

# Centre for Learning and Teaching

## focus

on university teaching and learning

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### Active Learning at Dalhousie: Editor's Message

Welcome to the Spring 2019 issue of *Focus* where we take a closer look at active learning, a student-centred practice where learners move beyond passive listening to engage with content in new ways.

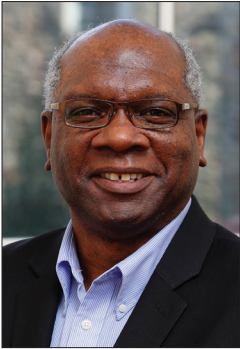
At Dalhousie, there has been an increased focus on implementing active learning strategies over the past year. Some examples include a one-day symposium sponsored by the AVP Academic that explored active learning at the university, twenty-five grants to design and implement active learning strategies funded through the Academic Innovation Program, and the 2019 theme of the Dalhousie Conference on University Teaching and Learning, which will feature keynotes, presentations, papers, and workshops centred on active learning.

In addition to these opportunities to explore and discuss active learning, there are faculty who are experimenting with new ways to integrate active learning into their instruction every day. In this issue, we'll hear from a few of these individuals. First, J. Pemberton Cyrus provides an overview of the efforts to promote active learning at Dalhousie. Then Kathy Cawsey describes "writing bursts," a technique that affords students in large, first-year courses regular opportunities to practice their writing, and Jennifer Van Dommelen shares Foldscopes™, a strategy she used to encourage active learning in an online biology course. We conclude with my review of *Hitting Pause* (2018) by Gail Taylor Rice, a book that delves into how we can insert active learning strategies into lecture-based courses.

We hope you enjoy this issue and will take away new ideas for implementing active learning in your own teaching practice. ■

# Active Learning @ Dal

J. Pemberton Cyrus, PhD, PEng, FEC,  
Associate Vice-President Academic (Acting)



Last September, our campus held a symposium focused on active learning, which, by definition, is any classroom practice that actively involves students in their own learning. Sixty professors engaged in discussions of active learning methods, including simulations, student response systems, and peer learning. Active learning can be as simple as a carefully constructed

question and answer session, or as complex as a simulation exercise involving actors.

Some of the features of active learning techniques are:

- Providing opportunities to recall knowledge;
- Opportunities for discussion (exercising knowledge);
- Activities that involve all students (deliberate inclusion);
- Timely feedback (always correct a wrong answer).

One of my favourite active learning strategies is “group quizzes.” I find this intriguing because it turns examination protocol upside down: students take the quiz individually, and then, based on their scores, are put into mixed groups and repeat the quiz in groups. The idea is that lower-performing students learn solution strategies from those students who perform better on the quiz, while higher-performing students improve their learning by teaching their techniques. In practice, students who do group quizzes consistently outperform those who do not when given the same individual, final exam (Cortright, Collins, Rodenbaugh, & DiCarlo, 2003).

## Why Active Learning?

Our 2017 to 2018 first-year to second-year retention was 84%, just a 1% improvement over 2016/17. From another point of view, that means we lost 16% of our first-year students last year: 339 students who will not receive a Dalhousie education. If these students choose not to return to university education, it could be a significant loss to our economy and society.

Our long-term objective is to continually increase our retention numbers. One way to do this is to increase engagement in the classroom. Engaged students are more likely to experience a sense of belonging, find educational

success, and remain at the university (Chen, Lattuca, & Hamilton, 2008; Crosling, Heagney, & Thomas, 2009).

Active learning is one strategy for increasing engagement in the classroom. Active learning methods are not necessarily easy to do, but they bring large benefits to both the student and the instructor. In his 2016 book, *Small Teaching*, Lang details research studies that show as little as 10% of a course devoted to active learning practices can have disproportionately large effects on student performance. “Small teaching activities have been proven to raise student performance on learning tasks by

**Active learning methods are not necessarily easy to do, but they bring large benefits to both the student and the instructor.**

the equivalent of a full letter grade or higher” (p. 9). Some faculty attendees at last year’s active learning symposium at Dalhousie echoed these ideas, concluding that active learning is worth the extra effort, but that one should not expect instant results: it takes time to get it right, and students will need to get accustomed to a different type of class structure. But when the benefits kick in, there is no turning back.

