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Journal of technology and teacher education

Volume: 23
Issue: 3
Year: 2015
Pages: 357-385
ISSN: 1059-7069
OCLC #: 41157008

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Towards a Theory of Distributed Instruction in Creative Arts Education

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This article examines how arts-based informal learning spaces engage young people at the intersection of creativity and technology. We conducted case studies of four youth media arts organizations to understand how teaching is defined and realized in these contexts. We find that teaching is a distributed act that sits at the intersection of people, tools, and activities. Drawing on theories of distributed cognition (Salomon, 1997), we provide examples of “distributed instruction” and describe how this form of instruction affords the development of creativity for young people who are learning to make art using digital technologies. We conclude by offering design principles for formal classroom settings that emerge from a theory of distributed instruction and discuss how these designed environments can offer opportunities for creativity and production in schools.
The current policy climate in schools has led many in education research to develop and study standards, assessments, and outcomes that are primarily focused on reading and math achievement gains. Teaching for creativity has fallen by the wayside as schools focus on ensuring that all their students meet content standards and that all their teachers provide added value to students in achieving learning gains. When schools do embrace young peoples’ creative production, it is often romanticized by teachers; we hesitate to do more than praise young people for being creative for fear that we will be criticizing students themselves (Sefton-Green & Sinker, 2000). And since we cannot provide critique for creative work, art-making is taken to be non-rigorous and non-serious, marginalized in our era of accountability. One notable exception is Hetland, Winner, Veenema, and Sheridan’s Studio Thinking project (2013) documenting the instructional routines of visual arts teachers in classrooms and how these routines result in learning outcomes that promote creativity such as developing craft, extended engagement and persistence, and envisioning possibilities. Their work is the first step to seeing art-making as a serious instructional endeavor.

While the Studio Thinking project helps us to understand the kinds of instructional practices that are useful for the development of visual arts skills and practices in schools, a much broader range of creative production practices is emerging in informal learning environments (Ito et al., 2010). Informal learning environments outside of schools allow young people to participate in creative production in a range of ways from intense to peripheral participation and to take an ideas-first approach to creative production, using materials and tools as needed rather than having tools, materials, and assignments drive creative production. Peppler (2013) contrasts increasingly limited opportunities for young people to engage in creative production in schools with out-of-school time that is, “dominated by self-directed activities of teens that are rooted in everyday forms of creativity” (p. 12). These forms of creativity are arts-based and often use new technologies to build, collaborate, and share new ideas and artifacts. In order to best understand how young people are learning to participate in the creative arts, we have to look to their places of practice: informal, out of school learning environments.

This article examines the teaching of creativity through studies of out-of-school learning experiences that focus on the intersection of creativity and technology. We conducted case studies of four youth media arts organizations to understand how teaching is defined and realized in these contexts. In examining how teaching functions in informal learning spaces as sites for creativity, we find that teaching is a distributed act that sits at the
intersection of people, tools, and activities. Drawing on theories of distributed cognition (Salomon, 1997), we provide examples of “distributed instruction” and describe how this form of instruction affords the development of creativity for young people who are learning to make art using digital technologies. We conclude by offering design principles for formal classroom settings that emerge from a theory of distributed instruction and discuss how these designed environments can offer opportunities for creativity and production in schools.

CREATIVITY AND LEARNING IN INFORMAL SETTINGS

Our research has focused on how young people learn in digital arts-based informal learning settings and thus we focus on understanding creativity at the intersection of the arts and learning sciences—the qualities of both individual and group creativity processes and experiences and insights into how creativity can be evaluated in designed learning settings. Creativity as defined by the intersection of the arts and the learning sciences has three key features: distributed processes, collaborative emergence and iterative processes.

In order to understand creativity as a distributed act, we turn to Csikszentmihalyi’s (1990) influential work on flow, which reframes the focus of creativity from belonging to a person to identifying the qualities of subjective experience that have ties to creativity. Flow refers to the phenomenological experience of being deeply immersed in an activity, including a sense of intense focus, agency, lack of self-awareness, and a distortion of the experience of time (Csikszentmihalyi, 1990). Flow is intrinsically rewarding, and flow encourages the deeper and more sustained engagements that support creative endeavors. Flow is a characteristic of an experience, not an individual. Despite this, flow was studied initially through the lens of individuals’ experiences, giving the sense that “being creative” was embedded in an individual’s character. However, arts-based work often involves groups and creativity often emerges through collaboration (Sawyer, 2003). Flow, as a characteristic of experience, is achieved when people work together over time to complete a task. Sawyer and DeZutter (2009) provide evidence that creative arts processes are distributed cognitive endeavors through their studies of improvisatory theatre. Many arts-based learning settings require collaborative engagement, people and tools working together to produce a piece of work. That the processes are distributed affords what Sawyer and DeZutter call “collaborative emergence” – an ac-
tivity that has an unpredictable outcome, with moment-to-moment contingency, where subsequent actions can change the effect of prior actions, and the process is fundamentally collaborative (p. 82). Youth arts organizations often exhibit these characteristics; creativity in these spaces can be defined as distributed and collaboratively emergent.

