New Literacies and Teacher Learning

Contents

CHAPTER ELEVEN

Connected Learning Professional Development: Production-Centered AND Openly Networked Teaching Communities

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INTRODUCTION

Committed to helping youth develop powerful ways of seeing and acting in the world, learning scientists and educators came together in 2010–2013 to imagine how to support production-centered ways of engaging in systems thinking. Conceived as a collaborative design research project between Indiana University, DePaul University, the Institute of Play in New York City, and the U.S.'s National Writing Project (NWP), the idea was to learn from curriculum designed for the Quest to Learn (Q2L) School in New York City that used systems and gaming pedagogy as a way for schools to be organized around core "Connected Learning" principles (Ito, et al., 2012). Connected Learning, a new approach to education that directly engages the interests, social capital, and future opportunities of students, served as a compelling framework for harnessing the innovations of the digital age to best support production-centered, interest-driven learning. Organized around a set of learning principles that outline how learning opportunities can be academically oriented, interest powered and peer supported, Connected Learning also includes design principles for linking learning across school, home and community. Our goals were to adapt these Connected Learning designs for schools, classrooms, and afterschool programs where there was an interest in these same

topics but not necessarily the same whole-institutional support infrastructure as that underpinning the Quest to Learn school.

One result of this work has been the creation of a set of curricular materials called *Interconnections*, which is a series of four scalable modular toolkits that promote engagement in design and systems thinking in young people by means of designing with new media (e.g., Peppler, Salen-Tekinbas, Gresalfi and Santo 2014). This work was meant to support youth in becoming the designers of systems using new tools and digital media in interest-driven ways. (We elaborate on what we mean by "design" later in this chapter.) What we discovered in the process of co-creating this curriculum, however, had far greater implications, owing to the power of Connected Learning principles, to shine new light on our understanding of how to shape effective professional development experiences.

Our discoveries first came when we began offering professional development for teachers who would pilot the *Interconnections* curriculum. Using an approach called Design-Based Research (Brown 1992) that positions both researchers and practitioners as active learners, we tested and tinkered with the *Interconnections* modules alongside a number of expert teachers across the United States affiliated with the National Writing Project (NWP), the largest teacher professional development network in the country taught by and for teachers. In one of the workshop "camps," which took place over the course of four weeks in the summer of 2011, National Writing Project teachers piloted the modules with more than 100 youth from Chicago. In the two weeks before the camps began, National Writing Project teachers received training from the research team on the tools (e.g., e-textiles, game design, coding software) as well as the concepts (e.g., design, systems thinking, circuitry, crafting) in this new curriculum that were also new to most of them. As the teachers engaged in the same production-based activities that they soon would be asking youth to do, they reported making a number of realizations that directly informed their feedback on the curriculum in the form of insights and mods. One of the educators, Laura Lee Stroud, was a secondary teacher, an English language arts instructional coach in the Round Rock Independent School District, and a member of the Central Texas Writing Project. Even while facilitating one of the production-centered modules with students, Stroud saw herself as a learner:

> As the youth entered the camps, for the most part not one teacher assumed the comfortable position of "expert" with our novice youths learning under us. Instead, we were positioned as learners alongside our campers. In some cases, our campers knew more about the content than did we, the teachers. We had to remember our new value of supporter, encourager, observer, and researcher… When we teachers had group time to reflect on our experience, we found that we all struggled in one way or another, and as a result, we had a newfound level of respect for our youths' learning processes and struggles, as well as a wonderful glimpse into our own learning process. (Peppler, Salen Tekinbaş, Gresalfi and Santo 2014: xix–xx)

Comments by teachers like Laura help remind us that improving the way we teach is often dependent on deeply engaging with what it means to be a learner again. The act of co-design—not only teachers creating the same projects as their youth, but also educators and researchers working collaboratively to create a supportive ecosystem of connected professional practices—is what we describe as a Connected Learning approach to professional development. This chapter outlines our approach, emphasizing production-centered design and openly networked teaching communities. This work connects Make-to-Learn practices (Peppler, Resnick, Eidman-Aadahl and Ito, in preparation) and constructionist theory (Kafai 2006; Papert 1980) with what National Writing Project educators know about writing to learn and writing-as-making (Lieberman and Wood 2001; Shipka 2011; Smith, West-Puckett, Cantrill and Zamora, under review; Whitney 2008) alongside peer-supported professional development and networked community building (Lieberman and Wood 2003; McDonald, Buchanan and Sterling 2004).

Expanding young people's access to learning opportunities in the home, community and social spheres, Connected Learning occurs when a young person's passions and interests (a) are cultivated and supported by their peers and adult mentors; and (b) translate into academic achievement, career opportunities and civic involvement. This chapter highlights the design opportunities of Connected Learning and calls forward the need to continue to create supportive ecosystems that move us, as educators, from spaces of externally designed professional development into spaces where we practice our profession as co-designers and colleagues.

