24. Connected Learning During Disconnected Moments?

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Abstract: This paper investigates 2 prevalent assumptions about technologies that underpin common approaches to answering the question of how to harness emerging technologies for learning: the assumption that technologies are obedient tools to serve higher-order cognitive functions and the assumption that technologies are coherent and bounded objects traversing pedagogical exchanges. By analyzing how these 2 assumptions operate in educational discourses that advocate for the adoption of technologies, as well as in my own teaching practices when technologies fail, I argue that these assumptions prevent us from researching and practicing learning with technologies from an ecological and networked approach that centers the situated, relational, caring, and social interactions among teachers, learners, and technologies as the pedagogical encounter unfolds.

Introduction

In *Connected Learning: An Agenda for Research and Design* (Ito et al., 2013), the authors grappled with a common and recurring question in educational discourses today: "How can we capitalize on today's new media to expand these forms of learning opportunity?" (p. 15). Attempts to answer this question by educational policy makers, researchers, teachers, and administrators across the fields of education, such as educational technology, games and learning, art education, curriculum studies, and more, had often focused on exploring the abstracted functionalities of specific emerging technologies and mapping those functionalities onto learning objectives. At the same time, based on the technologies' purported functionalities, attention priority is given to developing probable plans for further implementation of these technologies on a large scale across schools and other educational institutions.

However, as the authors of *Connected Learning: An Agenda for Research and Design* (2013) argued, learning is situated and context specific. Without an explicit deliberation of the specific contextual needs of each formal, informal, or nonformal learning setting, the adoption of emerging technologies by following a standardized formula that prioritizes cost reduction and scaling up merely serves dominant educational hierarchies and further exacerbates existing learning inequity among learners. Furthermore, without considering how pieces of technologies unfold and traverse differently through varying hands, locales, and temperatures, the purported learning potentials are also questionable.

Following this line of inquiry, this paper investigates two prevalent assumptions about technologies that underpin common approaches to answering the question of how to harness emerging technologies for learning: the assumption that technologies are obedient tools to serve higher-order cognitive functions and the assumption that technologies are coherent and bounded objects traversing pedagogical exchanges. By analyzing how these two assumptions operate in educational discourses that advocate for the adoption of technologies, as well as in my own teaching practices when technologies fail, I argue that these assumptions prevent us from researching and practicing learning with technologies from an ecological and networked approach that centers the situated, relational, caring, and social interactions among teachers, learners, and technologies as the pedagogical encounter unfolds. Instead of focusing on moments when technologies are connected and functioning smoothly, a reorientation to think through how we, as educators and researchers, might move forward in addressing learning with technologies during moments when technologies do not work and are disconnected is required.

Educational Discourses Advocating for Technologies

From Moodle to Vimeo to *Minecraft* to 3D printers, all of these entities are named technologies that were advocated for implementation or had been implemented in formal or nonformal educational learning contexts (Overby & Jones, 2015; Roland, 2010; Vanscoder, 2014). Teachers are constantly encouraged, and at times expected, to implement new hardware in classrooms and incorporate new software into their pedagogy for the purpose of harnessing learning potentials for students. In my reading, educational discourses advocating for the continual and further adoption of emerging technologies in the name of benefiting student learning often follow two general trajectories.

The first trajectory involves speculative theorizations about the usefulness and/or uselessness of emerging technologies, based on their generalized capabilities and designed functionalities, for learning in concert with existing pedagogical frameworks and approaches. In other words, these discourses speculate on the affordances of emerging technologies for learning by analyzing and reconciling conceptual tensions and foreseeable practical difficulties of introducing a new piece of mediation into normalized pedagogical practice.

For example, Gee's seminal text *What Video Games Have to Teach Us About Learning and Literacy* (2007) analyzed popular digital gameplay in informal learning contexts using prominent learning theories to develop what he termed *learning principles* for describing players as learners. He advocated for formal learning contexts to be reconfigured according to these principles by revising existing pedagogies, in which digital games were positioned as a possible new tool for teaching and learning. In a similar vein, K–12 art educators Overby and Jones (2015) observed children ranging 5–18 years old playing *Minecraft* and described the affordances of game playing for players as learners. Based on this observation, they devised curricular activities for K–12 art teachers to use to incorporate *Minecraft* into their classrooms by outlining the potential learning outcomes, such as the acquisition of skills for collaboration as well as basic programming skills. Another example lies in the context of the United States' national campaign endorsing the "maker movement" that advocated for learning with a series of digital fabrication technologies, such as "3D printers, laser cutters, easy-to-use design software, and desktop machine tools" (White House, 2016). Alongside this maker movement, Eisenberg (2013) provided a discussion of both the potential affordances of 3D printers as tools for children's learning and the challenges around adopting 3D printers in educational contexts in "3D printing for children: What to build next?" In summary, these authors advocated for the adoption of emerging technologies in both formal and nonformal educational settings by observing these technologies being used in informal settings, or "in the wild," and articulating learning potentials in relation to their use.

