

# **Material matters in children's creative learning**

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From 2015-2019 she undertook her PhD in Art Education in the United Kingdom. Her research, which was run as a partnership between Tate, the Whitworth Art Gallery, and the University of Nottingham, looked at the design of children's learning environments in modern art museums. Her writing on art education has been published in MIT's Journal of Design and Science, Medium, and The Australian. Louisa also runs the blog [Art Play Children Learning](#).

The age-old debate over why creativity and the arts are important in children's learning still continues. Education theorists from John Dewey (1934, 1938) to Maxine Greene (2000) have argued that the aesthetic experiences produced through the creative arts play an integral role in encouraging children to imagine and experience the world from new and multiple perspectives. While creativity has been flagged as a critical process to be supported in 21st-Century education systems (Jones, 2009; Resnick, 2017), a current emphasis on literacy and numeracy in standardized school curriculum has reduced the possibilities for children to think differently (Robinson, 2000). Furthermore, a focus on these subjects at the expense of the creative arts falls short of supporting the diverse and "complex systems of inputs and outputs" (Ito, 2007) that different children learn through. This approach to public school curriculum also comes at a time when children are predominantly being assessed on learning outcomes instead of creative and critical processes. As a consequence, the need to generate opportunities for children to experience and understand a rapidly changing world from alternate perspectives is now more important than ever.

In this essay, I explore how the coming together of a new materialist approach to education with the experimental practices of artists and designers can open up expansive possibilities for children's creative learning. While materials have long been an important part of educational and artistic inquiry, how they are understood in relation to children's creative learning varies significantly across different education theories. I argue that materials are not just passive substances for children's manipulation or self-expression. Rather, they are active and participatory forces that open up new and divergent learning processes (Barad 2007 & 2011; Bennett, 2004 & 2010; Braidotti, 2013). Furthermore, as artists and designers produce novel ways of working with materials, including the fabrication of new ones, these then provide dynamic springboards for educators to design children's material-based learning environments. In this paper, materials are defined as both tangible and intangible substances including paper, plastic, sound, resin and cardboard.

I draw on documentation generated from my PhD fieldwork in the learning departments at The Whitworth Art Gallery and Tate (UK) to illustrate this argument and demonstrate why materials matter in children's learning. The documentation was created as part of a body of data produced over a 12-month action research project that investigated the mediators that facilitate young children's (0-5 years) learning in art museums.

## **A history of materials in children's education**

Materials have held an important place in education ever since Friedrich Froebel's invention of the kindergarten in 1800's Germany (Pacini-Ketchabaw et al., 2017). Steiner, Montessori and Reggio Emilia education approaches have also emphasised the significance of sensory-rich material resources in supporting imagination and play (Montessori, 1994 & Steiner, 1995; Vecchi & Giudici, 2004). Piaget's (1964, 1999) developmental approach to education discussed children's manipulation of physical objects through linear stages of cognitive development. While Piaget acknowledged the active role children have in learning, he also believed that an individual's biological development preceded the human thought processes required to explore objects. This educational theory therefore assumes that biological and cognitive development occurs as independent precursors to children's interactions with materials, producing a chronological division between body, mind and materials.

Beyond Piaget, children's expression through materials has also been a lively topic in early childhood education (Gandini, Hill, Cadwell, & Schwall, 2015; Vecchi & Giudici, 2004). This perspective on children's learning has explored the critical role of emotions and subjectivity in art making. However, an 'art as expression' conceptualisation of creative learning situates children's artistic creations as representations or reflections of their pre-existing inner worlds, implicitly suggesting that human thought is produced before a child's encounter with a material. The material is then reduced to a passive substance that human meaning is projected onto. If we are to ethically consider the world as constituted of human and non-human forces, an expanded conceptualization of how children learn with materials needs to be produced.

