Tools for Sustained Student Engagement in InterLACE (Interactive Learning and Collaboration Environment)

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Abstract: This poster documents the important role that CSCL technologies like InterLACE can play in providing spaces for active learning, reflection and social discourse, and thereby sustaining student engagement. We present a suite of tools designed to support sustained student engagement in InterLACE (Interactive Learning and Collaboration Environment), an online collaboration environment designed to support STEM education. We include tools designed for use by researchers, teachers, and students that provide insight into vocabulary usage, participation rates, and collaboration patterns. Preliminary results from six classrooms will be presented.

Major Issues, Theories, Significance

Science, technology, engineering, and mathematics (STEM) education has experienced a philosophical shift away from the memorization of facts, figures, and procedures toward engaging students in more authentic science practices. Central to this practice-and-process focus is a multi-dimensional concept that we call "active and sustained learner engagement": the interaction of higher order cognitive engagement, motivation, and interaction among peers.

Sustained learner engagement requires assessments that are "concurrent, embedded, and integral to the teaching and learning process" (Chan & Lee, 2007; Black & Wiliam 1998). Increasingly new technologies can play an important role in helping teachers blend authentic scientific inquiry and formative assessment. Few efforts have been made to develop systems that help teachers understand their students' activity and learning as it happens (Shapiro & Wardrip, 2011). Researchers have only just begun to examine how the use of CSCL tools for formative assessment support teachers in addressing student learning needs as they evolve in the classroom in the moment of instruction across different kinds of pedagogies (van Es and Sherin, 2001). As well, beyond feedback on multiple choice type questions, even fewer tools are available to help students both incorporate and benefit from formative assessment data.

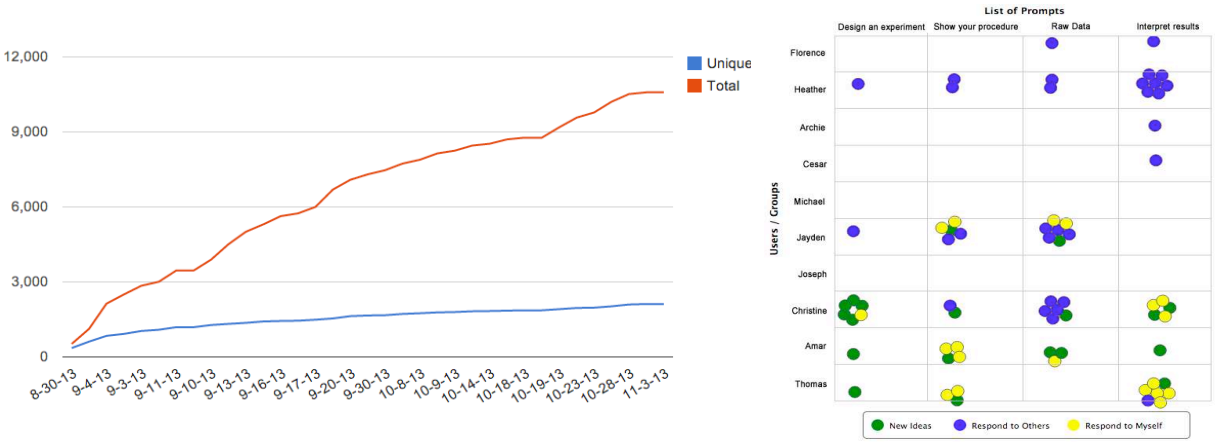
InterLACE (Interactive Learning and Collaboration Environment) is an innovative web-based computer supported collaboration environment that encourages scientifically meaningful experiences and promotes a broad range of active learning processes including epistemic practices of disciplines, authentic science practices as defined by the Next Generation Science Standards, and sustained engagement.

We have developed a suite of tools within InterLACE designed to measure and support this multi-dimensional concept of active learning and sustained student engagement by building on earlier work on formative assessment tools by Teplovs, Donoahue, Scardamalia and Philip (2007). The suite comprises three core toolsets, each of which is designed to answer one of the following questions: (1) What are students writing about? (2) How much are students contributing? (3) Who is working with whom?