The importance of iteration in defining creativity in digital arts production spaces comes from the research on “design thinking,” a learning process that captures how learning happens in domains including architecture, digital and video narratives, engineering and game design (Halverson & Sheridan, 2014). Researchers have identified some common aspects of an iterative process in design that moves from an initial phase of exploration and ideation— which often involves finding or describing a problem—to the construction of drafts, sketches, and prototypes which pose potential designs or solutions, to reflection on these through some process such as critique. Cycles move towards a refinement of the design, often ending with some form of sharing the product either through use, exhibition, sale, or performance (Cross, 2011). Likewise, there are commonalities across design problems and domains in the kinds of thinking encouraged at different stages in a design-based creative process. For instance, in the ideation phase, educators and researchers have highlighted the importance of thorough exploration. In their classic study in the visual arts, Getzels and Csikszentmihalyi (1976) found exploratory behavior before completing an artwork to be strongly associated with work that was judged to be more creative, and furthermore with more general judgments of creativity and artistic success in later years. Hetland et al. (2013) identified “Stretch & Explore” as one of the habits of mind repeatedly encouraged by visual art teachers through strategies such as generating multiple drafts, working from multiple exemplars, explicitly trying out different techniques, shifting points of view, and mid-process critiques of multiple versions. Likewise, studies of more structured design problems describe the need for educators to support learners past an “early commitment pitfall” by allowing ample exploration time with tools and materials before posing explicit design problems (e.g., Kafai & Resnick, 1996; Puntambekar & Kolodner, 2005). Iteration prevents “design fixation,” early commitment to less-than-optimal design solutions without the capacity to envision meaningful alternatives (Jansson & Smith, 1991; Purcell & Gero, 1996). Taken together, our understanding of what creativity means in artmaking environments involves iterative, collaborative efforts to generate emerging ideas at the intersection of the people and tools in the setting. But what do the environments in which the creative arts are fostered look like? We turn briefly to a definition and review of how informal learning settings have been studied and understood.
INFORMAL LEARNING SETTINGS AS PLACES OF CREATIVITY

We are interested in how learning environments that support creative art-making are structured and how we can characterize instruction in the context of these learning environments. With the exception of Hetland et al.’s (2013) analysis of the pedagogy of studio art classrooms, studies of the arts and learning have been almost exclusively the domain of informal learning environments (Halverson & Sheridan, 2014). Likewise there is growing attention to documenting and describing the learning that happens in informal and out-of-school settings (e.g. Heath, 2000; Hull & Schultz, 2001; Ito et al., 2010; Mahoney, Larson, & Eccles, 2005), but very little of this research focuses on how instruction happens. One of the challenges in describing instruction and teaching outside of school is in developing a definition of the environments themselves. Though “informal learning” has purchase as a concept for expanding and contextualizing our understanding of learning, it is often pitted against “formal learning” without a clear understanding of the ways in which they are fundamentally different. Do we mean informal in form? In style? In content? And how many of these dimensions must be “informal” in order for it to meet the criteria of informality? Sefton-Green (2003) suggests four primary ways of delineating formal learning experiences from informal ones: 1) Formal learning experiences are structured in purposive ways; 2) Learning is organized around an external intervention; 3) Learning is frequently measured and assessed and; 4) Learning is characterized by the use of discourse norms in traditional subject disciplines. The challenge, of course, is that many experiences we would characterize as informal learning environments have some (but not all) of these features. Likewise, some schools (ones without grades, for example) do not have all of these features. In our work, we define “informal learning” settings as those that are organized outside the parameters of the school day. In particular we focus on informal learning settings that engage youth in creative processes through digital art-making.

The closest analogue to the study of creative arts instruction in informal learning settings comes from museums; research on museum learning offers descriptions of instructional practice, with specific depictions of effective teaching as well as teacher training opportunities for new museum educators (Castle, 2006; Tran, 2006; Tran & King, 2007). Most other studies of informal learning settings, however, lack this emphasis on instructional practices. Perhaps this is true, in part, because the adults who work with youth in these settings are not often constructed as “teachers”; rather, they are described as coaches, mentors, partners, arts educators and adult participants.
While we typically associate “instruction” with “teachers,” Chávez and Soep (2005) describe their work in youth media organizations as, “a pedagogy of collegiality” which is characterized by joint exploration and accountability across youth and adults, as well as an emphasis on youth-led inquiry coupled with adult-mediated intervention. From an instructional perspective, the emphasis here is on accomplishing a task - in this case producing a radio story – rather than teaching something to young people. As a result, it is often unclear who is the teacher and who is the student, given that all participants are learning from one another in an effort to accomplish a shared goal. But how does their rich ethnographic description of novices developing the skills and habits of mind of radio producers translate to the theory of instruction and what teachers need to know to be successful? How can we map the “pedagogy of collegiality” back onto a theory of teaching?

Despite a lack of explicit focus on instruction in informal settings, there does seem to be a tacit assumption that multiple people serve in instructional roles across the lifespan of a program. This is marked by references to adults (plural) in the learning setting, as in Chávez and Soep’s (2005) description of the pedagogy of collegiality that emerges at Youth Radio: “when adults and young people make media together, they are also producing a relationship of teaching and learning” (p. 420). The same can be said for research on mentoring programs for adolescents, which suggests that mentoring is, “distributed among multiple adults, not only a single person identified as Mentor” (Hamilton & Hamilton, 2004, p. 401). These settings are often conceptualized in terms of the tasks to be accomplished and how the people within the setting (youth and adults) work together to accomplish these tasks. There is strong potential for alignment between the notion of teaching as distributed in informal settings and creativity as distributed in arts-based practices, especially where there is a range of expertise levels within the same arts practice.

**RESEARCH METHODS FOR STUDYING CREATIVITY IN INFORMAL SETTINGS**

This article investigates the instructional design of four youth media arts organizations (YMAOs), informal learning environments that engage groups of young people in creative expression. Specifically, we address the following research questions:

- How do youth media arts organizations design instruction?
- What does their instructional design reveal about their conceptual model of teaching?
Data Collection in YMAOs

We addressed these research questions in the context of four instrumental case studies (Stake, 2000) with arts organizations across the US (Table 1). The purpose of the larger study was to understand how young people learn to make digital art about the stories of their lives and the role this process plays in their identity development (see Halverson, 2010; Halverson, Lowenhaupt, Gibbons & Bass, 2009) and learning in and through the arts (Halverson, 2013). We chose these particular organizations for their documented record of success working with youth to produce digital media about the stories of their lives.

