The Journey of Loose Parts across Educational Landscapes and History

Ozlem Cankaya, Jamie Leach, Kadriye Akdemir

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The Role of Materials, Relationships, Space, and Time in Children's Loose Parts Play

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The authors discuss loose parts—pipe cleaners, acorns, fabric, stones, and so forth—as versatile materials not originally intended for children's play that they can manipulate, modify, and use in their play activities. The authors review the historical foundations of loose parts play, focusing on influential individuals and theories, and compare the prominent materials used in each approach to the current application of loose parts in early learning environments. They elaborate four key factors in play that influence children's participation, and they highlight some developmental benefits involving materials, space, relationships, and time. They conclude that loose parts play had a significant presence in children's lives throughout the nineteenth century and that a need exists for further research on the benefits to children of loose parts play. **Key words**: children; early childhood development; loose parts; loose parts play; play materials

Introduction

> Fearne Cotton was talking on the radio recently about the uproar and excitement in the house one morning when garden furniture was delivered, and the children attacked the packing to free the boxes to make a train. We often see children opening presents and instantly starting to play with the wrapping of the box and packaging rather than the contents. This is what we mean by loose parts; bits and pieces, scrap and empty cartons, pots and pans.
>
> —Play Scotland 2022

There are a growing number of calls to enrich young children's play, exploration, and learning by offering loose parts as play materials (Beaudin 2019; Beloglovsky and Daly 2016; Caldwell 2016; Casey and Robertson 2019; Daly and

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Contact Ozlem Cankaya at cankayao@macewan.ca

Beloglovsky 2014; Rawstrone 2020). Loose parts play (LPP) is often defined as children's unstructured play indoors or outdoors with versatile natural or manufactured materials (e.g., cardboard, sticks, sand, pipes, beads, stones). LPP is unique; it can involve a single item or many objects that can be moved, arranged, and combined in various ways, allowing individuals to use their innovation to explore and experiment (Nicholson 1971). Indeed, North American (Makovichuk et al. 2014; Province of Nova Scotia 2018; Government of Manitoba 2015) and global (Play Scotland 2022; Casey and Robertson 2019; Eren Öcal 2021; Gençer and Avci 2017; Sear 2016) policy makers and professionals explicitly endorse LPP as a means to facilitate child development and learning.

Children's play involves a wide range of behaviors and activities, resulting in varied developmental and learning outcomes depending on children's ages, social interactions, and materials (Lin and Li 2018; Howe, Leach, and DeHart 2022; Rubin 2001; Wood and Attfiel 2005). A substantial investigation has been undertaken on the developmental benefits of play with individual play materials such as play with blocks, LEGO sets, and sand in isolation that can be considered loose parts (e.g., Kiewra and Veselack 2016; Segatti, Brown-DuPaul, and Keyes 2003; Shabazian and Soga 2014; Schulz and Bonawitz 2007; Zippert et al. 2019). However, LPP can also uniquely combine various materials (Casey and Robertson 2019; Daly and Beloglovsky 2014). Engaging children in LPP as a means to enrich play experiences has grown in recent decades (Beaudin 2019; Beloglovsky and Daly 2016; Caldwell 2016; Casey and Robertson 2019; Daly and Beloglovsky 2014; Rawstrone 2020). There has been a noticeable absence of a detailed historical account of loose parts, indicating a gap in our current understanding and documentation of this concept. In addition, a prevailing misconception in circulation positions loose parts as a recent innovation. This myth has not been adequately addressed or scrutinized in academic and professional discussions, leading to a potential misunderstanding of its origins and evolution. Gull and her associates (Gull et al. 2019) highlight these issues, shedding light on the need for further investigation and clarification. By addressing these gaps, we aim to enrich our comprehension of loose parts and drive out misconceptions, ensuring a well-rounded and accurate depiction of the concept.

In this article, first, we trace the historical and theoretical foundations of LPP in the early childhood education landscape, synthesizing the diverse educational theories and approaches that have influenced and sculpted the contemporary employment of loose parts in early-learning settings. Following this, we contrast the similarities and distinctions in their materials and approaches

with the present-day application of loose parts in early learning environments. This comparative evaluation is subsequently conducted, examining loose parts' application in historical and current early-learning settings, highlighting the consistencies and variations among them. By identifying these characteristics, our review aspires to interpret the factors behind the efficacy of loose parts in captivating children's attention and fostering enriching play experiences (i.e., materials, space, relationships, and time) with some developmental benefits and outcomes.

The History of Loose Parts and Theoretical Framework

LPP refers to children's use of loose parts in their play during their early years and represents a dynamic concept. It describes and emphasizes how using a variety of materials can potentially shape children's creativity, exploration, and holistic development. Throughout history, perceptions of children in society have evolved. This shift in perspective has influenced the approaches to educating or enriching children's early-learning experiences (Sorin 2005). Concurrently, some toys and materials do not prescribe a specific purpose, and a persistent theme has been the encouragement of children to develop their cognitive capacities through play. These toys are often referred to as open-ended toys, such as DUPLO blocks or LEGO sets, which facilitate various types of play, particularly construction and pretend play (Travick-Smith et al. 2015). Although prominent examples of open-ended play materials and toys are well researched, loose parts prompt a reevaluation of the impact of materials in children's play given the increased availability of diverse materials in our environments that can be used in play both as singular materials and in combination (Akdemir and Sevimli-Celik 2024).

Various influential thinkers, theories, and early childhood education approaches have shaped and informed the encouragement of LPP, each offering a distinct perspective on how children engage with materials in their environments. Prominent play-based early childhood educational approaches include elements of loose parts to enrich children's play experiences. The following section details the key names, theories, and approaches related to children's LPP and the types of play materials associated with each approach. We evaluate how they incorporate play materials and compare them to the current use of loose parts.

Nicholson and Theory of Loose Parts

The most prominent name usually highlighted as the founder of loose parts theory is Simon Nicholson, a British architect, sculptor, and artist who coined the term loose parts. He defined loose parts as versatile materials, allowing them to serve multiple purposes and enabling children to explore and create through play. These materials can be either natural or synthetic. Nicholson (1971) described loose parts as "variables" by postulating that "in any environment, both the degree of inventiveness and creativity, and the possibility of discovery, are directly proportional to the number and kind of variables in it" (30). Nicholson's definition provided examples such as diverse materials, shapes, scents, and physical phenomena like electricity, magnetism, and gravity. He also cited various mediums like gases and fluids, sounds, music, motion, and activities such as employing chemical interactions, cooking, and fire. Additionally, he incorporated other factors like humans, animals, plants, words, concepts, and ideas. These components offer children opportunities for play, experimentation, exploration, invention, and enjoyment. Nicholson emphasized that there is no evidence that some people are born more creative than others and that children naturally enjoy playing and exploring their surroundings (Houser et al. 2016). Therefore, the loose parts theory postulates that the more varied and numerous playthings available to children, the more imaginative and inventive children will become. He also claimed that this involves children playing freely and calls for providing children with the right materials, making play space more open for growth and inventing (Nicholson 1971).