## **Materials as active forces in children's creative learning**

In this paper, I draw on a new materialist framework that repositions the role of materials in children's creative learning (Braidotti, 2006 & 2013; Dolphijn & Van der Tuin, 2012; MacLure, 2015). I argue that materials are not merely passive substances for children's self-expression or manipulation but vibrant and participatory entities that actively work in dialogue with people (Barad 2007 & 2011; Bennett, 2004 & 2010). New materialism situates meaning and matter as inextricably bound, recognising a direct engagement between people and the world. From this perspective, learning and agency do not exist solely in people but emerge from mutual transformations between human and non-human entities - a process physicist Karen Barad (2007) termed 'intra-action.'

New materialism challenges the notion of cause and effect relationships, recognising that phenomena are produced by "a multitude of interlocking systems" (Coole & Frost, 2010: 9). Creativity emerges from multiple sources and across multiple timeframes, generating dynamic relationships between people and materials over time. Children are therefore not separate from the material world but in a continuous state of becoming with it.

A new materialist approach to children's creative learning argues that different materials have the ability to open up experimental and divergent learning pathways (Lenz Taguchi, 2009 & 2011; Odegard, 2012; Pacini-Ketchabaw et al., 2016). A material's unique properties also make distinct suggestions to children that actively shape the process of learning. As children play with a material they are also learning about what these properties can do, such as how it can be rolled, stacked or moved. For example, a child's play with wooden blocks may open up learning around arrangement, balance and height through stacking, placing and constructing. Alternatively, children's play with large paper sheets may invite learning around gravity, weight and shape through movement and throwing. A material's properties may also transform as a child play with it, generating new opportunities for further experimentation. These transformations also allow children to extend and make their learning more complex over time. These divergent sensory and aesthetic experiences encourage children to learn in different ways.

## Materials in art and design practice

Materials have also long been a part of art and design practice. Cave art dating from 113,000BC demonstrates the use of mineral pigments to create paintings (Hoffmann et al., 2018). The discoveries and production of subsequent materials such as stone, terracotta, porcelain, bronze, charcoal, and glass all produced new possibilities for creative experimentation. Materials have continued to be explored in novel ways through modern and contemporary art practices such as dance, performance, installation, video, conceptual and live art. Paint, resin, plaster, polystyrene, fabric, and metal as well as abstract materials such as human participants, are constantly being explored in new and innovative ways by artists and designers. Florescent lighting was used by Dan Flavin to create electronic sculptures. Turner prize winner Susan Philipsz experimented with sound to explore memory and time. The human body has been a core material of Marina Abramovic's practice. This experimentation has allowed for the emergence of new relations between materials, concepts, emotions, tools and people over time (Ingold, 2011 & 2013). Art museums are rich archives of the varying ways that artists and designers have experimented with materials over time.

A recent 'materialist turn' in art and design practice has further emphasised material's aesthetic, multisensory and agentic abilities in the process of making (Barrett & Bolt, 2013; Boivin, 2010; Robertson & Roy, 2017).

Many artists and designers are also at the cutting-edge of material fabrication. Hannah Elisabeth Jones, a graduate of the Manchester School of Art, recently produced 'BioMarble', a flexible and biodegradable material made from casting hand-dyed waste paper. Israeli designer Shahar Livne created 'Lithoplast' from landfill designated plastics, plastic pollution from the natural environment and industry remnants using a process mimicking rock metamorphism. Additionally, material innovation is being pioneered collectively by organizations such as Material Driven, Material Lab and MIT's Mediated Matter research group. As artists, designers and scientists produce novel ways of experimenting with and fabricating materials; these then provide innovative foundations for designing children's material-based learning environments.