<table>
<thead>
<tr>
<th>Location</th>
<th>Production cycle length</th>
<th>Type of program</th>
<th>Time of data collection</th>
<th># of youth participants</th>
</tr>
</thead>
<tbody>
<tr>
<td>Appalachian Media Institute</td>
<td>Whitesburg, KY</td>
<td>3 months</td>
<td>Summer internship</td>
<td>Summer 2008</td>
</tr>
<tr>
<td>In Progress</td>
<td>St. Paul, MN (headquarters)</td>
<td>Varied</td>
<td>Ongoing</td>
<td>Summer 2007</td>
</tr>
<tr>
<td>Reel Works Teen Filmmaking</td>
<td>New York, NY</td>
<td>6 months</td>
<td>Semester</td>
<td>Fall 2007 – Spring 2008</td>
</tr>
<tr>
<td>Street Level Youth Media</td>
<td>Chicago, IL</td>
<td>3 months</td>
<td>Summer internship</td>
<td>Summer 2008</td>
</tr>
</tbody>
</table>

To understand the relationship between digital art production processes, creativity, and learning, we traced one production cycle at each organization – from participants’ initial entry to the final presentation of their work. In identifying a production cycle as the frame for our cases, we created further consistency in our data collection not by the amount of time we spent with each organization, but by the organizational structure provided for participants to produce their digital art. In order to capture the production cycle at every organization we collected a variety of qualitative data:

*Documentation of the process in action.* Most of this documentation was in the form of ethnographic observation, though we also collected video documentation at various points across the production cycle.

*Artifact collection.* We collected all artifacts youth created around the digital production process including application essays, journals, group brainstorming sheets, worksheets, edited/unedited video footage, and blog
entries. We also collected curricular materials used by organizational leaders and individual workshop facilitators.

*Interviews* were conducted with participants, organizational leaders, facilitators, and mentors.

Data collection was iterative; we employed a constant comparative method across our case studies (Glaser & Strauss, 1967). We began with two open-ended case studies (*Reel Works* and *In Progress*) and then returned to the field a year later to conduct two more directed case studies (*AMI* and *Street Level*) based on our initial interpretations. To answer the research questions addressed in this article, we drew specifically from participant observations of the instructional process in action, interviews with instructors, organizational leaders, facilitators, and mentors, and adult-generated artifacts including curricula and worksheets.

**Data Analysis Focused on Instruction in YMAOs**

To answer questions about the design of instruction and beliefs about teaching, we conducted an iterative, thematic analysis (Aronson, 1994; Braun & Clarke, 2006) in order to build a model of each organization’s instructional design and to interpret how these models communicate theories of teaching. Analysis of ethnographic observations and interviews consisted of a two-tiered coding process (Saldaña, 2009). First we identified all “instructional moments” in our observational data and references to these moments in our interviews (e.g. Athauser & Matuga, 2008; Santangata & Angelici, 2010). We classified instances as “instructional moments” when they involved at least one instructor and one youth participant interacting around the digital art production process. After coding individual instructional moments, we explored themes across these moments, allowing us to identify thematic links within and across organizations.

**HOW DO YMAOS TEACH FOR CREATIVITY?**

At all of the organizations we studied, the production process was time intensive and highly structured; organizational leaders concentrated on designing their instructional space and communicated their intentions through the formal structures they put in place prior to each production cycle. This finding is in direct contrast to the myth of artistic, creative production processes as best accomplished when unconstrained and free from formal in-
structional practices (Sefton-Green & Sinker, 2000). Table Two describes the primary formal structures of instructional design that were common across all organizations.

<table>
<thead>
<tr>
<th>Table 2</th>
<th>Summary of instructional design</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Meeting time</td>
</tr>
<tr>
<td>AMI</td>
<td>Summer, 10am-5pm daily</td>
</tr>
<tr>
<td>In Progress</td>
<td>Summer, 10am-5pm daily</td>
</tr>
<tr>
<td>Reel Works</td>
<td>School Year, 6pm-9pm Tuesdays &amp; 10am-5pm Saturdays.</td>
</tr>
<tr>
<td>Street Level</td>
<td>Summer, 10am-5pm daily</td>
</tr>
</tbody>
</table>

There are several common features across organizations worth discussing. First, organizations devoted a significant amount of time to guiding youth through the production process; they worked with youth for an average of 200 hours to produce a high quality piece of digital art. Over the course of those 200 hours, all organizations engaged youth in many formal lessons. AMI and Street Level engaged youth in formal instruction on a daily basis. Lessons ranged from the basics of camera work and Photoshop to discussions of genres of art and mission. Reel Works provided one weekly lesson about a key feature of documentary production, such as how to conduct an interview or how to choose music. While In Progress did not build lessons into their curriculum a priori, the director and intern often provided just-in-time instruction to individuals or small groups of participants, which focused on the technical aspects of digital art production. All organizations maintained a dedicated workspace and required (or strongly encour-
aged) youth to participate in the creation of artifacts that tracked their progress (Halverson, 2013). These artifacts were frequently shared among youth, instructors, and with future cohorts. This formalized guidance resembles the classroom formats found in the Studio Thinking project, especially the demonstration-lecture format (Hetland et al., 2013). What is different here is how this formalized guidance is distributed across people, tools, and time.

Of greatest interest is that all organizations employed similar instructional models that relied on multiple instructional roles (see Table 2). While the formal titles vary slightly, these titles were often functionally equivalent, resulting in remarkably similar staffing structures. Staffing structures included two primary instructional roles: 1) the director/facilitator who was responsible for the formal learning process, designing the flow of activities, and monitoring the progress of students and; 2) the mentor(s) (also filmmaker/intern/trainer) who offered more individualized support through apprenticeship. These mentors ranged from professional filmmakers (Reel Works, Street Level) to more experienced peers who had been through the organization’s process multiple times (In Progress), and sometimes included both types of mentors (AMI). These multiple roles were explicitly designed into the digital art production process to serve specific pedagogical functions for youth, and not because individuals lacked the capacity to get the job done. Below, we highlight unique aspects of each of the four sites with a focus on the way instructional roles were organized.

