Building creativity: collaborative learning and creativity in social media environments

Kylie A. Peppler and Maria Solomou

Kylie A. Peppler is an Assistant Professor of Learning Sciences at Indiana University, Bloomington, Indiana, USA. Maria Solomou is a doctoral student in the Learning Sciences Program at Indiana University, Bloomington, Indiana, USA.

Abstract

Purpose – *Using a systems-based approach to creativity and a sociocultural constructionist approach to learning, this study aims to highlight how creative ideas emerge within a community and spread amongst its members.*

Design/methodology/approach – *Using a design-based approach to research, this study took place within the social media environment, Quest Atlantis. Chat data were collected from 85 participants and screenshots were taken of the virtual architecture designed and built by players in the Quest Atlantis environment, in an effort to explore the nature of creativity and collaborative learning within the context of virtual 3D architectural construction.*

Findings – *The findings illustrate the rise and spread of creativity in online communities and also point to the social and cultural nature of creativity.*

Research limitations/implications – *This study, the first of its kind, focuses on how creativity operates within a single community in order to draw implications about digital creativity more broadly.*

Practical implications – *Implications for designing virtual and physical communities to promote creativity are discussed.*

Originality/value – *Documenting and analyzing an entire creative system in the everyday world can be a challenging endeavor. Social media, by contrast, offer an opportunity to document, describe, and analyze creativity, extend Csikszentmihalyi's work into the realm of social media and push back on current conceptions of digital creativity.*

Keywords *Learning, Learning processes, Multimedia, Social networking sites*

Paper type *Research paper*

Introduction

Traditionally, cognitive views of creativity have situated the source of creativity in the individual (Guilford, 1950). However, more recent scholarship on creativity has recognized the genesis and development of creative ideas as being part of a broader, socially determined process (Sternberg, 2003; Sawyer, 2006, 2007). Consistent with Csikszentmihalyi's (1996) systems model, creativity is becoming increasingly understood as a system, composed of:

- individuals;
- knowledge domains; and
- a field of informed experts.

In Csikszentmihalyi's model of creativity, individuals build on culturally valued practices and designs to produce new variations of the domain, which, if deemed valuable by the community (i.e. the field), becomes part of what constitutes the evolving domain. For example, curators at a fine arts museum make choices to acquire and exhibit the work of talented new artists, which in turn begins to shape the field of contemporary art. Each component of the system continues to impact one another over time. The presence of a field of experts implies

that colleagues and domain norms are essential to the realization of individual creativity (Schneiderman, 2000). Such a view removes the aura of mystery around creativity and, instead, emphasizes the importance of sustained discussion with peers and an appreciation of the constraints that one works within while producing a creative contribution.

Sustained discussion and far-reaching participation are central tenets of the social media/Web 2.0 movement, in some ways representing a natural progression from Platonian dialogues on creativity into today's dispersed, digital society. Given the proliferation of creative production that takes place within online communities and social networking sites, including MySpace, Facebook, and Ning, as well as media sharing sites, such as YouTube and Flickr, social media have taken a turn toward creative production today (Greenhow *et al.*, 2009; Barnes, 2006). Up until now, most research that has utilized a systems model of creativity as a guiding frame refers to a ''panel of experts'' to act as proxy for the ''field'', providing evaluations of creative contributions within the community (MacDonald *et al.*, 2006; Kaufman *et al.*, 2008). In social media, however, this is an outmoded approach as expertise is distributed amongst members, and crowd sourcing is used to determine the most valuable contributions (e.g. ratings on Amazon.com). This fundamentally changes the nature of how we view and assess ''creativity,'' calling into question of who constitutes the ''field,rdquo;, and expanding the methodologies that we can use to investigate creativity. It also raises key questions about whether a YouTube video that receives the most views is indeed the most ''creative'' of contributions to the community. If not, then what constitutes ''creativity'' in online communities?