## **Evaluating children's learning with materials in an 'unknowable' world**

Joi Ito discusses the limitation of 'singularitarian' thinking in believing the world is 'knowable.' He argues that we need to embrace the messiness, unknowability and irreducibility of knowledge in order to develop a sensibility and culture of flourishing. An emphasis on standardized testing, educational benchmarks and quantifiable learning outcomes becomes problematic when evaluating children's learning with materials as a result of the assumption that learning is controllable, easily measured and clearly defined (Olsson, 2009). John Rajchman (1998: 4) describes society as "an experiment and not a contract, a labyrinthine construction that we must enter and exist in many ways and by many ways, since 'the way' does not exist." Applying this post-modern perspective to children's learning, knowledge can be understood as part of a complex system that is continuously transforming, recombining and connecting in new ways. Constructing an evaluative method that is open to new and multiple connections is therefore an important part of producing education practice that adds to an increasingly complex and interconnected world, rather than reducing it down (Dahlberg & Moss, 2010).

A practical solution to this issue lies in the early childhood practice of pedagogical documentation. At its most fundamental level, pedagogical documentation is a critically reflective process that seeks to make children's and adult's learning visible through iterative cycles of planning, observation, reflection and change (Pacini-Ketchabaw et al. 2014; Project Zero & Reggio Children 2001). Records such as photographs, videos, audio recordings and artefacts such as artwork imagery are generated and used by groups of people to interpret what is happening in children's learning from multiple perspectives. Attention can then be drawn towards the expansive social, emotional and embodied relationships produced between children and materials. Pedagogical documentation can also support educators in questioning dominant discourses and power structures that function as 'regimes of truth' in education (Foucault, 1994; Mac Naughton, 2005).

Becoming critically reflective about these discourses and structures can encourage people to disrupt singular, universal paradigm of 'best practice' and move towards more a reflective approach that values uncertainty, contextuality and difference in education. Pedagogical documentation therefore acts as a complex and open-ended evaluative process that supports educators in continuously reconsidering their implicit assumptions and beliefs that shape children's education practices. In this research, pedagogical documentation was drawn on as the practice-based process for evaluating children's learning with materials.

## **Connecting new materialism, art practice and children's creative learning**

In this essay I argue that connecting a new materialist approach to education with the novel material practices of artists and designers has the ability to open up dynamic and expansive opportunities for children's creative learning. In the following section, I draw on documentation generated as part of my PhD fieldwork in the learning programs at the Whitworth Art Gallery (Manchester, UK) and Tate (London, UK) to further illustrate this point. The documentation was generated as part of a 12-month action-research project run across the two art museum locations. Extensive records comprising of field notes, video records, photographs and meeting transcripts were produced over 13 gallery-based activities. These records were then used to interpretatively evaluate how children's learning was produced from the art museum's learning environment.

## **Creative learning through plastic - David Batchelor's 'Plato's Disco'**

The Early Year's Atelier (or art studio) is run as a weekly drop-in activity at The Whitworth, University of Manchester. The program was set up by the art museum's Learning and Engagement team in 2015 as a creative laboratory for young children's play-based experimentation with materials.

As part of the research project between the art museum and myself, David Batchelor's sculptural installation 'Plato's Disco' (2015, figure 1) was selected as a starting point for constructing an Atelier activity for babies, toddlers and their families.



Figure 1: David Batchelor 'Plato's Disco' (2015). Image courtesy of the Whitworth, University of Manchester and the artist



The artwork was selected as it provided a rich starting point for exploring color mixing and color layering through translucent glass. When curating the design of the activity, the team substituted glass for plastic acetate and cellophane to allow babies and toddlers to safely experiment with the materials. Additional tools such as transparent tape, water spray bottles, over-head projectors and a lightbox were also selected based on their potential to open up new possibilities for creative experimentation. The equipment and materials were then laid out in a way that encouraged social interactions between children and their families (figure 2). For example, large rolls of cellophane were spread out across the space in a way that allowed groups of children to explore and play with the materials together. Additional materials such as hand torches and colourful tape were placed to the side with the intention of being introduced to individual participants in response to their experimentation.



Figure 2: The initial Atelier setup in the Clore Learning Studio at the Whitworth, University of Manchester. Photo credit: Louisa Penfold

The experience of Charlie,\* aged 2 years and 9 months, was draw on to reflectively interpret learning that was occurring in the space. Charlie entered the Atelier with his mother. The pair had attended numerous Atelier sessions at the art museum before. On entering the space, Charlie started gathering acetate pieces off the floor.