**Appalachian Media Institute**

*Appalachian Media Institute* (AMI) is a media training program for central Appalachian youth, which is housed at Appalshop, a non-profit multi-media arts and cultural organization focused on issues facing central Appalachia. While the other organizations in our study are all standalone organizations, AMI is one of many initiatives supported by a larger organization. A particularly unique feature of the AMI/Appalshop relationship is the use of Appalshop’s professional filmmakers as mentors to the AMI youth producers. Additionally, the local nature of Appalshop’s work means that young people who participate in AMI often return for multiple years as “interns” (youth participants), eventually transitioning to the role of “trainer” (program instructors).

Instruction was shared at AMI across various instructor roles. The Directors coordinated filmmakers, trainers, and interns and were responsible for keeping interns on track, making sure they met deadlines and fulfilled
the program objectives so that they could be paid for their internships. Di-
rectors primarily focused on organizational aspects of instruction, such as
choice of topic and teaching method. Filmmakers focused primarily on as-
pects of learning that were directly connected to production, such as design
or use of representations and tool selection, while the trainers focused on
classroom-related learning, including choice of topic and the use of technol-
ogy. It should be noted, though, that the directors were themselves filmmak-
ers and one was a former trainer and intern in the program. They were ca-
pable of engaging with youth about production, though they often chose not
to in service of keeping the organizational aspects in line. The distributed
nature of instruction at AMI led to the division of teaching responsibilities
among instructors depending on role. Figure One provides a visual repre-
sentation of the instructional interactions among AMI staff and participants.

![Diagram of Instructor Roles at AMI]

**Figure 1.** Instructor roles at AMI.

**In Progress**

*In Progress* is a non-profit organization based in St. Paul, Minnesota,
though many of their programs are run in local Minnesota communities and
other small communities across the US. We focused our research on the
Ogichidaakweg program, digital artmaking in the Anishinaabe communi-
ties in Minnesota. The goal of the program is to work with Anishinaabe girls
to produce digital art that will help them grow into strong women. Though
the program is designed for young women, boys and girls aged 7-20 partici-
pated throughout. Since the program is local, the Director traveled to Nett
Lake, Minnesota for two weeks to work with participants. The program had
been in place for 10 years prior to our study so, like the trainers at AMI,
former participants had become local artists in the community and served as mentors to more junior participants.

Instruction at *In Progress* was the least structured of the four organizations; many formal lessons grew out of direct needs expressed by youth participants. In part, this was due to the distributed nature of the production process that allowed multiple youth to take ownership of digital art projects at various points throughout the process (Halverson et al., 2009). This also meant that different participants mastered different aspects of digital production, often through intensive one-on-one work with the Director, the mentor-artist, or other more experienced youth. It is also important to note that the Director only stayed in Nett Lake for two weeks; after that time participants continued to work independently on their projects, checking in with the artist-mentor (a member of the Nett Lake community) on a regular basis. The Director would return to Nett Lake when time and funding would allow to continue formal work with participants, to help with the more technical aspects of editing, and to help craft a public showing for participants’ work. In the case of *In Progress*, instruction was fluid across and among instructors and youth. More broadly the Director actively trained former participants in all *In Progress* programs to become artist-mentors in order to develop sustainable programs with distributed expertise across all levels of participants. Figure Two provides a visual representation of the instructional interactions among *In Progress* staff and participants.

![Diagram of Instructor roles at In Progress.](image-url)
Reel Works

*Reel Works Teen Filmmaking* is a New York City-based non-profit organization founded in 2001 by two filmmakers interested in bringing digital film production to youth. Twelve new youth enter *Reel Works* every six months through *The Lab*, a 20-week program meeting biweekly where adolescents write, shoot, and edit short-form documentaries about the stories of their lives or issues that are important to them. Like AMI, part of Reel Works’ instructional philosophy was to have youth participants learn filmmaking directly from professionals. Every Lab participant was assigned his or her own mentor, all of whom worked in the film industry. Whereas the filmmakers at Appalshop worked side-by-side the AMI youth, Reel Works mentors came sporadically to the Reel Works space and met with their mentees independently.

There were also opportunities for the directors and the mentors to work with youth simultaneously. The pitch meeting, for example, was a crucial space during the production process where youth had to sell their film idea to a group of peers, instructors, and outside experts (Halverson, 2013).

Figure Three provides a visual representation of the instructional interactions among Reel Works staff and participants.

![Figure 3. Instructor roles at Reel Works.](image)

Street Level

*Street Level Youth Media* has worked with Chicago’s youth since 1993 in media arts and emerging technologies to promote self-expression, communication, and social change. We chose to study their Summer Arts Apprenticeship Program (SAAP) because it had the clearest production cycle and the most ambitious outcomes – a piece of digital art that would be shared in a multi-week, public gallery show. Street Level employed a full time program director who was responsible (along with the facilitators) for much of the curriculum design and program administration. Her interac-
tion with youth, however, was limited; she met with youth only three times throughout the eight-week process, interacting with them primarily as a program evaluator.

By contrast, the two facilitators met with the 14 participating youth daily to provide formal lessons and keep youth on track through journal assignments such as a timeline and a shot or image list. The mentors, professional artists who were being paid to work one-on-one with youth in their area of digital art expertise (video, sound, or graphic design), met with youth twice a week to work specifically on their pieces of art. While they were not responsible for general technology lessons (such as how to use Photoshop), mentors often provided just-in-time instruction to a larger group when there seemed to be a general need. In this way, mentors, facilitators, the program director, and more senior youth participants shared various aspects of instruction throughout the process.

