

Automated Data Analysis to Support Teacher's Knowledge Building Practice

Leng Jing, Johnny Yuen, Wing Wong and Nancy Law, University of Hong Kong,
 Email: lengjing2001@gmail.com, johnny.yuen@gmail.com, ow Wong@gmail.com, nlaw@hku.hk
 Yonghe Zhang, Beijing Normal University, 183812337@qq.com
 Stéphane Allaire, University of Quebec at Chicoutimi, stephane_allaire@uqac.ca
 Christian Perreault, Thérèse Laferrière, Université Laval,
 Email: christian.perreault@fse.ulaval.ca, Therese.Laferriere@fse.ulaval.ca
 Christopher Teplovs, Copenhagen Business School, ct.caict@cbs.dk

Abstract: Incorporating asynchronous online discussions as an integral part of introducing knowledge building (KB) in the formal school curriculum poses significant challenges to teachers. Making sense of the sheer volume of students' postings and identifying appropriate facilitation strategies based on these postings is a daunting, if not impossible task even for experienced teachers. This interactive event show cases the work of two research teams that have been developing tools to address teachers' concerns and researchers' interests on students' participation and idea progression in KB discourses. The approach taken by the team comprising researchers from the Centre for Information Technology in Education (CITE), University of Hong Kong and the Center for Knowledge Engineering (CKE), Beijing Normal University is to develop a web-based discourse analysis tool that can provide various forms of participation statistics as well as automatic coding based on linguistic features. The efforts of the Quebec-based team focuses on the use of lexical analysis, using preset lists of concepts or specialized dictionaries, and visualization of latent semantic analysis results.

Theme of the Interactive Event

Collaborative Knowledge building (KB), the production and continual improvement of ideas valuable to a community through collaborative efforts, is an important educational goal in the 21st century knowledge age. In Hong Kong, there is a history of more than ten years of implementing KB pedagogy and related online discussions in classrooms of different grade level and subjects. Although it has been well-received as one of the main educational goal of the 21st century, KB teachers find it difficult to monitor and assess students' participation and learning gain from online collaborative discussions. These difficulties arise from quantitative and qualitative approaches to assess online collaborative knowledge building discussions.

Quantitative approaches, for example participatory statistics, has long been used as a quick and easy indicator of students' participation in the online discussion. To a certain extent it is an informative indicator about students' participation in the online discourse. However, these figures do not necessarily reflect quality of idea progression among students; also, they are easily susceptible to students' manipulations in order to meet teachers' expectations. Qualitative approaches, on the other hand, impose other kind of workload to teachers. First of all, the sheer amount of postings contributed by students made reading and evaluating quality of online discussion a time consuming task. Second, the asynchronous nature of KB discussions made teachers think they have to keep constant eye on students' discussions in order to keep it on track. Although numerous in depth analysis has been conducted by researchers on various aspect of students' KB discourse, like evaluating progressive inquiry of ideas by students (e.g. Hakkarainen, 2003; Zhang et al, 2009), discourse characteristics (e.g. knowledge sharing, knowledge construction and knowledge creation by van Aalst, 2010), the theoretical underpinnings and methodology involved have been towards theory building rather than informing day-to-day teacher practice.

In order to help teachers and researchers to get timely and pedagogically relevant insights on students' KB to support teachers' day-to-day operations, research team at Centre for Information Technology in Education, University of Hong Kong (CITE, HKU) has been exploring for tools and methodologies that serve these purposes. Methodologically, the team has been investigating on understanding learner's knowledge building trajectory through visualizations of multiple automated analyses (Law, et al, 2011). In the study, visualizations generated by software tools on a number of discourse indicators, including use of scaffold supports, argumentative and questioning discourse acts, domain specific topics and associated keyword patterns, have shown to be informative in reflecting students' cognitive and metacognitive KB trajectories over a period of time. In addition, visualizations of discourse indicators also reflect the effects of teacher facilitations at various points over the KB activity.

At the technological frontier, CITE has been collaborating with the Research Center of Knowledge Engineering, Beijing Normal University (CKE, BNU) since 2006 to develop tools for the analysis of CSSL discourse data, especially discussion data in Chinese. The two parties are currently developing an online platform, COLODA – Collaborative Online Discourse Analyzer, to support analysis of online collaborative

discussion data. This platform is designed with the aim to support daily operations of KB teachers and researchers to generate timely and pedagogically relevant insights through, e.g. thread level analysis, keywords processing, automatic coding, visualization of discourse indicators and generation of relevant participatory statistics. Participants of this interactive event will be able to hands-on this analysis platform with a set of discussion data towards generating insights to inform evaluation of students' KB.

In Quebec, two paths have been taken to support feedback on students' discourse. The first is lexical analysis, using preset lists of concepts or specialized dictionaries. The second builds on the Knowledge Space Visualizer (Teplov, 2010), and analyzes the positioning of ideas within a team or a small classroom over time. Their use in real context will be demonstrated.

Objectives of the Session

- To introduce an automated online data analysis platform, COLODA, for teachers to gain quick and timely feedbacks about students' learning on CSCL platforms
- To explore different ways of working with online discussion forum data to gain insights to generate feedbacks for teachers' day-to-day practice

Session Activities

1. Overview of the session.
2. A brief introduction of the tools developed by the two teams, including COLODA, the collaborative online discourse analyzer and KSV, the Knowledge Space Visualizer, highlight the analyses and indicators that these tools could provide to reveal students' progress in understanding.
3. Identifying analyses questions analysis for exploration
 - a) Participants form groups and raise questions on students' learning in the database for later hands-on analysis
 - b) Due to the time limit, groups may discuss and narrow down to 3 questions for analysis
 - c) Groups could share their 3 analyses questions to all other groups on the whiteboard for collaborations or further refinements
4. Introduction of basic operations of the online analysis platforms
 - a) Base on the questions raised by the groups, hosts of the session will introduce some basic general functions to all groups for hands-on
 - b) For more specific research questions that may require specific functions of the analysis platform, relevant functions will be introduced by the hosts in the group
5. Group hands-on session
 - a) Participants will use COLODA to generate insights to their research questions about students' learning in the database.
6. Group reports and open floor discussions

References

- Aalst, J. van. (2009). Distinguishing knowledge-sharing, knowledge-construction, and knowledge-creation discourses. *International Journal of Computer-Supported Collaborative Learning*, 4(3), 259-287. doi: 10.1007/s11412-009-9069-5.
- Hakkarainen, K. (2003). Progressive inquiry in a computer-supported biology class. *Journal of Research in Science Teaching*, 40(10), 1072-1088.
- Law, N., Yuen, J., Wong, W., & Leng, J. (2011). Understanding learners' knowledge building trajectory through visualizations of multiple automated analyses. In S. Puntambekar, G. Erkens, & C. E. Hmelo-Silver (Eds.), *Analyzing interactions in CSCL: Methods, issues and approaches*. NY: Springer.
- Zhang, J., Scardamalia, M., Reeve, R., & Messina, R. (2009). Designs for Collective Cognitive Responsibility in Knowledge-Building Communities. *Journal of the Learning Sciences*, 18(1), 7-44. doi: 10.1080/10508400802581676.