International Panel Discussion: Challenges and Opportunities for Research and Design of Future Learning Spaces (Panel)

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Abstract

One key aspect of the educational transformation into the modern era has been the transition of spaces from being immutable to negotiable. In light of the technological, pedagogical, and theoretical innovations that have accompanied this transformation, this international panel discussion brings together five leading researcher centers that consider space as a meaningful, mediational tool within their learning environments. In each case, researchers present their innovative Future Learning Spaces along with the conceptual frameworks they use to describe them. By considering these five advancements together, this session aims to highlight the challenges and opportunities for research and design of Future Learning Spaces.

Keywords: educational technologies, future learning spaces, sociocultural.

Introduction

Innovations in educational thinking over the past several decades have led researchers and practitioners to make advances about the spaces where learning takes place, referred to as Future Learning Spaces (FLSs). Whereas once classrooms were viewed as immutable containers for knowledge transmission, today the idea of space is being constantly re-negotiated, driven by innovative technologies and pedagogies meant to prepare students to participate in the new knowledge society (Facer, 2014). This symposium brings together an international panel of experts, seeking to advance these conceptualizations, by presenting four perspectives on the role of space within changing educational designs.

One of the useful ways that learning scientists have approached the problem of re-conceiving education has been by adopting sociocultural perspectives of learning. Rooted in Vygotskian thought, this perspective views learning as mediated by cultural and historical tools that individuals internalize as they are socialized throughout their lifespan (Wertsch, 2007). Educational researchers have extended this view by considering learning to be transforming participation into certain ways of knowing, such as the practices or discourse of different communities (Lave & Wenger, 1991). The implication of this view for schools has been a re-conceptualization of classrooms from places where knowledge is transmitted to learning

communities (LCs) (Bielaczyc, Kapur, & Collins, 2013). In taking a community perspective, an array of mediators beyond just transmitting content knowledge becomes the subject of educational design.

Along with different pedagogies, activities, and assessment practices, space has gained relevance as a mediator of social configurations and interactions for students' transformations of participation (Jordan & Henderson, 1995). As such, one line of research in the learning sciences that has emerged is to explore how physical arrangements are designed meaningfully to foster students' trajectories from vernacular discourses, informal ideas, and peripheral participation to central or authentic discourse and practices (Roth et al, 1999). Still, this new focus comes with the recognition that space is only one among other ubiquitous mediating structures that share a complex relationship (Pea, 1993). Instead of treating them separately, FLS research emphasizes space within the other situationally related tools such as activity, social or epistemic norms, assessment, or learning trajectories. This integrated view of space and the mutual fertilization of mediators within learning ecologies is one of the greatest opportunities and challenges related to the theoretical underpinnings of FLSs.

In this international panel discussion, we bring together five diverse international lines of FLS research. From each presenter, we seek to understand (1) the way they conceptualize space within their research, (2) the unique designs of their research setting with an emphasis on space; (3) challenges and opportunities for researching and designing FLSs; and (4) advice for others seeking to develop their own FLSs. The format of the session will include an introduction to FLS by the session chair, followed by interviews of the international researchers. An ensuing discussion that includes the experts and audience will focus upon these four issues.

Five International Perspectives on Future Learning Spaces

Interconnecting the Knowledge Spaces of Different Communities for Sustained Knowledge Building

Jianwei Zhang

Real-world knowledge-creating communities achieve productivity through sustained inquiry and progressive discourse by which ideas are continually developed, refined, and built upon, giving rise to more advanced conceptualizations and deeper goals (Sawyer, 2007). Such efforts are further supported by interactions across communities that work as an interconnected intellectual field (Csikszentmihalyi, 1999). Educational efforts to create LCs for knowledge building need to enable similar social and cognitive dynamics sustained over long periods of time (Engle, 2006). This research aims to create socio-technological spaces that connect the knowledge of different communities across classrooms and school years. Existing designs of collaboration across LCs rely on directly sharing the original online discussion space—a single layer sharing. However, doing so proves difficult (Laferrière et al., 2012), as it requires students to read the messy and lengthy discourse of others to understand their progress, causing high cognitive and collaboration load (Dillenbourg & Bétrancourt, 2006).

