International Society of the Learning Sciences

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CHICAGO 2010

Learning in the Disciplines

June 29 - July 2, 2010

9th International Conference of the Learning Sciences

hosted by

University of Illinois at Chicago
Learning Sciences Research Institute

Conference Proceedings - Volume 1a

Full Papers

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Arts and Learning: A Review of the Impact of Arts and Aesthetics on Learning and Opportunities for Further Research

Kylie A. Peppler, Heidi J. Davis, Indiana University, 201 N Rose Avenue, Bloomington, IN, 47405
Email: kpeppler@indiana.edu, hdavis2@indiana.edu

Abstract: Traditionally, learning scientists have paid little attention to the discipline of the arts as the more prominent focus has been on science and mathematics. Despite this, the learning sciences could benefit from further understanding how the arts offer alternative methods of inquiry, representation, and understanding. At the same time, leaders in the field of arts education are calling for more research in areas that intersect with the learning sciences, pointing to the mutually synergistic ways that the two fields could inform one another. Guided by feminist communitarian methodology, this paper brings together a review of a wide body of research in the field of arts education, spanning affective, cognitive, social, and transformative effects of the arts. Insights are shared for how the arts as a discipline can inform the study of learning and, conversely, point to ways in which learning scientists can contribute to the field of arts education research.

The arts and aesthetic traditions have long since been a crucial part of the education experience. Scholars, such as John Dewey, have written extensively on the role of the arts in education (1934/1980), conceiving of the art object, the process of engaging in art making, and the resulting aesthetic sensory experience as theoretically independent entities. According to Dewey, the activity of art making is important because it engages learners in the process of building, designing, and constructing artifacts and provides a tool by which we search for meaning. Both of these notions lie at the heart of a great deal of learning sciences research. Despite this history, learning scientists have paid little attention to the discipline of the arts as the more prominent focus has been on science and mathematics. There are few art educators found in the learning sciences literatures and there are few scholars identified with the learning sciences community who deal with the arts in an explicit way. Despite this, there are many aspects of learning that could benefit from further research into how the arts and aesthetics play a role in our current conceptions, including the study of representations (Latour, 1987; Lynch, 1988), the design of new experiences, environments and technologies (Brown, 1992), and visual research methodologies (Pink, 2001), among many other areas of learning sciences research. One example that seems particularly ripe for exploration is the study of representations, particularly how children engage in drawing, dramatic re-enactments, and role-play when representing their ideas in simulations or models (c.f., Danish, 2009). Artistic and aesthetic facets are innate in all of this work, while their role in the learning process is seldom explored.

Historically, cognitive views of learning have prevailed in arts education (Deasy, 2002; Gardner, 1991) but more recently views have expanded to take on increasingly diverse theoretical frames and areas of study related to learning (Alexander & Day, 1992; Eisner, 2002). Taken together, these bodies of research have contributed to our understanding of the role of the arts in (1) the methods of data collection and analytical techniques (Barone, 2008; Sullivan, 2005); (2) the healing, therapeutic, and restorative processes (Eisner, 2002; Malchiodi, 1999; McNiff, 2004); (3) the discovery of the self, the group, the community or diverse cultures (Greene, 1995; Dewey, 1934/1980; Heath & Soep, 1998); and (4) in expression and communication as well as the particular habits of mind that are cultivated through the arts (Hetland et. al, 2007). More recent studies point to the long-term impacts of the arts on learning and development that outweigh other extracurricular activities (Catterall, 2009). These bodies of research are summarized more fully in this article but, taken together, represent a robust body of knowledge that is rarely built upon in learning sciences research. At the same time, leaders in the field of arts education are calling for more research on learning and artistic expression as well as more research on the arts and the transfer of learning (Arts Education Partnership, 2004). This points to the mutually synergistic ways that the two fields could inform one another. With this community bond in mind, we adopt the feminist communitarian model as our guiding methodological framework. This framework celebrates community ties and conceives understanding as inseparable from community (Friedman, 1989).