In fact, though tasks were defined based on assigned roles, many of the people who occupied these roles had occupied other roles in earlier programs. The two facilitators had been mentors previously, and often lamented their limited ability to work with youth participants on their artwork now that they themselves had become facilitators. One facilitator explained: “There is a different level of relation that you have with them. Whereas the mentors can get in there on a real intimate level on a one to one level and offer a suggestion and just the fact that it is a different setting you can have a whole different response.”

In this way, what was expected of the “instructors” was constrained by their role definition, rather than by their individual expertise. This was done purposefully here (and in the other organizations) based on their beliefs that split roles contributed to the power of the program by offering both the structure of a traditional classroom and an apprenticeship experience in which youth were given the opportunity to interact with professionals. One instructor noted: “We definitely wanted [the participants] to see us as kind of different than the mentors.” We will discuss Street Level in more detail in the next section. Figure Four provides a visual representation of instructional interactions among Street Level staff and participants.
Figure 4. Instructor roles at Street Level.

What Does Arts-Based Instructional Design Reveal About Their Conceptual Model of Teaching?

In order to shift from description to analysis, we focus in on Street Level to explore the relationship between the instructional design as intended and their underlying conceptual model of teaching. As described in the instructional models above, when we first examined discrete instances of instruction, the models appeared to be disparate and disconnected. Individual instructional interactions between a facilitator and students were simply not sufficient as a unit of analysis for instruction in this context. However, as we began to look across instances at the learning context, it became apparent that learning was stretched across the environment as a whole, distributed across multiple instructors, roles, locations, technological tools and points in time.

The Collective as Key Unit of Analysis

The unit of instruction was often one youth artist working with multiple instructors and tools over a period of time. The field note excerpt in Text Box 1 highlights the distributed nature of instruction in the production context. As a youth participant edits raw media footage, three different instructors encountered that media and offered insight into the work. Mentor 1 offered B the technical expertise necessary to complete the initial task of transferring footage into Final Cut Pro. Mentor 2 reminded B to consider
the audience for the piece as she began the editing process. Mentor 3 identified additional skills B might use for editing and provides encouragement. In this case, the types of interaction offer different degrees of engagement with technology and learning and again mirror the structures of successful studio arts classrooms (Hetland et al., 2013). For example, Mentor 2 plays a framing role, helping B consider the purpose of the work, but she does not provide technical support. Mentors 1 and 3 both contribute to B’s technical skills, but they do so in distinct ways. The sum of these interactions provided the support necessary for B to engage meaningfully in the editing process. In this case, instruction (and learning) occurred in interactions with multiple instructors playing multiple roles.

Mentor 1 is still helping B with the capture...B is downloading some found footage, and about ready to start editing. Now that B has the technical element figured out, Mentor 1 extracts himself, saying, “So I’ll let you just start, and you let me know if you need anything.” She calls him back over immediately and asks about a red line that appeared above her editing in final cut pro. He explains that this is about rendering. He walks away again, and she continues editing.

About ten minutes later, Mentor 2 comes over and listens to some of the interview. She asks B if B has an idea of where she is going with it. She asks B if she has this in mind for the final project. B says, “yes”, and Mentor 2 says she’s glad to hear that. She praises the interview. B is making an editing choice, and chooses the transition from her grandfather to her grandmother as her comment, “I married an older man”. B is happy with this transition and continues clipping audio.

A few minutes pass with B editing, then Mentor 3 interrupts, “Can I just show you this?” and she shows B how to zoom in using final cut. Mentor 3 sits down with B, who asks her, “Can I crop it here?” and Mentor 3 shows her how to do it. Mentor 3 asks B what she is planning on doing with it. Again, B repeats her plans to use it as a final project. Mentor 3 asks if she can hear what she has so far. She listens to the editing. After she listens, she says, “Great, you’ve got to leave, ‘I married an older man’, that is such a good transition.” B thanks her. Mentor 3 shows her how to use the audio balancing tool to even out the audio. She demonstrates it, then she says, “I’ll take it out and let you decide.” B thanks her, and says, “yeah, I think I’ll do that later.” Mentor 3 says, “OK, cool, sounds like a good idea.” (Fieldnote, 7.10)
The design of instruction was also a negotiated process through conversation and in context. Multiple instructors and participants worked together to identify the appropriate elements of teaching, with learning occurring across these multiple interactions:

Mentor 1: “What do you guys want to learn?”
Youth 1: “I just want to make a piece that’s really good.”
Youth 2: “I feel like testing myself, being out of my comfort zone which might help me learn more about myself. But I don’t have anything specific I need to learn”
Mentor 2: “One place to start might be on backing stuff up and making DVDs.”
Mentor 1: “What about camera exposure, shots, and angles? Do you guys feel like you know a lot about that?”
Youth shake their heads no and Mentors seem to agree silently to that idea.
Mentor 3: “Do you have any equipment?”
Youth 2: “I have a videocamera, but I wouldn’t want to bring it because it sucks.”
Mentor 2: “Sometimes, crappy cameras are really good. Do you know a lot about microphones?”
Youth 1 & 2 shake their heads no.

In this case, the instructors engaged with youth about their prior technical knowledge, as they made decisions about what technical skills to present and the equipment they would need to teach these topics. The youth gave general responses about their goals in the program, and the instructors brainstormed ideas for topics with one another. At the end of the excerpt, Mentor 2 reminded the group that the priority was the work, rather than the equipment, noting that sometimes, the quality of the cameras is not the most important thing. As evident above, decisions about content (and pedagogy) were negotiated in dialogue among instructors.

