

Inside this edition: *The research of education*

Volume XXVII Number 1 Summer 2012

Research

magazine

UNIVERSITY
of GUELPH

CHANGING LIVES
IMPROVING LIFE

BRAND NEW KEYS FOR LEARNING

PLUS

Field courses
in classrooms

Video boosts
writing skills

Studying with
social media

Language-
learning
technologies

Improvisational musicians Mark Laver (left) and Daniel Kruger are part of a Guelph research team using music to help communities find new ways to gel. Read more about their efforts on page 24.





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SPARK

Students Promoting Awareness of Research Knowledge

The University of Guelph *Research* magazine is written and co-ordinated by participants in the Students Promoting Awareness of Research Knowledge (SPARK) program.



Fourth-year international development student Samantha Beattie could never understand why her professors insisted she write so many essays. But that all changed when she met with Profs. Karl Cottenie and Tom Nudds. She discovered that the best way to master valuable skills – like essay writing – is to reinforce them time and time again. Read more about how repeated practice improves learning on page 15.



As a child, fourth-year biomedical science student Natalie Osborne imagined her beloved stuffed toy sheep “Lamby” would one day spring to life and roam the farm she grew up on just outside Guelph. She was interested in writing about a new specialized course developed at Guelph’s Ridgetown campus designed to teach sheep management practices to students through a unique, hands-on learning technique. See page 7.

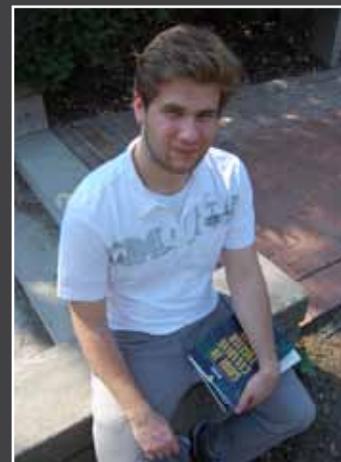
Research magazine co-coordinator Katharine Tuerke, a neuroscience doctorate student, developed critical thinking and problem-solving skills at graduate school. Now, first-year students in an enquiry-based learning seminar are learning such skills at the beginning of their academic career. Read more about enquiry-based learning seminars on page 18.



Fourth-year marketing management student Nicole Yada found it challenging to stay focused and engaged in large classes. That’s why she was excited to learn about the newly revamped first-year biology classes that emphasize student interaction. Read more about this story on page 33.



Research magazine co-coordinator Joey Sabljic, a fourth-year English student from Guelph, Ont., has always had a love for romance languages, which is why he’s also studied Spanish since his first year. He writes about a Guelph professor who is researching how new technologies can be used to enhance second-language learning. Read his story on page 12.



uoguelph.ca/research

Volume XXVII Number 1 Summer 2012

Focus: The research of teaching and learning

Vice-President (Research)

Kevin Hall

Acting Associate Vice-President (Research)

John Livernois

Associate Vice-President (Strategic Partnerships)

Rich Moccia

Editor and Director, Research Communications

Owen Roberts

Executive Editorial Advisors

Karl Cottenie, Department of Integrative Biology

Tom Nudds, Department of Integrative Biology

Peter Wolf, Centre for Open Learning and Educational Support

Editorial Advisors

Associate Deans of Research*

Associate Editor and Project Co-ordinator

Joey Sabljic, Katharine Tuerke

Copy Editor

Stacey Curry Gunn

Design

Dave Peleschak, JnD Marketing

Address correspondence to:

Owen Roberts, Director, Research Communications

Office of Research, Room 437, University Centre

University of Guelph, Guelph, ON N1G 2W1

519-824-4120 Ext. 58278

inforc@uoguelph.ca

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***Associate Deans of Research**

Stuart McCook, College of Arts

Glen Van Der Kraak, College of Biological Science

Sylvain Charlebois, College of Management and Economics

Deb Stacey, College of Physical and Engineering Sciences

Belinda Leach, College of Social and Applied Human Sciences

Bev Hale, Ontario Agricultural College

Gordon Kirby, Ontario Veterinary College

Publication Mail Agreement number 40064673

Liz Synder, Manager Research Communications and Marketing

Please return undeliverable Canadian addresses to:

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Guelph ON N1G 2W1 Canada

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www.uoguelph.ca/research



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Association**

Education builds on a solid research foundation



Kevin Hall

THE UNIVERSITY OF Guelph is highly focused on excellence in teaching and student learning. Guelph's reputation as a learner-centred institution that fosters deep learning is well known.

To build on our success as educators, we strive to continually enhance our understanding of the teaching strategies, methods and approaches that best support student learning. To that end, the scholarship of teaching and learning (SoTL) has gained much momentum at Guelph. Defining SoTL is a challenging issue in and of itself, but it is broadly about using systematic inquiry and evidence-based approaches to improve student learning.

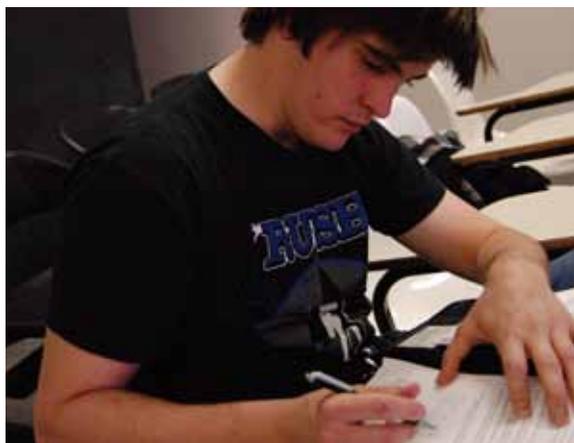
With this issue of *Research*, we do something we've never done before – that is, explore the nexus between teaching and research as a vehicle for learning. In every college at Guelph, faculty and staff are applying their research expertise to actively explore ways to improve the learning environment.

A variety of discipline-based research methods and approaches reflect SoTL. Deductive and experimental approaches provide strong evidence of learning, as well as case studies and other approaches. Evidence-based approaches based in systematic inquiry have in common a focus on the effectiveness, efficiency and/or appropriateness of how educators teach and students learn.

This issue of *Research* brings further attention to the solid foundation of research on teaching and learning, and the need for continuing educational research to best serve the next generation of informed and engaged citizens.

As always, I welcome your comments and opportunities for partnerships on these essential research endeavours.

Kevin Hall, Vice-President (Research)



IF I GIVE THEM THE NOTES, WILL THEY COME?

Sure... if you're a good instructor, says the research

BY KATHARINE TUERKE

DOES PROVIDING STUDENTS with PowerPoint notes before class decrease attendance? Not according to Prof. John Dawson, Department of Molecular and Cellular Biology.

Faculty members wonder if students are less engaged in lectures when notes are posted. The research doesn't bear that out – it's shown that in some cases students believe having notes actually helps hold their attention, because they're more aware of the topic or issue.

Faculty members also wonder if they need to be exceptionally adept at PowerPoint presentations. Dawson found that the answer is yes: because PowerPoint has become a popular pedagogical tool, the most engaging presentations have colour, animation, variation in design and use good transitions.

But technology is only a fraction of the equation that maintains student interest and attention – Dawson says the lecturer is the main factor in keeping class attendance up.

Indeed, the lecturer designs the content, crafts the presentation and chooses the technology and method to engage their students. It is the variety in lecture and presentation modes that maintain attention and keep interest. Students come to class for face-to-face contact.

"The perception of a caring, prepared, good professor encourages students to feel a connection and desire to go to school," says Dawson.

Dawson's findings were published in the newsletter of the Society for Teaching and Learning in Higher Education. 



Meeting student expectations

BY SAMANTHA BEATTIE

LANDSCAPE ARCHITECTS KNOW that when it comes to design, meeting expectations is essential to customer satisfaction. Applying the same logic to the University of Guelph landscape architecture program, Prof. Nathan Perkins, School of Environmental Development and Rural Design, is researching students' expectations of the program experience, and then addressing them the first week of classes.

In August, Perkins asks incoming students to complete

LEARNING GETS DEEP WORKING WITH SHEEP

BY NATALIE OSBORNE

A UNIQUE EXPERIENTIAL learning course offered at the University of Guelph's Ridgetown campus shows how faculty members can provide their students with opportunities for deeper learning.

The course involves hands-on experience in sheep management and brings together students, farmers and industry members. Former campus director Art Schaafsma and faculty members, including livestock professor Paul Luimes, developed the course in response to student and industry requests for more focus on sheep production and management.

The model has been so successful that Schaafsma hopes it will be adapted for other agricultural areas within the school.

"We really hit a homerun – the course builds a nice bridge between students, producers and industry at a very practical level," says Schaafsma. "It gets the producers back on our campus and they learn together with the students. That's a piece that's been missing for years and we're going to try and cultivate that as much as we can, not only for sheep but for other livestock and crops."

Here's how it works: The campus brings together a group of industry members and sheep producers who identify a specific, straightforward question related to production or management practices. Then, students develop and perform a research trial designed to answer this question quickly and effectively. The research is conducted on a cost-recovery basis, supported by farmers and key industry members.

Afterwards, students write a scientific report and communicate the results directly to producers.

a 70-question online survey. He asks the students what they think they will be doing in their classes, as well as how much time they plan to spend doing homework.

He evaluates the survey results and meets with the students during the first week of school. They discuss the students' initial expectations and how the program may differ from what they anticipate.

Contrary to their expectations, students only spend about 20 per cent of their time learning to draw and create designs. The majority of their classes revolve around activities such as essay writing and math. During that first week, Perkins works on altering these perceptions to bring them in line with what the students will be actually experiencing.

Landscape architecture is a relatively small program – accepting only 50 students out of 600 applicants a year. Perkins says they can't afford to lose participants, especially because students from other programs can't transfer in without having to start over.

After seven years, this system seems to be working. On average, Perkins says only one in 50 does not graduate.

“Considering Guelph is home to the only English-speaking undergraduate landscape architecture program in Canada, it's essential that we continue to successfully train students for the industry,” says Perkins.

Supporting this endeavor is Prof. Maurice Nelischer, former director of the School of Environmental Design and Rural Development. 

For example, farmers wondered whether feeding corn silage to lambs would be an effective way to cut high feed costs. Students fed various corn silage diets to a flock of 120 lambs, collected data and then analyzed the results. Their findings surprised producers and professors alike – it turns out feeding corn silage did not provide any economic gain.



Luimes says this type of research provides rapid, reliable answers to industry questions. What's more, it equips students with a variety of skills, from on-farm practices and research techniques to communication and extension tools.

Because students must think critically about the material and then go out into the community to present the knowledge they gained, Luimes says they engage in deep learning that lasts.

The experiential course also allows students to put the theoretical concepts presented in the traditional sheep management class into practice.

“I was pleasantly surprised at the quality of answers the students gave in their discussions and the insights into management practices that they had,” says Luimes. “It's a great course because it incorporates research, teaching and extension – it brings them all together in a really neat package.” 

Catalyzing new connections for education technology

BY
KATHARINE TUERKE

THE CONNECTION BETWEEN research and education is clearly seen in the design, development and use of technology to enhance students' educational experience.

The University of Guelph's activity in technology development is abetted by the Catalyst Centre, which helps faculty members partner with and bring their innovations to industry.

The centre kicked up its level of activity this spring when it held a workshop to bring together educators and industry. Technology providers learned about how their programs were being used in the classroom and educators provided feedback on the unique software needs of each discipline.

Industry liaison officer Dr. Haridoss Sarma says the workshop was the centre's first initiative in education and learning.