Our research seeks to extend Csikszentmihalyi's work into the realm of social media, pushing back on current conceptions of digital creativity. Central to a systems view of creativity is the premise of how the extent and longevity of a community's permutation of new ideas ultimately defines each idea's value as a creative act. Our study takes place within the multi-user virtual environment (MUVE), Quest Atlantis (QA; see http://atlantis.crlt.indiana.edu), an educational virtual world that engages players with educational content while supporting social interaction between a live community of players (Barab *et al.*, 2007). QA functions as a social network that participants virtually inhabit through the use of personalized avatars, roaming freely throughout the game environment as they communicate with other players, similar to other MUVEs like Second Life (Greenhow *et al.*, 2009). Similarly, there are areas within Quest Atlantis where players can create their own objects that are then explored and reflected upon by the other participants in the space. This interaction between individuals as well between individuals and their environment is a key example of how social media platforms enable online communities to evolve a domain in-game.

Quest Atlantis's Architecture Unit was designed as a constructionist (Papert, 1980) space where individuals can actively contribute to their virtual environment and, in turn, shape the experiences of other players in the game through the creation of 3D architecture. Players complete a game-like mission learning about 3D architectural building but must ultimately align their values and aesthetics with one of two architectural firms. This mission explores how communities take up the themes of creativity and constraint within the production of their own virtual 3D building designs and how this domain evolves over time given the feedback and contributions of its members. Using a design-based approach to research (Barab, 2006) as well as a sociocultural constructionist approach to learning and design (Peppler and Kafai, 2007; Pinkett, 2000), we sought to address how in using a systems-based approach to creativity, what ideas were seen as creative and taken up by the larger field of QA members. Further, we investigated how learners collaboratively engaged in building and enabled the spread of ''creative'' ideas.

Social media skeptics might wonder whether and to what extent substantive learning occurs in online communities. Our work focuses on how a new domain, like 3D architectural building, can be used to showcase how individuals learn and creatively innovate. As they do so, participants negotiate with other members of the community, picking up tips and tricks in the domain, and discuss and share information with others (Dodge et al., 2008). In this way, social media draws our attention to the fact that creativity is a collaborative rather than an individual endeavor. Further, social media provides an opportunity for us to observe how creative ideas rise and spread within a community, which would otherwise be difficult to track an entire system in the physical world.

The lessons from this endeavor have far-reaching applications, not only because they illuminate how creativity and innovation proliferate in an increasingly online society, but also because they have implications for how organizations of all types can better design for the promotion of these outcomes. We close with a discussion of how social media expand our notions of creativity and focus on implications on how to harness the creative power of collaboration in both our online and physical communities.

Research questions

Using a design-based approach, this study investigated the following research questions:

1. How does the online community determine creativity?
2. How does the field take up ideas? In what ways might these be considered to be spreadable ideas?
3. How are specific creative ideas determined through the interactions/mediation between the individual, the field and the domain?

The Architecture Unit in Quest Atlantis

This study was hosted in Quest Atlantis (QA), a multi-user virtual environment where players (''Questers''), aged 9-16, immerse in educational and socially negotiated activities. Quest Atlantis has commercial gaming characteristics that are combined with educational features to produce meaningful lessons. The QA environment responds to players' choices based on their previous performance in a particular trajectory, resulting in a transactive experience between player and environment (including the virtual space as well as the social fabric of the online community) where each affects and influences the other (Barab *et al.*, 2010; Barab *et al.*, n.d.). What distinguishes the particular creative experience in Quest Atlantis from other social media environments is that players formulate their ideas through immersion in a narrative, positioning them as active agents of change. Therefore, agency and the idea that the world can be changed based on Questers' creative choices is a powerful means of explaining the relationship of the individual with the field and the changes that are acknowledged as creative.

Units within QA are sets of missions that target towards a larger narrative. One such unit, Architecture, was developed specifically to explore Questers' relationships with the themes of social alignment and creative expression, and provides players with the tools to create their own 3D virtual buildings in a gaming narrative based on Ayn Rand's novel, *The Fountainhead* (Rand, 1943). The Architecture Unit is situated within an area of QA that hosts a number of media production and consumption trajectories (Jenkins, 1998; Peppler and Kafai, 2007), and is unique among other QA environments in that it was designed to be player-run, emphasizing creative production as a means of evolving one's identity in the play space.

Rand's novel centers on the experience of an architect, Howard Roark, who chooses to struggle in obscurity rather than compromise his artistic and personal vision. Another architect, Peter Keating, who chooses to sacrifice his creative freedoms in favor of capital gains, represents the antithesis of Roark's philosophy in the work. *The Fountainhead* embodies the enduring dichotomy of creativity vesrus constraint and personal integrity versus social alignment. These themes presented in the novel provide the backdrop for exploring the influence of cultural ideologies on creative communities.

