Creativity, Self-Directed Learning and the Architecture of Technology Rich Environments

By Punya Mishra, Chris Fahnoe, Danah Henriksen & the Deep-Play Research Group*, Michigan State University

Some people regard discipline as a chore. For me, it is a kind of order that sets me free to fly.

— Julie Andrews

We shape our buildings; thereafter they shape us.

—Winston Churchill

Introduction

As we move further into the 21st century, the need for "21st century skills" such as creativity, flexibility, and independence among tech-savvy learners is ever increasing. At the same time new digital, networked technologies offer unparalleled opportunities for creative and independent learning (Pink, 2009). Just a few examples of the kinds of rich, immediate, and varied knowledge resources that are widely available today include instructional videos on YouTube, free access to rigorous university courses, and the development of complex personal learning environments. This blend of need and opportunity makes for an exciting time in history for educators. These technologies allow both novices and experts alike to participate in the creation and cultivation of their own learning. However, it is no longer enough to simply be literate about information/technology.

The complexity of this landscape means that students must become skillful, independent, and creative learners (Partnership for 21st Century Learning, 2004). They need to be able to successfully navigate these opportunities by seeking, analyzing, integrating, and redefining what they know. The world we live in is more complex, globally integrated, and information-rich than ever. Successful thinkers must be able to manage this complexity, solve problems with innovative solutions, and network in a diverse global environment (Pink, 2005; Florida, 2002). Learners must be able to see connections and synthesize information both within a body of knowledge and across disciplines (Freedman, 2007). These skills are hallmarks of a creative mind, and they take discipline-breaking and divergent thinking into the realm of the real world (Root-Bernstein, 1996; 1999; 2003; Mishra, Koehler and Henriksen, 2011).

To engage this kind of thinking, learners need a deep understanding of disciplinary content, but must also be able to see across disciplines. Learning environments are highly influential on creative processes and many educational psychologists and researchers have suggested that environments have the power to make or break the creative potential of students (Amabile, 1996; Robinson, 2003; Giroux and Schmidt, 2005).

Creativity From an In-disciplinary Approach

Providing creative outlets and opportunities for students continues to be an important goal for many educational institutions. Many schools have identified creative thinking as integral components of future success (Jerald, 2008). But Mishra and the Deep-Play Research Group (2012), describe how an emphasis on teaching discrete or disconnected creative thinking skills may not be useful. Rather, creativity requires a "deep knowledge of the discipline that creative work emerges within" as well as that thinking that spans disciplines (Caper, 1996). This "in-disciplinary", or dual-nature ap-

proach, better represents how creativity actually works (Mishra, Henriksen & the Deep Play Research Group, 2012). Instead of trying to explicitly teach creativity, the learning environment itself must be designed to support creative thinking.

Students in school do not usually have the opportunity, or even the frame of reference, to navigate complex exploration or creative thinking (Cropley, 2003). We must understand that the design of learning environments, and experiences for students, are highly influenced by factors such as tradition, national requirements, accountability, teacher evaluations, and high-stakes testing. All in all these influences limit the kinds of opportunities students have to dive deeply into disciplinary content and to pursue their inherent interests. The prospects for detailed exploration or curiosity are also restricted by tight schedules and the demands of assessment. Furthermore, as students build knowledge, they have few chances to make connections between disciplines due to the bounded designs of academic tasks and institutions. Therefore, most assignments and experiences in school are isolated to disconnected areas of study, preventing students from looking over the walls of different disciplines to develop personalized, creative connections (Giroux and Schmidt, 2005). Such limitations follow directly from the design of the learning environment, as shaped by the demands of rigid educational policy and school structure (Fusarelli, 2004).

To intentionally design possibilities for innovation we must go beyond benchmark achievements to include creative habits of mind. The opportunity and ability to intensely engage in a discipline, or to think across disciplines requires more than a wide but shallow approach to content. It means that learners must be pushed to question, apply previous knowledge, and persist down winding paths. Establishing patterns, seeing connections, and synthesizing concepts across disciplines requires guidance, real-world thinking, and activities that promote creative thinking in order to fine-tune independent learning skills. Therefore, the "in-disciplined" learner must have the opportunity for problem-based learning steeped in real-world context and guided practice, with time and collaboration for exploration and inquiry. This develops the types of skills, habits, and opportunities that support the creative process and innovative thinking.

Self-Directedness in the 21st Century

Beyond supporting alternative lessons designs, we must consider the types of skills that learners need to navigate and benefit from such experiences. New developments in the 21st century educational landscape, along with remarkable leaps in technology and knowledge access, put expectations on students to take initiative in their own learning (Teo, 2010). For learners to participate fully with "in-disciplinary" experiences, self-direction and regulation are essential skills. Self-directed learning (SDL) is a concept that exists in many 21st century learning frameworks, and is often considered important to personal learning experiences (Caffarella, 1993). The P21 Framework Life and Career Skills (2010) include "Initiative and Self-Direction". The ISTE Standards for Students (2007) specifically calls for students to be able to "plan and manage activities to develop a solution or complete a project". The AASL Standards for the 21st Century Learner (2009) note that learners should "pursue personal and aesthetic growth". And the enGauge 21st Century Skills (2003) Inventive Thinking section includes "adaptability, managing complexity, and self-direction."

Although research on self-directed learning has been around for some time, the context has changed with the growth of online learning, greater access to technology, and connections to information and resources not previously available. Schools are recognizing the importance of self-directed learning as a necessary skill for the 21st century as well as the need for teachers to "enhance students' abilities for accessing self-directed learning" (Chou, 2008).