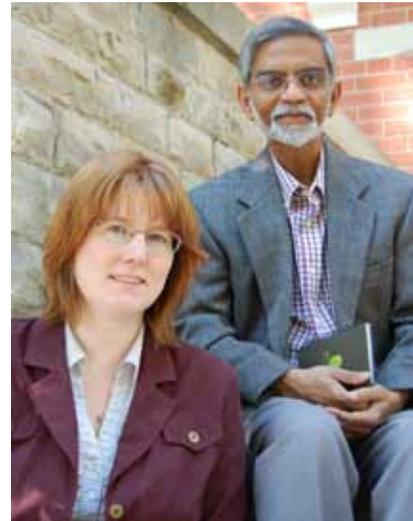
“Our goal was to identify the technological issues, uses and needs of the university required to support and improve education,” he said.

One major concern identified by educators was that it would be difficult to create a software program that transcended educational initiatives, because needs are so specialized.

“Each discipline is unique in its educational need, teaching methods and technology support,” says Sarma. “Having educators and industry work together improves educational software so it is targeted and as useful as possible.”

Participants said technology and education is a broad and increasingly important sector, and that this workshop was able to capture many of the diverse topics and key issues. As a result, a follow-up session will be held next year that will include student representatives.

This workshop was sponsored by Desire2Learn, Nelson Education, Open Text and the Ontario Centres of Excellence. 



Prof. Lori Jones (left) and Haridoss Sarma brought their business, research and education perspectives to the Catalyst Centre's innovative technology and education workshop.

IS SOCIAL MEDIA A SCHOLARLY TOOL?

BY KATHARINE TUERKE

SOCIAL MEDIA IS often dismissed as an unwelcome distraction in many classrooms. But instead of fighting it, one University of Guelph professor is using it to engage students and improve learning.

Prof. Mark Lipton, School of English and Theatre Studies, believes social media can be used as a functional tool and critical resource in the classroom. Treating his classroom as a laboratory, Lipton uses his pedagogical practices to test if social media increases student engagement.

“For media studies faculty, it is important to teach both about and through digital media,” says Lipton.

He says social media can be used as a functional tool to engage, interact and communicate with students.

However, he says, social media can also be used as a critical resource to teach students about digital media issues, such as social hierarchies and networks, the politics of privacy, the changing nature of net neutrality, cloud computing, copyright and creative commons, and politics of media ownership.

Lipton says that with Internet accessibility and wireless device use on the rise, students can now roam online and participate in social media during class. So, he asks, why not use Facebook as a discussion tool to focus their attention on the lecture?

Here’s his approach: Lipton verbally invites his first-year students to join the class’s open

Facebook group. There is no assessment – and with that concern removed, Lipton finds students become motivated to use Facebook as a participation tool during lectures. In fact, his lectures often jump to the class’s Facebook discussion group, allowing him to respond to student remarks and answer questions. Lipton extends his lectures from the use of Facebook groups to the topic of privacy, and how students can use specific privacy settings to manage their public identity. He also underscores the importance of privacy, using cautionary tales about how poor identity management can go beyond embarrassment to legal consequences.

“Projecting the class’s Facebook wall during lectures proved a powerful tool to moderate discussion, share announcements and follow student thinking,” says Lipton. “Even if a student chooses not to participate, he or she can still benefit from Facebook as a classroom management system.”

This immediate and interactive exchange between student and professor creates a unique learning environment, where both contribute to the course content. By giving students a direct means of influencing lectures in real time, students stay involved and are able to absorb more information.

At the end of the term, the use of Facebook in class is assessed using two surveys. Students are asked to evaluate the impact of

using the Facebook group in the classroom using an open-ended reflection and a simple numeric rating scale. The response has been overwhelmingly positive: the majority of students consider it to be “interesting” and “innovative,” says Lipton.

As well, most students said the Facebook group increased their focus and

interest during class. It personalized learning and taught students to use social media responsibly. Providing students with real-world examples of more theoretical topics enabled them to gain a thorough understanding of the material, they said.

Lipton has also explored the use of other social media tools including geotagging/foursquare, Youtube, social tagging and Twitter to teach surveillance, satellite technology and social consciousness as well as critical thinking and creativity.

“Education must adapt and respond to this new challenge,” says Lipton.

His Facebook study has recently been published in *Learning Through Digital Media Experiments in Technology and Pedagogy* as part of MobilityShifts: an International Future of Learning Summit. 

Prof. Mark Lipton uses social media as a functional tool and critical resource to engage students and improve learning.



Romeo + Juliet on your tablet

BY JOEY SABLJIC



AFTER SEVERAL YEARS of development, a Guelph researcher has found that adding multimedia components to Shakespeare's works leads to far greater student engagement, understanding and interest. Now, he says that this multimedia approach is one of the ways of keeping not only Shakespeare's works but much of popular literature

studies alive and thriving within the digital age.

The tragic love tale of Romeo and Juliet still influences today's pop culture, from movies to music. Now, with smartphone and tablet technology on the rise, a team of Guelph researchers is putting Shakespeare's tale into students' palms – and into the digital age – through a new, downloadable application.

School of English and Theatre Studies Prof. Daniel Fischlin and a team of graduate and undergraduate researchers, computer programmers and professors at Guelph have put their expertise together to launch their newly developed Romeo + Juliet: The Shakespeare App across several different tablet and smartphone platforms.

"To get across this content to a youth audience, you have to move your teaching and content into the digital space and respect where a lot of young people are doing most of their living and learning – whether that's through web-based apps or social media," says Fischlin, a University Research Chair. "We want to show that Shakespeare is still very much alive in today's digital world and that he's still informing modern thought and pop-culture through his digital presence. And we want to do so while respecting Shakespeare's presence in more traditional media like theatre and book culture."

The app mainly works as a gateway to related web-based resources, guiding users towards multimedia content that Fischlin and his team have carefully researched and found to be pedagogically useful. He and his team then went through the play, flagging words, phrases or expressions that they thought might raise questions among readers.

Then, they linked these key words or phrases to related images, illustrations, Shakespearean-era music or video clips of the play being performed. And with each link, Fischlin and his team have

created a portal that's carefully mediated and gives readers access to online materials with the greatest educational value.

To give readers an additional layer of depth, Fischlin included video segments featuring Shakespeare experts from Guelph's very own School of English and Theatre Studies, who weigh in with their own opinions and interpretations of the play. This way, says Fischlin, students can have the benefit of listening to multiple perspectives to form their own ideas on how to read the play.

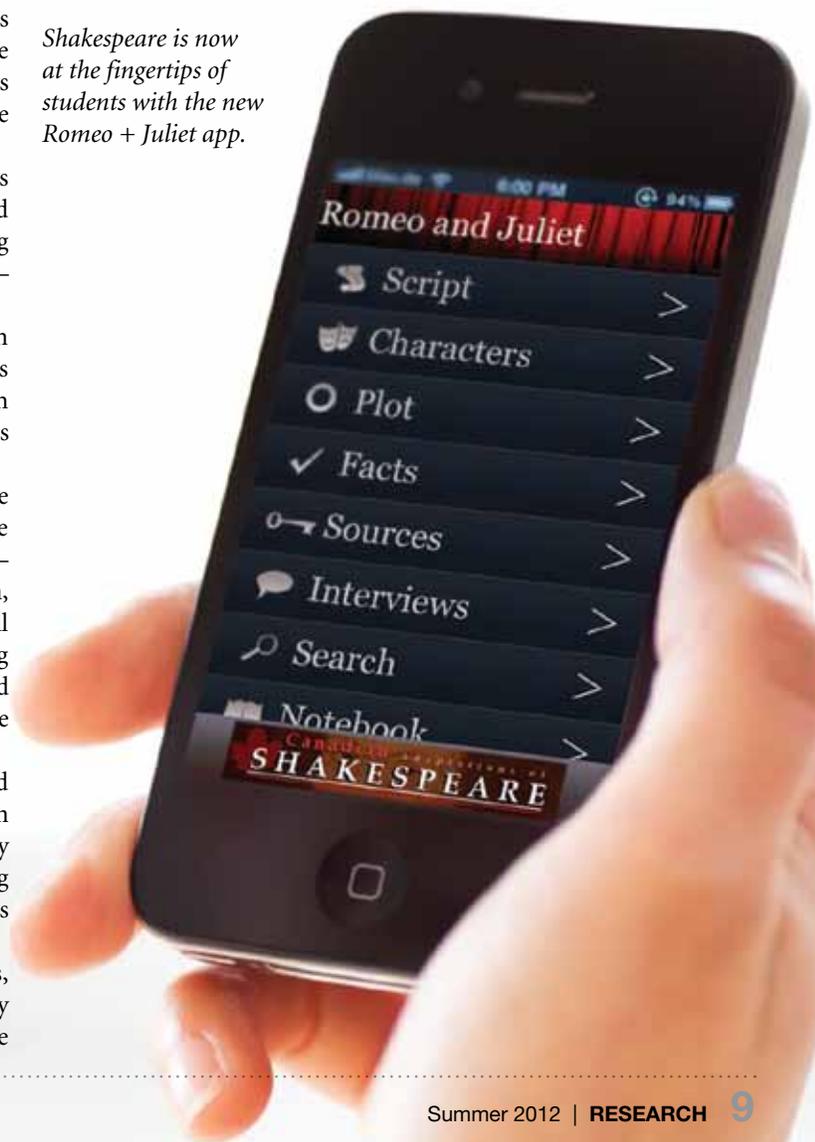
"What we're emphasizing is that it's a media-rich, content-filled, quality controlled platform for accessing this information on mobile devices," says Fischlin. "And you, as an instructor, can actually make good scholarly and pedagogical decisions about what would work best within this learning situation."

Fischlin and his team plan to refine and design future versions of the app based on the feedback they receive from its current users. At the moment, the Romeo and Juliet app is currently available for download for iPhone and BlackBerry. Within the coming months, they plan to widely launch the app on the iPad, Android and Playbook platforms.

The project receives support from the Social Sciences and Humanities Research Council and the University of Guelph Catalyst Centre. 



Shakespeare is now at the fingertips of students with the new Romeo + Juliet app.



STAY FOCUSED

Online ‘video-scribed animation’ improves students’ writing skills

BY KATHARINE TUERKE

ONLINE LEARNING AND video instruction have become more common teaching methods in universities. In the face of limited opportunity for in-person interaction between classmates and the instructor, effective written communication has become even more of an essential skill – it’s often the only way for people to communicate with each other.

Some call writing a lost skill in our multimedia world. But can using video actually improve the quality of students’ writing?

That’s a question Jonathan Beer, a master’s student in the School of Computer Science at the University of Guelph, is trying to answer. Under the supervision of Prof. Blair Nonnecke, Beer discovered that “video-scribed animation” improved students’ writing and performance by changing the students’ self-regulation strategies – that is, the ability to generate thoughts and actions that are planned and adapted to attain personal goals.

Video-scribed animation is a video of someone drawing out the concepts on a whiteboard while the author narrates. Concepts can be presented in words, cartoons, pictures, diagrams, flowcharts and hierarchies. Aside from being fun to watch, video scribing is a powerful learning tool because it captures and maintains attention, reinforces key points and presents auditory and visual information simultaneously.

With online education growing, teaching needs to adapt and discover what methods are effective for students in an online environment. Research has shown that students taught to self-regulate their environment, behaviour and cognitive thoughts will improve their writing and tend to produce higher-quality written pieces.

“Writing is a skill and excellent communicative skills will help prepare today’s students for interacting effectively in our increasingly digital world,” says Beer.

To date, no research has investigated whether self-regulation strategies can be taught using a video. So Beer and animator Lauren Ellis developed a YouTube video called “Writing Process Animation.” In it, they compressed 20 hours of hand-drawn illustrations into a 13-minute video-scribed animation. A cartoon version of Beer demonstrates and explains the self-regulatory strategies that he uses when creating a blog.

To begin, he explains the benefits of environmental self-regulation by reducing background and context distractions, such as turning off cellphones and avoiding checking email.

Then, before students begin to write, he asks them to set goals and deadlines, make an outline and research their topic.

Beer then models behavioural and cognitive self-regulation by monitoring his progress while planning, researching, writing and revising his blog.

