Symposium: ICT4D and the Learning Sciences

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Abstract: Over the last two decades, the learning sciences have contributed immensely to curricula-based learning in formal environments. Recently, there is an increased emphasis on learning that occurs outside formal institutions, especially through the use of technology. Design experiments and design-based research have resulted in several innovations and in an overall conception of designing and researching new learning environments. Not surprisingly, technology has been a critical component of research and teaching. Yet, this focus has primarily been on developed nations in the West. Recently the participation from other areas of the world, especially Africa, Asia, the Middle East, has been on the increase while the community of researchers and scholars is internationalizing. One area of innovation that has not been part of the community but which we wish to bring to focus through our symposium is the use of *information and communication technologies for development* (ICT4D) in emerging economies.

Overview

Over the past several years the field of *information and communication technologies for development* (ICT4D) in emerging economies has become an active area of development and increasingly more scholars are studying ways to make the use of ICT in these international contexts more efficient. Although ICT4D is being applied in many areas such as microfinance and health, education and learning are increasingly critical areas of concern. At a recent conference on ICT4D over 50% of submissions were related to some kind of education or learning innovation, a significant number focusing on informal learning settings (ICTD 2007). In this symposium we propose to present findings from field studies of innovation in Africa, Asia, and the Middle East, and relate them to the learning sciences. We believe that these studies have several lessons that the learning sciences can benefit form as a field. One of the advantages of ICT in developing and emerging economies is that restricted resources force us to innovate to derive new ways of doing things. These innovations are not restricted to technology, but also how to socially organize learning or education. Moreover, the implementations teach us the importance of integrating the findings with the ecology of the place, that it is critical to integrate the innovations with the social and cultural practices of the locality for long-term use and benefits. In this symposium we bring to light several challenges associated with doing this kind of work ranging from finances to the ability to partner with local institutions and be able to carry out fieldwork in geographically distant field sites.

Education for all students, particularly in developing countries, requires understanding the worldviews and epistemologies of diverse cultures as well as the conflicts and problems that students may experience when crossing cultural borders to learn western ideas (Aikenhead, 2001; Aikenhead & Jegede 1999; Snively & Corsiglia, 2001). Although science, engineering, and literacy are potentially a driving force for economic solutions to poverty, little attention is given to the cultural context in which these areas of study are taught, particularly in reference to indigenous knowledge and technology of which the villagers are most familiar. Indigenous knowledge represents descriptive and explanatory ways about nature acquired across generations from cultures with strong oral traditions (Kawagley, Norris-Tull, Norris-Tull, 1998; Dzama, E.N.N. & Osborne, J.F., 1999; Snively & Corsiglia, 2001). In one clear example, indigenous knowledge has transformed modern science in many areas, most notably taxonomy, medicine, agriculture, natural resource management and conservation (International Council for Science, 2002).

Research in developing countries requires a perspective of understanding emerging technologies as not simply external *tools*, but integral parts of socio-cultural practices within a community (Miller & Slater, 2000). From a communities of practice perspective, establishing social and technical connections among community constituents is critical. Further, information and communication technology (ICT) can be "used to promote connections: between one learner and other learners, between learners and tutors [or elders]; between a learning community and its learning resources." (Jones, 2004, p.1). For example, although the current network infrastructure in many African nations is underdeveloped, mobile phones are prevalent in many emerging economies and are inherently democratic as many poor people make sacrifices to pool resources within a community to purchase airtime for purposes such as conducting business in the market (Friedman, 2007; Jones & Marsden, 2006). As mobile smart phones can now be used for maintaining communications, accessing

computer networks, and capturing and delivering multimedia (Giulio, Antti, & Antti, 2007), there is vast potential for connecting African schools to the internet for the first time and for using mobile devices as a data gathering device to share and communicate ideas within the context of the local culture (Rogers, 2003).

Symposium Themes

As researchers and developers in the field our sense is that what is needed are new frameworks, methodologies, and empirical studies to illustrate social organization and ways in which the social and the technical may be combined to enable ICT4D to be 'made within the local context' in everyday settings of use, many times this being informal settings where socialization and communication are focal. This will require close and ongoing cooperation between learning scientists, social and cultural analysts, linguists, computer scientists, and engineers. To foster such collaboration we encourage dialogue that brings researchers and developers working within international contexts together to consider themes of broad relevance to situating ICT4D in formal and informal learning environments.