This project adopts a multilevel design to create a macro-level, cross-community knowledge space on the top of the discourse spaces of different local communities. The macro-level knowledge space is enabled by the platform of Connecting Idea Threads of Youth (CITY) developed on the basis of Idea Thread Mapper (ITM), a Web-based tool to trace conceptual trajectories in long-term online discourse (Chen et al., 2013). CITY interoperates with Knowledge Forum (Scardamalia & Bereiter, 2006) and other tools for collaborative discourse. As members in each community engage in sustained discourse in their protected online space, they review their unfolding idea threads, each of which consists of a set of idea contributions that address a shared theme or problem (Zhang et al., 2007). Organizing distributed discourse entries into timeline-based idea thread helps to make the collective progress visible for reflection. Different communities then select and publish productive idea threads for cross-community sharing and build-on. Social interactions in CITY allow members to discover,

follow, comment, cluster, and adopt the idea threads from different communities for mutual learning and dynamic idea contact.

Knowledge Construction in the Instrumented Classroom: Supporting Student Investigations of Their Physical Learning Environment

James D. Slotta

This research program leverages the physical classroom space to support a knowledge community (e.g., Scardamalia & Bereiter, 2006). Our pedagogical model, known as Knowledge Community and Inquiry (KCI), builds on the foundation of knowledge communities, with an added major emphasis on scaffolded inquiry (Slotta & Linn, 2009). The present research was conducted within an instructional environment referred to as Embedded Phenomena for Inquiry Communities (EPIC; Slotta, Tissenbaum, Lui, & Zukowski 2012), where KCI was applied as a pedagogical model to develop a knowledge community for elementary students to investigate Embedded Phenomena. In EPIC classrooms, students work collaboratively and collectively, sharing information and solving problems. Interactions, including the exchange of data and theories, are carefully designed to support the growth of collective knowledge concerning the EP under investigation, as captured in various representational forms.

We employed the WallCology EP as the setting for whole-class inquiry, targeting life sciences topics of biodiversity and population ecologies (Moher, Uphoff, Bhatt, Lopez-Silva, & Malcolm, 2008). The ecosystem comprised four differentiated but interconnected habitats, one on each wall of the classroom, which varied in terms of environmental conditions (temperature, light and humidity). In our EPIC activity, students made observations about the morphologies and behaviors of organisms to determine their life cycle relationships. Constructing a representation of the lifecycles of any species was a challenging task; it was not always clear which organism belonged to which species. It required careful observation for students to actually "see" life events like laying and hatching unfold. Additionally, since each monitor displayed a different habitat, students at one monitor see something different than students at another monitor, necessitating the sharing of observations. The goal of the EPIC design innovation was to create a more powerful means of sharing and working with these observations, by aggregating individual or group inquiry actions, and encouraging teacher and students to attend to interesting data.

Designing Spaces to Foster Collaboration

Elizabeth Charles

Our FLS is based on a cross-institutional researcher-practitioner team made up of learning scientists and physics instructors, at the college level in Quebec. Members of the team have been directly involved in fostering Active Learning Classrooms (ALCs) over a six year period. The architecture and furnishings of ALCs shift the object of instruction toward student-centered activity and reshape the teacher's traditional authority structures. Instead of rows of front-facing desks, these new spaces feature cone-shaped tables that draw learning groups' attention to collaborative technologies such as large writable surfaces, and networked computing systems that support teachers' orchestration (Charles & Whittaker, 2015) and allow for monitoring of distributed collective knowledge.

Using reflexive methodologies of action research and design-based research, the team has studied processes involved in adopting and effectively using ALCs to promote learning and change instructional practices. Our current research involves comparing the implications of the three primary models of ALCs within the college network. Differences between the ALCs models hinge on the types of perceptual spaces they provide the student groups (public vs. private, networked vs. singular, interactive vs. static) and the flexibility of the group configurations (fixed tables vs. flexible tables). These studies have expanded our understanding of how ALCs function and the role of the learning community to support the ways these learning spaces are used. For this panel we will draw commonalities derived from these diverse

case studies and suggest guidelines that support meaningful joint-activity mediated by the physical space and pedagogical commitment.

Conceptualizing and Researching Overlapping Communities of Learners

Scott P. McDonald & Michael M. Rook

The Krause Innovation Studio on the campus of the Pennsylvania State University is a future learning space with two separate but complimentary learning environments. The first is a de-centered classroom designed to enable seamless movement between small and large group discussions. The second is a diverse-use open space designed to support collaboration with multiple privacy levels including public, semi-private, and private tables and rooms. Both spaces incorporate technologies to facilitate group collaboration and serendipitous learning interactions. Often, multiple learning communities (LCs; Brown & Campione, 1994) interact within the Studio, and we are attempting to understand how the Studio supports those interactions.