To test their hypothesis, students in an online second-year course called “Computers and Society” were assigned to write three blogs. After writing two blogs, half of the students were given the video-scribed animation to help them improve their blogging skills.

These students showed improved environmental and personal self-regulation, compared to those who weren’t given the video. That is, students who watched the video were more likely to work in quieter environments and set more concrete, challenging goals.

Interestingly, students who did not watch the video were more likely to have achieved their grade goals on previous assignments than the students who watched the video.

“Self-monitoring can help writers increase the awareness of their actions, or inactions, during writing periods,” he says. “This process helps students identify their

strengths and weaknesses so they can adopt more effective strategies.”

Students rated the video as entertaining and educational, and indicated that it caught and sustained their attention. The steps in this video can be applied to any type of writing.

Beer says: “Students’ overwhelming positive response and increase in self-regulation strategies show that video-scribed animation can be used as a valuable educational tool.”

The video-scribed animation is available at www.youtube.com/watch?v=V1pnpL8295E ■



Prof. Blair Nonnecke (left) and master’s student Jon Beer found that online videos improve students’ self-regulation and writing skills.

PLAN

BOOORING!

DON'T SKIP THIS!



SUPER-IMPORTANT!

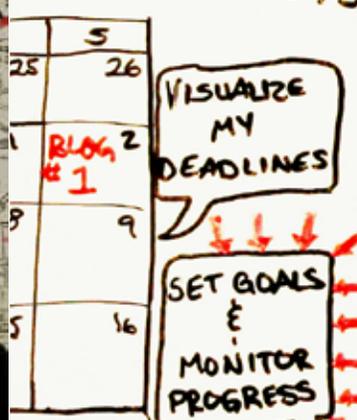


GOALS

SHORT-TERM CONCRETE CHALLENGING

DO THIS!!

- DO MAKE A TIMELINE
- DO SELECT A TOPIC
- DO CREATE AN OUTLINE



BLOGJOURNAL.TXT

MY GOALS

WHAT ARE YOURS? SET YOUR OWN GOALS!

PLANNING

- * Interesting Topic
- * Outline before draft

RESEARCH

- * 5 high-quality sources
- * Take notes → outline

DRAFT AND REVISION

- * Engaging Intro
- * Min 3 sub-sections
- * Strong Conclusion

MONITORING

June 16:

PLANNING

- * Interesting Topic
- * 9:30 - 9:45
- brainstormed topics
- lots of great ideas
- will start with grooveshark+IP

* Outline before draft

* 9:45 - 10:45 (@Library → Quiet) ENVIRONMENT

WHAT

- made rough outline
- 5 minute phone call → DISTRACTIONS
- overall, good focus





Prof. Denise Mohan assesses how interactive programs and webcam technology affects students' second-language learning.

Speaking in technological tongues

Researcher investigates new ways to enhance second-language learning

BY JOEY SABLJIC

NEW LANGUAGE TECHNOLOGIES and software programs can help enhance the learning experience for both in-class and distance education students looking to learn new languages, says a Guelph researcher.

School of Languages and Literatures Prof. Denise Mohan, who teaches Hispanic Studies, is quickly finding that new technologies – such as webcam-based language software and interactive wiki pages – can be used as a powerful supplement to classroom lectures. And in the process, these technologies can create a more engaging and immersive language learning experience that leads to higher levels of learning.

“Technology will never replace people in learning languages – you still need people to talk to you – but what they can do is enhance the learning process and support the in-class activity,” says Mohan.

Now, Mohan can have direct, one-on-one conversations with students outside of the classroom using language software called XpressLab. For certain assignments, students create audio and video recordings of themselves presenting their original work or answering questions in Spanish to send to Mohan. Then, she is able to respond to the student with a recording of her own.

Her students have also participated in interactive wikis, through which they can write and engage in discussions in both Spanish and English with students from the Universidad Nacional Autónoma de México in Mexico City. Through the wikipage, the students get a greater grasp of everyday, conversational Spanish and Hispanic culture, while also learning how to

communicate more effectively using written Spanish.

But what initially led Mohan to begin exploring these new technologies began as a simpler experiment. Over several years, Mohan made her PowerPoint presentations available to her students. At the end of each semester, she surveyed her students to see how many of them had downloaded her lecture slides. Then she asked whether downloading the presentations allowed them to better grasp course material. Finally, she compared the final grades of those who downloaded the presentations to those who hadn't.

She found that the grades barely differed between the students who did and those who didn't download the lecture slides. Yet, students who regularly downloaded and used the presentations felt that the slides had given them a better grasp of the course material, had enhanced their performance and encouraged them to invest and immerse themselves more in the class. This led Mohan to believe that final grades are not the only indicator of student success or of how well a student was able to understand course material.

She says a student's continued engagement with the course throughout the semester – the learning experience itself, not just the grade outcome – is a valid learning experience indicator.

“So it could be about students feeling more engaged with the learning process itself, more than anything else,” says Mohan. “You want students to experience a deeper sense of learning and engagement with the course material and that's where some of these tools can play an important role.” ■

A better option for multiple-choice testing

BALLOONING CLASS SIZES in university language courses across the country are stretching thin many course instructors – and creating demand for a more streamlined solution to evaluate their students over the semester.

As a result, many university language instructors are now adopting a multiple-choice testing format. Research shows that a vast majority of first-year university courses across all disciplines employ some form of multiple-choice testing.

However, Prof. Denise Mohan, School of Languages and Literatures, has found that many of these multiple-choice tests don't push students towards a higher level of thinking and engagement. Nor do they give instructors an accurate picture of how well their students understand course material.

Mohan has been researching methods for designing multiple-choice format tests that will demand a much higher level of response and engagement from students – as well as serving as a helpful supplement to other forms of testing.

Rather than relying on pure memorization when faced with a blank space, students taking an improved multiple-choice test are asked a question. They must first understand the meaning of the question and then apply their knowledge and comprehension skills to answer the question logically.

Mohan is working towards a study where half of the students will be tested traditionally, through written and oral exams. The other half will be tested mainly using multiple-choice formats.

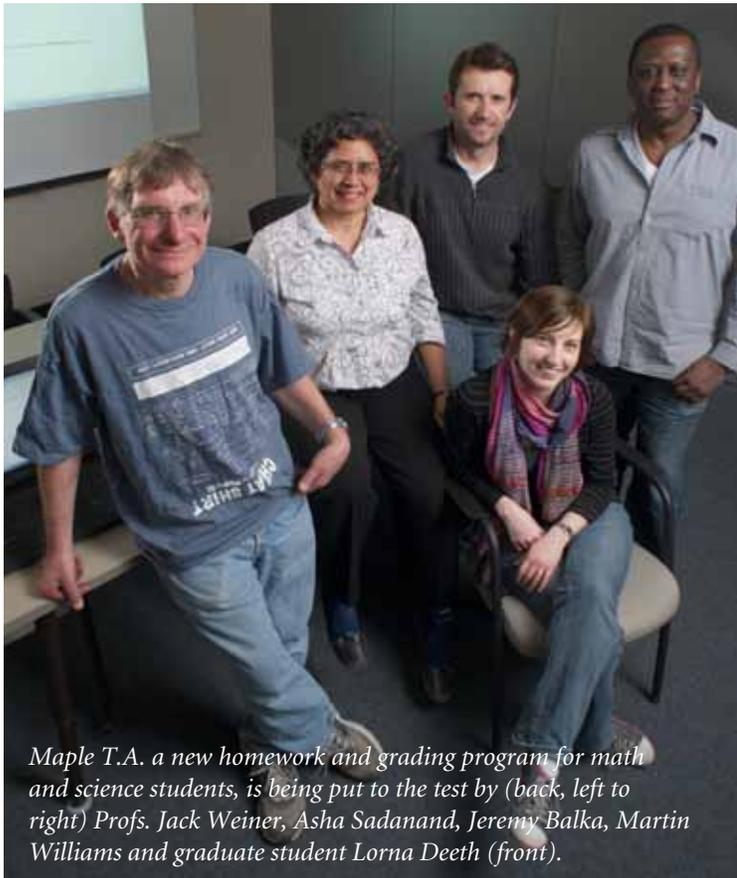
After both sets of students have written their final exams, Mohan will then hold an exit interview in Spanish, where students will pull together everything they've learned over the semester and have a conversation with the instructor.

From their final marks and exit interviews, Mohan will compare the multiple-choice and non-multiple-choice students, to see if there is any difference in their demonstrated mastery of the language.

“Multiple-choice testing should not replace other forms of evaluation,” says Mohan. “But if designed well, it could be a very powerful tool in an instructor's arsenal.”

THEY PUT MATH TO THE TEST

BY KATHARINE TUERKE



Maple T.A. a new homework and grading program for math and science students, is being put to the test by (back, left to right) Profs. Jack Weiner, Asha Sadanand, Jeremy Balka, Martin Williams and graduate student Lorna Deeth (front).

Have you ever been stuck on math homework and didn't know where things went wrong? A new technology tool called Maple T.A. is rescuing University of Guelph students all across campus. It's a software program that guides them through math-related homework questions, providing corrections and often feedback every step of the way.

In collaboration with Maplesoft, University of Guelph researchers are evaluating the impact of using Maple T.A. in math and science classrooms.

It's an easy-to-use software program for creating tests and assignments that can instantly assess students' responses in any mathematical format.

"Maple T.A. is a powerful and versatile tool that encourages students to learn and

formats (i.e., units, decimal places, etc.).

Profs. Jack Weiner and Steve Gismondi (math), Asha Sadanand (economics), Jeremy Balka (statistics) and Martin Williams (physics) are investigating whether Maple T.A. improves math skills for students in mathematics, economics, statistics, physics and engineering. This multidisciplinary approach will assess if the program is effective for different instructors, courses and students.

Weiner is using Maple T.A. in his introductory calculus class to design and customize homework questions and solutions. Receiving instant feedback improves students understanding, retention and recall of the material.

According to Weiner, "With technologies like Maple T.A., students can better determine

ultimately master math through practise, making mistakes and receiving immediate feedback," says mathematics Prof. Jack Weiner.

Maple T.A. is a flexible program that instructors can easily modify for their course and evaluation methods. It extends the capability of computer testing significantly beyond traditional multiple-choice, matching, and fill-in-the-blank questions because Maple T.A. uses open-ended questions and can grade algebraic and numeric solutions given in a variety of

where their problems lie than they could with traditional text-based assignments. Educators have more time to focus on those students' needs, which helps boost their overall motivation, retention and comprehension."

Gismondi is using Maple T.A. as a learning tool to improve first-year math students' academic experience. Students are encouraged to use the program to master difficult concepts through homework and practice tests.

Sadanand is investigating whether there is a difference in the average final exam grades between students using Maple T.A. to complete weekly homework assignments and a control group using regular written assignments.

The Maple T.A. group could attempt questions multiple times and receive immediate feedback while the control group received fewer questions that were returned a week later with part of the questions marked and posted solutions for the rest. Early findings show the Maple T.A. group had a 1.5% higher average but further regression analysis is needed.