Nicholson's theory is based on the Affordances Theory proposed by Gibson (1977). The concept of "affordances" is a term coined to describe the possibilities for action that objects and environments offer animals, including humans. He argues that these affordances are directly perceivable without the need for intermediary processes such as inference or symbolic thought, challenging traditional views that perception involves indirect cognition. Gibson's theory suggests that the environment and the observer are complementary, with affordances revealing their reciprocal relationship. This notion extends beyond physical properties to encompass the ecological, suggesting that perception is inherently value laden and tied to the observer's capabilities and intentions. According to Gibson, affordances are neither subjective nor objective but exist in relation to the perceiver, fundamentally bridging the gap between the organism and its environment. This concept has significant implications for understanding perception, action, and the interaction between organisms and their environ-

ments, offering a holistic approach that emphasizes the interconnectedness of life and its ecological context. In terms of materials, affordances refer to how an object or material can be used or interacted with. Children's LPP can involve a variety of materials: factory-made or natural materials, reusable and upcycled materials, and commercial toys. These materials, with many affordances, provide children with more opportunities to learn and develop new skills through indoor or outdoor play (Beloglovsky and Daly 2016; Drew and Rankin 2004; Bairaktarova et al. 2012).

Nicholson's theory of loose parts initially focused on outdoor environments. However, this theory has also gained traction in indoor settings, primarily due to its universal applicability and its developmental benefits (Houser et al. 2016). The migration of the loose parts concept to indoor settings can be attributed to several factors. First, accessibility issues mean that not all children have the luxury of safe outdoor play spaces, making the theory's indoor application pragmatically beneficial. Second, indoor environments can offer a controlled setting, which addresses safety concerns without compromising the quality of play. Regardless of the environment, the core principles remain constant—loose parts stimulate play, catalyzing many developmental benefits (Cankaya et al. 2023). Therefore, including loose parts in children's outdoor or indoor environments merits consideration by educators, parents, and urban planners.

As proposed by Nicholson (1971), the core principle of loose parts remains intact in its current understanding and applications. Both revolve around the interaction between children and their environment, emphasizing object affordance or the multiple ways youngsters can engage with individual elements in their surroundings. However, there are noticeable differences between Nicholson's original theory and today's expanded concept. While Nicholson largely focused on natural, outdoor settings, today's view includes indoor and manufactured environments, offering a more inclusive perspective that accounts for diverse living conditions. Current interpretations also embrace a wider range of materials, extending beyond natural items to incorporate synthetic and recycled materials. The concept of loose parts has also been adapted to fit within stricter safety guidelines in some countries and has found its way into formal educational curriculums (Makovichuk et al. 2014; Province of Nova Scotia 2018), acknowledging the potential developmental benefits of this form of play.

In the context of a critical pedagogy that focuses on cultural diversity and decolonizing children's curricula, the concept of loose parts takes on an additional layer of significance (Attfield 2022; Kilderry 2004; Rawson 2023). Loose

parts can be sourced from various cultures and traditions, providing an avenue for children to learn about and appreciate diversity in a hands-on manner. For instance, including materials from prominent cultures and weaving supplies in a play setting invites children to explore different cultural artifacts directly (Kilderry 2004). These items become loose parts that stimulate creative play and serve as educational tools that foster cultural awareness and inclusivity. Educators can guide children through the multiple meanings and uses of these culturally diverse loose parts, facilitating discussions that enrich understanding and promote respect for different perspectives (Bock 2002; Brown 2012; Smith-Gilman 2018). Therefore, in a pedagogical setting prioritizing cultural diversity, loose parts can act as more than just objects for play. They become instruments for social learning, for a culture specific and intercultural dialogue (Makovichuk et al. 2014). The concept of loose parts can be a powerful tool for bridging cultural gaps and fostering more inclusive learning environments.

Children from different cultural backgrounds often come into the classroom with distinct communication styles, social norms, and ways of interacting with their environment (Attfield 2022; Berk and Winsler 1995; Kilderry 2004; Rawson 2023). Children's unique traits or home experiences may not always align with the mainstream, child-centered pedagogical methods employed in preschools or early childhood education centers, leading to misunderstandings or to the hindering of active participation. Many loose parts (e.g., stones, leaves) do not have an obvious cultural script and can invite children of different cultural backgrounds and identities (i.e., gender, disability) to create personal meanings with such objects and potentially increase social engagement. Identifying similarities and celebrating differences can support a sense of community within and outside of the classroom.

Currently, incorporating loose parts helps create a learning setting that is inclusive and engaging for all children (Cankaya et al. 2023; Kilderry 2004). In doing so, the playrooms become spaces in which diverse cultural identities are acknowledged, valued, and included. This form of pedagogy, which leverages loose parts to facilitate play and cultural inclusivity, can be instrumental in unlocking each child's full potential, no matter that child's cultural background. In this way, the concept has evolved to meet contemporary needs while staying true to its foundational principles.

Sørensen and Adventure Playgrounds

Carl Theodor Sørensen, another pioneering architect of the twentieth century,

significantly contributed to developing children's play spaces through his innovative concept of the "junk playground," which later evolved into the "adventure playground" movement (Kozlovsky 2008). His concept emphasized using loose parts and natural materials to encourage creative, unrestricted play among children, particularly those living in urban environments.

Sørensen's vision was rooted in the belief that children benefit from interacting with their environment in an unstructured way, allowing them to explore, imagine, and create. This vision aligns with the definition of LPP, in which children engage more deeply in play that involves movable objects that can be manipulated, combined, and redesigned in various ways. Sørensen's ideas laid the groundwork for the first adventure playground in Denmark in the 1940s. Supplying play materials rather than conventional play equipment expands the range of play opportunities available to children (Cooper 1974; Nicholson 1971). Materials like wood, rope, tires, and even discarded furniture characterized this playground concept, offering children many possibilities for play beyond the fixed equipment in conventional playgrounds. Such environments foster a sense of adventure and creativity, allowing children to construct their own play landscapes. The idea was to use "junk" to create playful landscapes that cater to children's imaginative and exploratory nature but that also reflect a broader ecological approach to play, one in which materials that might otherwise be considered waste are repurposed as valuable play resources (Hayward, Rothenberg, and Beasley 1974).

Sørensen's emphasis on the importance of play in natural settings, coupled with his innovative use of loose parts, has had a lasting impact on the design of children's play environments, one followed presently in many countries. These playgrounds often begin on vacant, fenced-in lots, and children are encouraged to plan and replan the area as their interests evolve. Reactions to adventure playgrounds have been mixed. Children are frequently enthusiastic and active, but the community often questions the undesigned and unattractive appearance of the playgrounds (Hayward, Rothenberg, and Beasley 1974). The legacy of Sørensen's junk playgrounds, as the precursor to modern adventure playgrounds, highlights the environment's critical role in shaping children's play experiences, offering valuable insights into the potential benefits of LPP outdoors. Yet, research supports the benefits of this type of opportunity in combination with loose parts for children's development. In a systematic review, Gibson, Cornell, and Gill (2017) show insufficient high-quality evidence to determine the impact of engaging with loose parts on children's cognitive, social, and emotional development during outdoor play.