The Role of Multiple Spaces

We also found evidence of instruction stretched across multiple classroom settings. In our case study, different learning spaces, including physical classrooms, virtual learning environments, and the city of Chicago worked in tandem to support learning and creativity in the media arts. Collectively, multiple workspaces afforded youth the opportunity to use particu-
lar technological tools for varying purposes. There was a traditional classroom equipped with technologies that allowed sharing of video and audio presentations; youth also had access to a computer lab, which contained the interactive tools necessary for production and where technical expertise was shared. At several points during their program, youth journeyed out into the city to generate footage, as well as to seek ‘found’ sound and footage for their productions. Facilitators also created a self-contained social network site for youth to store and share their work, to provide feedback and suggestions to their peers, and to elicit additional feedback from mentors and instructors. Each of these spaces functioned in tandem with the others to create a distributed learning environment that supported distinct aspects of the production process using different technological tools.

The interaction among these learning environments served to integrate different elements of the production process. The skillful navigation across these different contexts constituted an important element of instruction. Presentations by mentors and artists often highlighted the importance of artmaking and learning as stretched across physical and digital spaces. During one such presentation the instructor used the classroom environment to display his work. In the context of presenting his art, he explained the technical skill involved and highlighted the ways in which he draws on the external environment (including the internet) to make art. In so doing, he bridged spaces and explained how youth could do the same as part of their production processes. Identifying the role of various spaces in the learning and production process can be seen as an integral aspect of instruction in this context.

**Technology as Embedded in a Process**

Instructors often helped young people to recognize when to (and when not to) use particular technologies. As instructors led youth through the production cycle, each stage of the process required different technical skills and required that instructors understand how to integrate learning from one stage to the next. From planning to production to presentation, the instructors and the learning context reinforced and integrated the technical skills across stages in the process. For example, initial stages of the process took the form of a writer’s workshop, laying the groundwork for production. The instructor engaged participants in traditional writing instruction including free writing and memory recall exercises as a method for generating material for the next stage of the process. Although there was no technical element
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To this work, the instructor’s knowledge of the production process allowed her to frame the writing task in terms of production. She clearly identified the role the writing played in the process, reminded youth about the role of audience, and grounded the purpose of the task in the production cycle. At the same time that technology played no role in this stage of the process, the instructor grounded the experience in the technical aspects of production relevant for future stages.

Similarly, the presentation of a film in the classroom context at one stage laid the foundation for youth editing at a later stage. The instructor applied technical knowledge to film critique as she framed the process in terms of production in this interaction:

Facilitator: “What about the b-roll?” What did you notice about that?
Youth 1: “She just did it to represent her”
Facilitator: What about “the voiceover? Is that her?”
Youth 2: “No, it’s a little girl”.
Youth 3: “Sometimes the voiceover is connected to images, sometimes not.”
Facilitator: “She’s using a strategy that you can use.”

This excerpt provides an example of how instructors framed different moments in the learning process in terms of digital media production. As youth discussed elements of the film they viewed, the instructor emphasized particular elements of film (such as b-roll), then reminded youth that they, too, could leverage these elements in their own work. In both cases, youth were at points in the process when they were not themselves engaged in production activities. Even still, the instructor grounded their learning in production, highlighting particular technical aspects relevant to their work. Hetland et al. (2013) call this, “teaching through artworks” and this instructional approach figures prominently in their studies of studio art classrooms. The instructors in our study displayed an understanding of how to integrate the technical into all stages of the process. As such, knowledge about the artistic production process figured prominently in this setting.

CREATIVITY IN ARTS-BASED INSTRUCTIONAL SETTINGS

Studying how young people learn to engage in creative production in out-of-school settings provides new insights into the teaching of arts-based practices and provides lessons for more formal instruction around creativity,
the arts, and technology. While our instructional models closely resemble the *Studio Thinking* vision of arts-based instruction (Hetland et al., 2013) our findings point to instruction as stretched across the program design, the roles and tools as they were employed in the organizations’ instructional models, and the enacted practice, across people, space, and time as the roles and tools (Spillane, Parise, & Sherer, 2011). While the popular rhetorical shift from “sage on the stage” to “guide on the side” embraces a more distributed, student-centered model of learning, the frame still maintains the teacher as the sole adult expert in the space (Bielaczyk & Collins, 1999). A theoretical focus on the self-contained expertise of the classroom teacher remains despite the growing popularity of co-teaching models that afford more than one adult in a classroom, especially in specialties such as Visual Arts. All of the case study organizations decoupled instruction, splitting knowledge domains into organizational and content-area expertise, where technological expertise was leveraged, when relevant, in both of these roles. In interviews, instructors voiced the belief that multiple roles contributed to the power of the program by offering both the structure of a traditional classroom and an apprenticeship experience in which youth were given the opportunity to interact with professionals. Their beliefs and resulting instructional design are consistent with a distributed expertise model for the design of learning environments (Brown et al., 1997; Pea, 1997) grounded, in large part, on learning through cognitive apprenticeship (Collins, Brown, & Newman, 1989). In using apprenticeships as models for teaching and learning, teaching becomes a distributed act, determined by what the community is trying to accomplish, rather than an a priori set of goals that frame the teacher as always expert and the learners as always novices.