The second trajectory involves empirical studies, with a wide range of methodologies, of emerging technology incorporation in formal educational contexts. These studies examined the ways in which emerging technologies had been incorporated into pedagogy to draw conclusions about how it supported, revised, and/or challenged students' learning outcomes. In other words, these discourses build their case for the learning potentials offered by emerging technologies by describing, measuring, analyzing, assessing, and reflecting on student responses before, during, and after the pedagogical encounter with these technologies.

For example, in "Creativity in Digital Art Education Teaching Practices," Black and Browning (2011) articulated a strong stance advocating for fellow art teachers to incorporate digital technologies in classrooms in order to equip students with "emerging modes of literacy" (p. 20). They shared their three years of longitudinal action research study with in-service teachers that focused on their efforts to adopt digital image–editing software in concert with analog art–making media. They concluded by recommending that technologies be considered secondary to conceptual ideas driving the lesson plan for effectively helping students develop their creativity. In other words, emerging technologies are seen as secondary tools to be adopted after considering the primary learning objectives. In "The Education Arcade: Crafting, Remixing, and Playing With Controllers for Scratch Games," Davis, Kafai, Vasudevan, and Lee (2013) described their implementation and evaluation of an elective workshop on Scratch game design and custom controller building

using MaKey MaKey with middle school students. They argued that the incorporation of Scratch and MayKey Maykey under the theme of an arcade "helped the youths see their game in an interactive context, where they could make connections between their games, their peers' games, and the larger experience they were helping to develop" (p. 441). In this instance, they argued that the adoption of these emerging technologies provided students with useful learning experiences that were applicable beyond the pedagogical exchange.

Assumptions About Technologies in Educational Discourses

In both of the discourse trajectories mentioned above, the incorporation of technologies was not seen as the end in and of itself. Rather, technologies were positioned as tools to help equip students with various 21st-century transferable knowledge and skills, with cross-disciplinary deep learning as the actual learning objective (Pellegrino & Hilton, 2012). In other words, these emerging technologies were conceptualized as secondary tools to serve primary and preexisting learning agendas. These authors argued that through the mediation of these tools, students are better able to attain the learning objectives in a specific academic subject. As Roland (2010) stated, art educators need to "focus on the outcome" of our established arts learning goals instead of the tools by which we achieve those goals (p. 19).

However, these narratives rely upon two specific unverified and questionable assumptions. The first assumption is that learning objectives are independent from the technologies by which they are achieved, which might seem paradoxical at first glance. However, if we take a closer look, we can recognize that their arguments for or against specific technologies were built on using the end to the justify the means, or put differently, using the language of learning outcomes/objectives/potentials in existing educational paradigms to justify the adoption of technologies. In doing so, they assumed that there are higher-order and generalizable learning objectives, which are independent of the mediation of the tools themselves, that should drive curricular decisions determining whichever tools to adopt. Learning objectives are the primary nonnegotiable goals, whereas specific technologies are interchangeable to serve those goals.

This assumption risks the romanticization of higher cognitive functionalities that are positioned as independent of technological mediations, which constructivist theories of learning have long rejected (Dewey, 1938/1997; Lave & Wenger, 1991; Piaget, 1962; Vygostsky, 1978). At the same time, this assumption reveals its celebratory position of embracing new technologies: If these learning objectives are independent of the tools and they could be achieved with any tools, why are we centering the adoption of emerging technologies instead of prioritizing questions around how to reconfigure existing educational technologies, such as books or whiteboards, in pedagogy to better serve learning objectives? Underlying this choice to invest attention, capital, and resources in developing procedures to incorporate emerging technologies over other educational questions is an inherent ethos that technological change equals progress and a belief that progress is good. In other words, these narratives assumed the good of adopting emerging technologies from the onset and use existing paradigms in education that traffic in the language of learning objectives to legitimize this belief. This belief deserves reckoning if the aim of educational reform is to disrupt dominant educational hierarchies and to counter existing learning inequity among learners, in which progress to what end, for whom, and in what contexts are called into question.