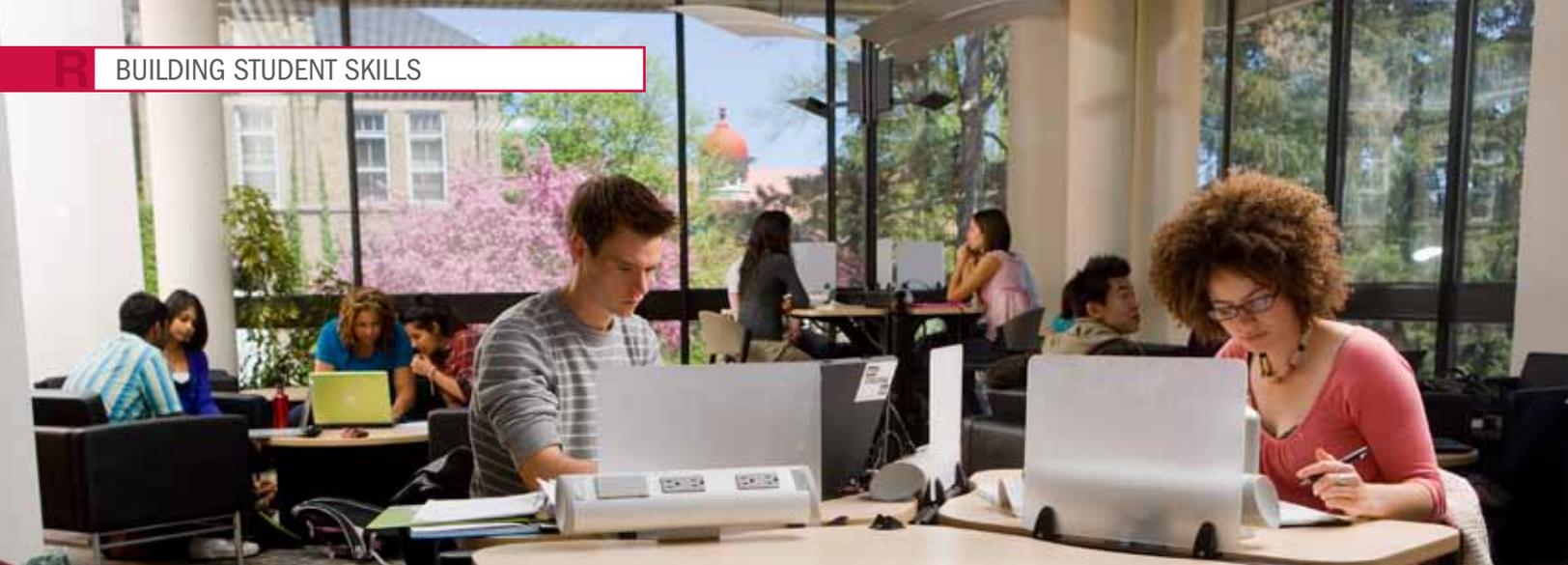
Similarly, Balka investigated if Maple T.A. could also help his second-year statistics students. He and Sadanand will use surveys to gain insight into the students' attitudes towards using technology in the classroom as well as their perspectives on the program's usability and helpfulness.

Williams hopes the students in his electricity and magnetism course will use Maple T.A. as a learning tool for homework and quizzes. He is comparing learning outcomes before and after they have access to the program. Students are encouraged to discuss and work together on problems because having to explain and articulate ideas improves students' mastery of difficult concepts.

"We believe students need to actively do math problems repeatedly to develop mastery. Maple T.A. is a robust, online program that helps students master difficult concepts by giving them easy access to immediate and timely feedback," says Williams.

Graduate students were heavily involved in the development of the individual Maple T.A. content development. Future initiatives will investigate how online students can benefit from Maple T.A. for distance education courses.

Funding for this research was supported by Maplesoft and the Mathematics of Information Technology and Complex Systems (MITACS). ■



Studies show students who learn on their own boast improved marks and a deeper understanding of course material.

Making large-class learning more personal

STORIES BY SAMANTHA BEATTIE

RESEARCH SHOWS THAT inventive teaching approaches make large university classes more personal, even those with hundreds of students. University of Guelph Prof. John Livernois did just that, by developing a self-directed learning method to make his first-year Introductory Microeconomics course a more in-depth experience.

“Instead of talking at my students in a formal-style lecture, I wanted to engage with them,” says Livernois of the Department of Economics and Finance. “That way, students can go a little deeper and really see how all of the concepts make sense.”

Livernois conducted research to compare his students to 3,000 other North American students, by giving them a standardized, multiple-choice test at the semester’s beginning and end, to assess their microeconomic knowledge.

He found that, following a semester of his innovative class structure, the students had higher-than-average improvements, which he attributes to having freed-up class time for students to engage in self-directed learning.

For example, instead of attending three weekly lectures, students only attend one. In place of the other two lectures, students are responsible for independently watching online lecture videos. In many cases, self-directed learning is successful in deepening knowledge because students are given the opportunity to tackle concepts at their own pace and reflect on the material, according to Livernois.

Self-directed learning has also resulted in smaller class sizes for lectures. Because students only attend one lecture a week, the entire class is split into three sections – each attending a seminar-style class on different days.

With fewer students, Livernois is able to better facilitate discussion and assign in-class application problems. In some instances he breaks the students into small groups for role-playing exercises or to interpret and graph real data.



Prof. John Livernois

Livernois says such exercises help to make the connection between abstract microeconomic concepts and the real world.

“The students who benefit the most from this course structure are those who are capable of working independently,” says Livernois. “However, it is also important that I learn from my students’ feedback and work to enhance their learning experience as best I can.”

Livernois says this course structure is ideal for not only microeconomics, but for any large class where learning may be inhibited by the formal-style lecture.

This research was conducted in collaboration with Prof. Barb Bloemhof. Funding was provided by the College of Management Economics. **R**

NEEDED: REPEATED EFFORT

Repeating material helps
students master new skills

TO MASTER SKILLS, students need to be given the opportunity to practise them, instead of jumping from one topic to the next. That's the approach being taken by Integrative Biology Profs. Tom Nudds and Karl Cottenie, who experimented in their third-year community ecology course with an approach to learning known as "introduce, reinforce and master," or IRM.

Throughout a course, the skills first introduced to students are reinforced by further practice and repetition, though the content varies as students progress through the course material. By the end, students are more likely to have mastered the skills and the content than if they only encountered them once or twice.

"The literature about IRM suggests that students understand and retain content and concepts better if they actually work with them instead of memorizing them," says Nudds. "We wanted to test IRM for our own students to see how well they did throughout the course."

Specifically, under the hypothesis that IRM would improve student learning, Nudds and Cottenie predicted that performance on group research projects would steadily improve over time.

"From an experimental perspective, unless the same tasks are re-evaluated over time, and in that sense held constant, it is not really possible to demonstrate improvement," says Nudds.

Nudds and Cottenie experimented by introducing three assignments, each requiring students to use the scientific method and clear communication to analyze a contemporary problem in community ecology. The assignments were based on the same expectations, with each progressively more difficult. Students used the feedback directly to improve their next assignment.

Following the IRM model, the first assignment was an introduction to the skills and a hypothesis generated by a contemporary issue in community ecology. By the third assignment, students took a more inquiry-based approach, choosing and analyzing their own hypotheses.

Nudds and Cottenie measured improvement by performance on the assignments. Despite the increase in difficulty, they found that students' marks steadily rose with each assignment, as expected.

"The final grades were strong," says Nudds. "Students do master the skills we want them to, which also means that IRM works effectively."

Since 2010, Nudds and Cottenie have continued using IRM in this course and other courses. For example, Nudds adapted it to a large first-year class, despite some conventional thinking that suggests these students aren't ready for it. Nudds actually found that first-year students show the same progress at mastering research skills.

Nudds and Cottenie see opportunities for other faculty members to experiment within the classroom.

"It's really about enhancing the educational experience and helping students acquire transferable skills for other courses and post-graduate careers," says Nudds.

This experimental teaching approach was supported and funded by the Department of Integrative Biology. ■



Let's talk

Improved communication between veterinarians and pet owners helps keep pets healthy

BY KATHARINE TUERKE AND NICOLE YADA

SINCE VETERINARIANS DON'T have the animal conversational skills of Doctor Doolittle, they're dependent on the information pet owners give. Improving communication between veterinarians and pet owners directly increases the furry patients' chances of getting better. But veterinary students rarely get to practise their communications skills with real clients – until now.

The newly built Hill's Pet Nutrition Primary Healthcare Centre is dedicated to advancing veterinary medicine through teaching, research and service. It's unique because video cameras and two-way mirrors are located throughout the teaching clinic, capturing students' interactions with clients, peers, technicians and staff.

Prof. Michael Meehan and Jason Coe, Department of Population Medicine, are using video recordings of veterinary student-client consultations as a teaching tool to give students feedback and improve their communication skills. Coe is also using focus groups to identify which teaching practices are effective or ineffective and why.

"Good communication ensures that veterinarians get more accurate information about the animal and its problem. It also helps owners understand – and potentially adhere to – a veterinary plan of action," says Meehan.

During the first three years of veterinary school, students take the Art of Veterinary Medicine courses, which focus on professional skill development and communication.



Research shows that improving communication skills can help veterinarians develop a more open, trusting dialogue with pet owners.

They use the Calgary Cambridge Guide to learn about veterinary-client consultation communication. It's an evidence-based template for conducting a clinical consultation based on 40 years of human research that's been adapted for veterinary medicine.

Outside of class they practise their communication skills through role playing with peers and simulated clients. Students learn to use open-ended questions, paraphrasing client concerns and practicing relationship-centred communication. They also rehearse developing a rapport with clients, recognizing the client-pet bond, communicating medical conditions and tests as well as initiating and closing the interview.

In fourth year, students apply the skills they learned in class to the clinic. For veterinary students, the first meeting with a real client can be stressful and cause them to revert back to old communication styles and habits. So getting feedback on client communication is informative and unique.

Fourth-year students review their consultations throughout their rotations in the centre. They learn what to do, what not to do and why. Students also identify each communication skill used, a technique called skill spotting. The two-way mirrors and video review sessions allow faculty to watch and review the communication skills being used.

"By recording all student-client consultations, students receive specific and personal feedback on their communications skills as well as observe the progress they've made by the end of their rotation," says Meehan.

Especially good examples of consults will be used as teaching resources for future students. Aside from videos, communication skills within the clinic are also assessed by evaluations from clients, staff, technicians, peers and by the students themselves.

Recently, Coe used focus groups to gather feedback on the teaching tools and techniques used by final-year veterinary students at the Ontario Veterinary College during their Small Animal Primary Veterinary Care rotation.

"Research shows that using the appropriate educational approach is instrumental to achieving high quality teaching and learning," says Coe.

