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Facilitating Inter-Collaborations in the Learning Sciences

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The aim of this article is to discuss issues surrounding facilitating inter-collaborations in the Learning Sciences. *Educational Technology* has recently published two special issues related to the Learning Sciences:

(1) on whether the fields of Instructional Systems and Learning Sciences are disparate or convergent; and
(2) on Design-Based Research, which seemingly is gaining much momentum and attention.

The field of the Learning Sciences is by its fundamental origins interdisciplinary in nature. It attempts to understand learning, or rather "how we learn," and this question requires multiple perspectives and fields of understanding. Researchers from multiple disciplines, such as education, computer science, neuroscience, linguistics, anthropology, and others, have been interested in this issue. Learning Sciences researchers not only study learning in formal settings, such as classrooms, but are also concerned with learning in and out of schools, including after-school care, museums, etc.

The social constructivist orientation to learning underpins the Learning Sciences, and notions of communities of learners and practice are prevalent. The basic premise is that if we want to understand learning, we have to go to where learning occurs—in the very complex and messy real world. The field attempts to identify strategies and ways to promote richer forms of learning in terms of skills, competencies, dispositions, and knowledge. Because situated cognition is deeply an epistemology of the Learning Sciences, context and environments are central to this study. However, more recently, Learning Scientists have been asking questions relating to how understanding of learning can be translated to the design of activity structures, and strategies for sustaining and scaling up educational innovations, curriculum, and computer-mediated environments. Its methodology includes both quantitative and qualitative methods, and Design-Based Research has been very much an integral methodology. Another integrated stance is that technology can promote learning in meaningful ways.

Increasingly, researchers in Instructional Systems Design and the Learning Sciences are finding convergence in their work, as issues of similar concern arise, especially on current notions of situated learning and authenticity (Hung & Looi, 2004; Looi, Hung, Bopry, & Koh, 2004). Educators and researchers from both communities are beginning to collaborate in joint activities, although there are still some that remain in closely knitted specializations because of their fundamental, deeply-held beliefs about how learning and instruction occur.

The recent special issue of *Educational Technology* (Carr-Chellman & Hoadley, 2004) depicts one attempt at beginning a dialogue between these two communities. Christopher Hoadley himself was a graduate in the Learning Sciences and is now employed by Penn State in Instructional Systems, in part to foster dialogue. Learning Sciences programs for Masters and PhDs are also gaining currency, an example of which is a recent LS start-up at Indiana University–Bloomington. Some researchers previously active in Instructional Systems departments in the USA are engaged currently in Learning Sciences work, such as Sasha Barab (Indiana University) and David Jonassen (University of Missouri).

In a recent visit to several USA centers for learning—or Learning Sciences centers—we noticed the clear emphasis on the collaborative nature of the field. Although we may not be able to find departments as yet in many universities under the umbrella of the Learning Sciences, we are beginning to find programs with such orientations. The precursor is the Northwestern University Learning Sciences program started by Roger Schank and Roy Pea more than a decade ago. More recently, the University of Michigan and Indiana University (noted above) have started their Learning Sciences initiatives and PhD programs. With prominent Learning Sciences community members such as Allan Collins (Northwestern and Harvard), Roy Pea (Stanford), John Bransford (University of Washington at Seattle), Jeremy Roschelle and Nora Sabelli (SRI), Carl Bereiter and Marlene Scardamalia (OISE), Marcia Linn and Alan Schoenfeld (Berkeley), Chris Hoadley (Penn State), Barry Fishman (Michigan), and others scattered throughout USA, the Learning Sciences is gradually maturing.

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In Europe, although researchers may not term themselves Learning Scientists, there are clearly prominent researchers, such as Yrjö Engeström and others. Similarly, in the Asia-Pacific region, we have Learning Sciences-like research initiatives emerging in Japan, Taiwan, Singapore, and elsewhere. The researchers we have mentioned above are just some we have been in contact with and have recently visited.

The focus of this article is to articulate more clearly the issue of inter-collaborations in the Learning Sciences. Inter-collaborations refer to the collaboration of members across communities, such as neuroscience and education, or computer scientists and educators. Increasingly, inter-collaboration (as opposed to intra-collaboration, which is collaboration between members of the same community) is a hallmark of this emerging and growing field. What are the factors and strategies which promote inter-collaboration? How can we further develop the capacity of members across the disciplines and communities of the Learning Sciences—all interested in the issue of how learning occurs—to engage in inter-collaboration?

The Need for Inter-Collaboration

Cross-community, interdisciplinary work is increasingly important. Research in the future will require scholars to work with people in other communities. Hence, there is a real need to understand how individuals can make transitions across disciplines. Issues lie in building capacity toward this end, and to develop tools, structures, and activities that bridge gaps between and among communities. Underlying these structures, individuals need to maintain dialogue and develop mutual trust; and understand the underlying and often hidden assumptions, identities, and epistemologies of members across communities. Norms, languages, and terms used in one community differ from those in another, and hence, we need time and structures to facilitate dialogue between communities. Engeström, Engeström, and Karkkainen (1995) point out that boundary work is linked with the creation of new kinds of task combinations, collaborative connections, and dialogical expertise that breaks down boundaries between professionals and disciplines. We have coined the term "inter-collaborations" to depict the work of individuals interested in understanding issues underlying learning across boundaries or communities.