Directors and facilitators often emphasized the structural, pedagogical aspects of their role. They identified several ways in which they served as managers of behavior, schedules, and tasks. While they also discussed the pedagogy they employed, they viewed their role as primarily one of enforcement, regulation, and structuring learning. Unlike the facilitator role, the mentor/trainer/filmmaker role was designed to engage youth in a collegial relationship by offering technical expertise and building relationships about art-making. By placing professional media artists in these roles, the organizations hoped to create a genuine apprenticeship experience with students working closely with an expert in the field. In practice the delineation of roles did not result in the complete delineation of tasks; rather there were many occasions of overlap and instructional redundancies. In the following sections we elaborate a theory of distributed instruction as means of describing design principles for creative arts-based learning environments.
Distributed Cognition as a Framework for Understanding Instruction

Distributed cognition offers a theory of knowledge as “stretched across” individuals and contexts, and developed through a range of social activity and collaborative processes (Hutchins, 1995; Salomon, 1997). The distributed nature of knowledge means we must attend to interactions among participants and the tools that they use, as we investigate what those interactions reveal about the complex development of knowledge in a distributed learning process. Distributed cognition shifts the “locus of knowledge” from inside the individual to within and among actor-tool-activity networks (Salomon, 1997). A theory of cognition as fundamentally distributed emerged in large part because of our increasing reliance on computing tools to offload human intellectual tasks (Halverson & Clifford, 2006; Salomon, 1997). As a result it may be especially relevant to take a distributed cognition perspective in instructional spaces that value computing technologies as a core part of their learning process. We saw this in our analyses as well. While we initially coded instructional moments by identifying interactions among mentors and participants, it became clear that instruction was also stretched across technologies and may or may not include interactions among people.

Research that employs distributed cognition as a frame for understanding classroom learning describes classroom spaces as communities of learners (Brown et al., 1997; Brown & Campione, 1996) and knowledge as distributed among students, teachers, and the tools with which they interact (Salomon, 1997). Brown and her colleagues describe communities of learners as models of distributed expertise where knowledge is co-constructed among the teacher, the students, and the tools that they use including the curriculum, technology, and assessments. Furthermore, they describe learning as embedded in mutual appropriation and negotiation, and knowledge as situated in interactions among people and tools. This model is a useful way to understand the design of learning communities that take seriously the distributed nature of expertise. Despite an understanding of knowledge and learning as stretched across, the teacher is still seen as the singular adult expert in the room, “first among equals, for she has a clear instructional goal” (Brown et al., 1997, p. 205). As a result, most studies of distributed cognition in the classroom continue to promote the notion of teacher knowledge as contained within an individual (Deng, 2007). Our findings indicate that we can also begin to jettison the notion of the teacher as the single focal point for instruction. This is especially relevant for creative arts endeavors, which are fundamentally distributed and therefore sit comfortably within a
pedagogical model that embraces expertise as stretched across individuals, tools, and time.

**Challenges of Embracing Distributed Instruction for Creativity in Classrooms**

While our findings push on the construct of distributed instruction, we also saw multiple drawbacks to this reframing. The primary challenge of embracing a distributed instructional approach seems to be the inefficiencies of multiple roles. In our study, *Street Level* was the most extreme example with 11 adults for 13 youth participants. We often noted a “too many cooks in the kitchen,” phenomenon, where youth received conflicting feedback from multiple adults. As may be seen in the examples we presented, this often led to instructional redundancies as the split between roles was not as distinct as intended by design. Directors and facilitators were themselves professional artists and therefore at times functioned in the mentor role. Additionally, the mentors engaged in forms of instruction intended for the facilitators. These inefficiencies have implications for the use of this distributed model for the design of learning environments. Specifically, harnessing the trade-off between distributed instruction and instructional inefficiency seems especially important given recent calls to better leverage the positive effects of digitally-mediated informal learning spaces for formal schooling (Bull et al., 2008).

The second challenge we see is a required shift in the process of designing instruction, particularly around the use of technologies. In formal learning environments, especially in the current age of standardization, the design flow for teachers almost always begins with content and moves to technology (e.g. I have to teach concept X, what tool or representation is most useful for that purpose?). Much of the scholarship on technology in classrooms points out that technology and content are separate and ought to be more integrated. The organizations described here offer an important counterpoint; in these informal learning environments, young people are producing digital media and therefore both the content and the technologies used are up for grabs. Whereas teachers in traditional classrooms may be hesitant to make changes to their technological system when they already have methods that work for them, instructors within these organizations must rely on a just-in-time delivery model for technology use in order to accommodate students’ production needs (Gee, 2007; Halverson, 2012). As such, they offer an important site for understanding instruction in an integrated context where technology and content go hand-in-hand.
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Third, traditional notions of classroom authority may conflict directly with distributed instruction. We observed many instance of rules and conventions as open to negotiation, not just between “learners” and “instructors” but among instructors as well. What was to be produced, in what ways, and what constituted quality was all openly discussed, critiqued, and revised. The negotiations empowered participants and instructors alike, and resulted in a highly diverse set of final pieces and made it possible for YMAOs to engage in the kind of creative processes we outlined at the beginning. Challenging for formal environments, however, is the companion result that not everyone produces the same type of product at the same time. Such diversity in outcomes may be good for creativity but is potentially problematic for assessment and equity imperatives at play in formal school contexts.

DESIGN PRINCIPLES FOR CREATIVITY IN THE CLASSROOM

Our work with YMAOs demonstrates that informal, arts-based learning settings exhibit “distributed” characteristics, where instruction tends to be stretched across people, tools, and resources. Yet, it is also clear in these cases that distribution tends to be an implicit outcome of instructional activity rather than an explicit theoretical framework guiding the instructional design. While this distinction may be of little concern to practitioners within out-of-school and informal contexts, it presents a problem for the development of 1) more formal learning environments where artmaking and creativity are goals but where designs for learning become assessed, sustained, replicated, and scaled and 2) educational research that shifts attention away from individual teacher expertise. If educators, designers, and researchers are to understand and effectively harness new technologies and instructional strategies for learning creativity in the 21st Century we require a theoretically-grounded instructional design that accounts for the distributed nature of teaching and learning.