The focus of this paper is to turn our attention to the arts as an understudied area and examine how the field can expand as well as open new avenues of research in the learning sciences. This paper brings together a review of a wide body of research in the field of arts education, spanning affective, cognitive, social, and transformative effects of the arts. In addition, insights are shared for how the arts as a discipline can inform the study of learning in educational settings and, conversely, point to ways in which learning scientists can contribute to the field of arts education research.

History of Arts Education

The study of the arts in education has a long history arcing back to the Greek and Roman eras. Plato and Aristotle wrote of the importance of the arts, "for their didactic impact as instruments of cultural maintenance," (Efland, 1990, p. 8), alluding to the earliest function of the arts as visual public curricula to convey cultural values and encourage public discourse. In his influential book, *A History of Art Education*, Efland (1990) depicts the ways in which the social status of the artist contributed significantly to how art education has been conceptualized throughout time. For example, while art objects were seen as important for the education of Greek and Roman societies, the rich did not participate in art making, for artists were not deemed important in society. Conceptions changed in the Middle Ages, when learning in the arts became a form of religious penance for many monks, thus shifting the status of learning in the arts from low-status to highly esteemed. The next big shift occurred during the Renaissance, when academies were created to educate learners on the philosophy of art, which separated art making, traditionally done by lower status individuals, from theorizing about art, now part of the newly formed academies. As these two learning contexts developed, separate identities emerged: craft and fine art. No longer appropriate only for the working class and clergy, the concept of fine art brought high status to learning in the arts and opened the door to public art education.

In the United States, art education began with emphasis on drawing in Benjamin Franklin's academy in Philadelphia (1739/1931). The Industrial Revolution also encouraged drawing as a technical skill that should be included in the general education setting. Similarly, art at the university level began in other departments such as science and anthropology. For example, drawing was a subject taught in the School of Science at Yale long before the School of Fine Arts was established. At the turn of the twentieth-century, as fine art schools emerged across the country, technical skill and art history dominated learning in the arts. At the same time, Dewey's work on aesthetics entered the educational discourse, linking all learning to aesthetic experiences and aesthetic experiences to art in his seminal work, *Art as Experience* (1934/1980). As aesthetic awareness entered the stage of learning in the arts, somatic and intuitive understanding began to get the attention of much research. Research on the imagination and creative expression emerged from this pool of research, as well.

In more recent years, these discussions have been eclipsed in some of the current day educational policy imperatives that place central the role of science, math, and literacy in 21st century education. Often missing from these conversations is the enduring role that the arts and aesthetic knowing plays in education. Aesthetic awareness concerns the heightening of sensory perception (Greene, 1995), enabling learners to discern and demarcate something temporal as rare, unexpected, or beautiful. Arts researchers often point out that art-centered experiences are not automatically aesthetic in nature, but rather meaning is developed through the reflective and critical eye (Dewey, 1934; Freedman, 2003). Desantis and Housen (2000) developed a theory of aesthetic development that outlines patterns of thinking that correlate with the amount of art-centered experiences a learner has had. The theory presents a continuum in which lower levels of aesthetic connection align with fewer exposures to art. This work points to the importance of art education for aesthetic growth, which is of central importance to studies of arts learning, as well as in other domains.

Methodology

What follows is a brief review of the vast body of research that has taken place in the field of arts education. At its outset, four guiding questions framed our review and helped to organize our writing, consisting of: (1) What counts as learning in the arts? (2) How has learning been historically studied in the arts? (3) As an understudied area in the learning sciences, what implications do the arts hold for future research? By contrast, (4) how can the field of learning sciences expand the efforts of arts education?

