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Editorial: Learning Sciences Research in the Asia Pacific Countries

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Learning sciences is an interdisciplinary field that studies learning and education in formal and informal contexts. The goal of learning sciences is to understand the conditions and processes that lead to effective learning, so that the knowledge can be used to redesign formal and informal learning environments to bring about deep learning. As an interdisciplinary field, it draws upon research methods and outcomes from various disciplines such as information sciences, cognitive sciences, artificial intelligence, neurosciences, design studies, instructional design, cognitive anthropology, and educational psychology.

Historically, the community of learning sciences researchers emerged in the late 80s in North America, among universities such as Northwestern, Vanderbilt, and MIT. In recent years, learning sciences is gradually permeating the Asia Pacific region. Singapore, for instance, set up its Learning Sciences Lab in 2005. Special interest groups in learning sciences are also forming among members in the Asia-Pacific Society for Computers in Education (APSCE) community. The diffusion of learning sciences to wider geographical regions of different historical and cultural contexts has its significance. Among the learning sciences researchers with different foci of study, the epistemology of situated cognition is prevalent. These researchers typically employ design experiment methods by conceptualizing and implementing interventions in authentic settings so as to advance understanding of theoretical models. To advance these theoretical models, studies conducted in different context and cultural conditions would be necessary. Asia Pacific countries have their unique education systems and contexts; therefore, studies in this region would contribute to the understanding of ecological validity of theoretical models, and could potentially enhance the relevance of these models to Asia-Pacific countries.

This special issue includes empirical studies, descriptions of programs, discussions on methodologies, and discussions on the contextual implications of learning sciences research in the region. The special issue starts out with a bibliometric study on learning sciences research in the Asia Pacific countries in the past 14 years, from 1997 to 2010 conducted by Tan, Chai, Tsai and Lim (2012) . They found that most active research contributions in the region were from six countries: Hong Kong, Singapore, Australia, Japan, New Zealand, and Taiwan. An intentional effort in establishing a learning sciences research community could enhance research productivity. Singapore and Hong Kong, for example, saw a steady growth in the contribution of journal papers in the past 14 years. Learning sciences research in this region is strongly influenced by theoretical frameworks developed in the western communities, for example, the knowledge building and learning study approach. This reflects the infancy of learning sciences research in the region, and therefore a huge space for researchers to move from theory improvement into knowledge innovation effort. Similarly, time-tested experimental approach is still favored, rather than the design experiments approach advocated by learning scientists (e.g., Brown, 1992). For research involving intervention, technology-mediated pedagogies prevail, particularly those involving the use of computer-supported collaborative learning (CSCL) technologies.

The selection of papers in this special issue, to some extent, responds to the findings in the bibliometric study. We have included papers that reflect multiple theoretical roots, multiple methods, and multiple levels of research in learning sciences. Among these papers, there are several that employ design experiments approach, and explore new frontiers, for example, in the area of teacher learning.

Song, Chen and Looi (2012) examined a teacher learning approach known as collaborative-apprenticeship learning (CAL). Over three cycles of design research that spanned one and a half years, the teacher participants were found to have deepened their understanding of rapid collaborative knowledge improvement approach and improved their enactment of innovations in their classrooms. In the process, some novice teachers progressed from an apprentice to become mentors helping new teachers in the project. This study illustrates the use of design experiment approach in learning sciences, explores the topic of teacher learning, and contributes to our understanding of the mechanism for scaling up innovative practices across schools.

Similarly involving teacher learning and design experiment, the study by Sari and Lim (2012) focused on the impact of socio-cultural factors on the course of design experiments process in the study of Online Learning Community for Teacher Professional Development. Using the lens of the four Hofstede's cultural dimension – power distance, individualism, uncertainty of avoidance, and masculinity – the authors explicated how these socio-cultural factors affected the collaborative partnership between the researchers and the teacher participants, and influenced the trajectory and implementation of the design experiment.

On the other hand, Yeo, Tan, and Lee (2012) reported the first phase of a design experiment involving a teacher's enactment of problem-based learning (PBL) in a physics classroom. Using the cultural-historical activity theory (Engeström, 1999) as a lens, the authors uncovered the tensions and contradictions in the activity system as the teacher attempted to implement the new practice of PBL in his classroom. It highlights the differences between the academic model of PBL and the lived-realities of the teachers, which echoes the partnership tension between researchers and teacher participants highlighted by Sari and Lim (2012).

