InterLACE: Interactive Learning And Collaboration Environment

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Abstract: InterLACE is a new web-based platform developed to support collaborative learning in the classroom. It is designed to quickly and easily capture student ideas and representations using any computer, tablet, or smartphone. With a persistent, shared workspace, students' ideas can be visualized and manipulated to support group sense-making class-wide.

Purpose

The InterLACE Project aims to develop and test an innovative web-based computer supported collaborative learning (CSCL) environment to support co-located collaboration in high school physics classrooms. Students benefit from sharing their ideas as well as viewing, organizing, and refining one another's ideas as they emerge. InterLACE has been designed to lower the implementation barriers to collaborative learning (Hynes et al, 2012) for teachers by making it easier to monitor student discourse and adjust lessons on the fly when the situation demands. The first InterLACE tool, developed and tested in five Boston and New Hampshire high school classrooms, provides a shared, interactive work space to facilitate collaborative learning. Students can post, visualize, build on, reorganize, comment on, reflect on and improve their own and/or fellow classmates' ideas. It enables students to use the virtual artifacts they create to build knowledge together, argue for their point of view, make connections, and expand on one another's ideas, resulting in deepening and broadening the collaborative dialogue and knowledge building activities.

Contributions

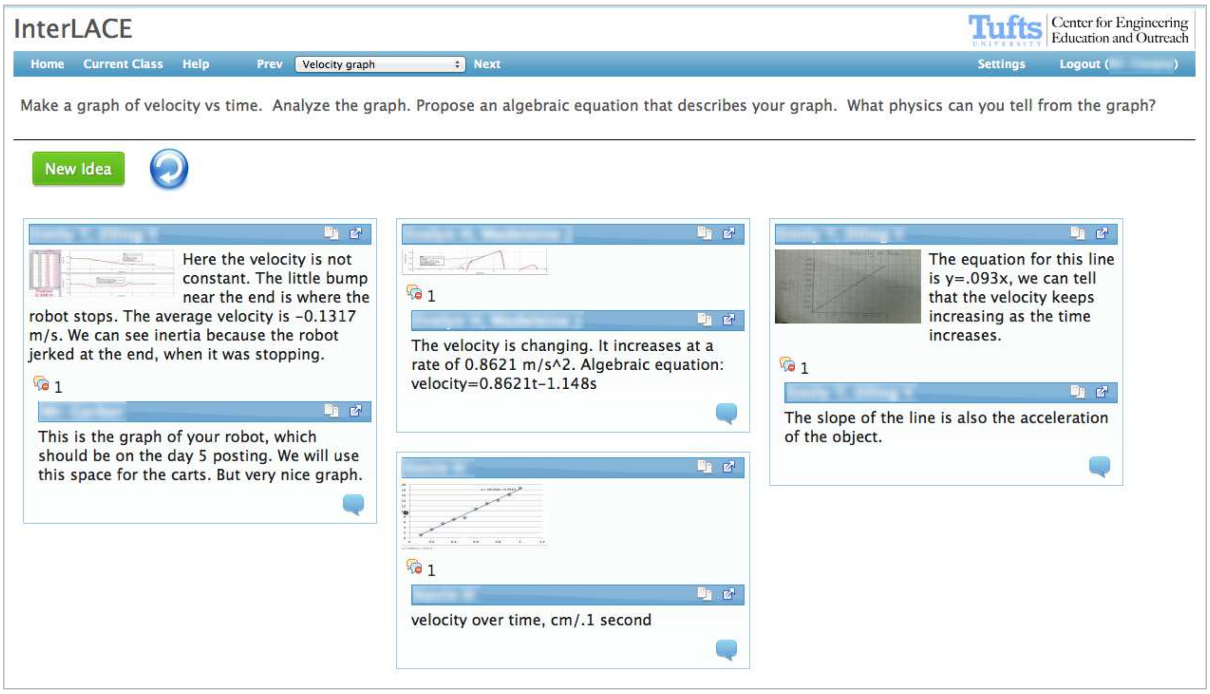
Building on lessons from learning sciences, CSCL views learning supported by technology as the "shared effort of students to build shared meaning interactively" (Stahl et al, 2006) rather than just absorb facts from the teacher. This involves: active engagement, a focus on knowledge construction, idea improvement, feedback and adaptive instruction. CSCL technologies support these collaboration activities by providing a "joint problem space" (Teasley & Roschelle, 1993), or shared dynamic interactional space where class-wide knowledge-building can take place and students can observe each others thinking.