Our intent for this review is to precipitate dialogue that bridges the educational discourse in two communities of research. In that regard, we selected a methodology anchored in communitarian epistemology apropos for building community ties and mutual interest. Our research methodology emanates from the feminist communitarian model, which puts forward that "the community is ontologically and axiologically prior to persons" (Christians, 2005, p. 152). This model provides three key foundations for this paper: where to look, what is important to look at, and how to use this information. First, this model provides a sociocultural lens, which suggests that meaning is mediated through social dialogue. From this perspective, we began the literature review by looking to key portals of dialogue in the arts community. As such, we bring together several landmark studies found in books and major journals published by leading arts education organizations, including the National Arts Education Association (NAEA) and the Arts Education Partnership (AEP).

Second, our methodological framework guided the process of selecting key themes for the paper. The feminist communitarian model holds that rules situated within a community are understood by valuing the multiplicity of voices as opposed to formal consensus. Within this framework, we looked to multiple voices in the social dialogue that provided themes that are unique to the arts. Taken together, this body of research can be summarized in four unique properties of arts learning that have broader implications for learning more generally, which are summarized in Table 1. In the following sections of the paper, we go into each of these four themes in further depth, highlighting some prior landmark studies as well as pointing to ways that the work can inform our understanding in the learning sciences.

Art as Inquiry

Arts-based researchers look to aesthetic response within the disciplines of art in order to develop meaning. Arts-based research is a methodology, which includes art making into any of the phases of research from inquiry and data collection to sharing findings and conclusions (Deasy, 2009). Poetry, narrative, film, drawing, collage, painting, performance, dance, music, and sculpture are a few of the mediums used in the creative research process. Arts-based research can be used to explore questions in any discipline, not just inquiries about art. Arts-based research critically investigates learning based on the belief that there are multiple ways to develop meaning. Here, we focus on arts-based research in education, though it exists in other disciplines, such as engineering (Penny, 2000), and anthropology (Pink, 2001).

Table 1: Summary of the current research organized into four key themes.

Properties of Learning in the Arts	Definition	Implications for the Learning Sciences
Art as Inquiry	The methods and mediums used by artists offer tools for art as a way of research.	Qualitative research methods.
Art as Transformative Experience	Art-centered experiences offer therapeutic and restorative properties.	Affective understanding. Self-efficacy. Learner readiness. Restorative experience. Healing.
Art as a Means of Discovery	The arts provide opportunities for multiple solutions, which allow individual differences to emerge and allow individuals to be reflexive about the self, the group, the community, and diverse cultures located across space and time.	Community Building. Collaboration. Cross-Cultural Awareness. Sociocultural Theory.
Art as Literacy	Engaging in the arts requires specific habits of mind and knowledge-in-action to be able to read and write the arts.	Habits of Mind. Literacy. Critique. Representations. Transfer.

There are many definitions and labels for inquiring about the world through artistic practice. Most descriptions include the notion of viewing education through the artistic lens. But that means slightly different things to different researchers. Sullivan (2005) summarizes four ways that education research has been interpreted through the arts: 1) educational connoisseurship, 2) Arts-based Educational Research, 3) arts-informed research, and 4) a/r/tography. A fifth group is added to Sullivan's list by including the scholARTists mentioned in Cahnmann-Taylor and Siegesmund's collection of arts based research (2008).

Sullivan's first group, Eisner's educational connoisseurship, is based on *seeing* and *sensing* educational phenomenon through the expertise of an *educational critic*, modeled upon the concept of the expertise of an art critic, who makes judgments based on having exposure to many images Similarly the educational critic makes judgments based on exposure to many educational experiences. Eisner continued to push the idea of art practice informing research by creating the Arts-Based Research Institute in 1993. In 1997, with his colleague Barone, the concept and the term, Art-based Educational Research (ABER), emerged. ABER points to the unique insights and ways of expressing that can be found only in the arts..