In the Architecture Unit, Questers become acquainted with the opposing ideologies of Rand's novel when they meet both Roark and Keating at an architecture firm. In order to begin apprenticeship at the firm, Questers have to identify their values as they relate to integrity and social alignment, resulting in their choice to join either Roark's team (which has less constraints on the types of buildings they can build but with fewer city contracts) or Keating's team (which has more creative restrictions but is guaranteed more money). Upon their choice, Questers go through a tutorial that introduces them to their mentor architect's philosophies, followed by the chance to build 3D architecture within the game space based on their mentor architect's list of guidelines. If the buildings they design do not follow their mentor architect's ideas, the players cannot move forward. After they have earned the trust

of their master architect, they earn a plot in their master's ''sandbox world'' to start building. It is in this ''sandbox'' where Questers exchange ideas with others while in the process of constructing their own buildings.

It is important to note that, while Rand's novel emphasizes individualism, the narrative in-game opens the possibility for players to formulate their own opinions about Rand's ideology and to come to the understanding that creativity, as Csikszentmihalyi would say, is determined by the interaction between the domain, the field and the individual.

Methodology

Eighty-five elementary- and middle-school-aged youth from several countries engaged in the architecture mission in schools, after-school centers or at home. Data was collected from multiple sources, including submitted reports throughout the gaming missions, screenshots from Questers' buildings, as well as chat and message logs. We analyzed qualitative data focusing on specific spreadable ideas that emerged through the interactions with the field, including chats about the most popular ideas that emerged in the community. Events were then further coded and analyzed to illuminate how players learn about such ''spreadable'' ideas and use collaboration to enhance their creative visions. A deeper analysis of the cases in relation to the spreadable ideas provided us with an understanding of the how the sociocultural context created in the sandbox worlds influenced how the youth functioned at the individual, as well as at the collective, level.

Findings

Creativity as a cultural construct

The Architecture Unit was a design-based research project. From its inception, we designed the mission and narrative to support two very different creative cultures. The first culture, led by Roark, operated under the following architectural challenges:

- All architects can use bright and extreme colors. They can make any combination they like to give their building any feeling they want.
- Texture can be any choice from a variety of textures.
- Curved surfaces and unusual shapes are allowed anywhere.
- Roofs can have any style and be made with any available material.

By contrast, Keating's team was designed to emphasize conformity and have strict rules, which included:

- All buildings must have a brick texture on the front side.
- Architects can choose from one of 15 textures for the rest of the walls.
- Architects must use only straight and parallel lines with no curved surfaces.
- All buildings must have one floor with two doors and square windows.

As the players were apprenticed into each of these firms, it shaped the techniques they used in the space. Even when there were no constraints placed on building, players continued to build in the styles in which their master architects valued despite having access to the same materials and sharing 90 percent of their training across the two firms. Figures 1 and 2 illustrate the differences in architecture across the two firms.

Clearly, the aesthetic impressions of creativity in the two worlds were quite different. The buildings in Keating's world follow conservative structures and are mainly square-shaped; they emphasize earthy tones, giving an impression of bricks, and present a generally more unified vision for the building. As reflected in Figure 2, however, the buildings in Roark's world have colorful interior and exterior designs. Even though the building in Figure 2 is largely rectangular, the colors and overall aesthetic are decidedly non-conformist. While Figure 1 is predominantly uniform, Figure 2 represents an amalgam of styles, combining multiple colored modules, an inset courtyard that creates an interesting façade for the building's entrance, and exotic foliage.

