

Exploring the Influence of Culture on Collaborative Learning

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As on-line learning becomes more ubiquitous, and multi-ethnic on-line classrooms become more commonplace, it becomes more crucial to explore cultural communication issues and how we can design on-line learning environments that can facilitate productive learning experiences under these conditions. Our short term research focus is to develop automatic on-line assessment technologies and adaptive support technologies as infrastructure for supporting and studying collaborative learning in multiple cultures. The specific objective of our international collaboration has been to explore the intersection between the technology research area of text classification and the behavioral research area of collaborative learning process analysis. Beyond simply being an application of existing technology to a well defined framework for discourse analysis, this collaboration has yielded interesting new technical challenges and findings (Donmez et al., 2005; Rosé et al., 2005; Stegmann et al., 2006; Wang et al., 2007; Wang et al., submitted), questions about behavioral research methodology (Gweon et al., 2005), and finally questions about design of new forms of collaboration support that may be enabled by this technology (Gweon et al., 2006; Wang et al., 2007a; Kumar et al., 2007). Using our automatic process analysis technology, we have achieved almost human reliability on automatic application of an existing collaborative learning process analysis coding scheme (Weinberger & Fischer, 2006) to newsgroup style data from a number of large studies of script based support for computer supported collaborative learning in Germany (Donmez et al., 2005; Wang et al., 2007). Using this same analysis technology in conjunction with adaptive support agents (Wang et al., 2006; Kumar et al., 2006), we have run successful collaborative learning studies both in Taiwan (Wang et al., 2007a) and in the US (Kumar et al., 2007). This inter-disciplinary research endeavor brings together three large bodies of work, namely work on international standards for assessment of achievement in science and math education (Chang, 2005; Chang & Tsai, 2005) from the science education community, text classification technology (Rosé & VanLehn, 2005; Wang et al., 2007) in the language technologies community, and work on scripted collaboration (Weinberger, 2003; Weinberger & Fischer, 2006) in the computer-supported collaborative learning community. An important outcome of our research to date has been the development of the publicly available toolkit, TagHelper tools (<http://www.cs.cmu.edu/~cprose/TagHelper.html>), which has been developed to support the analysis of verbal data using text classification technology.

Currently, there is surprisingly little exchange between the computer-supported educational research communities of Asia, the US, and Europe. In contrast to correlational comparative work (e.g., Stigler & Hiebert, 1999), experimental studies are largely limited to samples drawn from single countries. While random assignment of subjects to experimental conditions allows one to draw conclusions that are general to the population from which the sample was drawn, limiting that sample to a single country makes key contextual variables that are not general across countries invisible to the analysis of the results. Thus, it is not possible to identify *causal* effects of or interactions between contextual variables on the one hand and the manipulated variables in the experimental design on the other hand. Recent evaluations of Western teaching practices within Asia cast doubt that findings can be transported wholesale from one community to the other without an understanding of what important contextual variables are, such as expectations about the role of the teacher and the role of the student in the classroom, and how they interact with key educational interventions (Chang et al., 2006; Chang & Tsai, 2005). Our long term

research goal is therefore to create needed experimental infrastructure to facilitate the type of experimental studies that would allow us to move beyond this limitation.

Because of the important role of social processes, in particular processes of communication that are heavily influenced by culturally based expectations and norms, the area of computer-supported collaborative learning is an ideal field in which to begin investigations of multi-national experimental studies. Known differences already exist, for example, in communication tendencies of Asians and Westerners (Setlock et al., 2004), which may affect both the need for and the effectiveness of collaborative learning support mechanisms that have been proven effective in an European educational context (Weinberger et al., 2005). As one specific example, Setlock et al. describe differences in argumentation strategies, where Westerners tend to focus mainly on points where they disagree, whereas Asians discuss points whether or not they disagree. It is important to note that although the Setlock et al. study is not a learning study, an interesting finding from their international comparison was that not only did their communication medium manipulation have a differential effect across cultures, but the relationship between those communication related variables and outcome variables related to the task were different across countries. Thus, what is needed is a detailed process analysis of collaborative behavior with and without support as well as a large scale effort to explore the relationships between process variables and learning outcomes. Such an analysis would allow us to build on prior work exploring more deeply hypotheses about how external processes, such as social processes, are related to and influence cognitive processes that lead to learning.

We plan to employ a stage model research methodology in which we begin by testing support approaches in a different cultural context from where they have previously been proven successful. Using a similar iterative process used to optimize the design of such support in its original context, we will optimize the design for a second cultural context. By comparing what works best in separate cultural contexts, we will then be in a position to form and then test hypotheses about how important contextual variables influence the effectiveness of specific forms of collaborative learning support. Think aloud protocols and logs of collaborative learning discussions will provide a rich resource for exploring social and cognitive processes to supplement findings from tests and questionnaires. The proposed research may offer insights that help us grapple better with issues related to how we as a nation should respond to the results from international comparisons such as TIMMS and PISA.

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