Goldschmied's Treasure Baskets and Heuristic Play

An early childhood education scholar, Elinor Goldschmied, explored the concept of loose parts in the 1950s before Nicholson declared his theory of loose parts. She introduced the concept of "treasure baskets," which is also closely associated with the conceptual underpinnings of loose parts (Gascoyne 2012; Hughes and Cousins 2017). The treasure basket contained a collection of natural, household, and recycled objects placed in a sturdy, round, wicker basket. This carefully curated basket would typically include everyday objects and natural materials such as soft fabrics, wooden utensils, smooth stones, and textured textiles to engage a child's senses and stimulate exploration. The key idea is to offer children a rich sensory experience and promote their natural inclination to discover the world through touch, taste, sight, and sound. Goldschmied believed that curiosity and concentration form the basis of all learning and creativity (Gascoyne 2012; Hughes and Cousins 2017).

Goldschmied's work also characterized heuristic play as an approach, emphasizing its nonprescriptive nature of play with various materials. This approach entails providing a wide range of objects and receptacles to a group of children within a controlled setting, granting them the freedom to engage in unstructured play without adult intervention. The term "heuristic" refers to discovering, finding, and gaining insights. This type of play aligns mainly with exploratory play. Heuristic and exploratory play are characterized by their indifference to success or failure, right or wrong values, and the process of exploration and experimentation. The key materials for effective heuristic play encompass ten to twenty distinct collections of items, eschewing commercially manufactured toys complemented by a diverse array of containers (Selleck, Hughes, and Cousins 2014). Natural and creative heuristic play forms the bedrock for future problem solving, scientific inquiry, and mathematical exploration (Hughes 2009). In this framework, there exists no room for categorizing events as successful or unsuccessful or right or wrong, because every experience holds intrinsic value and contributes positively to a child's development.

Treasure baskets and the concept of loose parts share similarities, primarily in their aim to encourage children's independent exploration, sensory development, and curiosity (Gascoyne 2012). Both methods understand the value of hands-on interaction with various objects, which allows children to develop a range of skills, from motor to cognitive, and even social, abilities. However, there are distinct differences that set the two methods apart, making each valuable in its own right. Treasure baskets are generally curated for infants and toddlers by

adults and are specifically designed to aid in sensory development during these critical early years. They often include a mix of textures, shapes, and materials that are safe for young children to explore, providing them with the opportunity to manipulate objects and understand their properties. This form of exploration proves crucial for building foundational knowledge about the world.

On the other hand, loose parts are often recommended for a broader age range, extending their benefits to preschoolers and even to older children (Flannigan and Dietze 2018). LPP provides an environment in which objects can be anything safe, one that allows manipulation and creativity. This encourages children to think more flexibly and to engage in more complex forms of play, which can involve problem solving, imagination, and even cooperation with other children (Guerra and Zuccoli 2013). Additionally, children can be in charge of selecting the materials with which they play instead of such materials being determined by adults.

Although treasure baskets are usually a set collection of items, LPP encourages the continuous changing and addition of materials, often including items from various cultures or different educational themes (Makovichuk et al. 2014). This not only sustains interest but also allows the incorporation of diverse cultural and educational contexts, making LPP more adaptable and inclusive. While both treasure baskets and LPP foster sensory development and curiosity through object manipulation, they differ in terms of age suitability, flexibility, and adaptability. LPP's broader application makes it a particularly useful tool for engaging children in diverse and inclusive educational settings.

The Montessori Approach and its Curriculum

The approach of Maria Montessori (1988) to education was grounded in the belief that children are inherently curious and capable of self-directed learning. The Montessori educational model was developed in Italy in the early 1900s (Edwards 2003). The goals of the Montessori model center on nurturing a child's holistic development, while also highlighting the teacher's role as a guiding figure in a child's learning journey (Aljabreen 2020). The Montessori approach sees a child as having the capability to initiate learning independently within a nurturing environment carefully structured by adults (Beach 2023). Montessori playrooms provide a wide range of materials, each with a specific purpose and designed to promote hands-on exploration (Montessori 1976). Children autonomously select their activities and actively interact with tangible objects (Lillard 2008). They receive brief guidance from educators and then have the freedom

either to observe their peers or independently to choose materials with which to play, either alone or in groups (Becker, Rigaud, and Epstein 2023). Educators are provided with highly detailed instructions for guiding children in the use of materials. In this approach, the educator's role is to act as a guide for students who have the capacity for self-regulation (Aljabreen 2020) and to step in when children handle the materials too roughly (Lillard 2008).

The Montessori materials have a fascinating origin. A significant number of the early materials were originally created by Edouard Séguin for children with intellectual disabilities and were later modified and incorporated by Montessori in the early 1900s. Montessori observed children in the classroom, considered their developmental requirements, designed materials she believed would cater to these needs, and subsequently observed the children using these materials. She continued to modify and improve them until she was confident that the materials would effectively address one or more specific needs (Lillard 2008). Materials used in Montessori include wooden puzzles, sensorial materials like geometric shapes, and practical life items such as pouring and scooping tools. These materials are carefully designed to encourage children to engage in purposeful, self-directed activities, promoting independence, concentration, and the development of fine motor skills. Montessori frequently recounted instances of a child becoming completely absorbed by the wooden cylinders. Even when other children sang and danced nearby, or a child's chair was lifted, the child's concentration remained undisturbed (Montessori 1998). Montessori educators still observe this high degree of concentration in children experiencing their curriculum (Lillard and Heise 2016).

Montessori developed materials that have self-assessment features to be used for children with cognitive delays (Becker, Rigaud, and Epstein 2023). For example, the "pink tower" comprises ten cubes, each varying in size from one to ten cubic centimeters. Children are directed to arrange and stack the cubes in ascending order, allowing them to detect errors easily in cube selection because the final cube will not be the smallest if chosen incorrectly. Each material is created within the broader context of all the other materials. In other words, the materials are intentionally designed with a complex, interrelated nature, in which each material complements or interacts with another, creating a cohesive learning experience (Lillard 2008). Materials encompass concepts that are suitable for children's development in various curriculum domains, including math, literacy and language, social studies, the arts, and science (Becker, Rigaud, and Epstein 2023). Similarly, these materials facilitate learning through active participation

and help develop skills in math, color recognition, size understanding, reading, and writing (Aljabreen 2020).

Lillard and Heise (2016) designed an experiment in which supplementary non-Montessori materials were excluded from two classrooms. They administered six measures in a predetermined sequence at both the pretest and posttest stages to evaluate various aspects, including social cognition (theory of mind), social problem solving, executive function, reading ability, vocabulary, and mathematical skills. Despite the relatively short duration of the intervention, which spanned only four months, children in classrooms eliminating non-Montessori materials made significant progress on two out of six measures and exhibited a minor, albeit statistically insignificant, improvement on a third measure. Removing non-Montessori materials may have positively influenced children's task performance by emphasizing the need for them to remember and follow the rules while suppressing their immediate instinct to touch the location mentioned in the experimenter's command (Lillard and Heise 2016). Because children are seen as capable and the materials are designed to correct mistakes, the curriculum primarily evolves based on what children are interested in and how well they use these materials (Aljabreen 2020).