While ABER celebrates the distinctly different approaches available through the arts, other researchers maintain the traditional research framework for using the arts in research. For example, arts-informed research seeks to integrate scientific inquiry with artful and imaginative inquiry (Cole & Knowles, 2001). From this view, the arts are relied upon to represent understanding developed through more traditional research methods. To distinguish between ABER and arts-informed research, the results of an arts-informed study might be generalizable, while ABER would not seek generalizability, but instead value *aesthetic resonance* --that is, the research is recognized as holding meaning for a specific community (Eisner, 2008). Other researchers refer to themselves as a/r/tographers, who inquire about the world within the identity of being an artist who is also a researcher and a teacher. A/r/tographers approach research through living inquiry embodied within the daily roles of an artist-researcher-teacher. As such, a/r/tographers use multiple artforms and writing to build understanding by knowing, doing, and making (Irwin, 2004). In addition to these four interpretations of art as inquiry depicted by Sullivan, another key group includes ScholARTists, practicing artists who create stand-alone artwork developed from their research. Their artwork develops from fieldwork, such as collected and analyzed data, but the final piece is relayed through art. For example, Saldana (2008) created an ethnodrama about the nature of qualitative data based on field notes and 25 years worth of experience in the theater. ScholARTists use art practices for scholarships' sake (Irwin, 2004).

All arts-based research aims to establish research questions, share findings, and mine data in evocative and meaningful ways (Cahnmann-Taylor & Siegesmund, 2008; Irwin & de Cosson, 2004). For example,

Springgay's (2004) dissertation research on tactile epistemologies employs the methods of a/r/tography to examine student perceptions of *thinking through the body*. The paper version of the dissertation is accompanied by a DVD of seven videos. Aligning with the tactile epistemological content of the work, the paper version is hand stitched with fabrics and thread, and is augmented by the author's original photography and poetry.

Ultimately, research is a tool for making sense of learning in order to positively impact the lives of learners. Human understanding advances through exploration, interpretation, and representation, which are qualities of both the arts and sciences (Leavy, 2009). Arts-based research is beneficial for the learning sciences in myriad ways, but we have highlighted three of the most significant: 1) to provide the learning sciences with an expanded toolkit for developing meaning, 2) to acknowledge and clarify assumptions about what it means to know for the researcher, and 3) to include voices previously left out of the discourse on learning. In addition to the benefits of embracing aesthetic awareness as a useful component of research, arts based research also challenges other traditional notions. Embracing post-modern theories that state there is no one truth, arts-based research encourages research that opens the conversation--it is not the researcher telling the reader, but rather the researcher invites the reader to be an active part of the process in making meaning (Siegesmund & Cahnmann-Tayor, 2008). Barone also sees the wider readership potentially available through arts-based research as an opportunity to encourage social change (2008).

Art as Transformative Experience

Throughout history, humanity has responded to tragedy with art, as represented by the 9/11 memorial, *Reflecting Absence* or Picasso's Guernica, among countless others. Just as a nation uses art to heal and move forward, art as a transformative experience is important for education, as well. As Maslow's hierarchy of needs suggests, basic needs such as feeling safe and valued must be met before learning can occur (1943). The transformative nature of learning in the arts is well poised to meet this educative need.

Long acknowledged in the fields of art, psychology, and aesthetic education, the process of creating and responding to art offers therapeutic and restorative properties (e.g., Eisner, 2002). The transformative impact of art can be seen in studies like Malchioldi's (1999) work with children, which found stress relief and healing effects when art-making was used with hospitalized children. Kaplan et al. (1993) found that visits to a museum had a restorative effect on visitors. A number of self-proclaimed transformative art experiences exist in the literature, as well. For example, Hill (1951) professes that art making was instrumental in his recovery from tuberculosis and Allen (1995) shares how art helped her confront harmful beliefs and transformed her life.