TEACHING AND DESIGNING IN THE CONNECTED LEARNING CLASSROOM

Today, teachers often are positioned as passive recipients of policy and curriculum efforts to standardize education. We have found that in contrast, the principles of Connected Learning can provide both language and a needed spotlight on the agency that teachers have in the classroom as designers. On a daily basis, teachers make and design the classroom learning experience, deciding on everything from the placement of the desks to the moment-to-moment shaping of classroom dialogue—all the intangibles that we know are actually consequential to learning. Moreover, we're coming to recognize that the more teachers fluidly connect students to the outside world, the more relevant and impactful they make the learning experience. This, by its nature, is not easily scalable, nor should we strive for it to be. Teachers need to broker and connect the everyday experiences of their students to the curriculum, often within contexts of high-stakes testing and lock-stepped curriculum, requiring an intense amount of knowledge and improvisation.

In *Teaching in the Connected Learning Classroom*, Colorado State University Writing Project leader Antero Garcia argues that Connected Learning provides a vocabulary from which teachers can argue for what is best for the students in their classrooms and communities (Garcia, et al. 2014).

> I believe connected learning principles can provide a vocabulary for teachers to reclaim agency over what and how we best meet the individual needs of students in our classrooms. With learners as the focus, teachers can rely on connected learning as a way to pull back the curtain on how learning happens in schools and agitate the possibilities of classrooms today. (p. 7)

Bringing together many examples of practice where teachers are exploring ways to balance various mandates with students' passions and interests as well as learning goals, Garcia co-curates this collection not as a set of "best practices" but instead as a set of vignettes with related commentary meant to spur dialogue and inspire context-specific pathways among educators. "Context drives practice," he writes, and the language of connected learning is encouraged as a way to make meaning within those contexts while also facilitating the sharing of practice and expanding or developing practice across contexts as we go.

We know from Connected Learning research that forging learning opportunities between academic pursuits, youth's digital interests, and peer culture is not only possible but also positions youth to adapt and thrive under the ever-shifting demands of the 21st century. Students regularly seek coherence across the boundaries of school, out-of-school, and today's workplace (Peppler 2014). We find, too, that teachers regularly seek a similar coherence and that Connected Learning can provide some meaningful ways to design learning to that end. In order to access and effectively use these design principles, teachers themselves also need to challenge their ordinary practices, bringing their private acts of teaching into public performances within supportive communities (McDonald, Buchanan and Sterling 2004).

"MAKING" PROFESSIONAL DEVELOPMENT: THE NATIONAL WRITING PROJECT

Connected Learning in many ways reflects core beliefs and social practices held by National Writing Project educators and their local writing projects (Ito, et al., 2012; Lieberman and Wood 2002) with an emphasis on making and designing as integral to their founding vision for professional development. The National Writing Project began in 1974 when educators came together—across grades and disciplines from Kindergarten through to university—to dig into their passion for supporting literacy learning for youth with a particular focus on writing and

teaching writing. This self-organized peer-supported group of writing project teachers emphasized youth as producers, not just consumers and, because of this, invested in themselves as "makers" and started their own kind of maker movement. Thus, within these writing projects, a core theory of action is that if you are going to teach writing, you also need to write, or make, as well (Lieberman and Wood 2002; Whitney 2008). This is both a means of exploring a discipline and a key way in which National Writing Project educators turn their practice into shared public performances that foster community building and learning (McDonald, Buchanan and Sterling 2004).

McDonald, Buchanan and Sterling frame this as a situation of mutual risk taking which, when supported in a shared community of mutual benefit, allows for further risk taking and change:

> In facing the first two risks, writing and sharing, teachers experience the relief and exhilaration that comes from discovering that they too are writers and that writing is difficult for everyone—though no harder for themselves. In the process, they become open to the equally risky step of sharing their teaching of writing and of opening themselves up to both collegial critique and collegial learning. (p. 11)

Learning through writing and/or making, situated in social contexts, is a production-centered way of working that has been continually fostered as the network has grown, connecting nearly 200 writing projects' sites, colleges, and universities, as well as partners and educators outside the project, through work such as the National Writing Project-powered Educator Innovator Initiative. As a research and professional development network, the National Writing Project serves educators across the curriculum while continuing to encourage educators to make, share, and risk take across more traditional boundaries in education and learning. This means bringing together educators who work both in and out of schools, as well as constantly blurring and reimagining the lines between theory and practice, teacher and learner, researcher and designer. The National Writing Project catchphrase, "teachers teaching teachers," for example, underscores a set of shared social and participatory practices of learning from and alongside peers and colleagues that then extends into classrooms and teaching spaces where writing project teachers continue to learn from and alongside the youth with whom they work (Lieberman and Wood 2003).

Learning alongside one another is also fueled by the process of inquiry, or "inquiry as stance" in teaching (Lytle and Cochran-Smith 2009; Lieberman and Wood 2003). Inquiry becomes a means by which writing project educators constantly reflect on, share, and develop practice (Córdova, Kumpulainen and Hudson 2012). These inquiry-driven practices are connected to ongoing making and producing that writing project teachers do, which in turn has profound implications on what it means to teach writing as well as on notions of professional learning. Elyse Eidman-Aadahl, executive director of the National Writing Project, notes, "the very

notion of what it means to write today is being influenced by the kinds of composing possibilities that are available to youth" (Bradley, Douillard, Eidman-Aadahl, Oh and Paraiso 2014). Therefore an iterative, inquiry-driven approach supports National Writing Project educators in keeping abreast of the possibilities of these changes by continually tapping into the knowledge and experience of youth as well as networked colleagues.