One of the characteristics shared by the loose parts approach to materials and the Montessori approach is their advocacy of hands-on exploration, inviting children to discover, manipulate, and engage with the materials. While loose parts foster diversity and creativity, thus potentially fostering cognitive development and imaginative thinking (Cankaya et al. 2023), Montessori materials may also support elements of problem solving and pretense as children use practical life materials (e.g., pouring jugs, utensils). Furthermore, both approaches emphasize a hands-on learning environment, promoting sensory experiences that are instrumental for a child's learning journey. However, fundamental disparities emerge between the two approaches in their origins, underpinning educational philosophies, structural attributes, and intended learning outcomes.

Montessori materials, deeply rooted in pedagogical philosophy, are meticulously designed to focus on specific concepts or skills tailored to the Montessori curriculum (Bahmaee, Saadatmand, and Yarmohammadian 2016; Montessori 1976). This structured educational philosophy requires the approach and materials to be carefully curated by adults, not allowing children to select the materials in the curriculum. In contrast, loose parts encompass an assortment of miscellaneous materials that encourage a broader spectrum of exploration and creativity, often without predefined learning objectives (Beloglovsky and Daly

2016; Caldwell 2016; Casey and Robertson 2019; Daly and Beloglovsky 2014; Houser et al. 2016; Rawstrone 2020) Furthermore, Montessori materials are usually implemented within Montessori schools, adhering to the Montessori philosophy, while loose parts are found in various educational settings, including Reggio Emilia–inspired preschools and traditional early learning settings. The choice between these educational tools hinges on the distinctive pedagogical objectives of the given learning environment.

The Waldorf Approach

Waldorf education originated under the guidance of philosopher Rudolf Steiner in 1919 in Germany (Aljabreen 2020). Waldorf education aims to encourage children to do things with a clear beginning, middle, and end to produce tangible benefits for themselves and others. The Waldorf approach designs the curriculum creatively to nurture the inner potential of each child's genuine self (Schmitt-Stegmann 1997). According to Blanning (2010), practical life makes up a regular part of the routine in a Waldorf preschool. No formal academic teaching occurs in Waldorf kindergartens. Instead, they emphasize and nurture the willpower associated with physical intelligence. They achieve this through hands-on, creative tasks. Imaginative and creative play assumes a significant role in Waldorf kindergartens because such play lays the groundwork for all future, more advanced academic learning and thinking (Schmitt-Stegmann 1997).

The Waldorf approach was established to uphold the authenticity of children's emotions and thoughts while nurturing their intellectual growth, fostering creative attributes, and shaping their character (Arslan and Kartal 2022). Korkmaz and Öztürk Samur (2022) designed an experimental study in different schools—a Waldorf-inspired school as an experiment group and a regular school as a control group. The research yielded a notable outcome supporting the group that received the educational program rooted in the Waldorf approach, particularly in the subdimensions of creativity, flexibility, fluency, originality, and overall creativity in the posttest scores.

The Waldorf approach envisions the journey from childhood to youth, spanning from kindergarten to high school, as evolving through three distinct, roughly seven-year phases (Schmitt-Stegmann 1997; Bransby and Rawson 2020). Learning happens through active engagement in early childhood, and Waldorf education emphasizes physical activities, play, spoken language, and practical tasks. In the later school years, Waldorf education centers on nurturing moral responsibility, awareness of societal issues, and independent, critical thinking by

blending history, geography, and the sciences and by incorporating the arts into all subject areas (Schmitt-Stegmann 1997). The Waldorf school was founded on the premise that individuals will develop naturally when they have the chance to discover and engage with their environment (Aljabreen 2020). The Waldorf curriculum and teaching methods aim to help all children discover their inner potential and their true selves, and these true selves slowly become aware of their natural surroundings, human culture, and own abilities (Schmitt-Stegmann 1997). Waldorf education emphasizes a child's freedom and holistic development, with educators serving as both guides and artistic directors for that child (Aljabreen 2020).

The Waldorf philosophy strongly emphasizes the natural world and the use of natural materials in play (Bransby and Rawson 2020; Petrash 2002; Schmitt-Stegmann 1997). The Waldorf approach emphasizes the importance of imaginative and unstructured play and carefully selects materials to support this philosophy. Thus, children in Waldorf education are often surrounded by materials like wooden blocks, silk scarves, and woolen felt. These materials are chosen for their simplicity and connection to nature while emphasizing imagination, creativity, and hands-on play and learning. The materials are typically presented in a structured format in the classroom. For example, Waldorf classrooms might feature baskets of wooden pieces designed to be used for specific kinds of imaginative play such as building or storytelling. The arrangement of these materials is strategically designed to promote imaginative and symbolic play, contributing to a child's overall cognitive and emotional relationship with the world (Schmitt-Stegmann 19977). Additionally, the Waldorf approach often includes dolls and constructed playhouses to stimulate imaginative play within a semistructured context. These materials aim to align with the Waldorf philosophy of fostering a deep, emotional, and cognitive relationship between the child and the world (Becker, Rigaud, and Epstein 2023), and contemporary Waldorf approaches keep this tradition of human work alive so children can see where their lives come from (Blanning 2010; Petrash 2002).

Waldorf education employs a unique approach to learning materials, extending from early childhood all the way through to high school (Schmitt-Stegmann 1997). The predominantly natural materials used for younger children in this educational philosophy (e.g., wood, silk, wool, and cotton) take on simple, unformed shapes to stimulate the imagination—a piece of cloth can become a doll, a stick can transform into a sword. As students progress through the Waldorf curriculum into higher grades, the materials evolve, becoming more com-

plex and structured, and align with their developing cognitive and motor skills. In high school, for example, students may engage in intricate woodworking, metalworking, or fiber arts, requiring increased precision and skill. Throughout all stages, however, the emphasis remains on using materials that connect the learner to the natural world, fostering a sense of reverence and environmental stewardship and sustainability (Schmitt-Stegmann 1997).

In contrast, LPP is predominantly associated with early childhood settings. This approach emphasizes and encourages children to be autonomous, even when selecting the materials (Daly and Beloglovsky 2014; Beach 2023). The materials, ranging from sticks and stones to fabric scraps and recycled containers, ensure a wealth of options for creative expression, supporting the development of complex problem-solving skills and cognitive flexibility (Guerra and Zuccoli 2012). Children are free to use these materials in any way they see fit, leading to a highly exploratory form of learning driven by their own curiosity and initiative (Eckhoff and Spearman 2009).