The transformative impact of art provides insight for research in the areas of affective knowledge, restorative experiences, and self-efficacy. Art therapy is a branch of psychology that has greatly contributed to this range of research. Art therapy research has shown that healing and transformation comes from a place of affect that is beyond words (Malchioldi, 1999). Research has also shown that the affective benefits of learning in the arts act as a gatekeeper for positive self-identity in adolescents (Catterall, 2004). Similarly, in *Critical Links*, several research projects found that the affective properties of the arts contributed to positive transformations in the areas of motivation, cognitive development, school culture, academic performance, and attitudes toward reading (Catterall, 2002). Self-efficacy is also strengthened through experiences with art (Catterall, 2004; Catterall & Peppler, 2007). Eisner summarizes that self-efficacy is developed during the creative act as learners engage in a medium and bring their concepts into reality (2002). Kennedy's (2002) study found that learning in the arts increased the self-efficacy of at-risk youth, promoting positive self-esteem. In this way, experiences with art enhance individual, social, and cultural health. By readying the psychological state, learning in the arts reaches across disciplines and offers unique opportunities to restore health, which clears pathways to new knowledge.

Arts as a Means of Discovery

Another key contribution of the arts is that it provides opportunities for multiple solutions. As Eisner states, "…Standardization of solution and uniformity of response is no virtue in the arts. While the teacher of spelling is not particularly interested in promoting the student's ingenuity, the art teacher seeks it" (2002, p. 1). The diversity of solutions and the space that is afforded for creative solutions to a problem is at the heart of what it means to engage in learning in the arts. We see the valuing of multiple solutions as essential to allowing individual differences to emerge and engender a discovery learning process that engages the learner in learning about the self, the group, the community, and diverse cultures, which are outlined in the four sections below.

Arts and Learning about the Self. While self-discovery may happen in all disciplines, the arts seem to be a particularly fruitful context to cultivate solutions unique to the self, imagination, and creativity. Further discovering these areas in terms of their relationship to learning seems ripe for exploration into the role of creativity and imagination in learning and seems to also be an understudied area of the learning sciences. Imagination seems to play a role in self-discovery. Greene's seminal work, *Releasing the Imagination*, stresses that when a young person's imagination is not released, that young person may have difficulty situating the self as well as the role of the self in a larger community (1995). Heath and Soep expand on this to elaborate that the

arts allows individuals to be reflexive about the self as they hone the ability to make things of value to their surrounding communities (Heath & Soep, 1998). Similarly, Dewey alerts us to the transformative nature of the arts and aesthetics in challenging the status quo and the dominant elite in order to meet the needs of democratic society (1934/1980). This is particularly relevant to youth in marginalized communities because they have an opportunity to write their own narratives and insert themselves into the dominant discourse through the arts. This potentially sets the stage for higher levels of engagement in other arenas, like school. Catterall and Peppler also discuss the impact that the arts have on general self-efficacy in disadvantaged groups—the positive and authentic view of one's capabilities and achievements—developed in mastering an art form, and the critical and reflective dispositions that accompany its development (2007). Taken together, these strands of research call for future investigations into the differing effects of an arts experience for the audience and the artist, which are areas of inquiry that learning scientists are particularly poised to answer.

The Arts and Group Learning. As aforementioned, when young people engage in art making they explore a variety of disciplines and are learning at multiple levels, including learning about the larger group or classroom community as well as their place in it. Arts experiences frequently involve more than one learner. The performing arts, in particular, are steeped in this tradition as actors find their place in the production, musicians learn about their part in the orchestral work, visual artists work on large murals together, and dancers in their role in the dance. While the arts are not the only discipline to have group learning experiences, they offer rich opportunities to gain skills in a group setting and also to display final products. Research on collaboration would benefit from exploring the arts further to better understand the role of the collective in the arts. Researchers might also inquire into the specific qualities the arts bring to group learning processes as well as the qualities of the individual art forms that contribute to efficacious group learning and contrast this with what is known more generally about group learning and collaboration. Other areas that are ripe for exploration include investigating whether arts collaborations exhibit general tendencies to enhance equity in learning for larger numbers of learners in the group and particularly whether this is inclusive of already disenfranchised groups. Preliminary observations indicate that the arts can create more equitable learning opportunities for at-risk youth (Catterall & Peppler, 2007). Additionally, it would be interesting to explore whether the arts can serve as a training ground for learning to be part of a group outside of the arts and the conditions for such group learning to occur.