## The Active Learning Landscape at Dalhousie

In September 2018, a survey of active learning practices was conducted at Dalhousie. Ninety-two percent of respondents said they were doing some active learning in their classes. An analysis of the results shows that mostly easy-to-implement techniques are in use, such as “Question and Answer” in 82% of classes, “Think/Pair/Share” in 55%, and “Large Group Discussions” in 55%. The least used methods were the relatively difficult-to-implement “Jigsaws,” “Concept Maps,” and “Group Quizzes,” each with less than 10% (See Figure 1).

As a follow-up to the survey, a call for course-level active learning grants was issued. Fourteen were awarded to

faculty in Fall 2018 and eleven in Winter 2019. Many innovative ideas were proposed, and these can be viewed on the DalVision website: <https://www.dal.ca/dept/DALVision/funded-projects.html>.

On May 1 and 2, 2019, the Dalhousie Conference on University Teaching and Learning, “Diving Deep: Engaging Students Through Active Learning,” will focus on active learning. DCUTL is Canada’s longest-running university conference on learning and teaching. For more information and to register, go to: <https://www.dal.ca/dept/clt/events-news/annual-events/DCUTL.html>.

In conclusion, this is an exciting time for learning and teaching at Dalhousie. I invite you to try proven methods for engaging and exciting students about their learning. Contact the Centre for Learning and Teaching to consult on developing your own active learning methods. ■

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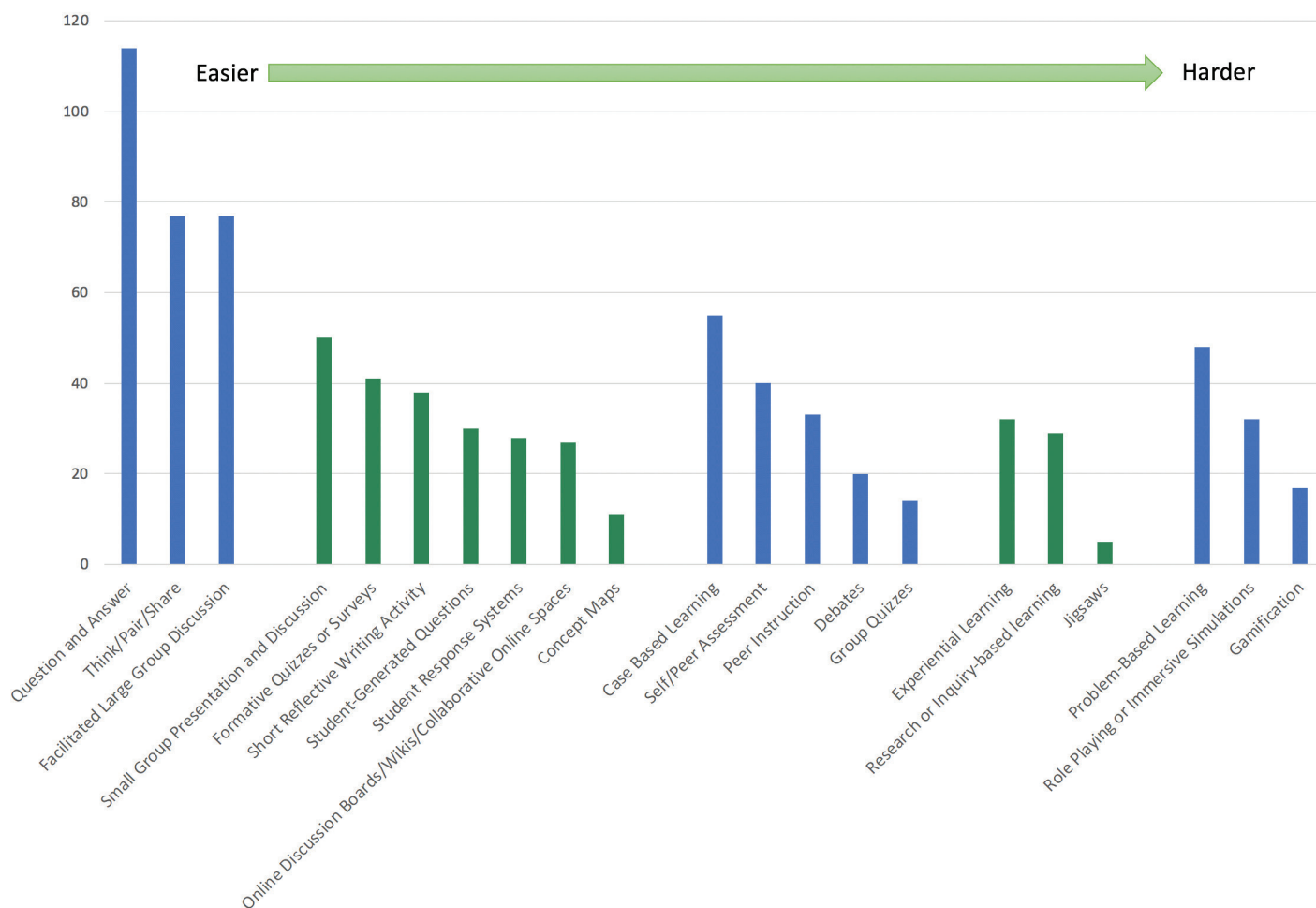