- *Instructional Design.* What underpins or constitutes ordinary activity is human interaction with others, designed artefacts, and environments. The notion of design has already been appropriated by the wider learning science community but we invoke it here not necessarily to import existing agendas but to raise the study of individual's interactions with one another, through designed artefacts that are situated in the environments they inhabit, as a central theme or topic for the study and design of ICT4D.
- *Accountability.* A defining feature of human-human interaction is accountability or the 'telling' of what is going on, what's being done, how something happened, what will happen next, etc. Accountability is a fundamental barrier to computer-mediated communication, computer-supported collaborative learning, and human-computer interaction and as heterogeneous computing applications and devices proliferate, combine and become more complex, the problem of accountability becomes a core theme for ICT4D to address.
- *Awareness.* Closely coupled to accountability, the theme of awareness draws our attention to the ways in which people keep track of ordinary activities and make situated judgments and decisions. Of particular and distinct note is the role of the physical environment or 'ecology' in awareness and the ways in which people exploit the ecologies they inhabit to organize their interactions.
- *Tangibility.* Technical research in tangible computing is well established. However, the learning sciences (with rare exception, Cf., Roschelle, 1996) currently offer little analysis of the everyday use and manipulation of artifacts, comparing physical manipulatives with their digital counterparts. Existing studies draw attention to the close coupling of object manipulation with the ecology of space, opening up new avenues for interdisciplinary consideration of the interplay between social studies and the design of ICT4D technologies that are embedded in the physical environment.
- *Coordination.* Being dispersed across multiple environments – in the office, the home, out on the streets, etc. – and accessed by multiple users – family members, friends, relations, community elders and so on – raises new challenges for managing interactions with highly mobile and ubiquitous computing systems. Central to such challenges are concerns with control, privacy, and the coordination of interaction more generally. These issues require us to consider the development of a range of socio-technical protocols to support learning and interaction.
- *Context.* The notion of context has been a defining concern of the learning sciences. Yet context is of primary concern to the behavioral and social sciences as well computer sciences and social and technical understandings of context vary immensely. For behavioral and social scientists, context extends beyond metrics to sense-making and provides for the meaningful character of interaction. The concept of context provides a fruitful vehicle for the social and technical to consider new avenues of collaboration.

Connecting Classrooms and Communities in Africa with Mobile Technologies – A Representative ICT4D Project

In this project run by the organizer of the symposium, researchers are investigating the facilitation of connections among community elders, primary school teachers, and science teacher educators using mobile phone (Tinker, Horwitz, Bannasch, Staudt, & Vincent, 2007) and Web 2.0 technologies (Alexander, 2006) to learn about sustainable agriculture in Africa. In the host country for the current project, past research has shown that elders are a valuable source of knowledge for schools and villages. However, this knowledge has not been systematically connected to the school science curriculum, due to social and technical barriers. As an important goal of the primary school curriculum in the host country is for children to learn from elders in the community, the authors were interested in how mobile phones and Web 2.0 technologies (blogs and wikis, instant and text messaging, cf., O'Reilly, 2005) could be used to establish and nurture connections. Establishing technological connections between indigenous knowledge and school curriculum is particularly important when posed within

the context of developing nations that are struggling to modernize and improve the educational experiences of their citizens in the midst of widespread challenges such as poverty, hunger, disease, lack of infrastructure, and environmental degradation (Leach, Ahmed, Makalima, & Power, 2006).

As most primary schools in the host country have limited access to electricity and wired telecommunications, the potential for using mobile devices for educational purposes to access and create information is immense. For example, in the year 2000, citizens of the host country had 49,000 cell phones in use and by 2004 the number increased to 222,100. Mobile phones are thus being explored as a platform for delivery of instructional multimedia and are critical for addressing the digital divide (Jones & Marsden, 2006), but also progress (Curry & Kenney, 2006), in developing countries.

In this project, science educators and instructional designers are collaborating with elders, teachers, teacher educators, and community members in the host country to establish a mobile network to develop curriculum that draws from local resources and makes them available on a global network. These ideas and curriculum artifacts are shared with educators and designers who are developing instructional multimedia materials to align with and enhance the primary science curriculum in the host country by including indigenous knowledge about sustainable agriculture from elders in the communities.