The difference in structure between Waldorf and loose parts materials is notable. Waldorf materials guide the learner toward a specific developmental path, gradually increasing in complexity in line with a child's age and abilities. On the other hand, loose parts provide a playground of possibilities with no predetermined outcome, championing a learner-centered approach that values autonomy and innovation. Loose parts promote a more exploratory form of learning, encouraging autonomy and complex problem-solving skills as children interact with versatile resources.

The Reggio Emilia Approach

The Reggio Emilia approach, developed by Italian educator and philosopher Loris Malaguzzi, was designed to address the educational requirements of children in Reggio Emilia, Italy, following World War II (Aljabreen 2020). Deeply grounded in Lev S. Vygotsky's social constructivist theory, the Reggio Emilia approach centers on the idea that children actively shape and influence their own lives (Malaguzzi 1993; Beach 2023). Consistent with social constructivist theory, the Reggio Emilia method encourages children to express their curiosity and interests by engaging in various forms of communication with the world (Beach 2023). *The Hundred Languages*, a poem by Loris Malaguzzi, constitutes a metaphor for how children express themselves and their understanding of the world. It forms a core principle that signifies the infinite potential of children to communicate through various languages or modes of expression. These can

include words, movement, drawing, painting, building, sculpture, shadow play, collage, dramatic play, and music, among many others (Gandini 2005).

This approach views play as multifaceted and a complex language through which children can explore and learn about the world. A fundamental tenet of the Reggio philosophy holds that the environment functions as a third educator (Westerberg and Vandermaas-Peeler 2021; Beach 2023). Children have a wealth of opportunities to convey their thoughts and ideas through a language that speaks to them (e.g., painting, sculpting, puppetry, dance, music, drama, collage). Its play environments are rich in literacy, equipped with adaptable materials and props, and foster children's problem-solving abilities and creative thinking and expression (Beach 2023). Children make personal discoveries using the materials in the environment and offer support for each other's developing inquiry processes as they engage with a variety of materials (Westerberg and Vandermaas-Peeler 2021). Moreover, documentation plays a pivotal role in the assessment process, with educators frequently using documents to refresh children's memory about the tasks they have completed and to revisit the ideas, theories, and hypotheses the children make during their play. Documentation also offers families insight into their children's learning, fostering active participation from the entire community and encouraging feedback about the ongoing learning process (Becker, Rigaud, and Epstein 2023).

The educator guides children's learning through direct and indirect means aligning with the children's interests (Beach 2023). Furthermore, the educator facilitates children's interactions with materials and objects through purposeful dialogue during each child's creative exploration. Through this focus and assistance, educators contribute to the children's engagement in object-centered exploration, language growth, and their creative journey (Eckhoff and Spearman 2009). The case study conducted by Kaynak-Ekici, İmir, and Temel (2021) explores the design and use of learning invitations in a Reggio Emilia–inspired school, in which they observed educators employing or creating learning invitations in several distinct manners as follows—changing the physical environment, offering interesting materials, asking questions and making comments, provoking shared and reflective thinking, and participating in children's play and activities. Educators developed an understanding of how best to support the children by forming relationships with them and their families.

Reggio Emilia–inspired settings spotlight materials. Reggio Emilia celebrates the use of found and natural objects, respecting children's capacity to transform the ordinary into the extraordinary through their play. Materials

include natural loose parts (e.g., sticks, leaves, stones), recycled materials (e.g., cardboard boxes, bottle caps), malleable materials (e.g., clay, wire), mirrors, and light tables. The more open-ended the material, the more intelligent it is deemed. Having a rich collection of materials is essential to the Reggio Emilia approach, and loose parts are embraced for their potential in encouraging children to express their creativity. For example, the REMIDA Project, established in 2005, focusing on recycled materials, emerged as a collaborative effort between Reggio schools and their local communities. The primary goal was to advocate the idea that waste materials have the potential to be viewed and employed as resources with a fresh, reimagined purpose. The REMIDA Project was devoted to storing, exhibiting, and distributing discarded materials to local schools and groups eager to transform these materials into art projects (Eckhoff and Spearman 2009).

Materials chosen to promote exploration, creativity, and collaboration are strategically placed in the environment to encourage children to engage with them in various ways, fostering problem solving, artistic expression, and social interaction. For example, Westerberg and Vandermaas-Peeler (2021) found that preschoolers participated in higher-level inquiry while interacting with educators, peers, and classroom materials. Educators occasionally offer children everyday materials for craft-learning opportunities (Kaynak-Ekici, Imir, and Temel 2021). The Reggio Emilia approach involves an evaluation in which the potential uses of a recycled object is scrutinized to explore the opportunities for incorporating the object into an artwork (Eckhoff and Spearman 2009).

Arguably, of all the educational approaches, Reggio Emilia most closely aligns with the principles of LPP with a few notable differences. Reggio Emilia settings typically exhibit a more curated selection of materials, strongly emphasizing aesthetics and art. However, LPP can encompass various materials, including synthetic and perhaps less traditionally aesthetic materials. The structure of activities can also differ. Although Reggio Emilia may involve more guided exploration with educators posing questions and encouraging reflection, LPP often leans toward a more child-directed approach, in which children take the lead in their play and exploration (Gandini 2005; Thornton and Brunton 2015). Still, both approaches celebrate the potential of materials to inspire and facilitate learning, and both recognize the importance of a child's agency in the learning process. In short, both Reggio Emilia and LPP emphasize the importance of the environment in children's learning, recognizing that materials play a crucial role in fostering creativity, exploration, and expression. They encourage children to

interact with materials in many ways, supporting the development of critical thinking, problem solving, and fine motor skills.

We acknowledge that most of these approaches came into life prior to loose parts or affordances theory (Gibson 1977; Nicholson 1971). Furthermore, because loose parts in some of these approaches have strict criteria for selection (e.g., Montessori), they are selected mainly by adults and may not fit the exact definition envisioned by Nicholson (1971). However, in the contemporary selection and use of the loose parts concept, particularly in centers where there is no particular attachment to any pedagogical approach, or when they are used or inspired by specific approaches (e.g. Montessori or Reggio Emilia), the selection and use of loose parts do not entirely differ from those described in these approaches. What defines loose parts is the drive for children to decide how they will use the loose parts at hand. In preschool education, currently and historically, toys purchased for children's activities are determined predominantly by educators or child care providers. They are adult led (Hartman and Brougère 2004; Prochner 2011). When we consider young children's play, we need to examine critically the materials offered to children, the physical environment, the time allocated to play, and children's social relationships.

Factors Affecting Children's Development in Loose Parts Play

Children's play is a fundamental aspect of early development, serving as a critical mechanism through which young learners explore, understand, and interact with the world around them. Several aspects of children's play—including materials, space, time, and relationships —are crucial in determining the frequency and quality of engagement. These factors have been thoroughly investigated in numerous studies (e.g., Howe et al. 2022; Lee et al. 2021; Mathieson and Banerjee 2010; Travick-Smith et al. 2015; Sandseter, Storli and Sando 2022). Importantly, these dimensions are also recognized by leading educational organizations and curriculum frameworks as essential for providing quality experiences in early childhood education (Makovichuk et al. 2014; Zosh et al. 2017), all of which we discuss in detail.