Figure 1 A representative building from Peter Keating's team

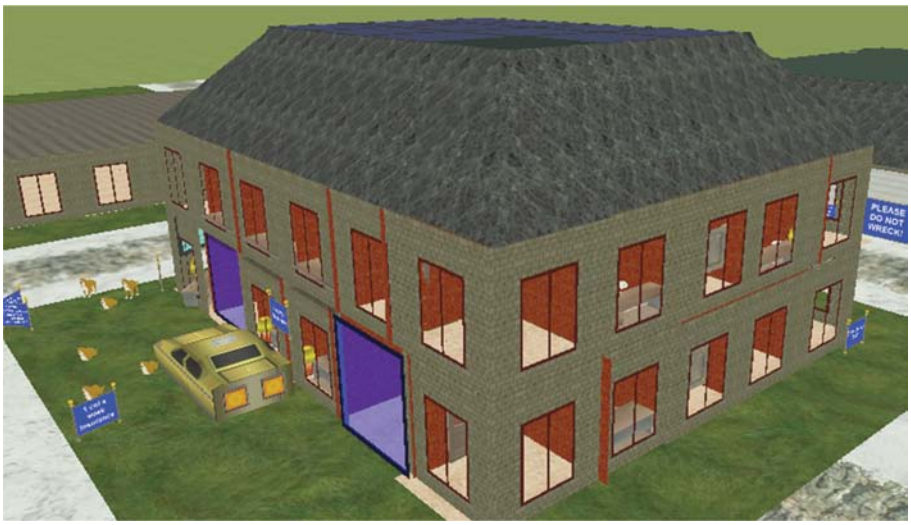


Figure 2 A representative building from Howard Roark's team

In sum, the two communities illustrate how two different, but related, systems of creativity could emerge, illuminating how creativity can be viewed as a cultural construct that is deeply rooted in local values. Further, such aesthetic values can be designed into the fabric of the community culture and deeply shape the domain. This also highlights that domains are specific to a community and many variations of what one might initially think of as a single domain of 3D architectural building can be made up of several variations of this domain with separate fields and individuals contributing to them. Very small variations in the articulated values combined with a simulation exercise to illustrate how these values are rendered in 3D architecture produced very different outcomes within these communities. Creativity also occurs within the constraints of the community values as evidenced in Keating's context, where creativity occurred even under a large number of restrictions. In art history, we see similar outcomes in medieval art and architecture, for example, where the Catholic Church held certain constraining aesthetic values. While there is a great deal of similarity in architecture during this period, there are also innovations and highly creative works produced as well (e.g. the Notre Dame cathedral).

Collaborative creativity. Beyond a cultural construct, creativity is a social endeavor. Our systems-based approach led to identifying several collaborative moments where creative ideas emerged and were fostered by the community. Creative ideas were those that were adopted in the 3D space and were appropriated within Questers' online chat and building practices. Throughout data analysis, we highlighted several cases/vignettes from Roark's building world that illustrated architectural trends that were enhanced by Questers' collaborations. The following vignette is indicative of such interactive practices.

Tina and Ellie were two middle school students on Roark's team who met for the first time while building in his ''sandbox''. Chat logs reveal that their initial conversations were inspired by a mutual admiration for each other's architectural aesthetics. The following is an example of how a piece of work can be acknowledged as creative by members of its community:

Tina: . . .i built this place
Ellie: this is cool
  Awesome! You did a great job, much better than mine!
Tina: go over 2 the place beside the skate board place at the rollerskaters
  no urs is good
Ellie: k
  thank you
  Awesome!
Tina: thnk
Ellie: Very colorful! =)
Tina: come over here follow me
  hey look inside
Ellie: this is your's too?
  Wow!
Tina: yeah fly threw [through] the top
Ellie: cool!
Tina: look inside
  I used these fountains in the building that got deleted
  do u like it
Ellie: Totally!

After Ellie and Tina engaged in discussion about the buildings each had designed in the architecture world, they brainstormed on ways that they could collaborate in the creation of some new buildings:

Tina: [. . .]why dont u build a building in honor of me and this place can be in honor of u and u can have the 1 in honor of u and i can have the 1 in honor of me
[. . .]
Ellie: Whoa thanks! I'll make a building in honor of you! Maybe the park when I get it done
[. . .]
Tina: im gonna watch u work
Ellie: I love Grecian architecture
Tina: yeah
Ellie: I don't think I like the orange and pink, can you think of some other colors while I work on this
Tina: green
  blue
  teal
  magenta
Ellie: k
  thanks
  that looks pretty

The end product of their collaboration was a very colorful two-story building, with one floor designed by Tina and the other designed by Ellie (see Figures 3 and 4). In this vignette, Ellie and Tina's collaboration comes in stages, representing a developmental trend from having the individual as the sole source of ideas to pulling on a wider repertoire of co-devised ideas. What might seem like parallel streams of individual efforts at the outset is, in fact, not contrary to the spirit of collaboration, but is an essential role in Csikszentmihalyi's conception of creativity. As each individual interacted and was influenced by their peers, the conversations in which Tina and Ellie engaged stimulated ideas different from what either individual would