Figure 1. Some active learning techniques in use at Dalhousie, grouped by difficulty of implementation.

# Writing Bursts

Kathy Cawsey, PhD  
Associate Professor, Department of English

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How does one keep a class of 300 students actively involved and participating?

This was the question I faced last term, teaching a large-size first-year English Writing Requirement course for the first time. I had taught large classes before, but since coming to Dalhousie ten years ago my largest had been about 90 students. I could

lecture at them for an hour, I guessed, but I am more comfortable with a discussion style of pedagogy. I firmly believe that a good teacher can get the same number of students participating in a class discussion, if not the same percentage, whatever the size of the class; but how, then, does one ensure the ones not participating vocally are still engaged and active?

I tried Top Hat, the campus's student response system (i.e., clickers), but I found it more useful for quick quizzes than for getting discussion started; indeed, it ended up disrupting the flow of the class more often than not, as students fumbled for their phones and as I paused for them to answer. I then remembered a method my undergraduate mentor at Wilfrid Laurier, Jim Weldon, had used to some success. At the end of every class, he would have the students write for one minute summarizing the main points of the class.

I received an Academic Innovation Grant in 2018 from the AVPA's office to scale these "writing bursts" for a large class. Writing bursts were helpful pedagogically on a number of levels. First of all, they gave me a good sense of what the class took from a given lecture; I could correct widespread misunderstandings the following class, or email individual students with fuller explanations. Second, I gained a better appreciation for which parts of the lecture the students found most interesting and memorable.

The writing bursts also encouraged students to engage actively with class material, enabling students to participate who were too intimidated to talk out loud in such a large class. The process also develops an important skill: distilling a large (hour-long) body of information into a short summary or thesis (minute-long).

Students were expected to write regularly, and some of them noted that their writing skills improved as the term went on. Pedagogically, summarizing and writing down information cements it in one's brain, and makes studying before an exam much easier.

The writing bursts had other, unforeseen, advantages. The TA could easily tell if a student had zoned out halfway through a lecture [by reading the writing bursts], and only give half-marks for participation. If a TA or I suspected plagiarism on an essay, we could compare the student's writing level on the essay with the level of the writing bursts. We had to take into consideration the fact that essays can be edited, of course; however, in some cases the gap in ability was large enough to raise concerns.

Students also recognized advantages to writing bursts. They often asked questions on the bursts, about parts of the lecture they had not understood or about upcoming texts. I would either answer those questions at the beginning of the next class, if I thought other people might have had the same questions, or in a personal email to that student, if the question was more individual. Some students commented by the end of term that it would be more effective if I gave a specific question each time, rather than just "summarize the main points of the class," because they noticed some students didn't take the time at the end of class to write the burst but had it written already by the end; however, I felt for the most part that writing the burst earlier did not necessarily detract from the benefits of the exercise. (Still, if I use this practice again, I may use different questions in response to this student suggestion.)

