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Core Research Publications of Learning Sciences and Computer-Supported Collaborative Learning

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1. Introduction

Learning Sciences (LS) is a research field investigating human learning in real-world contexts. One major component of LS is technology-enhanced learning and collaboration. Computer-Supported Collaborative Learning (CSCL) is partially overlapped with LS research in their alliance with computer science and artificial intelligence (Hoadley & Van Hanghan, 2011). There is mutual engagement with the two fields. Although LS and CSCL began separately, they were soon integrated under the same professional society, the International Society of the Learning Sciences (ISLS) in 2002, ensuring close contacts and exchange of researchers between the two fields.

One of the most important aspects of academic research is publications, especially those that are regarded as important by researchers. Publications listed as core readings in a course, for example, can influence fellow researchers, especially those who are still in training. They are likely to serve as bases on which they build their future research. The question we are asking in this paper is what are the core literatures of LS and CSCL research and how they are related. Given their overlapping research focus and researcher community, there is much reason to expect a strong overlap between the two fields. However, given a differential emphasis on collaboration, technology and initial history, there can be differences in what each deems as core research. We rely on document analysis to answer this question in this paper.

2. Methods

To identify core literatures of LS and CSCL, we used papers listed in the NAPLES website (Network of Academic Programs in the Learning Sciences), a network of graduate programs initiated by ISLS in 2012. NAPLES aims to foster high-quality LS programs internationally and provides a collection of resources (e.g., webinars, syllabi) with accompanying papers. Of these papers, papers listed in the CSCL section were grouped as CSCL core papers and the papers in the rest of the subsection as LS core papers. As for CSCL, we additionally selected papers from three review papers, Dillenbourg et al. (2009), Kirschner and Erkens (2013), and Tang et al. (2014). The first two papers provide a critical overview of CSCL research and cite major research up the time of the review. Tang et al. (2014) did a co-citation analysis of the CSCL papers published between 2006 and 2013 and identified 66 core CSCL papers. We are in search for comparable sources for LS research.

3. Results

3.1 Core Papers of LS and CSCL

Removing overlapping papers, the LS core literature list contains 452 papers. In terms of publication date, the majority (n=326; 72%) were published since 2000, but some were classic papers published

in early part of the last century (e.g., Watson, 1914). The list also includes papers published in neighboring disciplines such as anthropology (Mead, 1934), indicating that LS research builds on a deep and diverse intellectual heritage. Papers published since 2000 are a mixture of empirical, methodological and theoretical papers with topics addressing general learning mechanisms and domain-specific pedagogies. Many of them (*n*=245; 54%) are journal papers with the rest being books, book chapters, and other sources.

The CSCL core paper list contains 251 papers. Most of them (n=223; 89%) were published since 2000. The earliest paper in the CSCL core list was Bush (1945)'s article. The list includes papers from computer science and human factors as well as papers from cognitive science and psychology. Papers in the CSCL core list cover a range of topics such as theoretical issues of collaboration (Stahl, 2006) and mechanisms of collaborative learning. Many also covered pedagogical approaches and design of tools and environments. The majority of them (*n*=199; 79%) are journal papers with the rest being books and other sources.

3.2 Overlaps in LS and CSCL Core Papers

Fifteen publications appeared in both core lists (Table 1). Six of them are about analysis methods and the rest are about pedagogical issues such as PBL, and scripting, and guidance. These shared core papers indicate that LS and CSCL share strong commitments on rigorous methodology and effective pedagogical strategies.