Figure 3 Tina's skateboard park

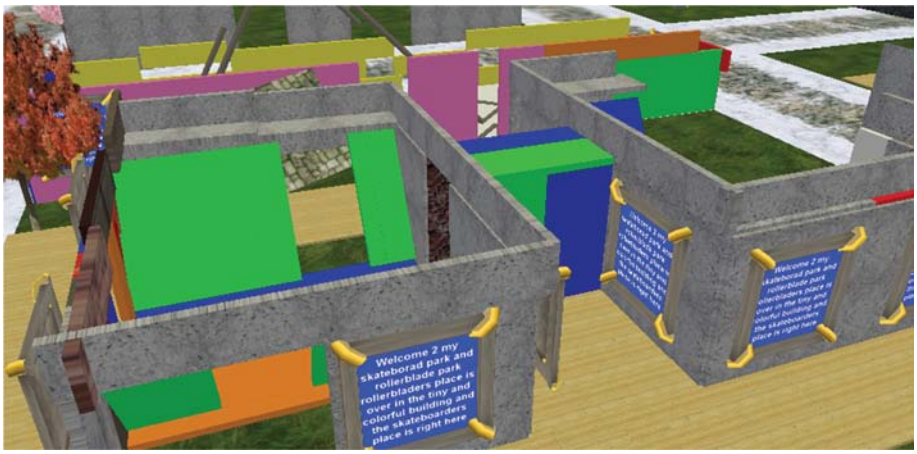


Figure 4 Ellie and Tina's final building with bright colors

have come up with on their own. Moreover, the larger Quester community recognized Tina and Ellie's building as being exemplary work, a societally enforced reward for the active co-creation of new ideas. Based on the success of their collaboration, the two worked together on a series of other buildings over the course of our data collection. This vignette illustrates how creativity can be a product of social collaboration and mediated interaction.

Spreadable ideas

Using a systems-based approach, we identified architectural ideas that were seen as creative by the larger field of Questers. Creative ideas were those that new builders wanted to appropriate and the field of participant observers (those with and without a building license) spent time discussing and valued highly for one reason or another. After further analysis, we focused on the most frequently replicated and discussed emergent ''creative'' ideas within the community:

- fire textures;
- mushroom-shaped houses;
- glass;
- bright colors/aesthetics; and
- animated objects.

Discussion of these ideas is presented below, in addition to insights into how communities adopt creative innovations through collaborative learning.

Playing with fire. A number of Questers found changing the texture of objects challenging but also a key space for creativity in their buildings. When the Architecture Unit was first introduced, several buildings began to have fire textures (see Figure 5) on their walls and on some of the objects. Questers seemed to like the particular texture because of its animated image, with many participants making comments in the chat log that concerned their personal associations with fire. Jath554mse, for example, reported: ''It makes me feel cool and very warm inside . . . because of its fiery color and the way the color moves . . . . I like what it looks like on the inside when you are in it because it looks like you are in a fire''. Given the difficulty in changing the textures of building objects, several Questers built tutorials for others to follow and a flurry of chat activity (both on and offline) resulted around this activity. Chat records, screenshots, and interviews were further analyzed to better understand how the incorporation of fire textures evolved within the community and how knowledge of these practices were spread.

Mushroom houses pop up everywhere. Another salient example of spreadable ideas within the community comes in the form of mushroom-shaped houses (see Figure 6) – easy-to-import objects that sprang up at the start of our observations, present in the majority of lots for several months, with some students stacking multiple mushrooms at different levels on a single building. At the community level, the idea seemed ripe with creative opportunity from the beginning; Questers would adopt one person's mushroom house for their property but would personalize it by changing the texture. The advancement of more technical proficiency in the community over time enabled for more complicated designs, evolving Questers' use of mushroom houses to more decorative elements within a grander