Following the previous assumption, the second assumption is that the adoption of technologies for the harnessing of their functionalities to serve specified learning objectives is context free and universal. In other words, each piece of named technology is imagined as a completely coherent and bounded object that encompasses the same exact functionalities and unfolding of events even as it travels through different times, locations, and people. However, this assumption has been repeatedly challenged and punctured in the field of science and technology studies. In their book *Culture+Technology: A Primer* (2005), Slack and Wise argued against imagining, understanding, and conceptualizing "technology as a 'thing'" (p. 95), as it deflects our attention away from the interdependent relations among the living and nonliving within which these things are given form. In other words, the observed and documented functionalities

of technologies are reflecting the larger context with which technologies come to perform, rather than a property of the "thing" we call technology. Similarly, in *Human-Machine Reconfigurations: Plans and Situated Actions* (2007), Suchman complicated the boundaries we draw around a piece of named technology and the simplified notion that the functionalities of technologies are inherent in the configuration of its material by its designer. As a case in point, the One-Laptop-Per-Child initiative that aimed to, and yet failed to, replicate learning experiences across geographical, cultural, and political contexts revealed the ways in which the unfolding of technologies' functionalities are not universal (Chan, 2013; James, 2010).

These two assumptions not only underlie educational discourses but also emanate through teaching practices, which prevents us from taking an ecological and networked approach to researching and practicing learning with technologies as advocated by the Connected Learning Research Network. In the following section, I reflect on my teaching practice with technologies to illustrate how these two assumptions played out in my initial interpretation of technological failures in the classroom and how that interpretation prevented me from recognizing the situatedness of unexpected learning potentials being offered by technologies I found myself interacting with during teaching.

Tales From a Teaching Practitioner

Technology never works, or at least that is how the saying goes. I have heard this expression on multiple occasions, particularly during informal exchanges with fellow pedagogues at conferences about the practicalities of teaching with digital technologies for various media-based learning objectives. As a known condition among teaching practitioners, the certainty of technologies' failing to function smoothly often prevents the possibilities for achieving the previously established learning objective given the space and time constraints of pedagogical encounters.

> It was February 3rd, 2016, around 2:30pm, right before the first session of our Minecraft Modification Workshop Series. Lugging giant post-it pads and the laptop cart holding ten Mac laptops, ten laptop chargers, ten computer mice, ten mouse pads, and three extension cords, I arrived at the local public library thirty minutes earlier than the start of the session to set up the mobile computer lab. I maneuvered the tables around the middle of the room, so that the extension cords, which were just slightly too short to rest comfortably under the table, connected to the outlets on the opposite end of the room, could at least reach the edges of the tables. After laying the laptops around the table in a way that successfully connected them each to a charger, I opened their lids, pressed the on/off button and began logging in. However, laptop #6 refused to let me log in. As I pressed "return" on the keyboard after entering the password, a window popped up on the screen to inform me that I could not log in as the time was set incorrectly. The computer provided me with the option to reset the time, which I assumed would enable me to log in afterwards, but it required the admin password. I did not have clearance for the admin password and was only given a general limited access user account, as these laptops were the property of the university where I was a graduate student and I was borrowing them for my workshop/ research. I turned the laptop off and on again and repeated the same motions of trying to log in with my general user account a couple of time with no success. The clock was ticking. I decided to abandon laptop #6 and moved on with the workshop without it.

The above vignette was drawn from my action research project, where I studied how to facilitate critical play of digital games with youth in a public library in the United States Midwest. It captured one, among many other, moments throughout the workshop when I also thought to myself, "Technology never works!" Although often expressed in a cheeky and joking manner, the moment the expression is uttered, it communicates truths about how we perceive our reality. Here, I ask the question, "What if we begin to take the expression 'technology never works' seriously?" By exploring the ephemeral moments when this expression emerges, perhaps we can answer the question of why

technology never works that is paramount for practitioners instead of buying into the argument for the adoption of yet another technology as a silver bullet to solve pedagogical woes. Technological apparatuses are often seamlessly embedded within our existing social practice in ways that make us no longer notice them when they perform their delegated duty. And yet, in that ephemeral moment when the technologies behave in unpredictable ways, we begin to take notice, and it is in those moments that this expression emerges.