In the four years of the Studio's existence, the research team has attempted to understand how the Studio supports multiple LCs. The research team has collected iterative sets of data including interviews with stakeholders during the design of the Studio (Rook et al., 2015), spatial use data, and most recently phenomenological interviews of learners across multiple LCs (Choi et al., 2015). In a previous study of the design of the Studio, Rook et al. (2015) uncovered three principles from an analysis of design stakeholders. The Studio was designed to include: "diversity of spaces"; environments that would facilitate the practice of "bring-your-own-device"; and "furniture to support social practices" (p. 9-10). All three were grounded in notions of how people learn including sociocultural theory (Vygotsky, 1978), situated cognition (Brown et al., 1989), and situated learning (Lave & Wenger, 1991).

This research program has led to the characterization of learning design principles that enable and facilitate the intersection of LCs. Learning spaces should scaffold authentic practices, allow for multiple representations of learning, and be pedagogically responsive (Rook et al., 2015). These principles are both empirical and theoretically grounded in ideas about LCs and how multiple LCs might interact.

Designing an FLS based on Learning Community Principles

Yotam Hod, Dani Ben-Zvi, Patrice Tamar Weiss, & Yael Kali

As a significant part of a recent ISF center of excellence grant, we have been engaged in a large-scale project to design and construct a new FLS for our graduate program, based on an LC model. The features of our LC include a (1) humanistic orientation; (2) emergent-design; and (3) design for enculturation.

By *humanistic orientation,* we mean extended efforts to get to know one another, such that group dynamics and transformative changes in identities and long-held learning practices are challenged and negotiated (Hod & Ben-Zvi, 2014; 2015). To support the creation of a safe and intimate space so that students can engage in such processes, we have designed the space with plants, rugs, a coffee bar, and warm colors to give it an inviting feeling. Likewise, we have repurposed several unused outdoor spaces with wooden decks and comfortable seating.

Flexibility is a key design aspect of our space based on the *emergent-design principle*. Our FLS will employ an innovative design called learning niches, which are noise-reducing partitions that fold in and out of the walls such that small groups of students can meet in private, with minimal interference from others but quickly be reconfigured to support interaction with the whole class. Other ways that we support flexibility are with easily moveable and combinable furniture, and an any-to-any communication system supported by embedded multi-touch screens, allowing for individuals or groups to collaborate with others via video, either inside or outside the physical space.

The LC is *designed for enculturation* of scientific practices, giving students opportunities to learn-to-be as well as to learn about content. We have accordingly designed the FLS to include

research facilities, giving graduate students direct access to authentic practitioners (Hod & Sagy, 2015).

References

Bielaczyc, K., Kapur, M., & Collins, A. (2013). Cultivating a community of learners in K-12 classrooms. In C. E. Hmelo-Silver, C. A. Chinn, C. K. Chan, & A. M. O'Donnell (Eds.), *International handbook of collaborative learning* (pp. 233–249), New York, NY: Routledge.

Brown, A. L., & Campione, J. C. (1994). Guided discovery in a community of learners. In K. McGilly (Ed.), *Classroom lessons: Integrating cognitive theory and classroom practice* (pp. 229-272). Cambridge, MA: The MIT Press.

Brown, J. S., Collins, A., & Duguid, P. (1989). Situated cognition and the culture of learning. *Educational Researcher*, *18*(1), 32-42.

Charles, E.S., Whittaker, C. (2015). Active learning spaces: Blending technology and orchestration. Lindwall, O., Häkkinen, P., Koschman, T. Tchounikine, P. & Ludvigsen, S. (Eds.) (2015). *Exploring the Material Conditions of Learning: The Computer Supported Collaborative Learning (CSCL) Conference 2015, Volume 1* (pp. 225-226). Gothenburg, Sweden: ISLS.

Chen, M.-H., Zhang, J. & Lee, J. (2013). Making collective progress visible for sustained knowledge building. In N. Rummel, M., Kapur, M. Nathan, & S. Puntambekar (Eds.), *CSCL 2013 Conference Proceedings Volume 1* (pp. 81-88). Madison, WI: ISLS.

Choi, K., Rook, M. M., & McDonald, S. P. (2015, November). Experiencing informal learning spaces. *Concurrent session at the Annual Conference of the Association of Educational Communications and Technology*, Indianapolis, IN.