Figure 5 An example of fire textures on the exterior of a house

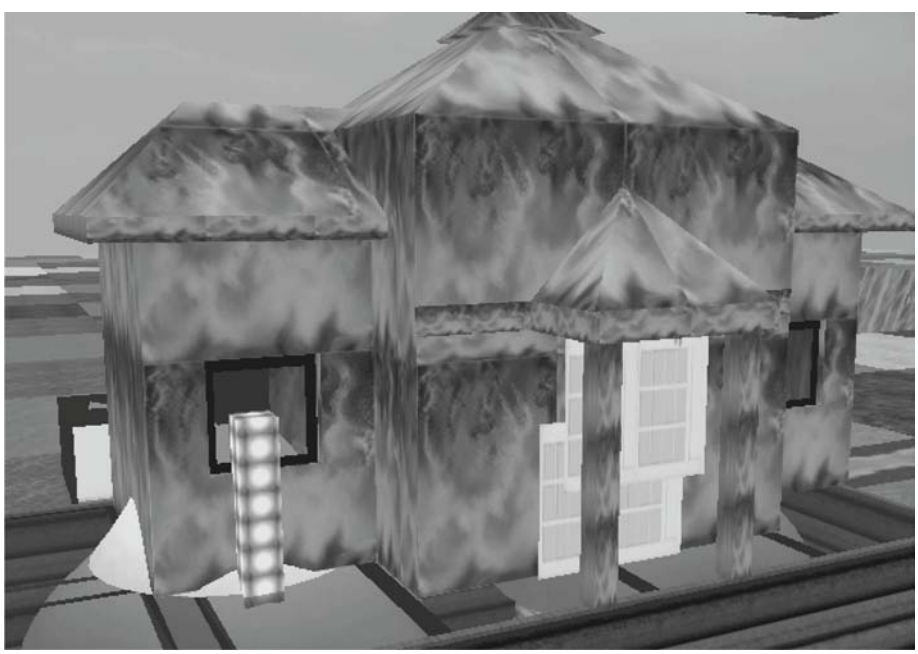
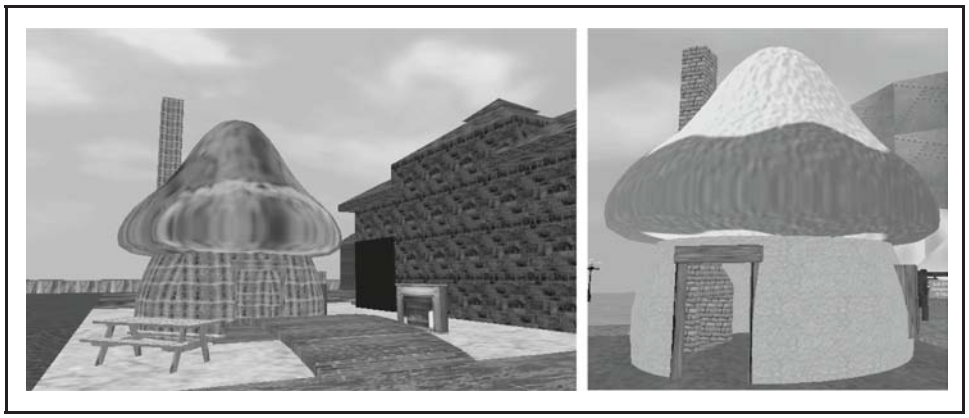


Figure 6 Two examples of mushroom house deployment in Howard's ''sandbox.''



architectural design. The permutations of how mushroom houses were employed and customized in the lots can be seen in Csikszentmihalyi's model as indicators of the objects' community-evaluated creative value.

And, yet, the mushroom trend died out entirely five months after data collection began. In its place, new buildings built entirely from scratch emerged, indicating a continual rising of technical proficiency rising within the community. Despite the fact that the means in which to import mushroom houses was readily available throughout the entire length of the study, architects, veteran or newcomer, avoided the use of mushroom houses entirely after the initial peak usage (even though they continued to be in line with Howard's preference for curved roofs), suggesting that a social valuation of new types of objects was governing the employment of these structures, apart from the unchanging game narrative.

This scenario illustrates the limited lifespan of creative ideas, a rising and falling of communal trends exemplified in a systems view of creativity as the ever-evolving domain – the take-up of mushroom houses could be seen as creative within the community at certain time points but was not seen as such in others. As the community became more sophisticated in their technical capacity, the solution was seen as unoriginal or artless. Time plays a significant role in a systems approach to creativity (i.e. how a one-time creative innovation may fade in favor of other solutions as the community evolves their practice). While there are many interpretations for why this may be the case, the shifting skyline of Howard's ''sandbox'' serves as an indicator of the evolving and changing of the community and that the visual markers of this change serve to reinforce or alter the direction of the domain.