Figure 3: Charlie plays with plastic in the Atelier. Photo credit: Louisa Penfold

After a few minutes, his mother picked up a water spray bottle and demonstrated how to use it. She commented, 'this is the first time he has used a spray bottle... as you can see he is spraying everyone and everything... I think he likes the look of the water flowing down things.' Charlie walked over to the window in the corner of the room. He started to spray the water on the window. He then began to stick the colorful plastic acetate shapes to the glass, remarking "I am making colors" (figure 3). As Charlie stuck the acetate to the glass in different formations, we interpreted his experimentation as exploring concepts such as transparency, opacity, light arrangement and color mixing through the water and plastic. The acetate's properties, such as how it adhered to the glass when wet, generated new starting points for Charlie to stick more acetate and cellophane onto different surfaces. Experimentation with the technique of spraying the water opened up new possibilities for both Charlie's experimentation. Charlie then sprayed the water onto a long strip of yellow cellophane that was hanging from the roof (figure 4).

He stuck the acetate shapes onto the cellophane using large amounts of water from the spray bottle. As the water ran down the cellophane, the dye from the plastic started to drip onto the floor. The dye ran from the acetate, creating an unexpected pool of yellow liquid, “the yellow is leaking... It is a yellow waterfall!” (figure 5). In the research, these unfamiliar and unexpected material transformations were important catalysts for learning as a result of their ability to encourage children to respond to unforeseen changes.



Figure 4 (left): Charlie creates a ‘yellow waterfall’ with the cellophane and water. Figure 5 (right): The plastic transforms after having water sprayed on it. Photo credit: Louisa Penfold

## **Creative learning through paper - Jessica Dismorr’s ‘Related Forms’**

This second documentation sequence was generated as part of the ‘Under-fives explore the gallery’ program at Tate Britain. The session was co-developed by the art museum’s Early Years and Family team and a practising contemporary artist. The program aimed to support family’s engagement with artworks and the gallery space. The sessions was planned and facilitated by a practising artist in collaboration with the art museum’s learning team. Jessica Dismorr’s painting ‘Related Forms’ (1937, figure 6) was selected as a starting point for developing the activity. In the curatorial planning of the session, the team considered how different materials could be brought together to encourage participants to produce new relationships with themselves, other people, artworks and the gallery space.



'Related Forms' provided a unique way of thinking about children's learning with materials and concepts. The initial activity set-up featured tin foil, tissue paper and tracing paper were presented alongside masking tape and scissors. The paper and foil were cut into large oblong shapes and carefully arranged across the gallery's granite floor (figure 7). This provided a sensory-rich starting point for children's play with the materials.



Figure 6: Jessica Dismorr 'Related Forms' (1937). Photo credit: ©Tate, London 2018.

Tom,\* aged 10 months old, attended the session with his mother and father. It was the first time the family has visited the art museum together. After entering the space, Tom's father sat him down in the middle of the paper arrangement. Tom looked around for a few moments before beginning to touch the tissue paper with his hands (figure 8). He then held, scrunched and threw the paper back and forth with his hands, exploring the weight of the materials using his body.

After a few minutes, Tom then began to crawl across the paper, foil and gallery floor. He laid flat on his tummy and slid himself backwards using his upper body strength (figure 9). He repeated this action numerous times and giggled as he did so. Tom's father commented "... I think he loves the physicality of it and how his body connects with things."



Figure 7: The material layout of the 'Under-fives explore the Gallery' session at Tate Britain. Photo credit: Louisa Penfold

While Tom was sliding, rolling and moving through the materials, he was able to explore the movement and friction of his body against different tactile surfaces. The different material's physical properties created unique opportunities for learning with texture, space, push, pull, weight and mass. For example, the smoothness of the floor created a unique opportunity for Tom to slide across and explore the push and pull of his body on the marble. Tom then picked up pieces of the tissue paper and raised them above his head (figure 10). These actions can be interpreted as an exploration of the paper's weight, the height of the material above his body as well as gravity's ability to pull the material to the ground.