At first glance, the moments when the expression "technology never works!" emerged during my action research can be grouped into two categories: figuratively not working and literally not working. The vignette above can be considered to refer to technologies not working, figuratively speaking. The reason it is figuratively is that the laptop was performing the initial encoded intentions of its designer, that of illustrating proper ownership of property through the prevention of unauthorized access. In other words, there was nothing wrong with its purported functionalities, and it was performing what it was told to do by those not present in the pedagogical encounter. By contrast, technologies literally not working describes moments when the purported designed functionalities failed to perform even under all the supposedly correct conditions, such as when software crashed and would not reopen for no apparent reason, or the projector refused to connect even though it was properly plugged in with all the right cables. In other words, it was not performing what it was told to do by its designer. With the prompt to send a crash report to the company that developed that software, it was apparent that this category of failure was considered an anomaly even for the designers and deserved dedicated attention on their part to further systematically investigate the conditions underlying this failure.

However, upon closer inspection, it became abundantly clear that these categories are not mutually exclusive at all and in essence point toward the same reality of previously established pedagogical plans being deterred. For example, the software crash simply could have been a result of the laptop's computational power being overloaded. Though perhaps not an intentional limitation encoded by the designer, the way it unfolded in that instance reflected the bottleneck that was set in place by the materiality of these machines. In that sense, it could also be considered a figurative failure. As with the vignette above, it was unknown even to the IT personnel, as we debriefed about the situation later on, as to why the clock reset overnight, and the functionalities that laptop performed actually excluded those who technically do have authorized property access for that point in time. In that sense, it could also be considered a literal failure.

What can be said about these two categories is that they merely classified moments of failure based on whether or not the reasoning for its failure is known, as in "known by the designer specifying its functionalities," and this act of categorization participated in the continual search of a supposedly correct way for usage. It presupposes that there is a perfect and universal operating condition, and under that condition technologies will always work. Through the interpretation of those moments as failures, regardless of whether or not the reasons were known, I was assuming the passiveness of these objects that required human agents to act upon them to unleash their functionalities, as opposed to recognizing the functionalities that they were, indeed, already performing. In other words, I was acting upon the assumption that technologies are completely coherent and bounded objects that should encompass the same exact functionalities and unfolding of events even as they travel through different times, locations, and people. In contrast, what happens if we assume that technologies are fulfilling their duties when they are not functioning smoothly? Where does that lead us in terms of analyzing technologies for learning in both formal and nonformal educational contexts?

At the same time, these categories revealed how I approached interpreting my engagement with these technologies from my position as a pedagogue, in which deciding where to focus my time and energies during teaching are prime sites of negotiation for constructing learning encounters. The expression of "technology never works!" communicated the frustration (at times giving up) of wrangling with technology in an attempt to get it to do what I imagined it is supposed to do so that students can learn through it, about analytical critiques of gender representation in video game texts, for example. With the workshop starting in a few minutes as described in the vignette above, I was torn choosing between abandoning the laptop to search for alternative activities that could substitute for the learning objective intended for that day or trying to solve the issue of accessing that laptop with students while facing the possible abandonment of a predetermined learning objective. In doing so, this scenario outlined how I had positioned technologies as a means to

an end and how I had also acted upon the assumption that learning objectives are independent from the technologies by which they are achieved. In contrast, what happens if we assume that learning objectives cannot be considered independent from technological mediations even during moments of failure? How might that revise our approach to researching and practicing learning with emerging technologies? What emergent learning objectives might we uncover?

Conclusion

Instead of centering on technologies, the Connected Learning Research Network advocates for an ecological and networked approach to researching and practicing learning with technologies that centers around the situated, relational, caring, and social interactions among teachers, learners, and technologies as the pedagogical encounter unfolds. In doing so, it highlights the supporting social infrastructure that is required for "broadened access to learning that is socially embedded, interest-driven, and oriented toward educational, economic, or political opportunity" (p. 4). In this context, this paper analyzed two prevalent assumptions about technologies that underpin educational discourses that advocate for the continual adoption of technologies as well as my own teaching practices when technologies fail. I demonstrated how, in these instances, technologies are imagined and positioned as obedient tools to serve higher-order cognitive functions and they are thought of as coherent and bounded objects traversing pedagogical exchanges. I considered the ways in which these assumptions become detrimental to recognizing the learning potentials being offered by technologies we find ourselves interacting with during pedagogical exchanges.

Instead of asking what technologies can *do* for us in terms of enhancing teaching and learning that assumes an eternal state of perfect functioning and operating, I call for us to ask what technologies *are not* doing for us for teaching and learning during specific moments in time and place as the pedagogical encounter unfolds? By exploring those moments, we might be able to further articulate how the interpretation of "technology never works" relies upon an ontological framework that assumes a passivity of objects and a specific form of agency among human subjects. In effect, this ontological framework configures the materiality of technologies as secondary to learning to make meaning, which requires further attention should we want technologies to work.

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