Discussion

This study calls our attention to the ways that creativity is a cultural endeavor, shaped and persisted through the actions and values of many people. The Architecture Unit shows how two sub-communities within an online population formed around opposing cultural values and, in turn, contributed to the online environment through virtual architecture that was consistent with their communal philosophies. Architecture is an especially appropriate theme for this experiment as, for as long as it has been documented in the West, a central function of architecture was to serve as a public manifestation of the creative values of a community, and architectural innovations that happen within those communities are inextricably linked to and confined by the values that the community holds. This dynamic is no different in online spaces. The proliferation of Web 2.0 capabilities – embodied in gaming environments, Facebook and YouTube, among others – is moving greater areas of the internet beyond transmission-only spaces and into dynamic environments that thrive on the thought transactions and contributions of a community of participants. Findings from the Architecture Unit point to the successful development of a dynamic social media platform

designed to promote engagement on behalf of distinct creative cultures and sustain engagement among individuals new to the domain of virtual architecture.

Analysis of the building trends that emerged within Architecture point to the ways that creative ideas are those that can be seen as spreadable. In online communities, more so than other communities, ideas spread quickly among members. The Architecture Unit also revealed that spreadable ideas have a limited lifespan as determined by evolving tastes and values of a community. For example, the mushroom houses that dominated community mindshare at the beginning of the study all but disappeared by the end, highlighting how creative innovations move in cycles of adoption and rejection, which is what occurs when ideas at their height of recognition then become pushed against in order to leave room for further innovation. As new members enter the community, they build on the ideas of prior work and try things in new combinations, continuing to evolve the domain.

Furthermore, the mechanism that enables creative ideas to spread and mature is the act of conversation. Data from the Architecture Unit shows us how creative artifacts served as the foundation for dialogues that enabled communities at large to determine and negotiate their cultural values. The act of conversation, as well as the ability to share artifacts that become the focus of conversation, is a central both to Csikzentmihalyi's model of creativity as well as the central tenets of social media. As more of our world moves into online spaces, social media platforms become a central fountainhead for dispersed communities to share innovative ideas and original artifacts, as well as contribute to the discussions around those ideas. The globalization of these dialogues points to the broadening reach of the field, as well as the creation of more informed domains. The Architecture Unit was designed specifically to seize this opportunity of social media, providing Questers with the tools to create their own artifacts and advance new domains. The increasing digitization of contemporary culture heightens the role of social media platforms as primary spaces where innovation is recognized, adopted and developed for the world at large.

This study demonstrates that today's leaders can design opportunities to foster collaboration and creativity in their own domains. For example, those in leadership positions can capitalize on social media tools like Ning, Second Life, or other types of software that allow them to create their own social media environment specific to their community's needs. Furthermore, it's important to have an archive and record of these collaborations so that, progressively, new generations of members can build on existing innovations and can define those ideas that are creative as those that are taken up and used broadly by the community. By better harnessing creativity in social media, organizations, policy makers, officers, and analysts can work together more efficiently; governments can leverage online platforms to collaborate with the public in the conception of citizen services (e.g. ChallengePost.com is now the ''challenge platform'' for the US Federal Government); and as more businesses and educational institutions move online, better understanding how to design cultures that inspire creative outcomes is especially important.

References

Barab, S.A. (2006), ''Design-based research: a methodological toolkit for the learning scientist'', in Sawyer, R.K. (Ed.), *Cambridge Handbook of the Learning Sciences*, Cambridge University Press, Cambridge, pp. 153-70.

Barab, S.A., Peppler, K. and Ingram-Goble, A. (n.d.), ''Videogames as a form of transactive art with dramatic agency'', *Journal of the Aesthetic Education* (forthcoming).

Barab, S.A., Dodge, T., Thomas, M., Jackson, C. and Tuzun, H. (2007), ''Our designs and the social agendas they carry'', *Journal of the Learning Sciences*, Vol. 16 No. 2, pp. 263-305.