The issue of crossing boundaries and communities is not trivial because each community has its own set of beliefs and identity. Members crossing communities may often encounter conflicts in identity. If members are truly to be engaged in inter-collaboration, we conjecture that there would be a need to co-form each others' identity. The end result of members (in the Learning Sciences) is a formation of a "new" identity which overlaps with the previous communities from which members came. This formation of identity should be a crucial concern for this emerging field of the Learning Sciences. Here identities can be seen as lateral transitions across communities.

The Process of Identity Transformations

In our recent trip to the USA, we visited, among others, the LIFE (Learning in Formal and Information Environments) center (see *http://life-slc.org*). The LIFE center is an example of an inter-community collaborative which attempts to integrate implicit learning (brain research), formal learning (school-based), and information learning (out-of-classroom contexts) as key research foci. The key research focus in LIFE is to draw upon the interdisciplinary dimensions of the neurobiological, cognitive, developmental, and socio-cultural dimensions of learning and their related methodological approaches in order to advance the science of learning and the design of learning environments.

The LIFE center aims to develop conceptual collisions (conflicts and dissonances) in terms of ideas and possibilities for the field—using multiple perspectives brought to bear on specific projects. Its aim is to build the capacity of people in the field of the Learning Sciences by advancing the members of the three disparate communities (brain sciences, psychological, and social-cultural) and integrating them in dialogue and ideas. It creates the processes and structures through which these interdisciplinary efforts can be managed and fostered. Mechanisms for promoting cross-talk and dialogue among the three communities include:

1. Fostering conceptual collisions—by facilitating presentations, especially among researchers across the three communities; comparing and contrasting critical differences that were previously invisible; and making visible or questioning epistemological and methodological assumptions of the three communities.
2. Hot topics—these topics are in the form of strategic workshops, annual reports synthesizing and summarizing current thinking on the interdisciplinary foci, etc.
3. Signature projects—which span an integrated focus, and which have sustained possibilities of success in terms of deliverables.

As a result of continued and sustained interactions or "collisions" among members of the three communities, it is hoped that the identities of the individuals are being transformed as they mutually interact with one another. Figure 1 illustrates this process of identity transformations.

On entering into another community, one sometimes realizes that his or her heuristics, patterns of behavior,

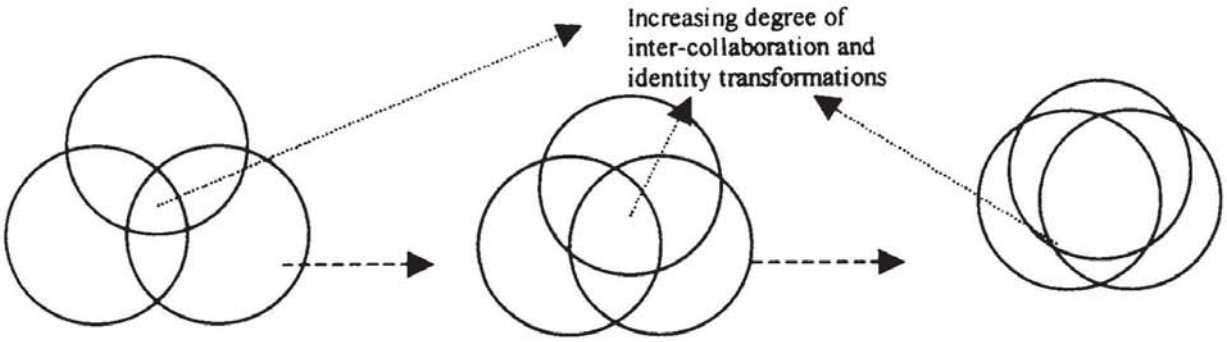

Figure 1. Process of identity transformations.

value systems, beliefs, practices, language, and symbols no longer hold. Some intentional or deliberate identity negotiations between parties become necessary. The confrontations or 'conceptual collisions' require intentional self-reflection (Weber, 2003). Individuals begin to realize that there are alternative interpretations, conceptual structures in thinking, and perspectives. They may also recognize that each individual may have different identities.

One important issue in bringing together individuals from different communities is to foster trust and mutuality. In order to enter into that trust, an individual needs to develop situationally adequate strategies for mindful appropriation of the other—such as listening, recognizing verbal and non-verbal cues, identifying roles via which others function in their contexts, and the assumptions which underlie other communities. These strategies complement inter-community support and are crucial to the success of these supports. In other words, individuals entering into another community need to discover the cultural knowledge of a community—its norms and beliefs, explicit or codified knowledge, its existing documented practices-in-action, and tacit knowledge which can only be picked up through observations, modeling, and apprenticeship (Hung, 1999).