To meet this need, we propose design principles that may operationalize a theory of distributed instruction as stretched across a sociotechnical system for creative art-making. Design principles for distributed instruction require that the role of instructor is fundamentally different. Because instructors are, quite literally, part of the learning community, they must express an open attitude toward learning: they may well have to learn new technologies and techniques alongside students. Likewise, instructors must be ready to recognize the inefficiencies of their design, learn from these
design flaws, and revise accordingly. When instructors learn from their stu-
dents and from their activity, learners themselves begin to view their par-
ticipation as legitimate. Neither “sage on the stage” nor “guide on the side”
is appropriate; rather the metaphor for the instructor might be more akin to
a conductor or a curator, orchestrating the classroom environment and in-
teractions among members. Giving just-in-time lectures on specific top-
ics, structuring critique sessions, curating resources, and designing rubrics
for feedback are some of the ways that learners can feel confident that the
instructor is both a central community participant and “in charge”. We ac-
knowledge the difficulty of designing these types of informal instructional
relationships, especially when learners are allowed to follow individual in-
terests (rather than being assigned to work in teams). The four design prin-
ciples outlined below can begin to elaborate how our emergent theory might
be realized through formalized instructional practices.

**Mentorship as Instruction**

Distributed instruction implies that instructional relationships perme-
ate the learning system. We can design for the diversity of relationships by
enrolling more advanced learners to mentor peers on targeted tasks (Brown
et al., 1997). Peer instructors, because they are engaged in similar produc-
tion activities, are often able to situate design problems and solutions within
the appropriate conceptual frame (Collins et al., 1989). Moreover, peer
mentors demonstrate the process of learning to solve design problems; they,
like teacher-mentors, become models for “learning how to learn” (Brown et
al. 1997; Brown & Campione, 1996). Instruction then starts to look much
more like mentorship that expands upon “top-down” teacher models to in-
clude “more equitable, constructionist and learner roles” (Kafai, Peppler, &
Champan, 2009, p. 90). In line with a distributed position, this vantage sig-
nificantly blurs the boundary between teacher and learner.

Mentors not only provide explicit scaffolding and goals for students
when appropriate, they also collaborate with, and learn from, students. This
type of mentorship requires both a practical and attitudinal shift. At face val-
ue, mentors partake in the same learning practices -- they create artifacts,
share what they have made, and contribute to critique sessions -- but do so
in a way that makes explicit the learning process and requisite expertise. For
example, a mentor could articulate a solution to a pervasive problem, ex-
plain the strategy used to realize it, and hear alternative solutions from stu-
dents who may have solved the same problem in a different way. The pres-
ence of mentors affords the kind of collaborative emergence Sawyer and deZutter (2009) documented in their studies of expert artists that marked creative expression. Collaborative emergence is made possible by undoing the teacher-as-singular-expert model of schooling.

**Asynchronous Learning**

Extending the notion of distribution to instruction causes designers, researchers, and instructors to forgo the expectation that all learners learn the same things, at the same time, and from the “top-down.” Learners must be allowed to follow customized learning trajectories, master new technologies, take on different roles, and develop new identities and ways-of-knowing. We call this type of learning activity “asynchronous learning.” As asynchronous learning plays out, it becomes entirely reasonable for learners to surpass the official instructor in certain areas of expertise. A distributed instructional design should leverage diverse interests as learning opportunities by eliciting instructional dialogue from these “learner experts.” Furthermore, asynchronous learning affords critique processes; creativity necessarily involves exchanging ideas about emerging artworks with other members of the community (Hetland et al., 2013). This is made possible only when learning is stretched across time and place.

**Collaborative and Extended Networks**

Whereas the notion of collaboration typically implies a working relationship between people, a distributed view expands possible collaborators to include tools, resources, and environments. We call these complex relationships “collaborative networks.” The instructional design should facilitate the formation of these cross-functional networks so that learners have opportunities to organize workloads in ways that effectively leverage people, tools, and resources. To ensure that collaborative networks take shape, designers must offer learners technical training, provide them with useful resources, and scaffold the assembly of cross-functional teams. There are times when no one in the room knows the answer to a question. The learning environment should extend to technological resources including open sources materials such as YouTube or Khan Academy, as well as more specific communities such as Google groups and listservs that focus on solving problems of practice. Likewise, designers should favor flexible over fixed
environments “Moddable” workspaces, circulating exhibits of student work, changing class locations based upon planned activity – all of these strategies help realize distributed instruction.

**Distributed Assessment**

A distributed view pushes designers and instructors to reconsider both what is assessed and by whom. First, this means embedding assessment in all learning activities in order to evaluate both process and product (Gee, 2007; Halverson, 2012). The sum of this data can be used to trace the trajectories of individual learners in relation to the environment of their learning (Moss, 2008). Second, a distributed assessment should afford learners the opportunity to provide feedback on the contributions of their collaborators using confidential evaluations, as well as more public critique sessions. This is especially important when learners work in collaborative networks, as their evaluations can provide insightful feedback about the instructional design. Instructors may also factor these evaluations into the assessment of learner participation. Doing so has the potential to cause learners to view mentoring and collaborating as part of legitimate learning activity rather than as an unfair aid to more peripheral community members. A distributed perspective also widens the focus of assessment: when instructors are also learners, the instructional design itself must be open to evaluation because designs always have a role in successful learning outcomes (Moss, 2008). Finally, authentic audiences should play a role in assessment. A key component of YMAO instruction is working toward bringing participant work to a public, much like in studio art classrooms. While placing student work “in harm’s way” and using the results for assessment may disrupt the “safety of the classroom,” presenting work to authentic audiences allows instructors to become allies rather than people for whom the work is done.

Through these design principles – mentorship as instruction, asynchronous learning, collaborative and extended networks, and distributed assessment – we hope to open up a conversation about design for creative production. It is clear to us through our empirical work with YMAOs and our theoretical understanding of knowing, learning, and creativity as fundamentally distributed that we need a new theory of teaching that aligns with the way young people become successful producers of creative work.
References