Csikszentmihalyi, M. (1999). Implications of a systems perspective for the study of creativity. In R. J. Sternberg (Ed.), *Handbook of creativity* (pp. 313-335). UK: Cambridge University Press.

Dillenbourg, P., & Bétrancourt, M. (2006). Collaboration load. In J. Elen and R. E. Clark (Eds), *Handling complexity in learning environments: Research and theory* (pp. 142-163). Pergamon.

Engle, R. A. (2006). Framing interactions to foster generative learning: A situative explanation of transfer in a community of learners classroom. *Journal of the Learning Sciences*, *15*(4), 451-498.

Facer, K. (2014). What is space for? Towards a politics and a language for the human in education. *Technology, Pedagogy and Education*, *23*(1), 121-126.

Hod, Y., & Ben-Zvi, D. (2014). A group psychotherapeutic perspective on transforming participation in a learning community. *Instructional Science*, *42*(6), 949-970.

Hod, Y., & Ben-Zvi, D. (2015). Students negotiating and designing their collaborative learning norms: A group developmental perspective in LCs. *Interactive Learning Environments*, *23*(5), 578-594.

Hod, Y., & Sagy, O. (2015). Enculturating enculturation: A meta-synthesis of the learning sciences' discourse and designs. In O. Lindwall (Eds.), *Exploring the Material Conditions of Learning: The Computer Supported Collaborative Learning Conference*, Volume 2 (pp. 773-774). Sweden: ISLS.

Jordan, B., & Henderson, A. (1995). Interaction analysis: Foundations and practice. *The Journal of the Learning Sciences*, *4*, 39-1 03.

Laferriere, T., Law, N., & Montané, M. (2012). An international knowledge building network for sustainable curriculum and pedagogical innovation. *International Education Studies*, *5,* 148-160.

Lave, J., & Wenger, E. (1991). *Situated learning: Legitimate peripheral participation.* Cambridge, UK: Cambridge University Press.

Moher, T., Uphoff, B., Bhatt, D., López Silva, B., & Malcolm, P. (2008). WallCology: Designing interaction affordances for learner engagement in authentic science inquiry. In *Proceedings of the SIGCHI Conference on Human Factors in Computing Systems* (pp. 163-172). ACM.

Pea, R. D. (1993). Practices of distributed intelligence and designs for education. In G. Salomon (Ed.), *Distributed cognitions: Psychological and educational considerations* (pp. 47-87). Cambridge, UK: Cambridge University Press.

Rook, M. M., Choi, K., & McDonald, S. P. (2015). Learning theory expertise in the design of learning spaces: Who needs a seat at the table? *Journal of Learning Spaces*, *4*(1), 1-13.

Roth, W. M., McGinn, M. K., Woszczyna, C., & Boutonne, S. (1999). Differential participation during science conversations: The interaction of focal artifacts, social configurations, and physical arrangements. *Journal of the Learning Sciences*, *8*(3-4), 293-347.

Sawyer, R. K. (2007). *Group genius: The creative power of collaboration.* New York: Basic Books.

Scardamalia, M., & Bereiter, C. (2006). Knowledge building: Theory, pedagogy, and technology. In R. K. Sawyer (Ed.), *Cambridge handbook of the learning* sciences (pp. 97-115). NY: Cambridge University Press.

Slotta, J.D. & Linn. M.C. (2009). Designing effective collaborative inquiry: New technology frameworks. *Proceedings of the Eighth International Conference on Computer Supported Collaborative Learning*. Volume 2 (pp. 34-36). Rhodes, Greece: ISLS.

Slotta, J.D., Tissenbaum, M., Lui, M., & Zukowski, M. (2012). Smart classrooms for knowledge communities: EPIC technology environment. *Proceedings of the Tenth International Conference of the Learning Sciences*, Volume 2 (pp. 64-71). Sydney, Australia: ISLS.

Vygotsky, L. S. (1978*). Mind in society*. Cambridge, MA: Harvard University Press.

Wertsch, J. V. (2007). Mediation. In H. Daniels, H., M. Cole, & J. V. Wertsch (Eds.). *The Cambridge companion to Vygotsky* (pp. l78 - 192). Cambridge University Press: Cambridge, U.K.

Zhang, J., Scardamalia, M., Lamon, M., Messina, R., & Reeve, R. (2007). Socio-cognitive dynamics of knowledge building in 9- and 10-year-olds. *Educational Technology Research and Development, 55*, 117-145.