Table 1. *The Overlapped Papers between LS and CSCL*

Author (Year)	Title of publications
Bielaczyc et al. (2013)	Cultivating a community of learners in the K-12 classroom.
Brown & Campione (1996)	Psychological theory and the design of innovative learning environments: On procedures, principles, and systems.
Cornelius et al. (2013)	Organizing collaborative learning experiences around subject matter domains: The importance of aligning social and intellectual structures in instruction.
De Wever et al. (2006)	Content analysis schemes to analyze transcripts of online asynchronous discussion groups: a review.
Erkens & Janssen (2008)	Automatic coding of dialogue acts in collaboration protocols.
Hmelo-Silver & DeSimone (2013)	Problem-based learning: An instructional model for collaborative learning.
Janssen et al. (2007)	Visualization of agreement and discussion processes during computer-supported collaborative learning.
Kirschner et al. (2006)	Why minimal guidance during instruction does not work: An analysis of the failure of constructivist, discovery, problem-based, experiential, and inquiry-based teaching.
Kolodner (2007)	The roles of scripts in promoting collaborative discourse in learning by design.
Meier et al. (2007)	A rating scheme for assessing the quality of computer-supported collaboration process.
Phielix et al. (2010)	Awareness of group performance in a CSCL environment: Effects of peer feedback and reflection.
Rosé et al. (2008)	Analyzing collaborative learning processes automatically: Exploiting the advances of computational linguistics in computer-supported collaborative learning.
Weinberger et al. (2007)	Knowledge convergence in collaborative learning: Concepts and assessment.
Weinberger & Fischer (2006)	A framework to analyze argumentative knowledge construction in computer-supported collaborative learning.
Wilensky & Reisman (2006)	Thinking like a wolf, a sheep, or a firefly: Learning biology through

	constructing and testing computational theories-an embodied modeling approach.

The extent of the overlap was not extensive (3% and 6% of LS and CSCL core papers respectively), but this does not necessarily mean that the two research fields are largely built on separate research bases. Often a core idea is presented over multiple publications, and researchers might cite different sources. Still, the small number of shared core articles was somewhat puzzling because the two fields overlap closely in their mission and researcher communities. To understand the unique characteristics of each field, we are in the process of exploring the unshared articles. A first pass suggests that there is more emphasis on content analysis in CSCL compared to LS. Interests in pedagogies are common in both fields, but CSCL tends to be focused on scripting compared to LS cover a wider range of pedagogical approaches than CSCL that tends to emphasize scripted collaboration more.

4. Discussions

LS and CSCL are both relatively new, but build its research on a diverse range of disciplines with deep historical roots. The shared core literature list suggest that the two fields overlap strongly in their interests in methodology and pedagogy. At the same time, a substantial part of their core literature is not shared. This may result from the nature of academic publishing, but it is also likely to be due to their different emphasis on collaboration and technology as well as the learning environments in which learning typically occurs.

The current research is ongoing, but there are limitations inherent in this kind of document analysis. Researchers may not agree whether a specific paper is indeed a core research of LS or CSCL. Academic research is also dynamic, and the list is subject to change with new empirical findings and theoretical developments. The list, however, reflects what emerged from countless readings, seminars, and interactions among learning scientists and can be taken as an approximation of the core knowledge base of LS and CSCL at the moment. Understanding their nature and relationship to each other can help us understand how our research efforts may contribute to the larger collective endeavor in LS and CSCL field.

References

Bush, V. (1945). As we may think. *The Atlantic Monthly*,*176*(1), 101-108.

Dillenbourg, P., Järvelä, S., & Fischer, F. (2009). The evolution of research on computer-supported collaborative learning. In *Technology-enhanced learning* (pp.3-19). Springer, Dordrecht.

Hoadley, C., & Van Haneghan, J. (2011). The Learning Sciences: Where they came from and what it means for instructional designers. In R. A. Reiser & J. V. Dempsey(Eds.), *Trends and Issues in Instructional Design and Technology* (pp.53-63). New York, NY: Pearson

Kirschner, P. A., & Erkens, G. (2013). Toward a framework for CSCL research. *Educational Psychologist*, *48*(1), 1-8.

Mead, G.H. (1934). *Mind, self, and society from the standpoint of a social behaviorist*. Chicago, IL: The University of Chicago Press.

Stahl, G. (2006). *Group cognition: Computer support for building collaborative knowledge*. Cambridge, MA: MIT Press.

Tang, K. Y., Tsai, C. C., & Lin, T. C. (2014). Contemporary intellectual structure of CSCL research (2006–2013): A co-citation network analysis with an education focus. *International Journal of Computer-Supported Collaborative Learning*,*9*(3),335-363.

Watson, J. B. (1914). *Behavior: An introduction to comparative psychology*. New York, NY: Holt.

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