Elyse also describes National Writing Project professional development as an opportunity for play and experimentation: "It might seem counterintuitive," she says, "for busy people like teachers to slow down, play, and experiment, but the insights we learn when we do are what help us teach for depth of understanding" (DeVoss, Eidman-Aadahl and Hicks 2010: 119). This way of approaching the design of professional learning opportunities within writing projects supports that continual sharing of inquiry through making and has been key to maintaining a "healthy technological ecology" for writing as it has become increasingly digital over time (DeVoss, Eidman-Aadahl and Hicks 2010). The framework of Connected Learning then provides the shared purpose and language from which to learn and design this kind of context-specific, inquiry-driven, and production-centered classroom experience across learning environments and among extended groups and networks of educators.

THE IMPORTANCE OF PRODUCTION-CENTERED DESIGN

Design—whether it be writing a story, designing an app, sewing a T-shirt, or building a robot—is an essential activity for learning because it positions the learner as an active agent in the creation process. As learners construct an artifact, they externalize their mental models and iterate on them throughout the design process (Kafai 2006; Papert 1980), revisiting prior understandings and refining them in a self-directed way. In contrast to prescriptive design tasks, where everyone constructs the same artifact in parallel or arrives at an idealized solution, production-centered design strikes a balance between structure and free exploration (Colella, Klopfer and Resnick 2001). For example, in working on a set of materials, one might encourage reflection upon the range of options available because of those materials as well as the constraints and parameters the materials cause within a design-task without determining what exactly is to be designed; in the same way, building a sharing process in a design cycle could support cross-design inspiration and connection among designers, further encouraging iteration and development. Such reflexivity is not only emblematic of youths' engagement with production-centered design, but it is also a trademark of the work classroom teachers undergo when designing classroom experiences.

In our work, we draw closely on Resnick's (2007) design spiral that describes the creative process of design as an idea that is realized by iteratively imagining,

creating, playing, sharing, and reflecting on the work. One can see how the act of *imagining* is central to the activities of both student and teacher, involving the open exploration of materials to ignite creativity and take work in personally meaningful directions. The next step in Resnick's design spiral, *creating,* describes the act of designing and constructing, which not only provides opportunities to develop and enrich creative thinking but also presents designers with the chance to experience disciplinary content through hands-on reconstruction of their prior knowledge. *Play* is where playful experimentation with ideas is done in a low-risk environment to explore the boundaries of the materials. The *sharing* of work is also critical to learning and motivation, for this is where many designers find new inspiration through the feedback they receive from an audience. Resnick also argues for systematic *reflection* on both the design and learning process—the discussions and meta-reflection that are so central to the classroom experience. Finally, Resnick describes this pathway through the design process as a spiral that is then iteratively repeated.

The realities of teaching allowed us to surface two additional steps in this design cycle which we found to be important to openly networked teaching and learning: *researching* and *publishing*. *Research* encapsulates the inquiry and related information-gathering that is critical to high-quality teaching and learning: the introduction of vocabulary and key concepts and the activities used to gather this information (including the use of videos, diagrams, and other information sources) based on the needs and questions that arise within a particular context. We also disentangle the sharing of the final product, a step that we call *publish* (i.e., posting to social media, podcasting, etc.), from more informal moments where sharing is done within the local community to assist in iteration. Current research has demonstrated that this is an important moment for learning and community building and that there are some crucial differences in who is likely to post in the informal, interest-driven hours (Lenhart and Madden 2007).

In sum, when people design, they envision new solutions to open-ended problems, work through multiple versions of any idea, integrate ongoing feedback into the learning process, and identify the strengths and weaknesses of both their processes and solutions. In this regard, it's easy to see how designing is not only a powerful activity for youth to shape their learning but also a mindset for teachers to work from when reflecting on our own teaching practice.

INTERCONNECTIONS: NEW CURRICULAR TOOLKITS AND ASSESSMENTS

An increasing number of kids in the 21st century have new opportunities for learning as a result of the ever-developing technological landscape, one that

continues to change the way students read and write. Youths' stories and modes of expression now tend to be filled with media-rich, interactive, and multimodal texts that integrate our digital and physical realities. Linking design to digital media tools expands the potential of production-centered learning even further: digital tools often make it easier, faster, and less risky to test ideas. There is no need to worry about wasting expensive materials, and erasing a mistake is as easy as clicking a mouse. There are a host of compelling tools that support their design efforts in the out-of-school hours—Scratch, Gamestar Mechanic, and Arduino Robotics, to name a few—yet the challenge for today's educators is finding a fluid and robust way to integrate these tools in the classroom when we lack curriculum to support these tools. Oftentimes there is a misconception that a new tool can be easily picked up and integrated into the classroom environment; this is simply not true. A guiding theoretical approach, pedagogical goals, guiding questions, and related means of assessment are necessary when introducing a new tool into the school day. In addition, standards alignment and related curricular connections are often also necessary, making the introduction of any new tools and technologies require a complex set of decision making.