To that end, the technical team has created a flexible web-based tool that provides a persistent whiteboard-like work space (see Figure 1) that makes student ideas available for class-wide visualization, discussion, joint organization, manipulation, and improvement, all of which can lead to the construction of a shared understanding of the concepts being studied.

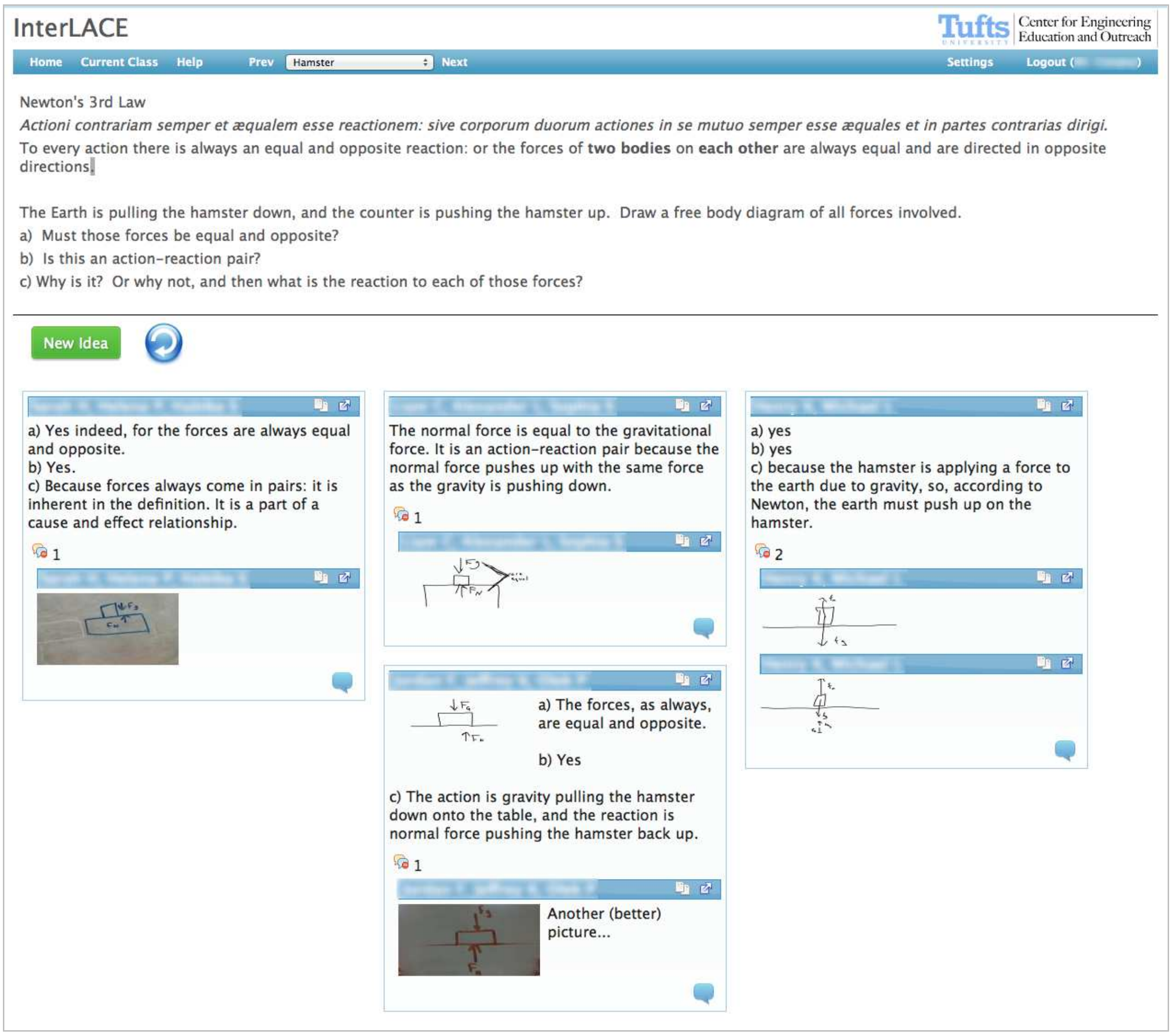
Learners represent ideas in different ways, so any technology must be flexible enough to support a variety of representation types. Currently, students can develop their ideas using text, images, screenshots, and sketched drawings (see Figure 2), with a plan to add videos. These representations are aggregated within the tool and visible to the entire class on students' computers, smart phones, or tablets, as well as on the SMART Board or screen at the front of the room. Teachers are also able to embed rich media and simulations into their lesson plans.