The following research questions were proposed: 1) What is the cultural context for implementing a mobile phone communication network in the host country? For example, what are teachers' attitudes toward indigenous knowledge? What kind of indigenous knowledge might be useful for learning about sustainable agriculture? 2) How do we connect the indigenous knowledge of elders, classroom teachers, and science teacher educators using mobile technology? 3) How do we design and develop multimedia curriculum that draws from these knowledge sources using mobile technology? In this paper, we will report on findings that address the cultural context and instructional technology issues that are part of the design phase of this project.

Data Sources and Analysis

Data sources include: (1) audio-recorded interviews with community elders to learn about the feasibility on connecting sustainable agricultural practices to the primary school curriculum; (2) audio-recorded interviews with teacher educator and science teachers to assess their feasibility of using mobile, web-based devices as a means of connecting understandings of the use of indigenous scientific knowledge in the curriculum; (3) primary school curriculum guides and other artifacts that pertain to indigenous knowledge. Formative evaluation has employed the model proposed by Tessmer (1993) and with additional techniques for alpha and beta testing from Alessi and Trollip (2000). In the tradition of qualitative research, iterative processes of data analysis are used to generate themes reflective of the data, to capture the complexities of the research context, and illuminate the questions that guide this research (Hammersley & Atkinson, 1983). Interviews are coded and categorized to identify emerging themes related to the subjects' perspectives on indigenous science, sustainable agriculture, and the use of mobile web-based technologies. The data will be further reviewed to look for confirming and disconfirming evidence related to interpretation of the data. From a post-colonial theoretical framework (Carter, 2004), we are interested in understanding the cross hybridization of ideas from Western and indigenous science perspectives as we explore teaching about sustainable agriculture.

Results

In reporting of the results, researchers have focused on the cultural context that is necessary to understand as part of the design phase of this project. First, we will report on the perspective of a community elder on sustainable agriculture. Second, we will report on teachers' perspectives on including indigenous knowledge in the curriculum. Finally, we will discuss how these cultural elements are being considered in the design of the curriculum that is being developed using mobile phone devices.

Community Elder: Organic Gardener

Dr. C has been a farmer since 1982. Originally an economist, he realized that farming was the only profession that would give him food sovereignty. He employs channel irrigation and traditional organic methods of growing crops without the use of mechanized equipment or synthetic fertilizers. Diverting water from a river, his farm is irrigated from hand-dug channels, sunken fields, and underground seepage from damned ponds. He uses organic compost from recycled plant material, natural pest control, and crop rotation. Dr. C grows maize three times a year (normally maize is harvested once); he also harvests a variety of fresh fruits and vegetables, legumes, and he farms fresh fish. He supplies food for six villages and the local hotels in the capital city. Villagers work for food at his farm. Dr C has been awarded a doctoral degree by University of [host country] in recognition for his experimentation, observation, knowledge creation and exemplary practice in the village and to the world at large.

Host Country Teachers

The interviews revealed that contemporary African educators were very aware of traditional beliefs and practices; however, this knowledge was not expressed in relation to understanding how indigenous knowledge might provide a context for the learning of Western scientific concepts. Teachers expressed that it is advantageous to discourage the use of traditional knowledge because it is not "scientific." According to the teachers, the importance and application of traditional ecological knowledge was also marginalized due to the severe impact of deforestation and economic pressures for survival. From our analysis of curriculum guides, Western science knowledge was largely compartmentalized and taught as a subject separate from the culture and environment where the children live. Most examples of indigenous knowledge were portrayed negatively as examples of "non-science." Nevertheless, the science educators are very interested in participating in a project designed to use mobile devices to connect them to information and resources outside their classrooms.

Design Considerations

We are iteratively designing, implementing, and evaluating mobile and Web 2.0 technologies in a participatory manner (Sharp, Rogers, & Preece, 2007). An activity-centered design approach (Bodker, 1989; Gay & Hembrooke, 2004) creates a living archive of traditional and scientific knowledge related to sustainable agriculture. This approach takes the position that "to *understand* development, it is essential not to impose assumptions about the goals of development of one group on individuals from another. Interpreting the activity of people without regard for *their* goals renders the observations meaningless" (Rogoff, 1991, p. 117, emphases in original). The pedagogical goal is to provide technologies for unfettered knowledge building and communication within real-world constraints found in large cities, where teacher educators work, and poor, rural areas, where primary schools are found.