The *Interconnections* series was intended to address these complexities, providing robust curricular activities that are well aligned with disciplinary and cross-cutting teaching objectives as well as standards, assessment, and other built-in professional development for production-centered learning. For example, in the process of learning how to design and program a solar-powered backpack, youth come to understand the systemic nature of energy and other targeted systems thinking, circuitry, and programming concepts. To facilitate this learning, the curriculum includes embodied role-play activities, opportunities to test how solar energy accumulates in different light sources and circuit configurations, and explorations of how to strategically design backpacks with circuitry and power in mind. Youth reflect on their process in various stages of learning before ultimately publicly posting their designs. Teachers are supported in this process with custom assessment techniques, tips, and suggestions for preparing the activities, descriptions of the Common Core and Next Generation Science Standards with which these activities align, an overview of materials required, and a series of handouts and related classroom resources (e.g., reference cards.) Lessons are also populated with "Voices From the Field," tips and reflections from National Writing Project teachers who have taught the activities before. *Interconnections* is a collection of four books created to introduce an innovative new way to support design thinking in young people that allows them to see how systems are at play in the digital contexts with which they regularly engage. Specifically, these modules put students in the position not only to use those systems but also to become designers of systems themselves.

Each book approaches the task in a different way. One focuses on teaching design thinking using game design, another uses digital storytelling, and two utilize "e-textiles" and other circuitry projects, which involve making physical computing projects based in fabrics, paper, and other everyday materials. The volumes incorporate design-based pedagogy with digital media and robust curricular resources for use in a variety of educational settings.

For example, one volume utilizes the Gamestar Mechanic game design platform (gamestarmechanic.com) to orient readers to the nature of games as systems, how game designers need to think in terms of complex interactions between game elements and rules, and how to pull out systems concepts in the design process. Another volume, on digital storytelling, focuses on how stories offer an important lens for seeing the world as a series of systems, and its curricular resources utilize the Scratch visual programming environment (scratch.mit.edu) as a means to tell stories about how to effect change in youths' local communities. The final two books cover the fields of e-textiles and physical computing from differing perspectives, offering readers insights into the systemic nature of electronics and circuitry. Each outlines a series of curricular challenges that result in the creation of a variety of electronic projects, one focusing on textile-based digital puppets and DIY flashlights that incorporate LEDs, while the other takes on the world of e-fashion through LED cuffs, t-shirts, and solar-powered backpacks. The Interconnections series has a relationship with electronics retailer, SparkFun (sparkfun.com/interconnections), to simplify the act of procuring the tools and materials featured in the e-textiles design challenges. Educators can purchase off-the-shelf toolkits, either for individual users or group kits for 20 learners.

In developing the volumes, we wanted to ensure that while we tied the work into insights found in the academic research, we also wanted to ground the volumes in the lived experiences of educators. The research team included a number of members that had worked as educators for many years in both formal learning contexts like public schools as well as informal ones like afterschool programs, libraries, and museums. Most importantly, though, the initiative's partnership with the National Writing Project meant that the kind of educators interested in the sort of innovative approaches we were developing were kept at the center of the project. Through this partnership, we hoped that the *Interconnections* volumes would be useful to educators in a wide variety of settings to engage youth in design activities in ways that would encourage them to become design thinkers, thereby positively transforming the world we live in today.

Each of the partners was involved in a broader movement started by the MacArthur Foundation in 2006 to investigate the ways that digital media was changing how youth learned and how these technologies might be leveraged to create new opportunities for learning that might have been previously unimaginable. To date, the Digital Media and Learning (DML) initiative has provided

over $80 million USD in grant funds to research and to developing innovations in digital learning. It has focused on youth interest-driven activity in digital spaces as a source of inspiration for creating new learning environments that incorporate the kinds of engagement and higher-order skill development found in places like massively multiplayer online (MMO) games or do-it-yourself (DIY) online creative communities like those centered around fanfiction, video blogging, and myriad other forms of making, tinkering, and designing. The Quest to Learn school, as well as the Gamestar Mechanic platform utilized in the game design module of *Interconnections*, were two examples of learning environments that came out of the Digital and Media Learning initiative, both aiming to build on youths' interests that they brought with them into school as well as focusing on the kinds of 21st-century skills they will need in order to thrive in the world.

PRODUCTION-CENTERED PROFESSIONAL DEVELOPMENT

Building on our new classroom materials (i.e., the new *Interconnections* curriculum and associated toolkits), we moved to thinking about how to make this kind of curriculum accessible to large numbers of teachers. Several professional networks, including the National Writing Project, have annual conferences targeted at sharing practices and engaging in hands-on professional development. For this project, we sought to create high-quality teacher professional development experiences to give new audiences tangible experiences with the newly designed curricular materials. Core to our approach is a belief that professional development should parallel student learning experiences, so that teacher-learners consciously experience being learners themselves, as well as see for themselves the facilitation strategies and classroom learning experiences modeled during the professional development. In other words, we strove to demonstrate the guiding theories and associated design work by engaging teachers in sample workshops from the curriculum.