Both students and teachers can dynamically rearrange these Post-it note type objects to identify patterns and connections across group responses (see Figure 3). Additionally, members of the class can use InterLACE's comment feature to build on and refine others' ideas, reflect on work, show support, and critique or defend ideas in real time. Teachers can contribute to the discussion, provide quick feedback, and monitor students' understanding. Individual student contributions can be highlighted for viewing, along with side by side comparisons from multiple students, to engage the entire class in a process of scientific argumentation and collaborative sense-making (Danahy et al, 2012). Instead of the teacher eliciting and evaluating responses and then synthesizing them, InterLACE encourages all students to contribute to the conversation and engage in the evaluation of how ideas relate to one another.

InterLACE supports and enhances students ability to participate in interactive, class-wide, multimodal discussions. Students' ideas become the focus of the classroom work. Information contributed by individuals with different perspectives can help the group pull together pieces of a problem other members hadn't considered to create better understanding for everyone. It enables the capacity for on the spot feedback based on students' ideas. Finally, using InterLACE, students can read and interact with the ideas of classmates, thus making their own thinking visible. All of these skills are critical to being an educated person in the 21st century.



<u>Figure 1</u> – Whiteboard Work Space



<u>Figure 2</u> - Flexible Idea Representation

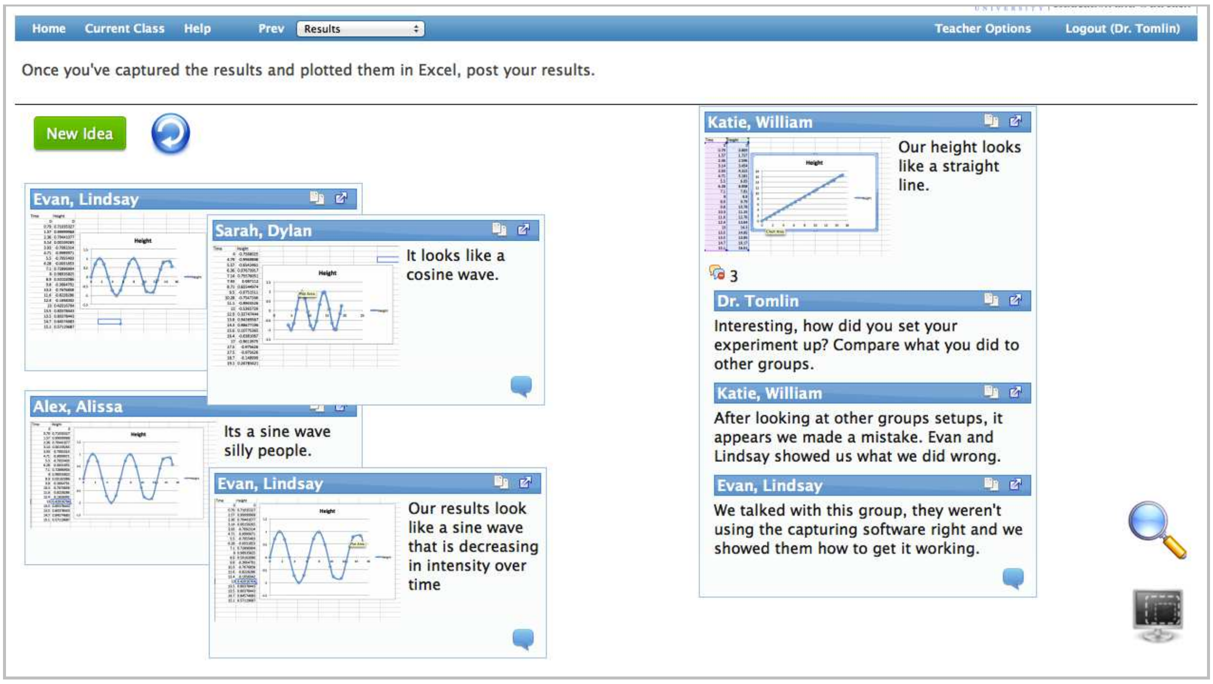


Figure 3 - Arrangement For Group Sense-making

Demonstration Experience

There will be two main goals of the demonstration. First, to demonstrate the capabilities of InterLACE and give participants a sense of how it can be, and has been, used in the classroom. Second, to solicit feedback from the audience about the direction the research should take next.

Audience members will be given the opportunity to directly interact with each other via InterLACE. A class session will be created specifically for the conference presentation. Participants will be given the URL and password, and after logging in they can specify a display name and enter the class. Then we will highlight several of the novel contributions of InterLACE:

- Idea representation must be flexible - Learners represent ideas in different ways (Rose and Gravel, 2010), requiring technology flexible enough to allow them to choose the representation that best captures their thought process. The demonstration will ask users to provide several different forms of rich media and text.
- Multiple platform integration – Built entirely in HTML5, InterLACE can be used on nearly every computer, tablet, phone, operation system, and browser. The research team will provide several different tablets that participants can use, in addition to their own computers.