Materials

Playing with open-ended materials can provide children with rich learning

opportunities and motivation for further exploration (Cutter-Mackenzie and Edwards 2013; Trawick-Smith and Dzuirgot 2010, 2011; Trawick-Smith, Russell, and Swaminathan 2011; Trawick-Smith et al. 2015). The impact of playing with open-ended toys such as wooden blocks and block-like materials (e.g., LEGO sets) on cognitive development is well established in longitudinal studies (e.g., Wolfgang, Stannard, and Jones 2001),

But not all toys and materials effectively prompt high-quality play (Cutter-Mackenzie and Edwards 2013; Trawick-Smith, Russell, and Swaminathan 2011). Trawick-Smith and colleagues (Trawick-Smith et al. 2015) examined the effects of toys on the play of three- and four-year-old children in preschools. They selected the toys, which varied in their features and intended uses, from a list nominated by educators and parents as being developmentally beneficial (e.g., rainbow people for make-believe play). Researchers emphasized how nonrealistic and open-ended toys that do not suggest a play theme allow for many kinds of play (e.g., constructive play and pretend play). Furthermore, everyday objects and natural materials can foster cause-and-effect or trial-and-error explorations and positively influence children's cognitive development by sparking imagination, creativity, and motivation for further exploration and learning (Bairaktarova et al. 2012; Kiewra and Veselack 2016). Thus, children's free play with open-ended materials naturally enhances observation, communication, and experimentation skills and helps develop rationale and construction skills (Bairaktarova et al. 2012).

The open-ended nature of LPP encourages exploration by removing constraints and predetermined outcomes. Children feel free to manipulate, combine, and reconfigure materials according to their own ideas and goals, thus supporting creativity, problem-solving skills, and critical thinking. Furthermore, the absence of strict rules or instructions promotes a sense of autonomy, empowering children to take ownership of their play experiences. The benefits of open-ended materials are clear for children's general cognitive development (Cankaya et al. 2023; Drew and Rankin 2004; Schaefer 2016), specifically materials that offer opportunities for construction such as blocks. Researchers frequently explore blocks because, due to their geometrical nature, they are open-ended toys that aid children's mathematical development (Trawick-Smith et al. 2017; Ramani et al. 2014; Schmitt et al. 2018; Wolfgang, Stannard, and Jones 2001). Such open-ended construction toys induce symbolic play, and the complexity of children's structures and building activities predict their later reading and mathematics achievement in school (Hanline, Milton, and Phelps 2008; Wolfgang, Stannard, and Jones 2001).

But it remains unclear how different toys produce a stimulating social environment for children during pretend play. For example, Howe, Leach, and DeHart (2022) investigated how the characteristics of an open-ended village play set versus a closed-ended train play set affected children's pretend play. The nature of the toys determined children's patterns of communication and behaviors, with the train set promoting prosocial (i.e., cooperative) behaviors and the open-ended village set facilitating conversations geared towards constructing shared meanings with play partners by asking questions and describing roles and materials. Although the themes in play sets are suggestive, they may not promote similar behaviors and outcomes in play.

Loose parts encompass a wide array of materials (e.g., natural elements, building materials, found objects) that can be grouped differently. Some practitioners and researchers group them according to their material of construction (e.g., wood, plastic), function (e.g., to play in the dark), and final form (e.g., finished or unfinished materials, structured or unstructured). Practitioners and educators agree that loose parts are important, and many lists have been compiled (Casey and Robertson 2019; Eckhoff and Spearman 2009) in addition to Nicholson's (1971) original list, which included natural resources (e.g., straw, mud, pinecones), building materials and tools (e.g., planks, nails, hammers), scrap materials (e.g., old tires, scraps of gutter materials), naturally occurring and disappearing phenomena (e.g., water, ice, snow, shadows, cobwebs, dappled light, rainbows), people and living things, and randomly found objects.

LPP engages children's senses on multiple levels. Natural materials like sand and water provide tactile and kinesthetic experiences, and colorful objects stimulate visual senses. These sensory encounters captivate children's attention and enhance their cognitive development. Research suggests that sensory-rich play experiences promote brain development and support the development of spatial awareness, fine and gross motor skills, and emotional regulation. Children require settings with which they can interact, allowing them to create, build, assess, and adapt their own creations and thoughts through play (Casey and Robertson 2016). In this way, materials serve as tacit instructors, guiding children toward action, while the teacher or mentor works alongside and in front of the budding educator (Guerra and Zuccoli 2013).

The affordances of an object or space encompass all the potential uses and functions it can serve, as determined by a child. For instance, many children might see a brick wall, intended to mark the division between a sidewalk and a garden, also as something to sit or balance on, walk along, hide behind, or

even jump off (Casey and Robertson 2019). Currently, we widely recognize that allowing children to explore materials fosters their learning and makes the learning processes evident (Cankaya et al. 2023). Educational settings deliberately organize this activity, which is primarily spontaneous and independent, by providing designated spaces and materials for children to plan and use, thereby integrating them into the educational experience. This aids in developing strategies for experimentation, expanding, and deepening the use of materials in educational settings, both in theory and practice. Consequently, educators make increasingly intentional choices about the materials they use. Inviting children to explore freely helps them learn independently and encourages deeper thinking, especially when they can choose what to play with and explore without restrictions (Guerra and Zuccoli 2012).

The benefits of various materials have been extensively researched. Again, Guerra and Zuccoli (2012) explored young children's creativity and its relation with two different materials, which they called "finished" and "unfinished." Finished objects were everyday items repurposed to have new or unexpected meanings and unfamiliar objects with altered interpretations. Unfinished objects were created from identifiable or unidentifiable materials, either new or repurposed, by either the children or the educators. Guerra and Zuccoli (2013) also concluded that engaging with various materials allows children to nurture their creativity using different approaches.

According to Cogorno Maldonado (2021), playing with loose parts supports imagination and creativity in young children. For example, a child can use loose parts as "tying ropes to a tire and attaching it to an existing metal play structure to create a swing" or "setting up a pretend house with bedding from coats, a kitchen replete with cups and plates, a closet with hangers and coats, and then playing family" (26). When projects involving finished objects receive sufficient support and adequate time, projects can stimulate thinking about the relationships between function, form, aesthetics, and the potential to design novel, creative, or functional items inspired by those observed and manipulated (Guerra and Zuccoli 2012).

Meanwhile, engaging with unfinished materials fosters children's creative thinking, enhancing their ability to generate fresh, innovative links between information, ideas, and objects. Similarly, using unfinished materials results in unique and unconventional connections that are not predetermined, stemming not just from children's exploration but also from the thoughts accompanying them, sparking contemplation and conversation (Guerra and Zuccoli

2012). Moreover, incorporating reclaimed materials into the art classroom offers students distinctive opportunities to link discarded items with their own one-of-a-kind artistic creations (Eckhoff and Spearman 2009). In addition to all these studies, Yavuz (2016) determined that using loose parts did not increase classroom creativity.