Sample Interconnections Professional Development Workshops: Scratch & e-Puppetry

In one workshop, offered to around 60 practitioners at an Annual National Writing Project gathering, we put together a production-centered event where participants had to write a short story and create an e-puppet representing one of the characters. The workshop combined content from the first two Design Challenges in the Interconnections volume on e-puppetry, *Short Circuits: Crafting e-Puppets with DIY Electronics* (Peppler, Salen-Tekinbas, Gresalfi and Santo 2014). *Short Circuits* explores the field of electronics and "e-textiles," which involves making wearable (and washable) computing projects that employ microcontrollers and

conductive thread alongside fabrics and other everyday materials in order to delve into literacy, puppetry, and storytelling. The production-centered professional development was faster paced than what would be experienced in the classroom, but it offered a chance for teachers to learn the cross-disciplinary content—science content around circuits, writing content around storytelling—and modeled the pedagogical strategies and guiding theory for the participants, all within the context of a single project.

At the start of the workshop, participants were given a watch battery, LED lights, and wired alligator clips and were told to create a working circuit from these materials. Once they achieved a functioning circuit, they were tasked to add an increasing number of lights to the circuit, exploring the various configurations (i.e., series or parallel) required to make all LEDs illuminate successfully. For some without any background in electronics or circuitry, this was challenging because, while participants may have understood the components of a circuit, they didn't have a fundamental understanding of how they interacted with each other; namely the direction of the current and how this related to the polarity (positive or negative) of the watch battery and how the components of the circuit were connected together. In the next phase of the work, participants were challenged to add a switch to the circuit and to really think through how circuits work (i.e., switches open and close the circuit like a gate that allows the electricity to pass through or interrupts the current from flowing to turn off the light). This was all done with materials that allowed participants to create physical models that were snapped together before moving to the basics of sewn circuits. This free-exploration activity, intentionally lacking in direct instruction, was based on the principles of constructionist learning (Papert 1980). Here, participants were expected to learn by doing and, by confronting where any of their misconceptions lay about circuitry and energy, evolving and deepening their understanding of how circuitry operates. This allowed the participants to understand the big ideas of circuitry (Peppler and Glosson 2013) before moving into applying this understanding in a new context.

In sewn circuits, the participants at the National Writing Project Annual Meeting were asked to replace the insulated wiring and alligator clips with conductive thread, which looks and feels like traditional thread but has conductive qualities. The ultimate design goal of the workshop was to creatively use the sewable circuit materials to make an electronic puppet that had a light (or two) that would work when you turned on the switch (or made a connection that closed the circuit and turned on the light). Participants each received two pieces of felt cut out in a puppet shape, a sewable battery holder, one or more LEDs, and two small pieces of conductive material to create a DIY switch along with a host of buttons, ribbons, fabric, yarn, and other materials to use to decorate the puppet and create their character. As educators worked through their plans and settled into sewing their circuit, the room hushed and you could see the intensity of engagement (see Figure 11.1).

Figure 11.1: National Writing Project practitioners focusing on creating their e-puppets at the professional development workshop. (Photo by Kim Douillard, 2014)

An interesting aspect of multimodal making such as this is that each participant comes with a unique set of prior knowledge—we found the most simple or most challenging part of the production process was different for almost every individual. One of the participating teachers reflected "for some the sewing was the hardest part, for others it was working through the circuitry, and for others it was totally about creating the puppet character they had in mind" (Douillard 2013). To complete the project, participants needed to apply an understanding of circuitry, think about how to leverage various materials to create unique characters (e.g., a red LED placed on the nose of the puppet would suggest a "Rudolph" character but when placed in the heart region may suggest "love" instead), and accomplish various design goals (e.g., how to hide or reveal the sewing lines). Teachers sitting side by side took note of the various approaches and designs in their midst and were inspired by their peers' novel uses of the materials and interesting gestures to facilitate closing circuits. The beauty of production-centered design work like this is that no two projects look alike.

To begin this design process, participants began by tracing their puppet on paper and creating a circuitry diagram, which outlined where they would sew their battery holder, LED light(s), and switches. As they were working, we asked them to draw and label the sewing lines to think about the directions of the circuit as well as to avoid short circuits (shorts). One of the main challenges that stretched thinking was moving between the 2D representations of the circuit diagram to creating the design in 3D. To accomplish this, many participants mapped physical materials to the surface of the puppet, as well, to aid in the visualization of the design and to "check" to see if things worked. Participants could then test and physically trace how the connections should flow as they drew their circuit diagram (see Figure 11.2).