The Need for Capacity Building in the Learning Sciences

In the same vein as inter-collaboration, we recognize that there is some degree of capacity building in the Learning Sciences in this aspect. n tandem with our recent study-visit to the USA, this aspect has been emphasized by many leading professors. The group at the University of California, Berkeley (TELS center led by Prof. Marcia Linn) centered on the science education WISE project. The WISE project began a decade ago working with PhD students who were also science educators. With the development of technology, WISE centered around a structured approach to science content, complemented by the development of good ICT technologies, such as learning resources and objects. The design and development of these resources were done through negotiations between content experts (science educators), education professors, and computer science developers. This content is scalable because the scientific issues can be appropriated by other places. After a number of years, graduate students from Berkeley found employment in other universities and soon brought WISE to their respective localities. In this sense, Berkeley invested in capacity building, and WISE projects were subsequently planted across the USA (and now internationally). The approach adopted at SRI International has been similar. A strong focus on the mentoring of graduates and post-docs from various disciplines in inter-collaboration was adopted.

TELS Inter-Collaboration Efforts

TELS *(http://TELSCenter.org)* merged WISE (from UC Berkeley) and Pedagogica (from The Concord Consortium) to offer the research community a platform for design, development, and delivery of inquiry science curriculum that includes highly interactive, dynamic visualizations and models—an example of boundary objects which facilitate inter-collaboration. WISE supports the design and delivery of inquiry projects, scaffolding students and teachers, and collecting data for purposes of assessment and analysis.

TELS has developed a suite of community resources to support center partnerships as well as the field in general. It has embarked on a collaborative and comprehensive research program. To date, TELS has formed 12 multidisciplinary partnerships to design inquiry activities. These projects, delivered via the TELS technologies, can be used by the community. To build on the research in the field, each of the 12 multidisciplinary partnerships reviewed the research on their topic and created a short perspective written for a general audience to identify the challenges of learning

that topic, the common intuitions students bring to science classes, relevant prior research, and promising directions for design. Each of these projects requires inter-collaborations among subject-matter experts, teachers, and developers. (For more details, see Linn, Davis, and Bell, 2004.)

The Learning Sciences in the Asia-Pacific Region

In Singapore and in the Asia-Pacific region as a whole, we have recognized that capacity in the Learning Sciences needs to be strengthened, just as there is a concerted effort to understand learning in the USA and in Europe. In Singapore, we have recognized that one niche area (which differs from the USA) is the strong linkages between educational research centers and institutes with the local schools. The Singapore school system, for example, has been able to scale up the level of K–12 education systematically and achieve international standings in science and math. We think that Singapore provides an excellent laboratory for designing and researching learning in the school system—in the messiness of actual learning environments.

In the Asia-Pacific region, work in the learning Sciences and IT is not as vibrant as in the USA, and thus, we need to build up leadership and research capacity in people who have a passion for the science of learning. When we have built up leadership and research capacity, these leaders will further the progress of learning as they build the capacity of others. In this way, we should be able to develop a sound theory of learning specific to the culture of education in this region.

Conclusion

We as researchers exist in exciting times. These are times where a focus can be forged among individuals of various disciplines, all willing to study learning—a meaningful agenda. Others who have not joined in the Learning Sciences collaborative are perhaps skeptical that this field can be sustained, as opposed to more traditional disciplines. Nevertheless, the community is well-connected and keenly aspiring to move ahead. The International Society of the Learning Sciences is also gaining momentum. What we need now is to develop trust and mutuality among related communities interested in learning—so that we can make this journey together. To reiterate, the "path is made by walking." □

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Additional Resources

Tuomi-Grohn, T., & Engestrom, Y. (Eds.). (2003). *Between school and work: New perspectives on transfer and boundary-crossing.* The Netherlands: Elsevier Science.

This reference consists of a series of chapters and interesting case studies centered on the issue of boundary crossing between communities—a topic closely linked to inter-collaborations. There is an increasing need for such activities as disciplines converge and where authentic problems arise from multiple perspectives. The book reconceives the concept of what is transfer of learning and adopts a developmental and historical perspective where context, cognition, and social inter-relationships are deeply co-evolving as 'transfer' occurs. In this sense, inter-collaborations arise developmentally.

Bourdieu, P. (1990). *The logic of practice.* R. Nice (Trans.). Stanford, CA: Stanford University Press.

The notion of identity is increasingly important in research relating to communities and collaborations within specific communities. But what constitutes an identity that spans communities as in inter-collaborations? Bourdieu provides a perspective of *practice* as being likened to participation in a game (metaphor)—a slow and lengthy process of not only acquiring the symbolic and cultural capitals of the practice, but investing in the ways of being in the practice. The tenets advocated by Bourdieu can be adopted for participation within inter-collaboration practices.