Figures 8 & 9 (top and bottom): Tom plays with tissue paper in the 'Under-fives explore the Gallery' activity at Tate Britain. Photo credit: Louisa Penfold





Top: Figure 11: The tissue paper's properties changed as Tom played with the material.

Photo credit: Louisa Penfold

Bottom: Figure 10: Tom lifts the tissue paper over his head.

Photo credit: Louisa Penfold

As Tom crawled, rolled and pulled himself across the paper and raised it above his head, the paper physically and aurally changed form (figure 11). As other babies and toddlers entered the space, they began to play with the paper in its new form, producing more complex transformations between children and the materials.

## **Creative learning fit for the 21st century**

While creativity and the creative arts always have and will continue to hold important places in education, a new materialist approach to creative learning sheds new light on how we understand this process and its significance in the 21st-Century. I argued at the beginning of this paper that previous education theories that position materials as passive substances for children's manipulation and self-expression fall short of acknowledging the dynamic and complex relationships between children and the world. The argument I have presented suggests that materials have the ability to support children in making new connections with themselves, others and the ever-changing world around them. This framework is important for educators, creative practitioners and policymakers shaping education policy and practices as it raises significant issues around about the importance of the creative arts and materials children's lives.

As a result of this research, I propose that children need more access to play with diverse and sensory-rich materials. While artist's experimental practices provide a dynamic starting point children's material learning, further collaborations with individuals and groups exploring materials across science, architecture, engineering and technology may open up even more possibilities for designing material-based learning environments. Additional networks between educators and practitioner's exploring materiality may also allow for more diverse, aesthetically-rich and child-friendly materials to be produced.

While the study does not offer a conclusive answer to the question of evaluating children's learning with materials, it does acknowledge some of the key dilemmas in basing educational assessment around standardized testing and learning outcomes.



It would be beneficial to pursue further research into the use of pedagogical documentation as a formative process for evaluating children's learning across multiple settings, timeframes and contexts. Results of this research will then give more complex insights into the transformative processes that occur between humans and materials. The evaluative framework can then also be used by a network of artists, designers, scientists, researchers and educators to further explore and share practices surrounding children's creative learning. While the future investigation of new materialism, experimental material practices and children's learning may require substantial resources, I believe these to be a fundamental part of producing an expansive and creative future.

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\* Not child's real name

## References

Barad, K (2007). Meeting the universe halfway: Quantum physics and the entanglement of matter and meaning. Durham: Duke University Press.

Barad, K (2011). Posthumanist performativity: Toward an understanding of how matter comes to matter. *Signs*, 28(3), p.801-831.

Barrett, E & Bolt, B (2013). Carnal knowledge: Towards a 'new materialism' through the arts. New York: I.B Tauris.

Bennett, J (2004). The force of things: Steps toward an ecology of matter. *Political Theory*, 32(3), p.347-372.

Bennett, J (2010). Vibrant matter: A political ecology of things. Durham: Duke University Press.

Braidotti, R (2006). Posthuman, all too human towards a new process ontology. *Theory, culture & society*. 23 (7-8), p.197-208.

Braidotti, R (2013). The posthuman. Cambridge: Polity Press.

Boivin, N (2010). Material cultures, material minds: The impact of things on human thought, society and education. Cambridge: Cambridge Press.

Coole, D. & Frost, S. (Eds.). (2010). New materialisms: Ontology, agency, and politics. Durham, NC: Duke University.

Dahlberg, G & Moss, P (2010). 'Invitation to dance,' Art and Creativity in Reggio Emilia. Oxon, UK: Routledge.

Deleuze, G (1995). Difference and repetition. New York: Columbia University Press.

Dewey, J (1934). Art as experience. New York: Minton, Balch & Company. Dewey, J (1938). Education and experience. Indianapolis: Kappa Delta Pi.