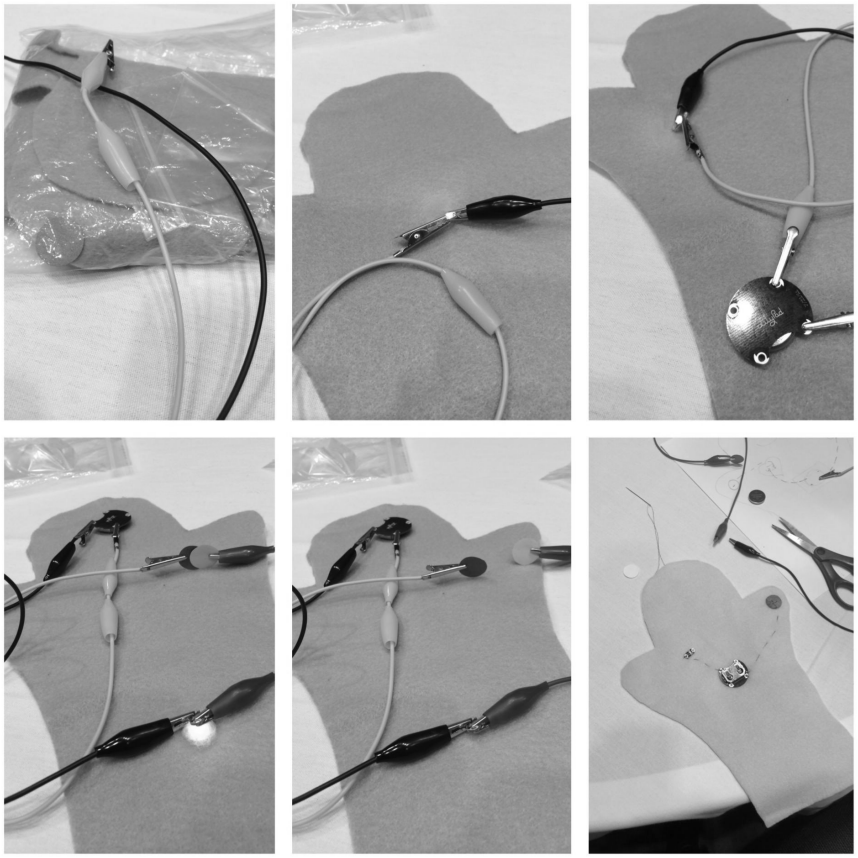

Figure 11.2: The process of designing and creating a circuit documented by participant Kim Douillard. (Photos by Kim Douillard, 2014).

Despite being able to get fairly complicated circuits involving multiple LEDs lighting up, it was thought provoking for participating educators to brainstorm how to translate the mess of insulated wiring into a sewn circuit that wouldn't short. Puppets, for example, necessitate that the fabric bends and moves in a range of directions with the handling of the puppet. This quality also makes it possible to put switches in interesting places (e.g., one half of the open switch on each of the two hands of the puppet to light up when touched together) but also easily introduces unanticipated problems in the circuitry design (e.g., when the two hands of the puppet touch, they might obscure the goal of the system if the completion of the circuit results in an LED illuminating near the puppet's "heart").

Kim Douillard, a co-teacher at Cardiff Elementary School in San Diego and director of the San Diego Area Writing Project, reflected on this professional

development session in terms of how the systems content encouraged new ways of thinking about the world in general, but also how the act of designing her e-puppet (see Figure 11.3) made her think differently about her teaching practice (Douillard 2013):

> I find that I have a better grasp of how to explain some of the approaches I use in my classroom. Like why design is so important to student learning, why mistakes are valuable to learning … if you take the time to work through what you did and figure out a better outcome, and why students need space to create their own plans and work through the spaces where things are not working the way they intend … I'm worried when we make things in the classroom too "neat" that we are working harder and learning more than our students. That's one of the things I love best (and hate the most) about teaching writing. When it's at its best, it's messy. I can have an overall plan in mind for the outcome, but my students benefit from getting 'just right' instruction along the way. And not all my students need the same instruction … and some benefit from learning by watching and listening to their classmates.

Figure 11.3: Kim Douillard's e-puppet. The heart lights up when the hands touch. (Photo by Kim Douillard, 2014).

The design process made visible the importance of "messy" learning, which allows for multiple points of entry and divergent goals. In our own research, we are beginning to find that this approach to learning allows for lots of simultaneous and interconnected learning about disciplinary content, the rules of design, the materiality of our world (how things work), among a host of other inter- and intrapersonal skills. Such opportunities for collaborative learning and serendipitous discoveries along the way are hallmarks of production-based design, which benefit students as well as teachers.

A similar appreciation for the spontaneous inspiration, open-ended exploration, and peer-to-peer learning affordances of production-based design was echoed by other practitioners at the conference, many becoming involved in an informal remixing trope across a number of digital platforms. For example, two attendees started a "#twitcatastrophe" game, involving an open call for people to tweet funny twists on themes from the meeting, which would then in turn be tweeted back as illustrations, pictures, Vines, digital creations, or more. Kevin Hodgson, a sixth-grade teacher at William E. Morris Elementary School and technology liaison with the Western Massachusetts Writing Project, described in his blog how his concept for a #twitcatastrophe—a "close read" (i.e., the concept in literary analysis involving the careful, methodical interpretation of a short passage of text) that involves a book literally closing on the reader's nose—was tweeted back first as a hand-drawn illustration, then reincarnated as a Scratch project, which he then remixed with additional technical capabilities, then shared back out as a Vine (Hodgson 2013):

> It was a blast, and reminded all of us how iteration and inspiration and creativity are at the heart of the remix culture. Each step—from creating the twitter game to the reader/artist response to the gameplay and remixing of the game—are different points on the compositional spectrum that we need to nurture and value.

This example highlights the benefit of production-centered professional development as being capable of drawing several participants into the activity using playful and engaging means. It is important that the participants used Twitter not just as a forum for commentary but as a place to share texts produced and elaborated on by multiple people. The resulting artifacts used humor to deepen the pedagogical goals around remixing and learning how to utilize the openly networked aspects of new media in effective ways for the classroom.

THE IMPORTANCE OF OPENLY NETWORKED LEARNING

Based on the idea that "[l]earning is most resilient when it is linked and reinforced across settings of home, school, peer culture and community" (Ito et al. 2012),

being openly networked in one's learning is a key principle of Connected Learning. This can mean many things, however, and in *Connected Learning: An Agenda for Research and Design* (Ito et al. 2012: 76), openly networked learning is described as both a matter of on- and offline design.