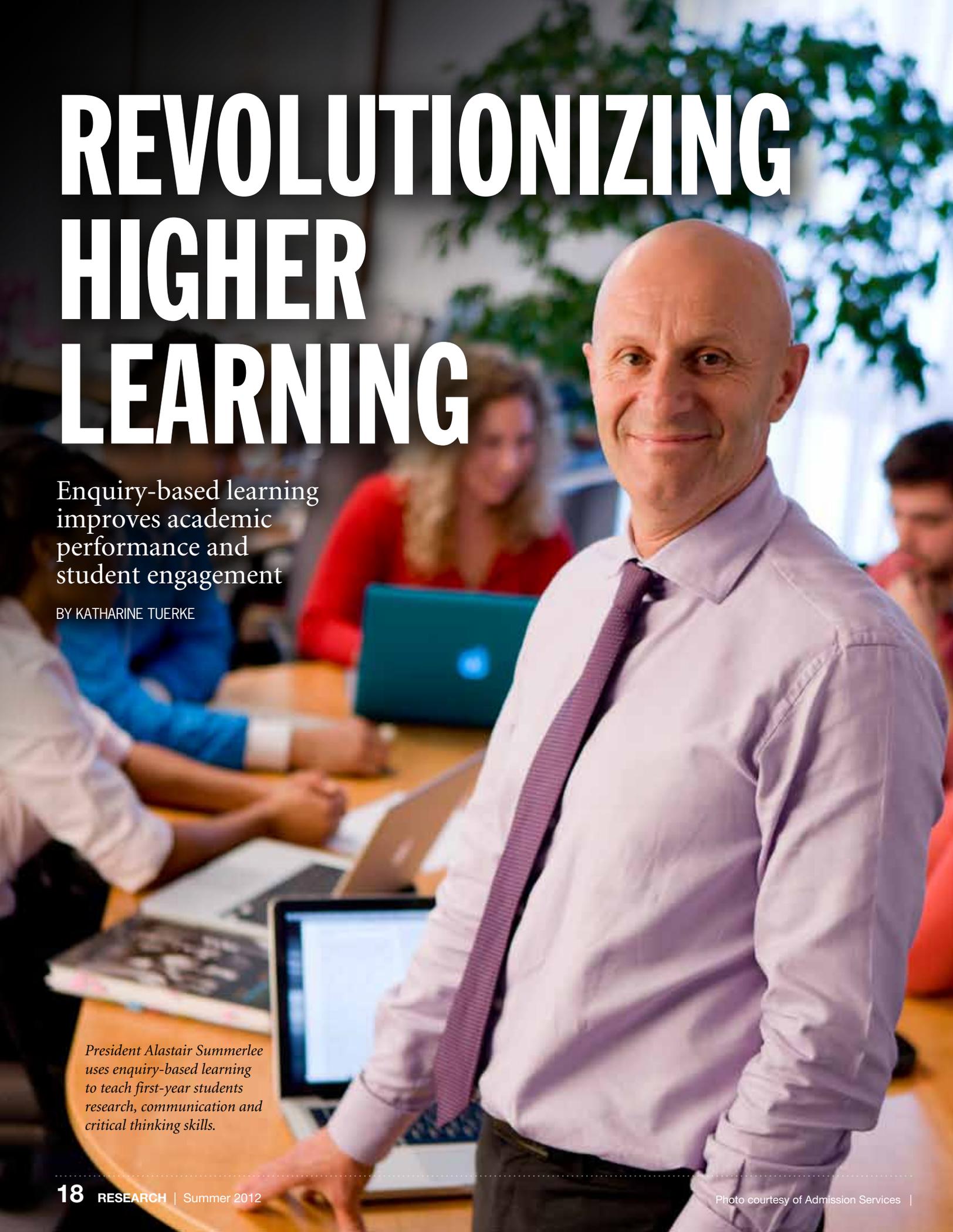
Final-year students' progression in preparing themselves for entering the veterinary profession are measured using the Mini-Clinical Evaluation Exercise (Mini-CEX), the Direct Observation of Procedural Skills (DOPS), the In-Training Evaluation Reports (ITERS) and multi-source feedback (MSF). These tools offer final-year students' feedback on their level of competency in preparation for entering the veterinary profession.

Coe's study explores instructors' and students' perspectives and ideas around the utility and benefit of the four assessment tools – the Mini-CEX, DOPS, ITER and MSF. To do this, he used focus groups with students, instructors and technicians working at the centre.

Coe collected the data last semester and is currently analyzing the results. These findings will shape curriculum development and evaluate if these four assessment tools are feasible, relevant and how they can be used to maximize the learning opportunities of final-year veterinary students.

The focus group research is part of a larger study investigating how to assess competencies across university programs and is supported by a University of Calgary Seed Grant. ■

REVOLUTIONIZING HIGHER LEARNING



Enquiry-based learning
improves academic
performance and
student engagement

BY KATHARINE TUERKE

*President Alastair Summerlee
uses enquiry-based learning
to teach first-year students
research, communication and
critical thinking skills.*

ENQUIRY-BASED LEARNING (EBL) is commonly used in medical-based curriculums but little research has investigated its effectiveness in other disciplines. The University of Guelph has participated in an educational experiment and produced evidence that teaching first-year students using EBL can improve the quality of undergraduate education for all disciplines.

University of Guelph President Alastair Summerlee and Prof. Jacqueline Murray integrated their backgrounds in biomedical science and medieval history to create a small, interdisciplinary seminar called “Sex, Gender and Sexuality.” They evaluated how using EBL to teach first-year students affects their academic abilities, engagement and use of resources.

“We need to develop an approach to education that empowers students to take control of their learning and to be engaged in the process of research and learning,” says Summerlee. “We encourage them to develop the skills to selectively process and transform information into knowledge and wisdom.”

Closed-loop reiterative EBL is a form of problem-based learning. Students are given a case-study that pushes them to generate hypotheses, research issues that arise and learn the context of the problem from all perspectives. Afterwards, students reflect on their approaches and solutions to assess their effectiveness and what could have been done differently.

The goal isn’t to “solve” the problem but rather motivate students to learn, investigate issues and appreciate and understand all aspects of a situation. After students are given the case study they’re instructed to identify three things: what they know, what they don’t know and what they need to know.

“EBL gives students the opportunity to develop analytical, group, research and communication skills to be fully engaged and responsible for their own learning,” says Murray.

In their qualitative study, Summerlee and Murray investigated if EBL affected students’ perceptions of their own learning, skill development, persistence and transferability compared to first-year students not exposed to EBL.

To evaluate the immediate effects of EBL, students were given surveys at the beginning and conclusion of the course to evaluate the immediate impacts of EBL

on their skills, experiences and expectations. Another survey was given to the students during their third year to measure if the skills they learned in first-year persisted and were transferable.

Students who participated in an EBL course in their first-year had greater confidence in their academic abilities, were more engaged and were better prepared for upper-year courses compared to control groups.

“We show that first-year students can learn independently when given the opportunity to develop the tools,” says Murray.

To complement the student self-reflection study, Summerlee and Murray also conducted a quantitative study to evaluate the impact of EBL on academic performance and student engagement.

EBL students performed at a much higher level compared to students in another small class not taught using EBL. Using surveys, they found that EBL students shifted the way they access information by preferentially using more sophisticated resources. Additionally, students were more engaged in their university and community, which is known to contribute to increased academic performance.

“If one course has the ability to transform all subsequent learning, imagine how much more could be done with widespread application of EBL across the curriculum at all levels” Summerlee says.

Both studies have been published in *The Canadian Journal of Higher Education*.

Murray’s current challenge is translating the face-to-face experience students have in their first-year EBL seminars

into an online, distance education course. Her new course focuses on hunger and has now been offered twice, with great success.

Support for first-year seminars was provided by the University of Guelph Alumni Association and generous contributions from private donors.

EBL shows how course design, evaluation methods and learning context have a profound impact on student approaches to learning. For more information about other pedagogical practices that encourage deep learning, please see the story on page 28. ■



Prof. Jacqueline Murray is the Director of the First-Year Seminar Program, which jump-starts university students’ learning in small, engaging, multidisciplinary seminars.

GET READY FOR WORK

BY SAMANTHA BEATTIE

WHEN COMPETING FOR a job, you're more employable if your degree and qualifications are enhanced with what's called psychological capital – positive traits, such as hope, optimism, resiliency and confidence. Numerous studies have found psychological capital is often associated with better employee performance and success.

But for Generation Y – those born from the mid-1970s to the mid 1990s – it's easier said than done, says University of Guelph Prof. Jamie Gruman, School of Hospitality and Tourism Management. This generation has an unjustifiably high level of self-esteem, which they haven't yet earned, and as a group they are not accustomed to taking responsibility for their failures or

achievements, he says. When the going gets tough, they tend to crumble early.

"That makes it difficult to develop their confidence and hampers their ability to positively contribute to the workplace," says Gruman.

To compare this group's psychological capital from the start of the semester to its end, Gruman created a survey consisting of a variety of validated scales from published research that measures each of psychological capital's components. He asked students to agree or disagree with a series of statements, such as "I can think of many ways to reach my current goals," to measure confidence, and "if I suffer setbacks while working on applied projects, I can get over it," to measure resiliency. He also

took into account his students' self-esteem levels by measuring two linked components – proactive personality and core-self evaluation.

But the projected outcomes weren't as expected...in fact, they were the opposite. Gruman found that for the majority of students, psychological capital actually *decreased*. He discovered that students with the highest self-esteem at the semester's beginning saw the largest decrease in psychological capital by the end.

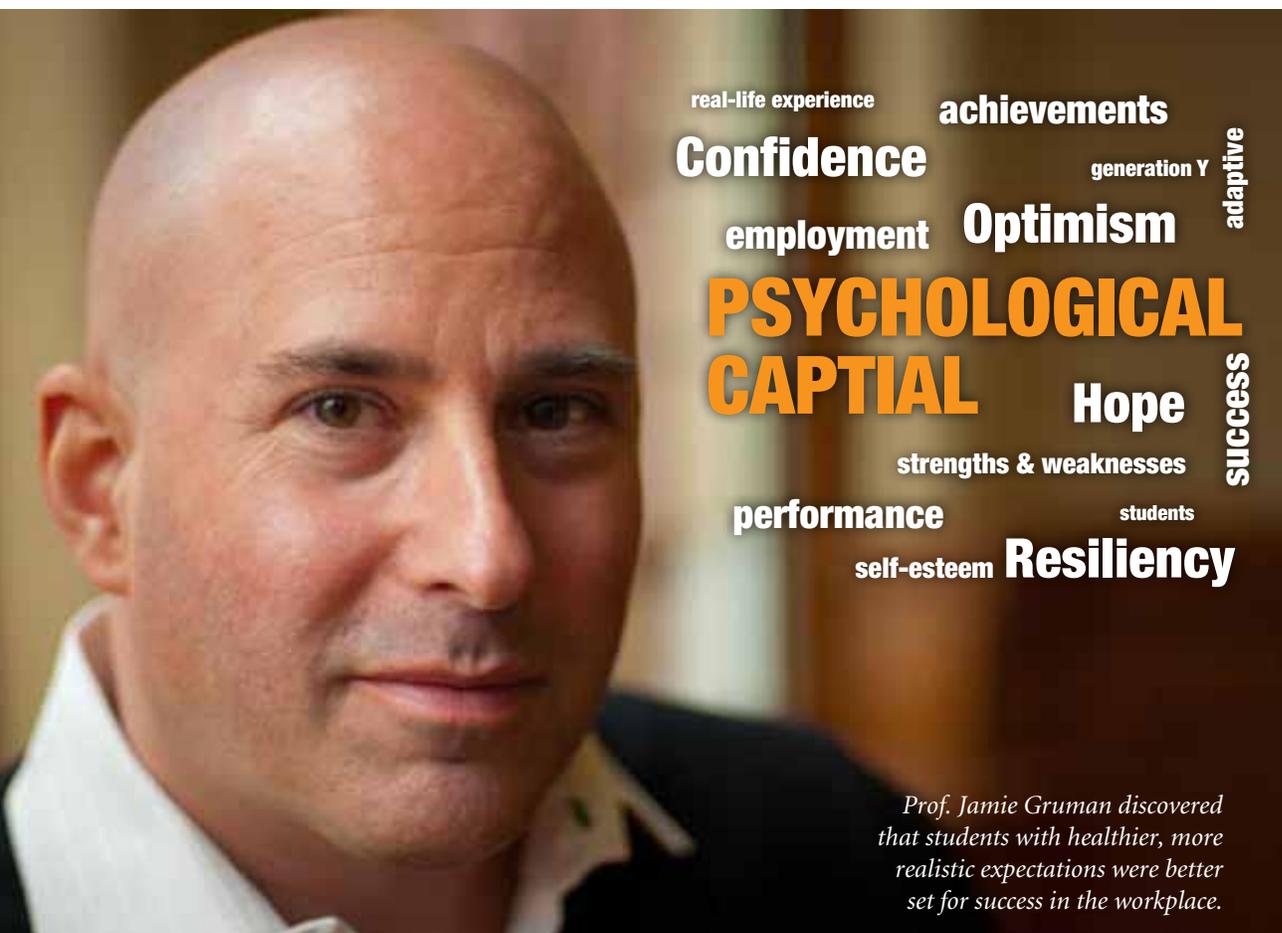
However, Gruman says there's a silver lining to this cloud. He thinks the initial drop in psychological capital may underline to students that the workplace can be difficult, and that they need a better sense of reality about it. This realization will make them better able

to prepare themselves for employment and success.

He says teaching Generation Y should include more explicit discussions about the importance of psychological capital and demonstrations of what optimism, hope, resiliency and confidence look like in the work place.

"My goal," says Gruman, "is to replace their maladaptive thoughts with adaptive ones."

This research was conducted in collaboration with lab technician Allison Crerar and University of Toronto Prof. Alan Saks. It was published in the *Canadian Journal of Administrative Sciences*. ■



Prof. Jamie Gruman discovered that students with healthier, more realistic expectations were better set for success in the workplace.