For this project, the nodes of the network to connect knowledge cultures within Africa and in the United States include the following: (1) A community elder in the host country is a farmer providing knowledge of sustainable agriculture practices, including channel irrigation, composting, and organic pest control; (2) A science and agriculture educator in the host country is conducting field testing of mobile devices and sustainable agriculture curriculum with pre-service teachers; and (3) A target primary school classroom and teacher has been selected from a primary science and agriculture class in the host. The class will be involved in developing a sustainable garden based on elder knowledge. In an effort to establish a culturally diverse virtual team connected by mobile phone technology, a living archive website is being developed to share information and document the communication patterns and progress of the project.

Blogs and wikis, using open-source software, WordPress (http://wordpress.org/) and MediaWiki (http://www.mediawiki.org/) are being developed and implemented as distributed knowledge and communication platforms. Moreover, taking the lead from projects such as MobilED (http://mobiled.uiah.fi/), we are exploring text-, voice-, and multimedia messaging, and the potential of solar-powered devices, including battery chargers (Solio, http://www.solio.com/) and wireless outdoor routers (Meraki, http://meraki.com/). The rationale for using mobile phones and handheld devices is that they consume less power than other hardware (e.g., laptops and tablet PCs) and can access the Internet via a cellular network, much needed in a country such as that found in Africa.

Paper 1: Computers and Aspirations in Rural India

Computer aided learning programs have expanded rapidly in rural India despite a prevalent environment of dire poverty and resource shortage of several kinds. The question of books, teachers, or buildings as against technology continues to be a prevalent argument, especially as the funds for such investments start coming out of the same pools of public funds. Much scholarly work has focused on institutions, learning methods, and teachers themselves, but little if any work looks at parents. This research includes interviews with parents of children in rural Indian schools recently provided with computer aided learning centers in the southern Indian state of Karnataka with an aim of documenting their perceptions of technology and education. The guiding idea behind the project is that technology deployments have second-order effects relating to the expectations from technology and the aspirations that arise subsequently. These second order effects are difficult to measure, but have consequential impacts across the spectrum from the family all the way up to policy circles. Using three years of continuing work primarily with rural parents, but also with children, teachers, policy leaders, and school administrators, this work describes the evolving environment around schools with computer aided learning. In the course of this work, we documented locations where rural parents had seen computers in use, who they associated with usage, and what kinds of abilities they attributed to computers, and computers. We find that the symbolic value of computers in the minds of parents is deeply tied to their locations of contact, and these in turn are highly instructive in understanding their aspirations as well as propensity to invest in their children's schooling. We find also an interesting tug between English language acquisition and computer use in parents' imaginations of power and class ascendancy. We find that a great number of factors, including the gradual diminishing of economic possibilities in agriculture, the fears of urban living, and even the economic pressures of dowry impact decisions related to parents' interest and

inclination to their children's technology use. In continuing this research, we hope to expand academic work on school technology initiatives to include larger concerns from within the 'science technology and society' scholarship on aspiration and social change. In an age of “One Laptop per Child” and other such technical innovations being at the forefront and driving the debate around ICTD, it is critical to understand the socio-organizing dimensions as well.

Paper 2: Interactive Teaching AIDS in India

The UN recently declared India as one of the largest HIV/AIDS infected populations in the world. Nine out of ten infected people are unaware of their status, increasing their risk of infecting others. Although education represents a “window of hope” in stemming the tide of the epidemic, as the World Bank says, traditional tools are ineffective. Due to cultural barriers and stigma around openly discussing sexual practices, many Indian institutions do not provide students with practical prevention education. Recently, ten Indian states rejected federal programs and banned sex education in their schools. The Indian education ministry has no mandatory requirement for health or sex education classes in elementary schools, colleges, or universities in India. For this reason, many learn about HIV/AIDS from mass media campaigns through television, billboards and radio. Although there are strong efforts to disseminate HIV/AIDS information in India, because of the nature of the strategies they utilize, individuals must make sense of these short, disparate pieces of information on their own. Young adults receive fragmented knowledge instead of a coherent conception outlining HIV/AIDS education. With little understanding of the connection between high risk fluids and direct transmission leading to a possible HIV infection, individuals memorize random fragmented data. The storage of disparate data in their minds may make it difficult for them to retrieve and apply the knowledge to a variety of situations. Interactive Teaching AIDS provides special learning steps to scaffold learners to develop a coherent conception of basic biology, the concept of bodily fluids, transfer of bodily fluids into the human body and its application to various misunderstood actions or scenarios. Through interactive animated modules, ITA helps the learner transfer a coherent conception of knowledge into their own lives in order to make more informed decisions. In the case of the Interactive Teaching AIDS curriculum, the knowledgeable adult is the doctor figure who guides the student through various concepts of understanding HIV/AIDS. After providing the student with a basic understanding of fluids and transmission, the doctor "challenges" the student to try to answer questions on his/her own, while providing guidance if the student decides to learn more. The doctor continues to provide the student guidance and allows them to practice their skills until the end when the student is able to answer questions on their own and has more competence and confidence with the subject. This study measures the efficacy of a pedagogically grounded new approach to teaching AIDS education in India. It evaluates changes in knowledge, attitudes and behaviors of 430 young adults after interacting with a technology-based animation program. The results reveal significant increases in learning with large effect sizes and students rapidly spreading prevention education through their peer networks.

