for kindergarten while also aiding in the reduction of barriers to high-quality learning environments (Brown et al., 2010; National Endowment for the Arts, 2011). There is wide support that the Arts acts as a channel through which emotional-regulatory competence, memory, language and literacy, math, symbolic thinking, and positive approaches to learning can be developed and honed (for a complete review, see Teaching Strategies, 2024). CW's supplemental curricular tool uses Art (e.g., poetry, literature, music, imagery, and film) as a medium through which children can express themselves and learn. The CW curriculum guides present ideas for teachers to engage children in the nursery rhyme poetry by providing discussion questions that elicit children's abstract thinking and imagination while also allowing for the acquisition of novel vocabulary. CW also provides thought experiments through visual arts (e.g., "draw where you think the Butcher the Baker and the Candlestick maker are going in their tub") that aids a child's inferential thinking skills and emotional expression. CW further provides physical activities (e.g., "line up and count the kids who can jump over the candlestick like Jack Be Nimble") that teach motor skills, direction taking, and numeral cardinality. Special thought was also taken into the composition of counter melody and rhythm for the songs by Natalie Merchant and the Chicago Symphony Orchestra to support the advancement of literacy skills in preschool aged children (Bonacina et al., 2021; Gordon et al., 2015). Mounting evidence suggests that beat synchronization and rhythm detection enhance phonological awareness (Bonacina et al., 2021; Gordon et al., 2015), while also promoting inferential thinking (Vuust et al., 2022). CW is unique because of its collaborative conceptualization by experts in the Arts, Social Sciences, Education, and Public Health.

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A Specific Case for Using Nursery Rhymes to Promote Phonological Awareness

There is extensive research that speaks to the effect early language environments have on a host of later-life outcomes (Hart & Risley 1995; Leffel & Suskind, 2013). In their formative study, Hart and Risley (1995) found gaping disparities in the type and amount of language use between families of professional, working class, and welfare parents. These disparities are assumed to contribute to academic gaps and are considered an injury to the equality of human rights (Finders et al., 2023). CW employs traditional nursery rhyme prose to engage children with English language and the mechanistic components of English language that aid with reading and writing development in the U.S. Learning that letters of the alphabet represent certain sounds, or phonemes – known as phonological awareness – is the foundation for preparing a child to read and write (Dickinson & Tabors, 2001; Dunst et al., 2011). Learning nursery rhymes provides children with an engaging resource that allows them to build this skill by identifying alliterations and rhyming words (Bryant et al., 1989; Dunst et al., 2011; Maclean et al., 1987). Harper (2011) contends that it is the literary patterns in nursery rhymes that are specifically conducive to children acquiring and retaining phonological skills.

In a randomized controlled trial, Harper (2011) found that children assigned to receiving a phonological awareness training program, that included explicit and interactive instruction with ten nursery rhymes, scored significantly higher on a screening test that measured fundamental literacy skills in preschoolers (Harper, 2011). Maclean et al. (1987) have shown that children as young as 3-years acquire phonological awareness through learning nursery rhymes long before learning to read. The authors further demonstrated that this relationship is not fixed, but rather a skill that aids phonological awareness regardless of a child's pre-intervention rhyme-detection ability. The authors emphasize how important this last finding is considering that nursery rhyme knowledge is a significant predictor of phonological awareness across child IQ and family background (Maclean et al., 1987). Specifically, traditional nursery rhymes have proven the test of transgenerational transmission; they are widely accessible, recognized, and employed across ELS, (Maclean et al., 1987) and why CW can be such an academic asset.

Furthermore, identifying rhymes is another example of the benefits of nursery rhymes for phonological awareness, as it applies to the identification of literary fragments. In fact, early rhyme detection predicts phonological awareness above and beyond other examples of literary