Service learning has been found to provide students with an educational experience that ties together study, community work and personal growth.

Community meets university

Service learning enhances breadth, depth of student growth in life skills

BY NICOLE YADA

LEARNING IN A way that establishes a personal connection with the topic is key in order to integrate knowledge into the learner's life, says Prof. Maurice Nelischer, Director of Sustainability and faculty member in the Department of Landscape Architecture. And research shows he's right.

Nelischer's teaching philosophy centers around service learning, an experiential learning technique that integrates community service with academic study. It ties together education, work and personal development. Reflection is a big part of experiential learning, to give students the chance to form their own cognitive beliefs about the experience.

"In a university environment, we don't want to indoctrinate students by telling them how to think," he says. "Service learning allows them to develop their own cognitive skills."

About five years ago, Nelischer started assessing how the "clients" of service learning see the program. Although the value to students was obvious, was the community likeminded?

It turns out it was. Community organizations – neighbourhood groups, civic organizations, non-profits and small communities among them – reported enthusiasm and interpersonal skills as the greatest strengths exhibited by students. Almost 95 per cent of those Nelischer surveyed reported they would like to work with students again if given the opportunity. Three-quarters of the agencies said the benefits of working with students "far outweighed" the problems and costs.

Within the landscape architecture department, an outreach centre has been established where organizations can submit their requests for service-learning assistance. Faculty members then evaluate the requests for how they align with their classes. Students have access to the ideas that faculty members haven't chosen, and they then do them for free. The voluntary adoption of the projects demonstrates the students' commitment to volunteerism and their belief in using their skills to help people.

Landscape architecture has established a large client base due to having done these projects for so long, but Nelischer emphasizes that this type of learning can be adopted in any department.

"Students must be put into situations where they have to use their knowledge," says Nelischer. "We want students to believe in what they're learning, not just know the facts."

Nelischer works with Prof. Lise Burcher on service-learning initiatives. Funding for these service-learning projects was provided in part by the Guelph Teaching Fund and the Ontario Agricultural College Teaching Support Fund, and through project-specific grants and a major grant from the Metcalf Foundation to fund a storefront design/planning service run by students. **R**

GETTING BACK TO THEIR ROOTS

Field trips enhance the active learning experience

BY SAMANTHA BEATTIE

YOUR GRADE SCHOOL hunch was right – field trips are fun, and they enhance learning.

Environmental Design and Rural Development Prof. Lise Burcher went back to the roots of education when looking for ways to enhance student learning at the University of Guelph.

“I wanted to develop an active learning strategy that extends continuously across various aspects of education,” says Burcher, “including intellectual, emotional and physical boundaries.”

To understand what makes a field trip experience as worthwhile as possible, Burcher’s conducting a longitudinal study that compares students who go on a field trip with no preparation or reflection to

those who engage in the Integrated Science Learning Environment model (ISLE). ISLE is a teaching method that requires students to complete pre-trip and post-trip work. This includes identifying learning objectives and conducting background research. After the trip, students complete integrative assignments on how the experience affects their learning.

For the past two years, Burcher has been surveying students who participate in regular field trips and students who participate in ISLE, to determine if there are any differences or benefits. So far, she’s found that field trips are intrinsically valuable, as they are both fun and engaging for students.

Also, the deeper relationships developed on trips – between students, and between students and teachers – result in more memorable experiences. Burcher says that ISLE adds an extra dimension. By doing preparation and reflection work, students grasp abstract concepts and retain knowledge better than those who don’t participate in ISLE.

“With ISLE, students get very involved with the community,” she says. “By thoroughly investigating the area, they really gain a social and cultural understanding, which helps in developing their own social consciousness and makes their school work extremely applicable to the real world.”

Prep work and reflection assignments enrich field trip experiences and help landscape architect students connect real-life experiences with classroom theory.



She points to students who took part in a field trip to Goderich, Ontario in the fall of 2011.

The purpose of the project was to help rebuild the community after a summer tornado left parts of the town in rubble. During the pre-trip work, student groups researched ways to actively connect with people after a disaster. As a result, when the students arrived, they were able to meaningfully interact with Goderich citizens to learn their preferences for new town designs.

After the trip, students completed their group design projects and presented them to city council. Burcher says that by participating in ISLE, students were able to uncover a lot of relevant and applicable ideas from the community – ideas that support what they're learning in lectures and that will be implemented in Goderich.

“By conducting my research over a number of years, I have generated a body of results that accurately reflect what the learning benefits of ISLE are,” says Burcher. “From here, I plan to further investigate other beneficial and active learning strategies.”

Supporting this endeavour is Prof. Maurice Nelischer, former director of the School of Environmental Design and Rural Development. ■

Quality not quantity

Students learn qualitative research skills in a community setting

BY JOEY SABLJIC

BECOMING A BETTER qualitative researcher can't be taught solely from a textbook or classroom lecture – rather, students need to develop these often subtle and tricky research techniques within a real-world environment.

Qualitative research is conducted mainly by observing and conducting in-depth interviews with research subjects in order to get a better understanding of what specific elements drive their behaviours, lifestyles and choices. It's unlike quantitative research, where data is collected through computational, statistical or mathematical techniques.

Sociology and Anthropology Prof. Jeji Varghese is looking at how adding an experiential service-learning portion to her course on qualitative research has resulted in students becoming more successful researchers. Besides understanding the basics of qualitative research, they can also put their skills towards addressing real community-based research needs.

“Some students were just not connecting to the entire research process in the classroom,” says Varghese. “They would walk away from the class without really having an appreciation or a grasp of qualitative methods or what it takes to use them. But now, I'm seeing more students with a higher level of understanding and engagement with qualitative methods.”

Varghese wanted her students to get closely acquainted with qualitative research techniques by having them address a real research need within their local community. Community partners often come to the instructor with a specific research need that can be addressed through qualitative research. For example, last year, the students collaborated with Wellington Water Watchers, a local advocacy group dedicated to drinking water protection and conservation in Guelph.

Their research project focused on drinking water choices, as they put together detailed sets of questions and interviewed several different populations of local residents (recent immigrants, long-time residents and parents of young athletes) about their reasons for choosing bottled, filtered or tap water. The students then carefully transcribed and organized their interview data to identify the

range of motivations within the residents' responses.

At the end of the semester, Varghese's students present their research findings to their community research partners and submit a final report to the class in which they reflect on the research process and the qualitative research skills they gained. Varghese says more students are demonstrating a better understanding of how to effectively interview and draw useful information from research subjects than they did in previous lecture-based versions of the course.

She's also planning to conduct a series of focus groups, where she will compare the overall learning experiences of students in a more lecture-based section of the course and students in the experiential course.

“Working within the community gives these students a first-hand understanding and appreciation of the merits and challenges behind qualitative research methods as well as an awareness of relevant local issues,” says Varghese.

Funding for this project is provided through the Community Engaged Learning Fund as well as the Scholarship of Teaching and Learning Award at the University of Guelph. ■



Prof. Jeji Varghese's students work with community partners to improve their qualitative research skills.



LEARNING TAKES AN UNEXPECTED TURN

Musicians and researchers bring improvisation to community classrooms

BY JOEY SABLJIC

GREAT MUSICAL CREATIONS can arise when a group of musicians is willing to actively listen and collaborate with each other. And it's that very same active listening and collaboration that an international team of Guelph-based researchers and musicians believe to be at the root of successful communities.

English and Theatre Studies Prof. Ajay Heblé – along with a wide-ranging team of collaborators – heads up Improvisation, Community, and Social Practice (ICASP). It's a multidisciplinary, multi-institutional international arts research initiative that uses musical improvisation as a model for building mutual understanding, co-operation and learning.

One of the areas they're looking at is how improvisation can be used as a teaching model that brings together students and youth from all backgrounds. Over the past year, musicians – such as multiple Juno award winner Jane Bunnett – and ICASP researchers have been working to bring improvised music into community centers, schools and shelters by leading improvisational workshops for at-risk, aggrieved and handicapped youth.

What they have discovered is that improvised music gives these young people an outlet to express their creativity in their own unique ways. This newfound sense

of artistic freedom allows them to discover a powerful sense of confidence in themselves and their abilities. Most importantly, these children feel empowered, take on leadership roles and express themselves creatively.

"Improvisation is a powerful teaching tool," says Heblé. "It really encourages a whole new level of listening, communication, co-operation and collaboration among students."

For several years, ICASP researchers have been studying regular improvisation workshops at local high schools, as well as at centers for at-risk, aggrieved and disabled children, such as KidsAbility Centre for Child Development and Give Yourself Credit – an alternative education high school in Guelph, Ont. – as well as centers for adults and youth suffering from post-traumatic stress disorder.

The musicians and researchers provide musical instruments to students – anything from recorders and flutes to keyboards and drums – and create an environment where students are able to learn and collaborate with one another.

With each workshop, the researchers and students gradually work towards developing their own musical skills as well as their own songs and compositions. Then, to cap it all off, they often have an opportunity to showcase their performance skills in front of a live audience at the Guelph Jazz Festival.

All the while, ICASP researchers are carefully documenting each workshop – taking film and photo footage. They also conduct a series of interviews with the youth, their parents and teachers over the course of the year to get a more in-depth sense of how they are responding, learning and growing from the workshops.

From all of this information, Heblé and his fellow researchers are piecing together a toolkit resource made freely available, which details how other teachers and educators can successfully bring improvisational techniques into their classrooms as part of their own curriculum.

"We've been seeing some incredible changes – there are truly tangible results," says Heblé. "We see children who may have been shy or reticent at one point undergo these incredible transformations and take

on leadership roles – all through the different approach that these workshops offer."

Funding is provided through a Major Collaborative Research Initiatives grant from the Social Sciences and Humanities Research Council, along with more than 22 partner institutions and organizations. ■

Improvisational studies by musicians such as Jane Bunnett (centre) show that bringing music into the community helps its members actively listen and collaborate with one another.

(Opposite) Jane Bunnett (left) and Ajay Heblé.





Close to home

Professor brings residential field course experience to class

STORIES BY JOEY SABLJIC

BEING IMMERSSED IN a faraway place can be full of intrigue and excitement for students enrolled in residential field courses. But is it essential for learning? Or can students gain similar experiential education by doing their learning and fieldwork within the local context...or even in the classroom?

Geography Prof. Alice Hovorka – working with Peter Wolf, director of the Centre for Open Learning and Educational Support – has designed a third-year geography course that re-imagines the location of the “field” being studied.

“Using the classroom and ‘everyday life’ as an entry point for field research is allowing students to create meaning and construct knowledge about the world for themselves,” she says.

The course, *Gender and the Environment*, emphasizes issues such as gender representation and roles closer to home.

In terms of geography, Hovorka and her students look at how gender affects the way both men and women use their immediate environments and spaces.

In place of an exotic locale, students use local spaces as their study field. The course explores just how and to what extent socially prescribed gender roles dictate a variety of factors, such as how men and women are to behave in public, what places or roles they occupy and even what they’re supposed to look like.

The students begin the course with a series of journaling assignments,

where they examine how gender roles or representations have affected their own life experiences.

Next, they branch out further, exploring and analyzing representations of men and women within several different types of media, including newspapers, advertisements and television.

Finally, the students conduct their own fieldwork as they venture out into locations in and around Guelph – bars, fitness centers, downtown streets, libraries and restaurants among them – to study how men and women interact and behave within these spaces.

But does it work? Hovorka and Wolf had students rate their overall learning experiences in a geography residential field course and in Hovorka’s classroom-based course. The findings, which were published in the *Journal for Geography in Higher Education*, showed that students scored the classroom-based course high for being able to practically apply theories and lectures. Students also felt that the classroom-based course provided more opportunities to collaborate with classmates,

explore their personal beliefs and learn through several different approaches – such as reading, writing and discussion.