Paper 3: Convivial Computing – Technology for Design, Expression and Innovation and Lessons for ICTD

A swift and sharp revolution of sorts is underway in the world of computing. This revolution stems largely from user participation that has been made possible by recent advances in computing. An increasing number of people are becoming producers rather than consumers of artifacts, information and content; expressing and designing for themselves as well as their fellow beings. From Open Source Software to Wikipedia, from Blogs to remixed videos on YouTube, people finally have an opportunity to participate in the process of expression and they are doing so in large numbers. This revolution is for the people by the people aided largely by recent advances in computing technology. Aided by advances in computing the relationship between people and computers can help us move towards more than the sum of its parts – collective intelligence. Are we finally taking a step towards becoming a convivial society (Illich, 1973) aided in large part by *convivial computing?* Illich proposed the idea of “tools for conviviality” and defined the concept of conviviality as:

> [ ] autonomous and creative intercourse among persons, and the intercourse of persons with their environments; and this in contrast with the conditioned response of persons to the demands made upon them by others, and by a man-made environment. I consider conviviality to be individual freedom realized in personal interdependence and, as such, an intrinsic ethical value. I believe that, in any society, as conviviality is reduced below a certain level, no amount of industrial productivity can effectively satisfy the needs it creates among society’s members (p. 11.)

There are six primary characteristics of convivial computing that I want to discuss and highlight in this talk: access to tools, ability for self-expression, ability to interact and form relationships with other people,

ability to use personal energy creatively, ability to personalize the environment, and opportunity to enrich the environment. Together, these characteristics enhance a person's self-image and make it possible for him to "invest the world with his meaning (Illich)." I will use the concept of conviviality to reflect on several ICT4D projects I have been involved with and a social innovation competition I helped organized.

Paper 4: Turning mobile phones into teaching machines in Turkey

Among all technological devices available in our era, mobile technologies including mobile phones and pocket computers are the most popular ones, and they have an important place particularly in young people's lives. In all over the world –except Canada– the mobile phones outnumber the personal computers with 5 to 10 times the total number of mobile phones as compared to the number of personal computers. With its widespread use and its features and functions such as mobility, reachability, localization, and personalization, mobile phone technology may lead to positive effects in learning environments. Our first and foremost aim in this study has been to make use of this profound interest in mobile phones in education, and contribute to the efforts to help in making these mobile technologies widespread in all spheres of education.

The push aspect of mobile phone technology may break the motivational barriers to learning for many students, and it may free the learner from studying in front of a computer screen. By the push aspect, we mean that the instructional materials will be sent to the students via mobile phones. They will be passive in the case of initiating their study or practice since they will not have to visit a WEB or WAP page in order to study or practice course contents. They will only read, listen, and reply (in SMS quiz questions) by using their mobile phones. On the other hand, the web pages developed for the instructional purposes use the pull aspect of web technology. This requires learners to visit web pages to study the contents. However, most of the learners are not willing to use these web sites to enhance their foreign language skills because of their lack of intrinsic motivation.

The mobile phones have great potential to provide supplemental practices for students outside the school. Mobile phone learning is a young discipline that is gaining more and more attention because of its promises for education. Therefore, the major aim of this study was to investigate the potentials and effectiveness of using mobile phones in foreign language education. More specifically, this study investigated how the use of multimedia messages (MMS) and SMS quizzes via mobile phones affects the students' English vocabulary acquisition.

