

SCHOOL 3.0

Based at McGill and drawing together universities from around the globe, the new Learning Environments Across Disciplines project explores how a new generation of technology-rich classrooms can keep students more focused and engaged — and keep would-be drop-outs in school. //

By Laura Pellerine



Do you know that scene in *Ferris Bueller's Day Off*, the one where the high school teacher lectures in a dry monotone voice while his students stare blankly back at him? One student, head on desk, is so bored that drool has pooled near his mouth, while the teacher attempts in vain to engage his charges by repeatedly asking, "Anyone, anyone?"

A new collaborative research project is hoping to prevent such scenes from happening in classrooms in the future — and to inspire at-risk students (Statistics Canada reported 190,800 drop-outs in 2010 alone) to give the classroom another chance.

Susanne Lajoie, a Tier 1 Canadian Research Chair (Advanced Technologies for Learning in Authentic Settings (ATLAS)) and professor in the Department of Educational and Counselling Psychology, is the principal researcher of Learning Environments Across Disciplines. The goal of LEADS is to figure out how students learn, and perhaps even more importantly, how to keep their attention in the classroom. The interdisciplinary research project is using technology-rich learning environments to fully engage students, and to better understand how the act of learning can excite, or bore, students of all ages.

"The big problem in today's world is students have all these beautiful toys — social networking, smartphones, iPads — and then they go to school and teachers tell them to turn off the technology," says Lajoie, who is a Fellow of the American Psychological Association and American Educational Research Association. "Now, that's one way to keep people focused. But another way is to bring the excitement of technology into the classroom — and that's not being done as cleverly as it should be. I'm not saying that just putting a computer into the classroom makes it a good tool. You have to design the technology so it enhances learning and emotional motivation."

Designing that technology is a big part of what LEADS aims to do. Backed by a \$2.5-million "Insights" Partnership Grant from the Social Sciences and Humanities Research Council of Canada, the researchers

will use technology-rich platforms to document how learning occurs, and what educators need to do to get students more engaged.

Joining Lajoie in the seven-year research project are 16 co-applicants and 12 partners representing 19 universities and agencies from Canada, the United States, Germany, Australia, Denmark and China. The project is divided into three themes. Roger Azevedo, a professor in Lajoie's department and the Canada Research Chair in Metacognition and Advanced Learning Technologies, is leading the exploration of cognitive and socially guided learning. Reinhard Pekrun, a psychology professor at Ludwig-Maximilians-Universität in Munich, is leading emotional engagement and disengagement studies. The third theme leader is Jacqueline Leighton, an educational psychology professor at the University of Alberta, who is tackling innovative forms of assessment with methods that go beyond traditional self-reporting data.

The theme leaders are overseeing collaborations between researchers from a wide variety of backgrounds, who gathered for the first time this past June at a two-day conference in Montreal. Psychologists and computer scientists, engineers and ethnographers, educators and physicians — even historians: None are new to the study of education, but they haven't ever shared their ideas with such a diverse pool of thinkers.

"There are people interested in learning theory, there are people interested in emotion theory, there are people designing technologies," says Lajoie. "We've all been working in silos but now we're going to be able to work together to build better tools. One person may be good at designing games but they may never have worked cross-discipline before, so how can they help physicians build games that would be better for medical simulation? By bringing people together we're going to be able to cross methodologies and cross theories."

One cross-discipline that students are sure to enjoy is the welcoming of video games into the classroom. Heading up this end of the project is James Lester, a professor of computer science at North Carolina State University, and co-investigator in LEADS' emotional engagement



01 Jacqueline Leighton
 02 James Lester
 03 Reinhard Pekrun
 04 Susanne Lajoie
 05 Roger Azevedo
 With members of the LEADS Research Group
 at the inaugural annual meeting in Montreal
 in 2012

and disengagement team. For Lester, whose research focuses on creating new learning technologies through the use of artificial intelligence, intelligent tutoring systems, computational linguistics and intelligent user interfaces, deciding to join the team was a no-brainer.

"There's a very strong intelligence computer community in Canada, particularly at McGill, that does work in the application of artificial intelligence to learning environments," Lester says. "Roger Azevedo is one of the key players, he holds a distinguished chair in educational psychology and he's a strong scholar in this area. When I learned that he and Sue would be principals in this effort, it was a really easy decision to join them."

One of Lester's serious games, *Crystal Island*, is a virtual world where students are forced to use their problem-solving skills. In the Grade 8 version, for example, students play the role of detectives stranded on an island when members of their research team start exhibiting symptoms of a disease outbreak. Students then have to use their knowledge of microbiology to diagnose the cause.

So far, Lester says the students are responding positively. "Going into a classroom where students are using game-based learning feels different from traditional classrooms. You sort of expect it could cause students to be louder and more talkative, and be less focused. Actually we find just the opposite — students are very, very focused."

"That's half of the battle," Lajoie says, "keeping people motivated. If they're engaged, they're going to remain and persist in that learning context."

LEADS researchers will largely work with students from Alberta's Rockyview Schools, made up of 40 grade schools in areas just outside of Calgary, and Montreal's Hooked on School network, or Réseau Réussite, that works with young people, parents and other concerned parties to help struggling students achieve success.

"I'm in my early 50s and when I was in school, science was memorizing a bunch of stuff in really thick textbooks," Lester says. "The concepts are interesting if you're a good student, but there are a lot of students out there who are in need of some help, and this technology can be really helpful to those students. One of the great promises of this work is expanding the pipeline at an early age — increasing the

number of students that are interested in science, technology, engineering and mathematics. It's too late to do that once they're in college, and some people believe by even upper elementary school. It looks like these technologies can make a real difference."

LEADS isn't just about designing technology to help students learn — it's also focused on how technology can gauge what students are feeling as they're learning. The researchers have designed affect studies that use various modalities, such as: galvanic skin response that measures, for example, if your palms become sweaty while nervous; posture (whether students are leaning forward in their seat, showing that they're more engaged, or leaning back in boredom); facial expression analysis; and natural language understanding. They'll use computational linguistics techniques to evaluate how a student is feeling based on the language they use. The affect researchers will also study students' problem-solving progress. What does it mean, for example, if a student slows to a halt while working on a science problem? Are they deeply engaged in reflecting on the problem, or are they at an impasse and don't know how to proceed?

"Really strong human tutors, teachers and coaches are very effective at providing engaging experiences for learners and are able to detect when learners are frustrated," says Lajoie. "So what we want to do with learning technology is to be able to detect when students are frustrated and be able to provide support for them so that they'll persist in a learning episode."

"Our goal is that people will become lifelong learners," adds Lajoie. "In today's world, people don't stay in the same jobs for a long time; there's a lot of adaptivity that people need in order to be successful. So we have to teach students how to learn, and to learn in new contexts. By finding ways of keeping people in school they'll have more success in the long run, not just for themselves, but for society." ■

Funding for LEADS is provided by a \$2.5-million grant from the Social Sciences and Humanities Research Council of Canada.