Slightly different from the kind of material already discussed, structured materials are composed of elements interconnected by a predefined network of relationships, and their use is geared toward achieving educational goals predetermined by adults. Unstructured materials are those that enable a more flexible combination, facilitating creative thinking (Guerra and Zuccoli 2013). Furthermore, simple, inexpensive items like crates and buckets can make children more active and creative than fancy playground equipment. Adding everyday objects during recess and lunch breaks can reduce how much time they sit around by half, boost their imagination, and improve their social and problem-solving abilities (Hyndman et al. 2014). Problem solving is another trend topic in loose parts studies, and researchers have concluded that unusual materials, especially discarded industrial ones, provide a broad spectrum of interpretive possibilities because of their lack of specific characteristic use, leading to questions and attempts to find solutions (Guerra and Zuccoli 2012). Also, loose parts can serve as resources for problem solving as children explore ideas and experiment with potential solutions (Casey and Robertson 2016).

Researchers (Cankaya et al. 2023; Flannigan and Dietze 2018; Houser et al. 2016) have categorized children's play with loose parts consisting of three types. First, functional play involves using loose parts for practical activities. Second, constructive play entails gathering loose parts to build something. And third, imaginative play occurs when loose parts transform into imaginary objects within play scenarios and stories. These distinctions help us understand how children engage with loose parts in various ways (Cankaya et al. 2023). Loose parts not only support different types of play but also support the development of children in many areas, as we have noted.

Space

There is substantial literature regarding how the environment may drive learning and motivation for children (Anders et al. 2012; Gottfried, Fleming, and Gottfried 1998), and the environment forms a foundational principle in early learning approaches such as Reggio Emilia and Waldorf that involve creating carefully designed, aesthetically pleasing classrooms comfortable and inviting to

children and families. In a longitudinal study, Anders and colleagues (Anders et al. 2012) explored the relationship between children's early home and preschool environments. The quality of the learning environment (e.g., the number of books provided) strongly correlated with children's academic outcomes in the first year of preschool, and this advantage continued at later ages. Furthermore, past research has elucidated the role of specific environmental experiences—novelty, complexity, incongruity, surprise—in fostering intrinsic motivation, including curiosity and exploration (Wachs and Gruen 1982). Also, researchers have discussed the importance of offering the optimal tasks that challenge children to facilitate intrinsic motivation (Deci and Ryan 1985). Adults who support children's autonomy become an important factor in nurturing children's interest in learning. For instance, Ryan and Stiller have found that children with autonomy in their learning experiences at home and in early learning environments have greater intrinsic motivation and self-determination (Deci and Ryan 1985; Ginsburg and Bronstein 1993; Ryan and Stiller 1991).

Creating opportunities with many affordances to explore with loose parts exerts an influence on children's interaction with their spatial environment (Fjørtoft 2004; King and Dickinson 2023; Woolley 2008). A configured space prioritizes safety, providing children the psychological freedom to experiment and explore without harm. The size and layout of the space directly affect the range of possible activities. A spacious area allows expansive play, encouraging children to think on a larger scale and to engage physically in broader movements, leading to more complex and inventive uses of loose parts (Fjørtoft 2004). The nature of the space (e.g., open versus contained, smaller, delineated areas) can guide social interactions and collaborative efforts among children (Hyndman et al. 2014). For instance, smaller alcoves may promote intimate, focused group activities, whereas open spaces might encourage larger, more dynamic group interactions. The aesthetic and sensory qualities of the space, such as color and texture, can also act as an implicit guide or stimulus, affecting how children perceive and use loose parts in their play. In short, the design and layout of the spatial environment serve as pivotal factors in maximizing the educational and developmental benefits of using loose parts.

Indoor and outdoor environments offer unique affordances and limitations that profoundly influence children's interaction with loose parts. Indoor settings typically provide a more controlled, stable environment with easier access to various manufactured materials like blocks and craft supplies. This stability often encourages more intricate, detail-oriented play. However, the often segmented

and constrained indoor spaces can limit the scale of activities while simultaneously influencing the nature of social interactions, potentially focusing them on smaller, more intimate group settings.

In contrast, outdoor environments offer expansive spaces encouraging large-scale, dynamic activities. The availability of natural loose parts such as sticks, leaves, and stones diversifies the play experience and fosters a connection with the natural world (Fjørtoft 2004). The sensory richness and unpredictability of outdoor settings, including varying weather conditions, add layers of complexity and stimulate creativity, problem solving, and adaptability. These external factors also influence the social dynamics, often encouraging more free-form, larger-group interactions. Thus, the characteristics of indoor and outdoor spaces each contribute to shaping the cognitive and social developmental outcomes associated with LPP in distinct ways.

Time

In children's early years, they construct knowledge from direct experiences that align closely with the contemporary educational approaches advocating for ample free-play time, especially with materials such as loose parts (Mooney 2013). Loose parts can be used alone or combined to create what children conceive. When children are provided uninterrupted time to play, perhaps particularly with loose parts, they engage in an exploratory and reflective learning process. This unstructured time constitutes not a break from formal learning but a critical space in which children can test theories, solve problems, and build upon their ideas in a self-directed manner. Moreover, LPP may require additional time, especially as children explore unfamiliar and unusual objects, discovering the objects' characteristics, offerings, and limitations.

Mooney (2013) emphasizes the necessity of real-world experiences in children's learning, a concept that can be powerfully supported by loose parts in play. These materials serve as tools that allow children to replicate and investigate the real world on a scale and pace that suits them. Given sufficient time, children can construct, deconstruct, and reconstruct scenarios, learning through iteration—a process that mirrors the way children naturally interact with their environment. When engaged in play with loose parts, time becomes a facilitator, allowing children to immerse themselves fully, experiment freely, and understand deeply, enabling them to connect their play to real-life experiences and knowledge.

Further advocating for educational methods that foster inquiry and cognitive growth, Mooney highlights the importance of open-ended activities, which

by nature, loose parts epitomize. These materials inherently invite open-ended questions and activities as children ponder over endless possibilities and outcomes of their interactions with the parts. The time spent in this mode of play is critical and is not to be rushed because the development of ideas and the evolution of play narratives demand continuity and the freedom to evolve. In such an environment, where time and loose parts intersect, children's inquiries are not bound by the tick of a clock but by the breadth of their curiosity and imagination. Thus, for children to benefit fully from playing with loose parts, they require extended periods of time (Mooney 2013).

Time facilitates the development of narratives and scenarios children create with loose parts. In pretend play, children develop stories, understand relationships between objects, and assign meanings to their creations. This kind of play fosters language development, social skills, and emotional development (Lillard et al. 2013). Such duration is also vital for them to experiment and build upon their ideas, a process that cannot be rushed. Time acts as a canvas for children, allowing them to paint freely with their imaginations. When children are not hurried, they are more likely to make discoveries, solve problems, and engage in complex thinking and scenarios (Clark 2022).