They did, however, give the field course the nod for opportunities for extended hands-on work and skill development.

Hovorka hopes that her classroom-based course will help open up teaching possibilities for geography instructors looking to enhance classrooms by integrating geographical concepts and approaches into the field of everyday life as legitimate points for research and study. It may also provide avenues for experiential learning beyond

residential field courses, which are increasingly challenged by funding and resource issues.

“The field is really more than some exotic place,” says Hovorka. “It is everywhere and students can use any place to create meaning in the same way that they would in a field course.” ■

“The field is really more than some exotic place.”

- Alice Hovorka

Creating a classroom-based field course gives students a way to study issues closer to home, such as gender dynamics.



PAIR AND SHARE

Revamped lectures and labs help develop students' practical skills

PHYSICS COURSES THAT emphasize practical problem solving and application-based curricula seem to be leading an upswing in overall learning and understanding among physics students, says a team of University Guelph physics researchers.

Profs. Martin Williams, Joanne O'Meara and several other colleagues from the Department of Physics have been researching the most effective ways to improve physics education in their classrooms.

For a start, they are creating space within lectures for students to discuss, debate and help teach concepts amongst themselves, as well as open-ended lab assignments that allow students to design their own research experiments.

"We're trying to teach students practical, real-world problem solving skills that they can apply not only towards physics – but towards many other disciplines or situations in their lives," says Williams.

From what they've seen so far from their students' overall grades and evaluations, these revamped lectures and labs help students to better understand lecture material and provide them with far more opportunity to connect and apply their learning in their lab exercises.

During his lectures, Williams will display a question dealing with a concept they are tackling in class, and then have his students vote on what they think is the correct answer using clickers – devices that work like remotes.

After they vote – and before he tells them the correct answer – each student "pairs and shares" with another classmate to discuss, debate and argue for why they made their particular choice. After the discussion, they vote again.

Williams found that the vast majority of the class is able to answer the question correctly the second time. What this shows is that through the pairing and sharing exercise, the students act as their own educators and must draw from their knowledge in order to successfully decide on the correct answer.

Aside from the lecture hall, Williams and his colleagues are also looking to overhaul their students' regular lab assignments. They're slowly introducing what they call enquiry-based labs in place of typical expository or "cookbook"-style labs, where students follow a list of procedures that detail exactly how they are supposed to conduct their experiment.

Enquiry-based labs do away with the "cookbook" altogether. Here, students are given a real-life scenario to solve – such as choosing the ideal material to construct a certain product – and are then given free rein to create their own experimental procedure. To Williams, these enquiry-based labs combine the students' creativity, knowledge and problem-solving skills in one exercise.

In the bigger research picture, these re-tooled lab and lecture approaches are just the tip of the iceberg. Williams and his colleagues are constantly analyzing new approaches to gain a clearer understanding of which technologies, methods or techniques hold the greatest educational benefits.

"We need to continue looking at and re-examining what's working and what isn't within our classrooms," says Williams. "We can look at the results we're getting, then go back and continue to refine and re-evaluate." ■

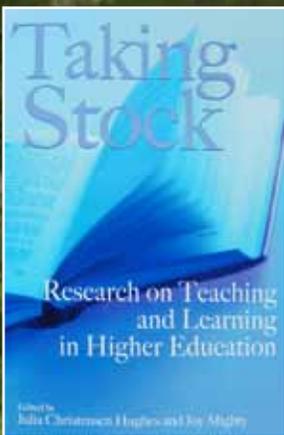
Prof. Martin Williams has found that creating space for lively debate in lectures and open-ended lab assignments improves students' real-world problem-solving skills.



BEYOND THE LECTURE

Educational research
encourages deeper learning

BY NATALIE OSBORNE



*Prof. Julia Christensen Hughes discusses the newest research on teaching and learning in higher education in her new book, **Taking Stock**.*

WHEN IT COMES to academic performance, does the student or the test determine success? It turns out the design of a course and its evaluation methods can have a significant influence on a student's approach to learning.

Recognizing the impact that learning contexts such as course design can have on student behaviour is one of the key messages in *Taking Stock: Research on Teaching and Learning in Higher Education*, co-edited by Prof. Julia Christensen Hughes, Dean of the College of Management and Economics. In *Taking Stock*, top pedagogy researchers from around the world discuss their latest work and suggest ways to enhance student learning.

The book also serves as a guide for faculty and administration looking to improve their awareness of pedagogical principles.

In the book, researchers describe how course design or "learning contexts" – which include classroom size and environment, evaluation methods, curriculum design and even the instructor's attitude – can dictate if students are more likely to take a surface approach or engage in deep learning.

Surface learning refers to a minimum-effort approach, such as cramming the night before an exam, where students do only what's required

to achieve the credit. Little to no information is retained after the course is finished.

By contrast, deep or "transformational" learning results in lasting changes in the student's knowledge and skill base, and occurs when students are genuinely engaged in the material.

"In some cases, students can be naturally predisposed to one approach or the other," says Christensen Hughes. "But research shows that there's no question that the learning context drives in large part student behaviour."

Traditional teaching tools such as lectures and multiple-choice exams have their place, but shouldn't be the only way students are taught, she says. Rather, educators should use multiple approaches to actively engage their students in deeper learning.

Christensen Hughes cites the "Ted Talks" format as a good example. These are 17-minute lectures presented by passionate, knowledgeable speakers who often engage in storytelling and use interesting visuals.

"All these elements can make a powerful lecture, but what's important is for students to then do something with this knowledge in order to internalize it, such as a discussion, debate, project or paper," says Christensen Hughes.

She believes the problem with many university programs is that the contexts that promote deeper learning are not introduced until the later years, which can make the transition difficult for novice learners in large, first-year classes. First-year students could be better equipped to handle the transition if they were taught skills including inquiry and problem solving, how to access and utilize resources and work effectively in groups.

This research is one of the reasons the Bachelor of Commerce program is including a new introduction to management course that allows every incoming student to have a small class experience in their first semester.

"Factors such as year level, student numbers and limited resources can create all kinds of constraints on what a faculty member might think he or she can do to promote deep learning," says Christensen Hughes. "But in any kind of context, there are opportunities for students to engage actively. It's about moving beyond just listening to a lecture and writing a test."

For an example of an educational approach that encourages students to be more engaged and raises their academic performance, see the story on page 18. ■

SoTL AND THE CENTRE

The University of Guelph is justly proud of its research traditions as well as the high quality of its teaching. It then follows that the University would take a scholarly and evidence-based approach to this key part of its mission. An increasing number of Guelph's instructors recognize the need to assess their teaching through research and enquiry to see what works and why.

Guelph's new Centre for Open Learning and Educational Support places the Scholarship of Teaching and Learning (SoTL) at the

heart of what it does. Combining the mandates of Teaching Support Services and the Office of Open Learning, the merged unit promotes, advocates and engages in evidence-based and scholarly approaches to educational practice.

It hosts and supports educators, educational researchers, administrators and practitioners, ensuring that the practice as well as the spirit of enquiry are part of the centre's work. These scholars and many others often present their research at the annual Teaching and Learning Initiatives conference hosted by the centre.

Recently the centre initiated the Educational Leadership In Teaching Excellence program, designed to promote faculty engagement in the principles, practice and scholarship of teaching and learning in higher education.

The centre celebrates and recognizes SoTL across the campus with a biannual award and staff at the centre, research and publish their own work in this important field.

When it comes to teaching and learning, the Centre for Open Learning and Educational Support, like the University at large, is committed to a scholarly approach.

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BREAK OUT FROM TRADITIONAL LEARNING

Research shows breakout groups actively engage students and improve learning

BY KATHARINE TUERKE

groups of up to five students would quickly assemble around their classroom seats, discuss a given topic for 10 minutes or so, and then reassemble for a discussion with the whole class.

Student satisfaction was measured with two online surveys, one midway through the course and the second at the end. On each survey, students answered questions about breakout group topics, usefulness and timing. Information about gender, GPA, participation and breakout group size was also collected.

The results show breakout groups improved students' understanding of the course material and helped connect coursework with current nutritional issues. More than 85 per cent said breakout groups enhanced their learning (females showed greater satisfaction and higher final grades than males).



Using small breakout groups to discuss and debate classroom concepts has been shown to boost students' understanding of course material.

UNDERGRADUATE ENROLMENT AND class sizes are on the rise, making it more challenging to actively engage students. For large audiences, breakout groups (small subgroups) are a common active learning technique to discuss concepts in further detail. But little research to date has examined the effectiveness of breakout groups in undergraduate settings.

That's where Prof. Genevieve Newton, Department of Human Health and Nutritional Sciences, comes in. She's examining the relationship between gender, cumulative GPA and students' perception of undergraduate-level breakout group effectiveness.

"It's a challenge to integrate active learning techniques with lecture-only formats and room restrictions, so it is important to identify

strategies that can be used successfully within these contexts," says Newton.

Traditionally, breakout groups have been used in settings such as professional workshops and conferences, where participants can interact, move around and easily assemble in groups.

But that's not so easy in university lecture halls, which may be crowded and often have fixed seating arrangements.

To examine the matter more deeply, Newton looked to the 280 students in her fourth-year undergraduate course on functional foods and nutraceuticals, where lectures are held in a lecture hall with a main floor and a balcony filled almost to capacity.

Breakout groups were used to debate issues and questions raised during the lecture. After the lecture portion of the class was complete,

Despite room restrictions, participants said breakout groups enhanced their learning and that they were easy to create and take part in.

Interestingly, students with a cumulative GPA above 90 per cent rated breakout group effectiveness lower. Newton says these students have, in their view, well-established methods of learning and are reluctant to partake in something that to them may not have a clear benefit.

"Applied approaches are a critical step to improve learning and breakout groups are one method that can be easily implemented in large undergraduate classrooms," says Newton.

The results of Newton's study have been accepted for publication in the *Canadian Journal for the Scholarship of Teaching and Learning*. 

A red pen is shown in the upper right corner, pointing towards the left. In the upper left corner, a red 'A+' grade is written on a document.

Marking made easier

BY NICOLE YADA

AS CLASS SIZES continue to grow, marking exams in an efficient, consistent manner is an increasing concern. Research from a University of Guelph professor has found that by reorganizing the teaching assistant (TA) support structure, it's possible to better manage the marking of long-answer, written tests for large class sizes.

Prof. Coral Murrant, Department of Human Health and Nutritional Sciences, started teaching human physiology 10 years ago to a class of 240 students. Then, when the high school curriculum shortened from five years to four, Murrant's class size almost doubled in just two years. She was given more TAs to support the double cohort, then had to figure out how to arrange this support effectively.

The challenging issue isn't the course's lecture component; rather, it's the testing and the subsequent marking, which is carried out by TAs. They must be quick and able to mark essay-type questions accurately, especially in Murrant's class, which is worth 1.25 credits. That means it's essentially two courses in one semester and every three weeks there's a test.

Currently, the course is split into eight sections. Each TA is responsible for two of these sections. The TAs attend lectures in their sections and take notes, so they're familiar with the language used in class.

In testing, she's tried to marry student satisfaction and TA workload. Each test question used to appear on a separate page, to leave room for answers. But it was actually too much room and led to unfocused responses that were hard for the TAs to mark.

Now, each question is split into three sections, to space out the page. While a previous question may have asked students to explain how a nerve membrane might change under various conditions, the same question now would be broken down to list each condition separately, with room to answer underneath each one. Dividing questions into parts has not only helped the TAs, it's helped the students as well, making them much more focused.

To gauge the effectiveness of the marking, Murrant keeps track of how many tests come back to be remarked, whether the marks were changed, and by how much the marks were changed.