Our Writing Requirement courses are a paradox: ideally writing would happen in small classes with lots of one-on-one instruction. But the nature of our institution means we teach them in huge classes with battalions of TAs to run tutorials. Often that means a disconnect between the lectures and the tutorials.

Writing bursts are one way of getting students actually writing in lecture, without sacrificing lecture content. The fact that they have other pedagogical value—feedback for the professor, study and note-taking skills for the students, and evidence for the integrity officer—is a bonus. ■

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# Using Foldscopes™ for Offline Exploration in Online Biology Courses

Jennifer Van Dommelen  
Senior Instructor, Department of Biology

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The essence of active learning is cognitive activity, which may be fostered through a variety of instructional approaches (Chi & Wylie, 2014). Defined for the online context as “anything the students are *doing* with the presented course content to enhance their understanding” (University of Florida Center for Instructional Technology and Training, 2017;

emphasis theirs), active learning is an inherent quality of undergraduate labs, and a principle of good instructional practice (Chickering & Gamson, 1987) that is repeatedly associated with improved learning (Armbruster et al., 2009; Kilgo et al., 2015) and positive affective outcomes (Corwin et al., 2018; Tirell & Quick, 2012).

Our online introductory biology courses include readings, quizzes, discussions, recorded lectures, and online and offline labs. Referring to offline labs in general, Jeschofnig and Jeschofnig (2011) attribute positive student outcomes to the responsibility students take for their own learning, the necessity of working through an activity on one’s own and the concomitant absence of opportunity to coast on the strength of a lab partner’s work, the removal of arbitrary time limits, and the sense of agency and personal ownership that comes with active engagement with the subject matter. Ranking consistently among our students’ reported favourites are those labs that take them away from the computer and guide them through “hands-on” activities such as outdoor observations or the extraction of DNA from plant material.

Light microscopy is an engaging activity for novice and expert biologists alike. We recently developed three new lab activities that incorporate the use of Foldscopes<sup>1</sup>: portable microscopes that are assembled from paper and a small lens, provided in a kit. Foldscopes can magnify up to 140X with a resolution of 2 microns; they can be used alone or in combination with a smartphone camera and produce images comparable to those obtained with a basic light microscope (Cybulski et al., 2014) at a fraction of the cost (Yong, 2015). With Foldscopes, we can provide

students with direct access to the microscopic world via a safe, inexpensive, and biologically meaningful activity that they can participate in without supervision.

In BIOL 1020 (Cells, Genetics, and Evolution), students use Foldscopes in two labs. Starting with Microscopy, students observe red onion (*Allium cepa*) cells and practice the basic microscopy skill of estimating the actual size of specimen. In a subsequent Osmosis and Diffusion lab, students observe the effects of osmosis on plant cell structure by treating their red onion cells with a concentrated salt solution. In BIOL 1021 (Organismal Biology and Ecology), students use their Foldscopes to observe chloroplasts in plant or algal cells. In all three labs, students combine their own observations with provided images and other material to make connections to the physiological and evolutionary significance of the structures and processes under study. They can also easily share their photos and observations via the online platform Padlet<sup>2</sup>, a virtual pinboard that can be embedded within Brightspace and which does not require students to set up an account to access.

Students collect and process their own specimens and images; while they are encouraged and guided to find specimens directly related to the lab, the activities aren’t contingent on students getting great results (though many of them did: see Figures 1-4!). This design allows some room for trial and error and gives students the freedom to observe and share other specimens of interest. They can also, if they wish, share their discoveries more widely via citizen science platforms such as iNaturalist<sup>3</sup>, Foldscope’s own Microcosmos<sup>4</sup>, and participation with initiatives such as BioBlitz<sup>5</sup>.