This result has led scholars to question whether nursery rhymes are needed at all, or if purely practicing and identifying rhyming words is sufficient for achieving the same phonological outcomes in early learning. To answer this, Dunst et al. (2011) compared experimental groups based on their nursery rhyme knowledge (i.e., the child's ability to recite a nursery rhyme), experience (i.e., the child's ability to play rhyming games and produce rhymes), and awareness (i.e., the child's ability to supply the end rhyming word to a familiar nursery rhyme). Results from the study displayed that nursery rhyme knowledge and experience had greater positive associations with phonological and print-related knowledge than purely supplying the end rhyming word to a familiar nursery rhyme (Dunst et al., 2011). Importantly, this finding suggests that nursery rhymes, in their holistic form, have added value for developing phonological awareness compared to simply acquiring the ability to match rhyming words together. To answer why this could be, Harper (2011) contends nursery rhymes provide children a way to interact and engage with literary fragmentation, perhaps enhancing their comprehension of sound segments (e.g., c-at and b-at). At some point, children learn that words can be segmented into differing beginning letters and similar ending sounds, which ultimately contributes to their ability to read, write, and spell (Harper, 2011). CW has indoctrinated this evidence into its curricular tools by providing teachers with a guide referencing the phonological concepts in each rhyme (e.g., Hickory Dickory Dock. The mouse ran up the clock) and alliteration (e.g., Peter Peter Pumpkin Eater), as well as providing vocabulary resources like synonyms (e.g., Humpty Dumpty is weak, fragile, dainty, brittle, delicate, etc.) and homonyms (e.g., wishing well or feeling well). The next section will speak specifically to the CW curricular resources and proposed framework for use in the classrooms.



The CW Supplemental PDF Resource Guides

The above discussion provides theoretical and empirical backing for CW and its use as an engaging and inclusive learning tool in ELS. The three schemes (i.e., whole-child pedagogy, self-concept, and Arts based programming) form overlapping and comprehensive concepts for

instruction that should be used as a supplemental guide in ELS so as not to overburden early educators. Each song/rhyme is accompanied by an artistically rich music video and reference guide of curricular ideas that cover literacy, math, science, social studies, socio-emotional learning, Arts, and physical activity. Teachers are encouraged to “pick and choose” activities from the reference guides that supplement their daily schedule and curricula (see Appendix). Access to the resource guides, videos, and songs will be available online and free of charge. Examples from a few of the learning domains are provided below.



Literacy

As mentioned, phonological awareness is the foundation for a variety of later reading, writing, and literacy abilities. CW provides teachers with key rhyming words, response rhyming words, compare/contrast words, similes, and related rhymes that they can be used alongside the overall thematic nursery rhymes and accompanying videos. For example, Humpty Dumpty has key rhyming words on its resource guide such as wall and fall, as well as response rhyming words such as tall, call, mall, small, hall, gall, and all. Teachers are encouraged to teach children new vocabulary with related similes to the story (e.g., weak, dainty, fragile, delicate, crushed, in bits and pieces) that are related to an egg falling, as well as contrasting and comparison words (e.g., careful and careless, dangerous and safe, and whole and broken). Activities that encourage children to use rhymes involve the children themselves creating nonsense names that are similar to “Humpty Dumpty” (i.e., Hoppity Poppity and Hickory Dickory) or that involve alliteration like Peter Peter Pumpkin Eater (i.e., Robin Robin rhubarb eater and Sammy Sammy sundae slurper). Suffixes can be further explored by explaining to children that words contain fragments. In Rub-a-dub-dub, teachers can explore different words in the poem like “bake” with different suffixes (i.e., bak-ing, bake-s, bake-d, bake-r). Vocabulary growth can also be expanded upon by introducing children to homonyms (i.e., see and sea or be and bee). These examples can be found on the resource guide for all fifteen nursery rhymes that have an accompanied novel song and music video.



These suggestions are meant to introduce children to literary concepts rather than require children to learn and perform comprehension.

One important curricular tool that is incorporated into CW is the use of and emphasis on open discussion. Every resource guide for every rhyme includes multiple open-ended questions that allow children to be introduced to new concepts and new words. Evidence suggests that environments that are rich in discussion aid in a child's brain development (Suskind, 2015). For example, the rhyme Rub-a-dub-dub involves the journey of three tradesmen in a tub: the butcher, the baker, and the candlestick maker. Each tradesman dons an apron that aids in his/her trade. One discussion question asks children simply: "What is an apron?" Children are encouraged to think about why each tradesman would wear an apron and what might be spilled on their apron. The resource guide aids teachers in promoting imaginative and inferential thinking: what are the different materials of aprons? (e.g., leather and cloth) and why would different materials be used for the different trades? These open-ended discussions promote perspective taking, emotion regulation, and vocabulary development.