As children progress through different developmental stages, their attentional and self-regulation capacities influence how they engage in play with loose parts (Barkley 2001; Savina 2014). For infants and toddlers, brief periods of interest typically characterize their play, with their attention lasting only a few moments as they explore the sensory aspects of loose parts—grasping, banging, or throwing them. As these young children grow into preschoolers, their increasing attention spans enable them to engage more deeply, and they often spend several minutes constructing simple structures or combining parts in imaginative ways. By the time children reach school age, their capacity to focus develops more, allowing for extended periods of play with loose parts that can involve complex scenarios and intricate constructions. Their engagement can last upward of twenty minutes and sometimes even longer if the activity captivates their interest (Baddeley 2001; Barkley 2001; Cumming et al. 2022; Diamond 2013; Garon, Bryson, and Smith 2008; Happaney and Zelazo 2022; Zelazo et al. 2003). During this stage, children are more likely to plan their play, set goals, and work persistently to achieve them, showing early signs of engagement.

As children grow, play engagement may involve designing elaborate structures or systems and working on them over extended periods, possibly revisiting and refining their creations multiple times. The evolution of play with loose

parts, from the exploratory handling by toddlers to the deliberate and sustained engagement by older children and adolescents, mirrors the growth in their attentional capacities and cognitive development.

Relationships

Social interactions are integral to children's engagement in LPP. When children engage with loose parts in a group setting, they have the opportunity to collaborate, share ideas, and negotiate roles. These interactions enhance engagement and promote social and emotional development. Play Scotland suggests that cooperative play with loose parts can lead to improved communication skills and conflict-resolution abilities and the development of prosocial behaviors such as sharing and empathy (Casey and Robertson 2016).

An adult can help young children's activities result in longer and more complex play episodes than when they play alone (Balfanz, Ginsburg, and Greenes 2003; Ramani et al. 2015; Schmitt et al. 2018). Children frequently involve adults in their play in early learning environments. Pramling-Samuelsson and Johansson (2009) explored why children involve educators in their play and learning by video recording children's play in preschool and primary schools. They found five categories of reasons to involve educators—to get help from the teacher, to acknowledge educators as competent persons, to make educators aware of other children breaking the rules, to get information about how things work (and confirm such information), and to involve educators in play. They found that children see educators as knowledgeable and that educators can contribute to their own learning processes. As children age, they mobilize educators as resources to learn about something or ask questions to expand and continue with the task. Children's time spent playing with adults can be a time to learn new skills, practice existing abilities, and build interests (Ramani et al. 2015).

The continuum of playful learning shows the different levels of child-adult involvement in experiences. On one end, free play gives children the freedom to play, explore, and discover independently. Later comes more guided play with adult participation and, eventually, adult-led, structured play at the other end of the continuum. Even in free play, adults need to recognize the benefits of free play for children and to foster it by providing the time, space, and materials to do so (Zosh et al. 2017). This is particularly salient for LPP, where adults need to assume a supportive role (e.g., guide, coplayer, observer) and for the play to remain unstructured and directed by the children.

Specific educator-child interactions in children's play can affect academic performance by enhancing motivation for children to think and express their understanding and learn from each other about numeracy (Ramani et al. 2015; Schmitt et al. 2018). Trawick-Smith and associates (Trawick-Smith et al. 2015) examined the relationship between educator-child interactions, enhancing play strategies, and promoting mathematical approaches. They found that in preschool, educator-child interactions during play might enhance mathematics learning in several ways. Educators may promote more complex, independent, and symbolic play as they interact with children. The result increases play abilities and can enhance intellectual growth, including mathematical thinking. Educators may also facilitate math learning directly by engaging children in mathematical thinking as they play. In particular, interactions that prompt children to think about numbers or communicate mathematical concepts are most desired for ensuring positive outcomes for mathematical learning (Trawick et al. 2017).

Peer interactions in play and other activities prove critical for children's development (Bratman 1992) and, when play occurs in small groups, it can be beneficial to young children's learning (Ramani, Siegler, and Hitti 2012; Ramani et al. 2014; Schmitt et al. 2018). Such engagement motivates children to think, express their understanding, explain, plan, and learn collaboratively about numeracy (Ramani et al. 2014; Ramani et al. 2015; Schmitt et al. 2018). Researchers have outlined the benefits for children's mathematical development of peer groups during constructive play activities (Balfanz, Ginsberg, and Greenes 2003; Ramani et al. 2014; Schmitt et al. 2018). Working with a peer may allow children to create more complex structures than they would complete alone, because they can each contribute to the building (Ramani et al. 2014). Furthermore, collaborative building requires them to create joint goals, such as establishing what they would build and how they would build it. It also necessitates the communication of actions, the representations of the blocks, and the significance of the structures they create. During peer play, children must coordinate their behaviors, communicate effectively to establish the interactions' goals and rules, and work through disagreements (Pellegrini 2009; Ramani et al. 2014). When peers solve problems together, they must understand each other's views to reach a joint solution. Through discussion, children attempt to resolve their differing perspectives and advance their understanding of difficult problems. Thus, peer involvement and cooperative play activities are characterized by this common understanding of the goals and processes to execute them (Bratman 1992).

Conclusions

The argument for incorporating loose parts into children's play underscores a collective recognition of its profound benefits for childhood development. We have summarized some of the historical traces and theoretical foundations of LPP within early childhood education, offering a synthesis of the diverse educational theorists and theories underpinning its application. Our exploration has revealed that the concept of loose parts constitutes not a novel innovation but an enduring and evolving element within play theory, necessitating a rectification of prevalent misconceptions regarding its origins.

By describing the consistent application and adaptation of loose parts across both historical and contemporary early-learning contexts, we have underscored the versatility and enduring relevance of LPP. As we consider the future of early childhood education, the versatility and adaptability of LPP stand out, highlighting the necessity for environments that recognize and use the potential of loose parts to enhance learning experiences for children of all backgrounds. We think it is crucial for practitioners, policy makers, and researchers to continue exploring the multifaceted implications of loose parts in early childhood settings. However, there exists a pressing need for empirical studies that explore how the indoor use of loose parts influences the way children interact with them (Cankaya et al. 2023; Cankaya, Martin, and Haugen 2023; Gibson, Cornell, and Gill 2017). Such research should consider variables such as the size and diversity of materials, the children's ages, the organization of space, and the duration and frequency of play sessions. It should also explore how these factors might interplay in children's development.

The vast array of materials classified as loose parts results in nearly limitless permutations of play scenarios, rendering the standardization of research conditions problematic. Furthermore, the subjective and intrinsic nature of play, heavily reliant on individual creativity and spontaneous decision making, complicates the measurement and quantification of engagement and cognitive outcomes. By building on historical analysis and addressing the gaps in current research, the field can foster a more nuanced understanding of loose parts than we currently possess. This, in turn, will ensure that the concept becomes effectively leveraged to enrich the play experiences and the developmental trajectories of all young explorers worldwide.

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