Educational designs such as the Science Leadership Academy's inquiry-driven, project-based approach (http://www.scienceleadership.org) or the trans-disciplinary inquiry model at McGraw Elementary (http://mcg.psdschools.org) spark intrigue about self-directed learning and new conceptions for the role of the traditional classroom teacher. In these settings, students must be able to manage resources, demonstrate independence, and use disciplined and critical thinking to solve problems. Zhao (2009) suggests the necessity of developing student motivation through self-directed study. Education has also adopted frameworks from the business domain — such as Design Thinking (http://designthinkingforeducators.com) — that promotes skills such as brainstorming, prototyping, and evolution. These models reflect learning environments that are intentionally created to support opportunities to investigate material in depth, and also cut across disciplines to make meaning of, and connections between, ideas.

Creativity and in-disciplined learning requires balancing the forces of order and chaos. Learning environments need to provide students a flexible structure within which students can experiment, collaborate, and problem solve. These are contexts that allow students to learn from both success and failure. Such open-ended environments, however, can be challenging to learners as well. They can appear chaotic and offer little guidance to students on how to navigate them. Clearly, well developed self regulation by the student can help them become better learners—particularly in such open-ended technology rich contexts. But this raises a range of pragmatic and theoretical questions, specifically about how would students develop these self-regulation skills? Can working in such open-ended environments actually help students develop such skills? In the following section we point to some preliminary research on this question.

Environments Supporting Self-Directed Learning

A middle school classroom in the Midwest was the site for such a research study (Fahnoe, unpublished manuscript). On one team, an intentionally designed environment leveraged technology to provide students with alternative ways to connect, collaborate, discover, engage, and reflect throughout the learning process. The general concept was a wider range of self-directed learning opportunities are available for students who have constant Internet access, personal devices, flexible schedules, and a variety of experiences. These opportunities were supported by connections to subject matter experts, time for deeper exploration, technology tools to collect and manage information, and abilities to extend the learning beyond the traditional school periods. Further, the staff members were committed to the idea that students should have an integral role in the learning process. The teachers also received significant training on both 21st century learning tools and methods to increase their technology pedagogical content knowledge (TPACK). This process allowed the teachers to recognize, envision, plan, and execute learning experiences that would be unique to their classroom and support the principles valued in 21st century learning discussions. The combination of teacher preparation, learning environment design, access to technology, and foundation on student ownership of learning could certainly generate meaningful self-directed choices for students to explore their interests and passions not available in other settings.

In this study students were surveyed about their SDL before and after participating in this program. An analysis of this data strongly suggest that such a technology rich, exploratory, learner-directed environment supported the development of self-directed learning attitudes and behaviors in middle school students. What is interesting is that even though the learning environment was not specifically designed to increase self-directedness, students in the study were more likely (in contrast to a comparable control group) to show an increased use of technology, to connect with their teachers online and after-school, to share their work and ideas online, to conduct information searching to solve their own problems, and to initiate skill development on topics of interests—all characteristics of self-directed learners.

Conclusion

So, how do institutions and designers develop environments that support self-directed learning? A majority of current research focuses on internal characteristics of self-directed learners. Yet gradually, we are beginning to understand that external factors have an impact as well. Guglielmino (1977) noted that certain learning contexts are more effective at promoting self-directed learning. Learning environments that use technology in meaningful ways may have an important impact on self-directed learning, as they connect students to resources in ways that were not previously available (Candy, 2004). We can also look to "real-world" learning applications or problem-based learning environments, which allow "learners to engage in their own problems, by providing contextualized support, and by exploiting breakdowns as opportunities for learning" (Fischer and Scharff, 1998).

The study reported here shows that in specific contexts, designed elements of the learning environment can influence the way that students manage self-directed learning. Educational stakeholders who seek to encourage self-directed learning in contemporary learning environments should consider factors such as: the alignment of technology to learning goals, trans-disciplinary learning experiences, real-world or problem based learning, a re-evaluation of school structures (length of periods, team structure, etc.) and giving students flexible opportunities for learning structures (online learning, independent study, etc).

Environments that foster and support self-directed learning could affect the role of the teacher, bringing about new conversations on that role and the resulting desired skills. Purposefully designed learning environments can provide opportunities for students to explore content in-depth and across disciplines by allowing more time for problem/project-based learning and collaboration, pervasive access to technology, problem-solving or inquiry-based design, a trans-disciplinary approach, administrative support, and intensive professional development for the teachers, As students learn to independently make meaningful connections and foster innovating thinking, such learning environments set them on the path towards truly 21st century learning in technology rich environments. As Zimmerman, one of the leading scholars and researchers in the area of self-directed learning said, "When students understand that they are creative agents, responsible for and capable of self-development and self-determination of their goals, their self as an agent will provide the motivation necessary for self-regulation" (Zimmerman, 1990; p. 11).

What is clear is that the development of creativity cannot happen (at the very least cannot happen easily) in the kind of traditional classroom and disciplinary structures we have today. Open-ended, technology rich learning contexts appear to provide opportunities for students to be structured in their ways of thinking, even while they are open to pursuing questions of personal interest—the crux of creativity. As educators we need to understand that we are architects and designers of learning environments that allow students to develop the kinds of mental discipline required to think outside of the disciplines.

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* The Deep-Play Research group at the college of education at Michigan State University includes: Punya Mishra, Danah Henriksen, Kristen Kereluik, Laura Terry, Chris Fahnoe and Colin Terry.