The interplay between the three factors that these questions address provides a framework for understanding and maintaining active learning and sustained engagement. The use of multiple tools provides for a degree of internal triangulation and checks of validity. Our goal is to extend this approach to provide a deeper understanding of the dynamics of learner engagement. If we can deploy analytics that tell us about all three factors, teachers should be in a position to design learning activities that are both challenging and personally engaging. And if students are writing about deep concepts, with posts and responses that continue over time, and are interacting with one another's ideas, then it may be more likely that student engagement and personal growth will remain high.

Preliminary Findings

We will present data from six classrooms. Single-class examples of the analyses that will be conducted across all classrooms are shown in Figure 1, which highlights three of the tools from the toolset. The vocabulary growth tool (Figure 1a) shows vocabulary growth over time, which is related to contribution rates (Figure 1b). Collaboration patterns are available in graphical and textual form (Figures 1b and 1c). We believe that the key to maintaining sustained student engagement is the interaction between these three metrics. However, each question can also be considered independently to provide insights about student activity.



(a) Vocabulary Growth (b) Participation and Collaboration

This group	has responded to	and has been responded to by
Thomas	Thomas (7), Christine	Thomas (7), Michael, Cesar, Heather (8)
Amar	Amar (4)	Amar (4)
Christine	Christine (4), Jayden (6)	Thomas, Christine (4), Archie, Heather, Florence
Joseph		
Jayden	Thomas (3), Michael (4), Cesar (2)	Christine (6), Heather (2), Florence
Michael		Jayden (4)
Cesar	Thomas	Jayden (2)
Archie	Christine	
Heather	Thomas (8), Christine, Jayden (2)	
Florence	Christine, Jayden	
Numbers in parentheses refer to the number of times a group responded if that number is greater than 1.		

(c) Collaboration Patterns

Figure 1. Analysis Tools.

Investigations into word use by students within their posts shows continued substantial gains in vocabulary growth over time both in terms of total words and unique words used within the class, from the perspective of all words (Figure 1a), academic words, and domain-specific words (i.e. words about the topic of physics). Measures of productivity are also important, and this toolset counts contributions over time by students including original posts, responses to others, and self-responses (Figure 1b). Visualizing this information provides the teacher and students instant access to not only the type and quantity of activity happening within the system, but also the nature of the interactions and the dynamics of the community of learners (which students are/aren't participating and which part of the lesson is generating the largest number of ideas and discussion). In addition, understanding the details of student responses to ideas (of their own or of their classmates) can provide high-level information into the nature of collaboration. Beyond the table information presented to the class (Figure 1c), we also look at the details of who is collaborating with whom by examining the associated social networks generated by the class over time within the system.

References

Black, P. J. & Wiliam, D. (1998). Assessment and classroom learning. *Assessment in Education, 5*(1), 7-71.

Chan, C. K. K. & Lee, E. Y. C. (2007). Fostering knowledge building using concurrent, embedded and transformative assessment for high-and low-achieving students. In *Proceedings of the 8th International Conference on Computer Supported Collaborative Learning* (CSCL'07), 108-117.

Shapiro, R. B. & Wardrip, P. S. (2011). Interactive representations of student activity to inform teacher collaborations: results from a formative investigation. In *Proceedings of Computer Support for Collaborative Learning 2011*. Hong Kong.

Teplovs, C., Donoahue, Z., Scardamalia, M., & Philip, D. (2007). Tools for concurrent, embedded, and transformative assessment of knowledge building processes and progress. In *Proceedings of the 8th International Conference on Computer Supported Collaborative Learning*, 721-723.

van Es, E.A., & Sherin, M.G. (2002). Learning to notice: Scaffolding new teachers' interpretations of classroom interactions. *Journal of Technology and Teacher Education, 10*(4), 571-596.