Weaving ICT4D Innovations into Everyday Life for Learning and Development

> The most profound technologies are those that disappear. They weave themselves into the fabric of everyday life until they are indistinguishable from it. (Weiser, 1991, p.94)

Despite the appeal of Mark Weiser's vision for human-computer interaction in the 21st century there is, at this current moment, a significant divide between learning technology developments and their resonance with the everyday settings in which they might be deployed, particularly where multi-national participants are involved and focal points for intervention. We believe that working out the significance of the social and cultural is a central problematic for the learning sciences if the divide is to be bridged. However, weaving technical developments into everyday settings ultimately depends on working out what the 'social and cultural' consists of and what it means for ICT4D. As a first measure in what has to be a long-term consideration of these issues we have invited participation from interdisciplinary researchers who have experience in the field working across the globe, from Africa to India to Turkey. The goal of this symposium is to enable themes of generic purchase to the developers of ICT4D systems to be initially identified and articulated. Moreover, it is to address squarely the theme of the conference, which is "to broaden the geographical, cultural, and intellectual scope of the learning sciences community, while maintaining its focus on the innovative consideration of learning as it occurs in authentic contexts."

If as learning scientists and technologists we take the vision of Mark Weiser seriously, then it is clear that the ultimate challenge for our field is to weave or *situate* new technologies into the very fabric of everyday life. Despite a great deal of impressive work developing and evaluating prototype systems, many researchers will no doubt recognize that ICT4D demonstrations are nevertheless very 'distinguishable'. Such systems have yet to disappear or become an 'unremarkable' feature of everyday life (Tolmie et al., 2002) and this is, we suggest, largely as a result of how the emphasis that been placed on the development of learning technology systems.

Although some attempts have been made to understand the 'fabric of everyday life' of target users, emphasis to date has primarily been placed on demonstrating theoretical principles from computer science and the capabilities of new ubiquitous technologies. Given the nascent state of the field and the immaturity of these new technologies, this has been an understandable first phase of growth. Nonetheless, with the movement of computing research away from the workplace and its diversification into novel areas of everyday life, the time is

ripe for serious reflection on the nature of everyday life and its importance to the ongoing development of ICT4D systems.

What we are suggesting then is that there is a distinct and pressing need for the learning sciences to reconsider its priorities in order for the field to develop, at least in terms of design and development, along the path envisioned by Weiser. This will involve rethinking current development strategies, which primarily focus on developing more novel, scalable and reliable solutions, to incorporate a complementary strand of research that is concerned to understand the social and social character of everyday life. The purpose of this complementary strand of work will be to inform the development of technologies that resonate with the ordinary activities that lend a setting its 'everyday' nature. This principle should resonate clearly with those conducting design experiments and design-based research.

Of particular concern from our own perspective is the resonance of technological systems with the social or cultural *organization* of ordinary activities, for reasons best articulated by the sociologist Harvey Sacks (1992):

> … it's the source for the failures of technocratic dreams that if only we introduced some fantastic new communication machine the world will be transformed, where what happens is that the object is made at home in the world that has whatever organization it already has.

As the organizer and colleagues have emphasized in previous work, we are not trying to scaremonger in delivering such quotes but draw attention to the salience of social or cultural organization to be the pre-eminent challenge to ICT4D writ large. Without exception new learning technologies are 'made at home' or 'woven into' everyday life by situating them into a 'world' (or more prosaically a setting) that has whatever organization it already has (Crabtree et al., 2003; Gonzalez, Moll, & Amanti, 2005). Technology's purchase relies on its capacity to be situated in and amongst that organization. We are suggesting, then, that understanding the socially organized character of a setting and its activities is a matter of central importance to the development of ICT4D for, as Weiser (1991) himself observed, the learning and computing sciences should be concerned with making "machines fit the human environment, instead of forcing humans to enter theirs".

This does not mean that the developers of systems for ICT4D should simply be constrained to design for existing organizations of ordinary activities in everyday settings, though there may well be great profit from doing so. Rather, we would suggest that understanding the social organization of everyday settings and ordinary activities provides a basis and rich insights for thinking about the design of new technologies, new forms of activity, and new forms of organization that are rooted in and resonate with the everyday life of learners, teachers, an community members.

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