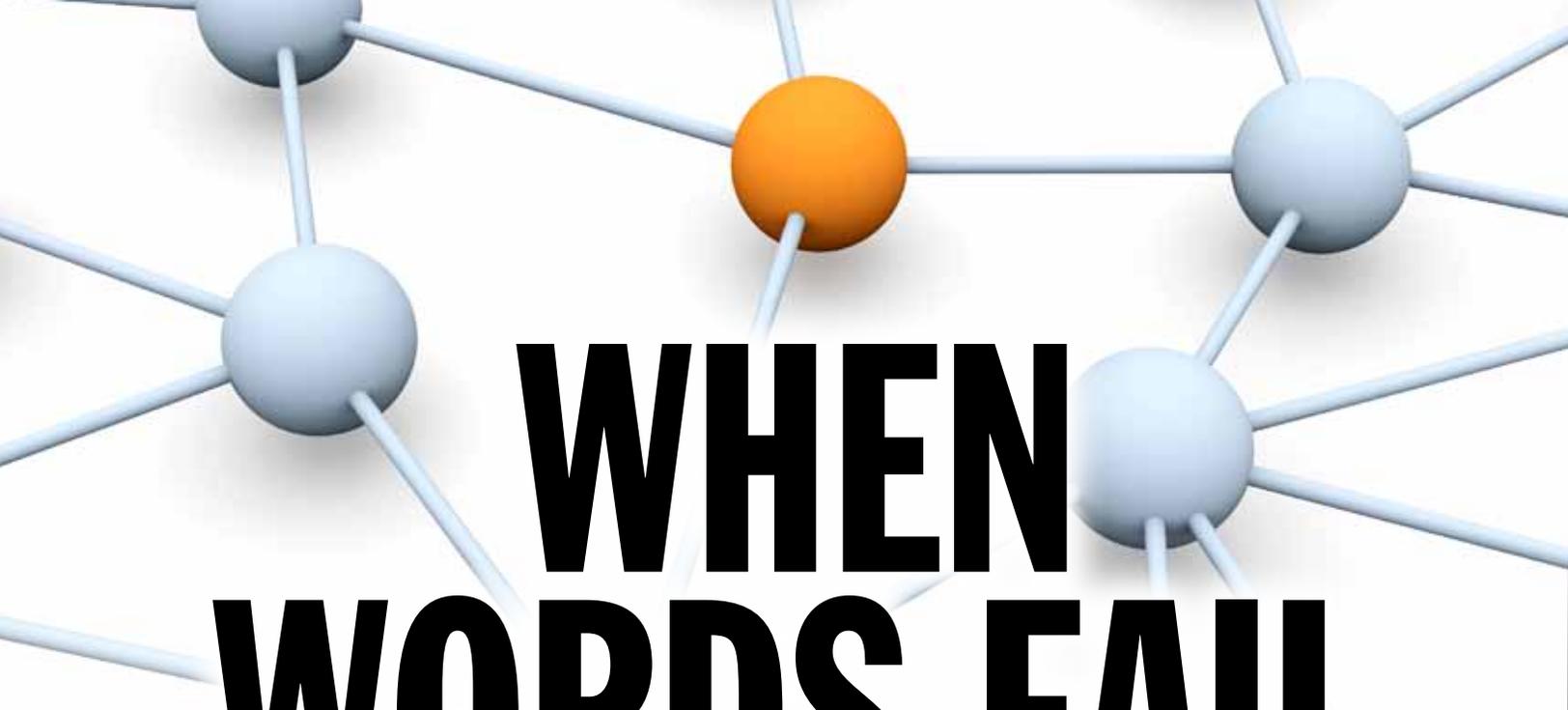
So far, she's found the TAs are efficient at marking the tests. But Murrant says she'll need to collect a few more years of data to see if there is an increased efficiency due to changing the test structure.

"I'm blessed by having a department that believes in the importance of maintaining the long answer testing style, even for large classes, and foots the bill of four TAs," she says. "There's an absolute link between teaching philosophy and testing style, and we're trying to preserve this connection."

Murrant's research was published in the journal *Advances in Physiology Education*. 



Prof. Coral Murrant is investigating strategies that will help make marking long-answer questions more consistent in large classes.



WHEN WORDS FAIL

That's when concept mapping comes in...and the results are 35 per cent more favourable than conventional teaching approaches

BY JOEY SABLJIC

A GUELPH RESEARCHER has found that concept maps – graphic diagrams that help to illustrate interconnected ideas and knowledge – can lead students towards an entirely new dimension of learning and understanding.

Integrative Biology Prof. Steven Newmaster says that the concept map is a standard tool of the trade in today's business world. But these maps also date as far back in time as the ancient Mayan and Aztec civilizations, as a way to propose projects, brainstorm new ideas, or share knowledge in an easily understandable and graphic way.

Newmaster is bringing concept mapping tools into his lectures as a way to better illustrate fundamental concepts, such as biodiversity or photosynthesis in plants, for his first-year biology students.

So far, he's found that concept maps are indeed helping many students get a handle on course concepts, by visually representing ideas.

"Concept maps really help to show the interrelation among different concepts – which sometimes isn't an easy thing to do verbally or with text," says Newmaster. "For me, the concept map is really a kind of modern-day learning object that students can connect with."

There isn't one set way to design a concept map. Many resemble a giant spider web, with a central idea as the hub and related ideas and concepts linked by interlacing branches or bubbles.

For instance, if Newmaster wanted to talk about biodiversity, he could link other directly related ideas, such as genetics, evolution or ecology, which could in turn be linked to other more specific words, images and details.

To find out whether or not the concept maps increase student understanding, Newmaster has been giving two sets of lectures. First, he teaches using a standard PowerPoint presentation. Then, he teaches the same lecture again using concept maps. After each type of lecture, he quizzes his students on the concepts they have just discussed and compares the results. He's found the concept mapping approach led about 35 per cent more of his students to the correct answers, providing evidence that concept maps may provide students with a more concrete way to engage with the course material, enabling them to pick apart tricky ideas and visualize how concepts are connected.

"We're hoping that with the concept maps, students will be able to see connections and then be able to apply their skills towards other areas," says Newmaster.

A paper on Newmaster's findings has been submitted to the *International Journal of Learning*. He also wants to further encourage concept mapping in his courses by making software for building concept maps freely available to his students.

Also involved in this research is Integrative Biology Prof. Karl Cottenie. 

Using active learning to increase student engagement

BY NICOLE YADA

WITH ALL STUDENTS in the physical and life sciences major required to take at least two first-year biology courses, it's not unusual to have enrollment of up to 1,800 students each year. Research has shown that for students to learn effectively in classes of this size, they must be able to connect and interact with the material. That's a challenge for instructors.

But by using pedagogical literature and feedback from students and faculty, a new approach is being taken to enhance engagement, learning and knowledge retention.

This approach involves reorganizing first-year biology into three subdisciplines: Discovering Biodiversity (BIOL1070), Biological Concepts of Human Health (BIOL1080), and Introduction to Molecular and Cellular Biology (BIOL1090). Prof.

Brian Husband, Department of Integrative Biology and associate dean (academic) in the College of Biological Science, says the idea is to present "a window" on biology by giving the students a glimpse into these themes. "It helps them understand that the big problems in society that have a biological basis involve interactions among all three," he says.

The students and professors work through problems and case studies together in the lectures to increase engagement. Involving the students means focusing on issues that the students find relevant, says Husband. Class time is used as much for these interactions as it is for traditional lectures.

The multidisciplinary team working on this initiative decided to introduce students to eight key skills for biological inquiry. Online practicums – accessible all year to students in any of the courses – introduce six of the eight basic skills, including written communication, information management and evaluation.

During the last three weeks of the courses, students are assembled in multidisciplinary teams to explore a biological issue, with teamwork and integrative thinking skills emphasized. In this part of the course, students use their ability to make connections between the three areas of study. Some programs don't require students to take all

tests explore the students' attitudes towards biology, their confidence about various biological concepts, and their understanding of some of the key concepts in biology, such as scientific method, evolution, cell theory and physiological concepts like homeostasis.

The results have been positive: student skill levels improve, confidence goes up, and overall impressions of the courses are positive.

Some students even indicated that the courses caused them to want to take more biology courses.

"We're trying to get them to think like biologists," says Husband.

Faculty involved with this linked course model are Profs. William Bettger and David Dyck (Biological Concepts of Human Health); Profs. Patricia Wright, Ryan Gregory and Steve Newmaster (Discovering Biodiversity); and Profs. Marc Coppolino and Andrew Bendall (Introduction to Molecular and Cellular Biology).



Breaking down biology into smaller bits improves engagement and learning for first-year students in large classes, according to new research in the integrative biology department.

three courses, so the interdisciplinary project allows them to have exposure to the other two facets of biology, to learn about these different perspectives and their value.

The success of the courses is measured through student evaluations, as well as through surveys given to the students when they first arrive in the class and when they finish. The

Profs. Coral Murrant, Kimberly Kirby and Kerry Ritchie from the Department of Human Health and Nutrition, and April Nejedly from the Department of Integrative Biology, have also been central to the development of these courses.

The Learning Enhancement Fund provided funding for early course development. ■



*“Dear all,
Please send me your course outlines for the courses you will be instructing in Summer and Fall so I can post them to our website.”*

FACULTY MEMBERS RECEIVE this email routinely each year from departmental administrators. It sparks reflection about our previous teaching experiences and how we can improve student learning, although we may not specifically frame this question as a research exercise.

Nearly 20 years ago, University of Guelph zoology professor Sandy Middleton identified the parallel nature of the scholarship of research and teaching. He said both teaching and research have the same phases: problem identification, hypothesized means to solve it, expected outcomes if the strategy is successful, implementation, assessment of results against expected outcomes, and, finally, implications for revising knowledge and approaches to its dissemination.

So some of us use this email as a call to arms, to start planning research about the effectiveness of a teaching activity we have used several times. We not only want to confirm the reliability of a particular approach that we have used in our classrooms, but more importantly, we want to persuade other educators to implement it as well.

Because we are also researchers, designing such a study is not that different from our other research, although the language, custom and standards of evidence might be foreign.

In essence, whether we know it or not, some of us probably approach each class as an experiment, changing one or two parameters by introducing new content, or a new learning exercise, and at least implicitly evaluating how well it worked with respect to student achievement of learning objectives. The scholarship of teaching and learning formalizes this activity by emphasizing active, rather than passive, learning on the part of faculty about whether particular ways of teaching are effective.

You’ll read about the University of Guelph’s teaching and learning success stories in this issue of *Research*. By showcasing our formal studies related to teaching and learning, we hope to help all faculty members recognize the importance of their personal stories and experiences.

If the final aim of undergraduate education is, as prominent pedagogy researcher Prof. James Wilkinson said, to have students “ultimately learn to perceive the world, review evidence, form hypotheses, and express conclusions unaided,” it follows that faculty and administration should value both the active but especially the personal scholarly approaches to teaching and learning. This implies that we should recognize the importance of the scholarship of teaching in our own practice, perhaps think about designing a formal study around some of our findings, and recognize these contributions in our colleagues for tenure and promotion.

So the next time we get a request for our course outlines, administrators can expect this response: “Thank you for your message. Attached, please find the design for our new experiment.”

Karl Cottenie

Tom Nudds

Peter Wolf

Karl Cottenie, Tom Nudds and Peter Wolf are the executive editorial advisors for this edition.



A PEDAGOGY PUZZLE

Down:

- 1 Art Schaafsma's course centres around this animal
- 2 These can help build students' self-regulation strategies and writing
- 3 A group used to engage students in larger classrooms
- 4 Famous Shakespearean duo app
- 5 These link related themes and ideas together
- 6 Place of research outside of the classroom
- 7 Giving these to students before class does not affect attendance
- 8 An essential skill for veterinarians

Across:

- 1 Teaches enquiry-based learning first-year seminars
- 2 Spontaneous, unplanned music
- 3 Researcher using field trips as part of her teaching method
- 4 Online software for math, physics and economics students
- 5 A social media learning tool
- 6 A measure of hope, confidence and resiliency
- 7 Book about teaching and learning research in higher education

FOR THE ANSWERS PLEASE SEE PAGE 32

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