Math

CW also provides activities for early educators to help children build their number literacy, cardinality, and mathematical skills. Research shows that early "math talk" and math activities lay the foundation for later mathematical and spatial skills (He et al., 2022). These activities not only involve number recognition and counting, but also the use of spatial words such as "above" or "beyond", comparisons of size and quantity, and how numbers can represent sets of things (He et al., 2022). Jack be Nimble involves an activity where children line up to jump over the candlestick without knocking it over. For this activity, children are encouraged to count as each child takes their turn jumping over the candlestick. Peter Peter Pumpkin Eater offers early educators the opportunity to begin introducing children to measurement and perspective. Activities for measurement involve asking children if people

can even fit into pumpkin shells, and if not, what can? Children can measure pumpkins in class and the measurements can be written on the board and used for number recognition. The Crooked Man also involves introducing children to distance (i.e., "and he walked up a crooked mile") which provides opportunities to start learning about relative scales. CW also encourages teachers, through its resource guide, to identify and recognize numbers (i.e., the letter three in the rhyme, Rub-a-dub-dub – 3 men in a tub or Hickory Dickory Dock – the clock struck 1). The resource guide for Hickory Dickory Dock also provides instruction and activities that introduce children to the concepts of time.

Another early learning skill that promotes math literacy and knowledge is spatial identification and awareness (Fisher et al., 2013; He et al., 2022). Each rhyme in CW is accompanied by tasks that allow children to learn about and recognize shapes. For instance, Humpty Dumpty provides educators a useful character to begin introducing children to shapes as he himself is egg-shaped. Other notable shaped characters are the clock in Hickory Dickory Dock and a heart in The Queen of Hearts. Jack-be-Nimble and Hey Diddle-Diddle provide children and teachers with activities that involve spatial words (i.e., "over"). More of these examples can be expanded upon and encourage discussions and activities related to spatiality (e.g., kids crawling "under," or going "through" the legs of other children, or leapfrog where kids jump "over" each other). CW examples also involve acting out rhymes, which lends itself to subjective spatial learning (e.g., children act out Little Miss Muffet sitting "on" a tuffet and the spider who sat down "beside" her). These rhymes serve as introductions to concepts that allow children better access to building and maintaining new learning skills.

Science

There are many activities that CW offers that allow children to explore and learn about the world around them. The resource guide for Humpty Dumpty provides early educators with activities related to gravity (e.g.,



what happens when an egg falls?), mass (e.g., how are eggs different depending on whether they are cooked or not?), biology (e.g., what other things in our world have shells?), etc. These topics can be introduced to children after they have learned and interacted with the rhymes to help promote information acquisition and retention.

Rub-a-dub-dub involves an entire theme devoted to water and planetary science. In this resource guide, CW provides activities that allow children to discuss why their planet is called “the blue planet”, the hydraulic system, as well as learning the different names of bodies of water (e.g., lake, river, creek, ocean, bay, etc.). This resource guide also has activities that let early educators begin teaching children about environmental conservation and sustainability. Evidence suggests that instilling a sense of “awe” in individuals about the beauty of nature increases connectedness, positive mood, and critical thinking, while decreasing materialism (Allen, 2018). Lastly, CW encourages children to engage in hypothesis testing (e.g., “what will happen to water if we leave it out over night? Will the tradesmen’s bathtub get lower or higher?”). These activities allow children to be introduced to the scientific method and the value of experimentation.

Conclusion

Using the Arts as a channel through which children can access learning serves to advance their understanding of themselves as well as their sense of self-confidence in early learning settings. Meanwhile, concentrating on the whole child – approaching teaching holistically rather than by means of rote learning or goal orientation – has better support in the literature for skill acquisition that helps the child in a multitude of learning objectives throughout their life.

The TMW Center for Early Learning + Public Health alongside the Carole Robertson Center for Learning and the CSO for Kids realizes the enormous pressures and burden present in ELS to meet varying kindergarten-readiness goals for early learners while also juggling the day-to-day needs of young children (Jeon & Ardeleanu, 2020). CW is not a curriculum, but a curricular tool that is developed to supplement ELS classrooms with both digital and interactive material that is supported within the developmental and educational research community. As a supplemental tool, CW should not overburden early educators, but rather provide them with a resource developed to engage children and provide more optimal learning outcomes, as well as more opportunities to engage in verbal interactions with children. This paper serves as evidence to this statement.

As a supplemental tool, Cabinet of Wonder should not overburden early educators, but rather provide them with a resource developed to engage children and provide more optimal learning outcomes, as well as more opportunities to engage in verbal interactions with children.



Photo by Joe Mazza / Brave Lux

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**Cabinet
of
Wonder**

miss Natalie
Merchant

**chicago
children's
theatre**

 **CHICAGO SYMPHONY ORCHESTRA**

Figure 1. The Schematic Core of Cabinet of Wonder