There are some common themes that weave the preceding three papers: a focus on teacher action and learning, the use of design experiment, and a highlight on the social cultural factors that influence the learning process. Yet, there are differences among these papers. Each of these papers highlights a particular aspect of the teacher learning process. Song et al. (2012) examined learning in a community and the scaling up of an innovation; Sari and Lim (2012) underlined the influence of social-cultural factors in design intervention; Yeo et al. (2012) uncovered the tensions in the activity system during an enactment of an innovation by a teacher. Even though not explicitly mentioned, an assumption of social cultural epistemology of learning is implicit in the studies mentioned. Included in this special issue are also papers that emphasize the contextual influence on student learning.

So et al. (2012) described two iterations of a design experiment that aims to foster collaborative knowledge building culture among students. The second iteration saw an enhanced scaffolding approach with more intentional activities that engage the students in reflection and collaborative meaning making. The authors found a discrepancy between students' espoused beliefs about collaborative learning and their actual practices. This study also attempted to design learning in context by encouraging students to leverage the affordances of the mobile technologies and the physical environment. Along the theme of learning in context, Im and Pak (2012) described a Korean program for science learning called "Scientific Exploration in Culture", or SEC in short. SEC provides Korean students opportunities to practice authentic science inquiry in historical sites in the country. This short paper provides a social-cultural lens to discuss the values of SEC as an alternative to fieldtrips.

As highlighted in the bibliometric study by Tan et al. (2012), science learning has been featured strongly in the learning sciences research in the Asia Pacific region. Likewise, this special issue receives several contributions in science learning. Hsu, Tsai and Wang (2012) reported their efforts in developing and investigating a digital game for third-grade students' learning on light and shadow. As a strategy to encourage self-explanation, prompts were incorporated into the game for the experimental condition. The authors found that the students who were engaged in the self-explanation activity outperformed those students in the control group in post-test and retention test.

Besides intervention study for science learning, two other studies attempt to develop structural models that relate variables that could affect science learning. These studies used validated survey instruments to elicit students' self-reported response to the variables, and statistical techniques were used to delineate the relationships among the variables. Using structural equation modeling, Chiou and Liang (2012) found that students' conceptions of science learning (high-level conceptions versus low-level conceptions) had a direct effect on their approaches to learning science (deep motive, deep strategy, surface motive, and surface strategy), which in turn contributed to their science self-efficacy. More intricate relationships among these variables were explored. On the other hand, using correlation and regression analyses, Yang, Tseng, and Lin (2012) examined the influence of academic motivation and social motivation on students' performance in a standardized national science examination. The academic motivation factors include goals of learning, values of learning, and beliefs about learning. The social motivation factors include both first-order expectation (one holds for himself or herself) and second-order expectation (expectations one believes others hold for him or her). These two studies are not interventional in nature; nevertheless, the findings shed some lights on factors affecting students' learning. Many of these factors are likely to be sensitive to the contextual and cultural influences, for example, how

the students perceived their parents' expectation of their science learning.

Assessment for learning has not been featured strongly in the learning sciences research in the Asia Pacific. This special issue includes a short paper by Lau, Hong, Lau and Usop (2012), who developed a computer adaptive assessment software for multiple-choice items for learning of mathematics. Unique in this system is the feedback based on five knowledge states of the students: full knowledge, partial knowledge, absence of knowledge, partial misconception, and full misconception. The principle underpinning this approach is to assess students' knowledge state by detecting bias reporting, that is, a mismatch between a student's perceived knowledge and actual knowledge. A survey of the students and teachers involved in the study revealed a favorable reaction to this software. The authors suggest that this system works by providing positive reinforcement, negative reinforcement, and opportunity for metacognition.

In contrast to the earlier papers that adopt social-cultural perspective of learning and qualitative approach to research, the preceding four papers are heavily influenced by cognitivist epistemology of learning. The research methods employed are mainly quantitative in nature. That said, however, rather than highlighting the artificial polarization between quantitative and qualitative methods of research (Ercikan & Roth, 2006), or between cognitivist and social cultural perspective of learning, we hope to move beyond the artificial boundaries created by these dichotomies. In this special issue, we invited Tobin and Ritchie (2012) to discuss their research methodology that is based on multi-theoretical frameworks. Within a framework of interpretive research, they incorporated ethnographic and neural level analyses – including video ethnography, prosody analysis, and facial expression analysis – to study social events. Their research thus represents an emergent social neuroscience. Underpinning their research is Sewell's (2005) theory of culture that guides the researchers in identifying not just coherence and sameness, but also contradictions and differences in social events. As the final paper of this special issue, we hope the multi-method, multi-theoretical and multi-level research introduced by Tobin and Ritchie (2012) could inspire research that charts new frontiers in learning sciences research.

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