- The power of persistence - As users answers are quickly displayed on the main projector, they must take ownership of their idea and be able to explain their thought process. Persistence plays many rolls in collaboration, from reducing cognitive load to improving parallel communication (Gergle et al, 2004) (Cherubini & Dillenbourg, 2007). Our observations show this persistence to be powerful in the evolution of the groups' shared sense-making.
- Simplicity and Speed – Through observation and discussion with teachers, we determined that time overhead involved in implementing technology-assisted collaboration into the classroom is a major barrier to implementation. Installing software or plug-ins takes significant effort. Students forget passwords or are confused by overly complex interfaces. InterLACE was designed to quickly capture ideas via interfaces that are intuitive and simple to navigate.

Participants will be prompted to respond to several questions, which will be relevant to the topic at hand. They will be able to use their own devices (provided there is a good wi-fi connection), as well as devices the research team will provide.

For this scenario, the questions would be simple and fun, with the first one being an opportunity to take a picture of themselves and give a short introduction. Participants can use the camera on their computer or tablet to take a picture and post their name/affiliation. Subsequent questions will attempt to both demonstrate the systems capabilities and potential use cases. Once participants have a sense of the goals of the project and the affordances of the software, they will be asked to provide feedback in areas that we are interested in perusing.

- Scaffolding – InterLACE contains less built-in scaffolds than well-known CSCL systems like Knowledge Forum, and instead relies on the teacher to provide much of the scaffolding. How can scaffolds be introduced in less rigid ways, specifically ones that build on users' existing affordances learned from social media?
- Assessment – Tools are currently in development to assist teachers in evaluating student contributions in InterLACE, but what else can be done from both a technology and pedagogical perspective to help teachers assess collaborative activities?
- Evaluation – How would participants set up controlled experiments to evaluate InterLACE as a CSCL system? Users are often co-located when using InterLACE, therefore communication takes place both online and off. How would participants combine log file data with information from coded video files? What particular aspects should we be looking for, such as inter-group communication? What does the role of the actual student content contributed to InterLACE play in evaluation?

This demonstration design will allow both participants and presenters to learn from one another and each take something of value from the session.

Supporting Materials
The research team has produced a video demonstration.

Video: http://youtu.be/CaANnbp9ZD4

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