In a related manner, current and historical research points to the arts as the foundations of a democratic society, including effects of the arts on positive social interactions, tolerance, and consideration to moral dilemmas. For instance, studies suggest that the arts promote empathy, tolerance, and solution finding through taking multiple perspectives (Catterall, 2002). These effects may not just extend to students involved in the arts, they may well impact participating teachers and school identity. For example, Noblit and Corbett (2001), noted in their evaluation of the A+ Schools program in North Carolina that school faculty developed a positive school culture despite typical administrative challenges and lack of resources. This work suggests that engagement in arts activities fosters democratic values. Further inquiry may advance notions of democratic public schooling.

The Arts and Cross-Cultural Learning. Because artifacts are a reflection of the values held by a group of people in a particular space and time, they allow us to learn about diverse cultures through their study. This type of learning happens even when we travel across space and time. Anthropologists and historians, for example, help us to understand diverse cultures through the study of their art, which is the foundation of fields like art history and music history. Moreover, the arts are rooted in cultural traditions. Engaging youth to identify more deeply with their own culture and share this understanding with others may also be a key contribution of the arts, especially as classrooms encourage this type of sharing with peers and teaching faculty. Moreover, youth from diverse backgrounds can develop deeper understandings around issues of race, culture, and class systems (Deasy, 2002). Drama, for example, has been found to engage youth in social change and build understanding among diverse groups (Rohd, 1998). This may be because drama allows youth to explore multiple roles and perspectives through role-play (Deasy, 2002). In doing so, drama helps youth to understand character motivation, complex problems and emotions, and social relationships, promotes conflict resolution, engagement, and positive self-concept (Catterall, 2002). This ongoing body of research demonstrates the efficacy of the arts of communicating meaning across cultures through complex semiotic systems.

Arts as Literacy

Literacy is now known to be both multimodal in nature (Kress & van Leeuwen, 1996) and mediated through shared social and culturally situated activity (Vygotsky, 1935/1978). As theories of semiotics are advanced, prior work has focused on monomodal domains of the various art forms and articulated the associated grammars of each individual system of communication (i.e., visual, auditory, etc.). More recently, researchers are promoting a multimodal view of literacy that is key to understanding newer art forms (Kress & van Leeuwen, 2001). These efforts broaden our conceptions to include a theory of "multimodal literacy" and what it might mean to "make meaning" across a range of modalities. Jewitt and Kress (2003) argue for two central practices in their theory of multimodal literacy, including "design thinking" as encapsulating the intentions of a designer in absentia of the materials and the "production thinking" emanating from those ideas in the materials. In sum,

artists make sense of individual modalities with the ultimate goal of making connections between several different types of modalities. Arts engagement fosters the ability to translate one type of literacy to another.

Further, current research on language and literacy point to the ways in which various modes of communication have value in the larger social and cultural context. For example, each of the major art forms (e.g., dance, drama, music, and visual arts) can be seen as its own symbolic system of language, one capable of expressing a range of emotionality and communicating a rich set of ideas and understandings that is oftentimes unattainable through speech alone. Not surprisingly, this realization allows us to view the meaning making of disenfranchised groups in new ways (Baum, Owen, & Oreck, 1997; Catterall & Waldorf, 2000), which is especially true for young children and those with disabilities that were previously seen as illiterate or pre-literate. Young children's drawings, for example, can now be seen as efforts at meaning making and expression and can be used for thinking and reflection (Kress & van Leeuwen, 1996). Through seeing these acts as art in their own right (Gardner, 1980), we begin to recognize these acts as literate activities and can begin to understand how young children as well as all learners begin to read and write the world through artistic acts.