> In online space, this means maintaining transparent and open standards that allow for people and institutions to connect and extend infrastructure across diverse settings (home, community, school) and technical platforms (mobile, PC, game devices, traditional media). In physical space, this means maintaining an open-door policy and using online infrastructures to extend beyond physical boundaries to allow greater access to resources, and connect across institutions and communities.

The importance of being networked in open ways, both online as well as face to face, is key to the professional practices that we have been able to develop together as co-designing researchers and practitioners. Playful games like #twitcatastrophe grow in these open spaces as well as thoughtfully shared documentation and reflection on the process and implications for making and thinking about systems via the *Interconnections* work. These abilities to "see" each other's work and grow and develop it, whether playfully or seriously, is an essential skill as networked technologies support the distribution and curation of knowledge. Given that knowledge can be accessed, curated, as well as produced by individuals, communities, and networks in increasingly distributed ways (Juhasz and Balsamo 2012; Williamson 2013), the capacity to form these connections, and to find patterns within those connections is required for learning today (Siemens 2005).

Networks like the National Writing Project, with established practices of being publically accessible, with practice alongside colleagues and across institutions and systemic boundaries a key characteristic of network activities, have historically been referred to as "third spaces" where knowledge could be shared and distributed across contexts and communities (Eidman-Aadahl 1996; McDonald, Buchanan and Sterling 2004). In our *Interconnections* project, similar practices of sharing, remaking, and reflecting supported networked educators as they ventured onto the early web (DeVoss, Eidman-Aadahl and Hicks 2005); Bud Hunt, known online as @budtheteacher and a member of the Colorado State University Writing Project, calls this work "'openly networked' reflective practice":

> I soon became one of those teachers, writing frequent blog posts and sharing podcasts—which I often recorded from my car as I commuted back and forth to my classroom—that discussed issues from my work as a high-school language arts teacher. I began to conduct lots of lesson planning on my blog, explaining my way through complex challenges for the people who may have been (or likely, were definitely not) reading along. But the audience for my contributions was complicated. I wasn't writing just for others, and I wasn't writing only for me. I was engaged in … "openly networked" reflective practice. (in Garcia et al. 2014: 71)

Outside our project, experiments in open online learning continue among individual educators as well as within and across institutions and organizations alike, raising conversations about what is possible for learning on the open web, along with questions and concerns. Mia Zamora, director of the Kean University Writing Project, writing in connection to connectivist-oriented MOOCs such as Connected Courses and the National Writing Project's CLMOOC, explains:

> [I]n this day and age—with the dynamism of open online technologies—learning can be driven by self-interest, research can be conducted with powerful global collaboration and crowdsourcing, and teachers and students can discover alongside each other as they break down old hierarchies that have limited the production of new knowledge. (Zamora 2014: no page)

Whereas scholars such as Juliet Schor, a professor at Boston College and a member of the Connected Learning Research Network, who look across the field of open learning and shared economies, writes that "new institutions and new practices, as they arise in a highly unequal and stratified society … will take on those [same] inequalities unless they are actively combated" (Watkins and Schor 2013). Learning in openly networked ways, we know, is no exception. And critiques of open learning will question the extent to which opening is actually fostering access for many or replicating access for those already networked into these extended communities.

Professional networks like the National Writing Project are designed to continually involve a greater and greater network of educators over time into its participatory communities of practice (Lieberman and Wood 2003; Wenger and Lave 1991). And even so, we are aware that not every educator, or even everyone from the network, can have the kind of hands-on open experience with production-centered design and systems thinking alongside other colleagues in a supportive face-to-face setting described above. Nor can we simply just move work online without thinking about the ways that we are explicitly opening up production-centered opportunities and inviting those who might not otherwise have access, for a variety of reasons, to actively participate and create through their participation.

What we have found, however, is that when we bring a production-centered focus into open spaces focused on inquiry and design, we begin to see how inequities might be shifted by allowing for co-construction of the open spaces themselves (Seely Brown, Shah and Schmidt 2013; Smith, West-Puckett, Cantrill and Zamora, under review). National Writing Project educators like Laura, Kim, Kevin, and Bud have over time become leaders through making their practices and reflections on practice visible to others in online spaces such as their own blogs and at forums such as National Writing Project Digital Is (digitalis.nwp.org). These same educators also have begun to imagine ways in which to actively open the invitation to work in openly networked ways with others on production-centered

inquiries and experimentation. Among these experiments is CLMOOC, a Connected Learning Massive Open Online "Collaboration" facilitated by National Writing Project educators during the summer months as part of the Educator Innovator Initiative.

CLMOOC: FROM PROFESSIONAL DEVELOPMENT TO PROFESSIONAL PRACTICE

CLMOOC began in the summer of 2013 and attempts to provide interest-driven, production-centered, and openly networked experiences for educators—both in and outside schools—to spark new ways of thinking about learning and about teaching. Being interest driven and production centered has meant that participants start by making things—whether physical or digital, text based or multimodal—and then share what they have made, as well as thoughts, questions, and reflections about what they made, with the larger community. It is designed to engage an increasingly extended group of colleagues in connected learning and National Writing Project social practices through playing, making, and inquiry-driven design iterations.