Barab, S.A., Dodge, T., Ingram-Goble, A., Pettyjohn, P., Peppler, K., Volk, C. and Solomou, M. (2010), ''Pedagogical dramas and transformational play: narratively-rich games for education'', *Mind, Culture, and Activity*, Vol. 17 No. 3, pp. 1-30.

Barnes, S.B. (2006), ''A privacy paradox: social networking in the United States'', *First Monday*, Vol. 11 No. 9, available at: http://firstmonday.org/htbin/cgiwrap/bin/ojs/index.php/fm/article/view/1394/1312 (accessed July 14, 2010).

Csikszentmihalyi, M. (1996), *Creativity: Flow and the Psychology of Discovery and Invention*, HarperCollins, New York, NY.

Dodge, T., Barab, S.A., Stuckey, B., Warren, S., Heiselt, C. and Stein, R. (2008), ''Cultivating self: learning and meaning in the digital age'', *Journal of Interactive Learning Research*, Vol. 19 No. 2, pp. 225-49.

Greenhow. C., Robelia, B. and Hughes, J. (2009), ''Web 2.0 and classroom research: what path should we take now?'', *Educational Researcher*, Vol. 38 No. 4, pp. 246-59.

Guilford, J.P. (1950), ''Creativity'', *American Psychologist*, Vol. 5 No. 9, pp. 444-54.

Jenkins, H. (1998), ''Voices from the combat zone: game girls talk back'', in Cassell, J. and Jenkins, H. (Eds), *From Barbie to Mortal Combat: Gender and Computer Games*, MIT Press, Cambridge, MA.

Kaufman, J., Baer, J., Cole, J. and Sexton, J. (2008), ''A comparison of expert and non-expert raters using the consensual assessment technique'', *Creativity Research Journal*, Vol. 20 No. 2, pp. 171-8.

MacDonald, R., Byrne, C. and Carlton, L. (2006), ''Creativity and flow in musical composition: an empirical investigation'', *Psychology of Music*, Vol. 34 No. 3, pp. 292-306.

Papert, S. (1980), *Mindstorms: Children, Computers, and Powerful Ideas*, Basic Books, New York, NY.

Peppler, K. and Kafai, Y. (2007), ''From SuperGoo to Scratch: exploring creative digital media production in informal learning'', *Learning, Media, and Technology*, Vol. 32 No. 2, pp. 149-66.

Pinkett, R.D. (2000), ''Bridging the digital divide: sociocultural constructionism and an asset-based approach to community technology and community building'', paper presented at the 81st Annual Meeting of the American Educational Research Association (AERA), New Orleans, LA, April 24-28, available at: www.media.mit.edu/~rpinkett/papers/aera2000.pdf (accessed January 16, 2011).

Rand, A. (1943), *The Fountainhead*, Bobbs Merrill, New York, NY.

Sawyer, R.K. (2006), *Explaining Creativity: The Science of Human Innovation*, Oxford University Press, New York, NY.

Sawyer, R.K. (2007), *Group Genius: The Creative Power of Collaboration*, Basic Books, New York, NY.

Schneiderman, B. (2000), ''Creating creativity: user interfaces for supporting innovation'', *ACM Transactions on Computer-Human Interaction*, Vol. 7 No. 1, pp. 114-38.

Sternberg, R.J. (2003), ''The development of creativity as a decision-making process'', in Sawyer, R.K., John-Steiner, V., Moran, S., Sternberg, R.J., Feldman, D.H., Nakamura, J. and Csikszentmihalyi, M. (Eds), *Creativity and Development*, Oxford University Press, New York, NY, pp. 91-138.

About the authors

Kylie A. Peppler is an Assistant Professor of Learning Sciences at Indiana University, Bloomington. As an educator and artist by training, she engages in research that focuses on the intersection of arts, interactive technologies, and new literacies. Her research has been or is currently being supported by grants from the Spencer Foundation, the National Science Foundation and the John D. and Catherine T. MacArthur Foundation. Kylie A. Peppler is the corresponding author and can be contacted at: kpeppler@indiana.edu

Maria Solomou is a doctoral student in the Learning Sciences Program at Indiana University. She is interested in digital media like gaming environments and investigates the ways in which learning and creativity are sourced through interactions in gaming contexts, virtual and in real life.