Moreover, artists shape and convey intellectual and emotional content in their artwork as well as to evoke intellectual and emotional responses in the viewer (Greene, 2001). As such, we begin to see that learning in the arts transcends the benefits for the artists and includes the audience in the learning process as well. This is because the art object presents opportunities for the audience to engage in learning. The arts naturally afford inclusive learning opportunities because arts tradition is deeply rooted in performance, ,which is a natural culmination of dance, drama, and music. Also, displaying the final product in the visual arts is a common culmination, which positions the audience as a primary motivating force in the arts (Sefton-Green, 1998).

As theories of constructionism would explain (Papert, 1980; Kafai, 2006), the process of producing a work of art engages the artist in an iterative exploration of ideas and emotions as the work proceeds in a meta-cognitive manner. During this process, the artist learns to refine aesthetic sensibilities and build knowledge about materials, while connecting to other disciplines. For example, figurative drawing engages an artist in further understanding human anatomy. The fact that the arts give use new ways to read and write the world, has spurred a flurry of research aimed at the arts and the transfer of learning to other traditional academic areas such as mathematics, spatial reasoning, and oral and written language acquisition (Winner & Hetland, 2000; Deasy, 2002). Studies and commentaries in the publication, *Critical Links* (Deasy, 2002), have accumulated support that the arts and oral and written language share interrelated physical and symbolic processes, an area of research that could be further explored in the learning and cognitive sciences.

Relationships between the arts and literacy and language development are found across all of the visual and performing art forms, though the research is currently most robust in music and drama. For example, music features a symbol system that shares fundamental characteristics with language. At its core, music can be seen as decoding and encoding procedures that have syntactic and expressive structures (Scripp, 2002). In a similar manner, Catterall found that dramatic enactments enhance youths' abilities to comprehend texts, identify characters, and understand character motivations (2002). Studies also indicate that dramatic activities promote both writing proficiency and prolixity in generating written material. Further research is needed into other artistic forms, particular dance and the visual arts, as very little current research exists in this area. Additionally, learning scientists could help to unpack the mechanisms at work in the connections between the arts and literacy. For example, math educators call for more research on learning and aesthetics in order to develop a mathematics aesthetic, which evokes awareness of the beauty in mathematical ideas (e.g., Sinclair & Crespo, 2006). Across these studies, we see that the arts set the stage for learning a unique language and communicating with others in the world at large. Further inquiry into theorizing such literacies is needed, with the learning sciences uniquely poised to contribute knowledge on design-based research, assessment, and situated learning.

Discussion & Conclusion

We have pointed to ways the field of arts education could benefit from research in the learning sciences as well as the ways in which the arts alert us to an understanding that is under-represented in the learning sciences. There are a range of cognitive, social, and cultural capacities engaged by learning in the arts. The following summarizes five opportunities for future research. First, research is needed to examine how youth develop such knowledge-in-action as well as the disposition to see the world through the lens of aesthetics, as we unravel how youth wrestle with ideas, materials, and meanings in the arts (Fiske, 2000). Second, there is a need to better understand how the various art forms uniquely impact the learning experience. For example, in what ways is learning in music distinct from other ways of representing ideas, such as dance or visual arts? Deasy adds that "finding alignment among the ways in which the study of different artistic forms demands and nurtures complex thinking has significance for the development of comprehensive arts programs and for our understanding of the nature of thought in arts learning" (2002, p. 6). Third, further research is needed on the design of learning environments in the arts. Better understanding of the pedagogical approaches and classroom contexts that support learning in the arts is needed (Horowitz & Webb-Dempsey, 2002). Fourth, there is also a need to define and measure "arts learning" (Catterall, 2002). Current studies do not unpack the extent and

quality of the learning experience in the arts. Consequently, we know little about the specific qualities of arts learning that contribute to the gains aforementioned in this paper. As a result, it is difficult to qualitatively compare arts programs and there is an assumption that all arts education is of similar quality. This does not contribute to our understanding of how variations in learning in the arts account for variations in learning outcomes. Lastly, further research is needed in traditional areas of the learning sciences to explore the role of arts and aesthetics in our understanding of design, representations, and research methodologies, among a host of other domains in the learning sciences.

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