Tapping into the parallels between writing, composing, and making, participants in CLMOOC engage, as young people might, in tinkering and experimentation. This allows them to play with habits of mind that foster the kinds of agency and creativity they look for in the youth they work with while practicing cycles of design, making/remaking, play and reflection with a wide range of tools, both digital and analog (Smith, West-Puckett, Cantrill and Zamora, under review). CLMOOC is also an opportunity for participants to tap into a connected community via open networks in support of their making and their learning. In this networked context, participants access what George Siemens describes as "specialized information sets" which offer their own possibilities for learning beyond any single person's "current state of knowing" (2005).

CLMOOC runs over the course of six weeks and is organized as "make cycles" that are open-ended invitations to make, compose, play, learn, and connect. So whether educators are making an interactive map in a tool like Thinglink.com (an image that gets poetically remade/recaptioned over and over) or are inspired one evening to create something new in their kitchen and document it for the community, we see the key role that "making"—that is, creating and contributing, sharing and responding, as well as remixing, leading, and remaking—plays in the ways that participants socialize and build connections. And when we reflect on this as educators, considering implications such as peer-to-peer learning and community critique for our classrooms and spaces of learning, then we start to see the importance of production in learning for the youth we work with, as well as us as

adults—supporting our collective ability to be not just knowledgeable and critical consumers of information but also its producers.

Stephanie West-Puckett, associate director of the Tar River Writing Project, describes this work as moving from "professional development to professional practice." Influenced by participation in CLMOOC, she created a local openly networked learning opportunity called #trwpconnect with her colleagues at Tar River. In sharing this work at the National Writing Project Digital Is website, she writes that since the structure of this opportunity was new to most participants, "[they] were unsure what to expect … and were surprised to learn that they would not be moving through content delivery modules and completing quizzes to assess their mastery at the end. Instead, #trwpconnect would become both an exercise in and a study of Connected Learning and the habits of mind and body (new literacies) that are necessary for collaborative writing, learning, and participation in academic and civic spaces" (West-Puckett 2014: no page).

CREATING SHARED ECOSYSTEMS FOR LEARNING: LEARNING ALONGSIDE EACH OTHER AS MAKERS IN TEACHING

Learning alongside each other as connected teachers and learning scientists, we have come to understand that the production-centered design activities we have described are not just isolated approaches to teaching, but, rather, are key parts of a larger movement to rethink learning in a digital age. There is an incredible amount of innovation happening at the edges of what we formally know as "education" and in places that people tend not to count as learning spaces, including homes, libraries, sport fields, community spaces, and so on. In these spaces we see youth learning in new ways connected to pursuing their interests, engaging deeply, and solving problems through engagement with technology and networked communities. It is this learning that we seek to know better as formal educators and researchers.

Taking our cues then from the youth-derived learning and design principles of Connected Learning, alongside what we know from design research and from working within inquiry-driven communities of practice as educators, CLMOOC and projects like *Interconnections* inform our rethinking of teaching and professional learning. No longer are production-centered and networked ways of learning optional for educators—instead these experiences are essential to learning and teaching and a core part of what it means to practice as a professional. What then are the implications for design-based research and teacher professional development?

Returning to Resnick's design spiral, we see that imagining, playing, sharing, and publications, research, and reflection are critical mindsets and actions that

support teachers and researchers in a range of practices. And we can also see how these practices can be supported in a range of ways, from the playful opportunities to explore a range of ideas and materials in interest-driven, production-centered ways on the open web at CLMOOC as well as through very deliberately designed and dedicated over-time collaborations as was experienced in the *Interconnections* project. What we see cutting across these two otherwise very different professional opportunities are educational professionals engaging alongside each other within the full design spirals, supporting an embodied experience of Connected Learning design and learning principles while making throughout.

We know that we're not alone in our desire to reimagine learning and teaching in more production-centered and openly networked ways; many educators, in fact, bring these interests and experiences with them into teaching, even if the actual context of their teaching is not currently as conducive as we might wish to these more connected principles and practices. The pressure is on, however, to reimagine learning opportunities and outcomes for a contemporary world (Thomas and Seely Brown 2011).

When we shift our focus from teaching to a focus on learning, we can start to engage deeply with what it means to be a learner, which ultimately guides us in rethinking what are the implications for teaching. This is what we describe as a Connected Learning approach to professional development or, picking up on the words of Stephanie West-Puckett, connected professional practice. And within this process of practice, and because of the production-centered, constructionist nature of the work, educators, researchers, and youth are working alongside each other and consequently building the exact right tools, knowledge base, and resources that are needed. We therefore call forward the continued development of creative supportive ecosystems of connected professional practices where educators, learning scientists, and the like can practice as co-designers and colleagues in order to build what's needed to support youth learning in connected and networked ways across their homes, communities, and social spheres.

Education can be done differently. Youth can engage in problems that are meaningful for them, connected to their lives, and that prepare them for lifelong learning in a changing and complex world. Toward that end, professional development can also be done differently, supporting adults and educators that youth work with to learn alongside each other, thereby coming to understand and embody the changes and complexities of a rapidly changing world.

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