Dolphijn, R & Van der Tuin, I (2012). *New materialism: Interviews and cartographies*. Ann Arbor: MPublishing, University of Michigan Library.

Foucault, M (1994). 'Truth and power', in J.D. Faubion (ed.), *Power: Essential works of Foucault 1954-1984*, (pp. 111-133). London: Penguin.

Gandini, L., Hill, L., Cadwell, L., & Schwall, C. (2015). *In the spirit of the studio: Learning from the atelier of Reggio Emilia*. New York, NY: Teachers College Press.

Greene, M (2000). 'Imagining futures: The public school and possibility,' *Journal of Curriculum Studies*. 32(2), p.267-280.

Hoffmann, D., Angelucci, D., Villaverde, V., Zapata, J., & Zilhao, J. (2018). Symbolic use of marine shells and mineral pigments by Iberian Neandertals 115,000 years ago. *Science Advances*, 4(2).

Ingold, T (2011). *Being alive: Essays on movement, knowledge and description*. Oxon: Routledge.

Ingold, T (2013). *Making: Anthropology, archaeology, art and architecture*. Oxon: Routledge.

Ito, J (2017). *Resisting reduction: A manifesto. Designing our complex future with machines*. *Journal of Design and Science*. Viewed August 22, 2018 at: <https://jods.mitpress.mit.edu/pub/resisting-reduction>

Jones, K (2009). *Culture and creative learning: A literature review*. Newcastle, UK: Creativity, culture and education.

Lenz-Taguchi, H (2009). *Going beyond the theory/practice divide in early childhood education*. Oxon: Routledge.

Lenz-Taguchi, H (2011). Investigating learning, participation and becoming in early childhood practices with a relational materialist approach. *Global Studies of Childhood*, 1(1).

MacLure, M (2015). 'The 'new materialism': A thorn in the flesh of critical qualitative inquiry? In Canella, G.; Perez, M.; Pasque, P (Eds). Critical qualitative inquiry: Foundations and futures. California: Left Coast Press.

Montessori, M (1994). Discovery of the child. New York: Random House Inc.

Odegard, N (2012). When matter comes to matter – working pedagogically with junk materials. *Education Inquiry*, 3(3), p.387-400.

Olsson, L (2009). Movement and experimentation in young children's learning: Deleuze and a Virtual Child. Oxon: Routledge.

Pacini-Ketchabaw, V., Kind, S., & Kocher, L. (2016). Encounters with materials in early childhood education. New York, NY: Routledge.

Piaget, J (1964). Development and learning. In M. Gauvain & M. Cole (Eds.), *Reading in child behavior and development*. (Second ed.). New York: W. H Freeman & Company.

Piaget, J (1999). Play, dreams and imitation in childhood. Florence, USA: Routledge.

Project Zero & Reggio Children (2001), *Making learning visible: Children as individual and group learners*. Reggio Emilia, Italy: Reggio Children.

Rajchman, J (1998). *Constructions*. Cambridge, MA: MIT Press.

Resnick, M (2017). *Lifelong kindergarten: Cultivating creativity through projects, passion, peers and play*. Cambridge, Mass: MIT Press.

Rinaldi, C (1993). *The emergent curriculum and social constructivism. The Hundred Languages of Children*. Norwood: Ablex Publishing.

Robertson, F & Roy, E (2017). 'Editorial: Multisensory materialities in the art school,' *Studies in Material Thinking Journal*, 17 (0), p.2-11.

Robinson, K (2000). Out of our minds. Capstone: London.

Steiner, R (1995). The kingdom of childhood: Seven lectures and answers to questions given in Torquay, August 12-20, 1924. Translated by H. Fox. New York: Anthroposophical Press.

Vecchi, V., & Giudici, C. (2004). Children, art, artists: The expressive languages of children, the artistic language of Alberto Burri. Reggio Emilia, Italy: Reggio Children.