Referring to the latter half of self-taught microscopist Antony van Leeuwenhoek’s life (1632-1723), historian Douglas Anderson (2014) wrote, “Almost everything he saw, he was the first person ever to see” (p. 25). Foldscopes can provide students not only with anytime, anywhere access to the unseen natural world, but also with the experience of following in the footsteps of one of the early pioneers of one of our most important scientific instruments, using a tool not unlike the one van Leeuwenhoek himself perfected. ■

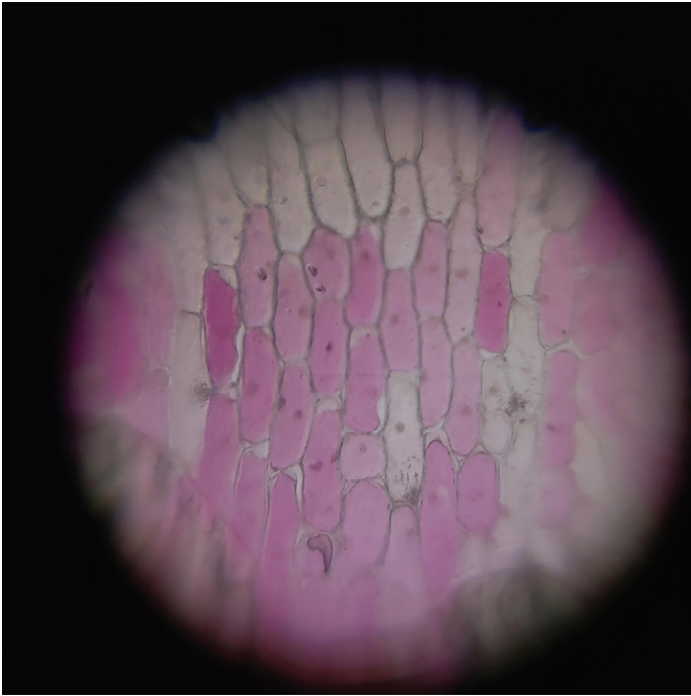


Figure 1. Red onion (*Allium cepa*) epidermal cells as viewed through a Foldscope; whole mount, magnification 140X. Anthocyanin pigment distributed throughout the cytoplasm acts as a natural stain. Photo by Meghan Del'Eveille; used with permission.

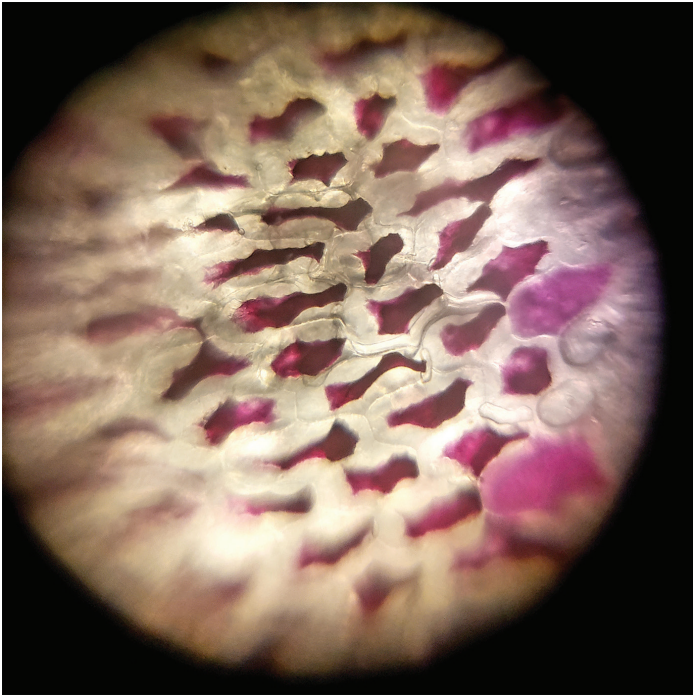


Figure 2. Red onion (*Allium cepa*) epidermal cells as viewed through a Foldscope; whole mount, immersed in NaCl solution for approximately 5 minutes; magnification 140X. Water leaves the cells, causing the plasma membrane to shrink away from the cell walls and concentrating the anthocyanin pigment in the cytoplasm. Photo by Stephen Lays; used with permission.

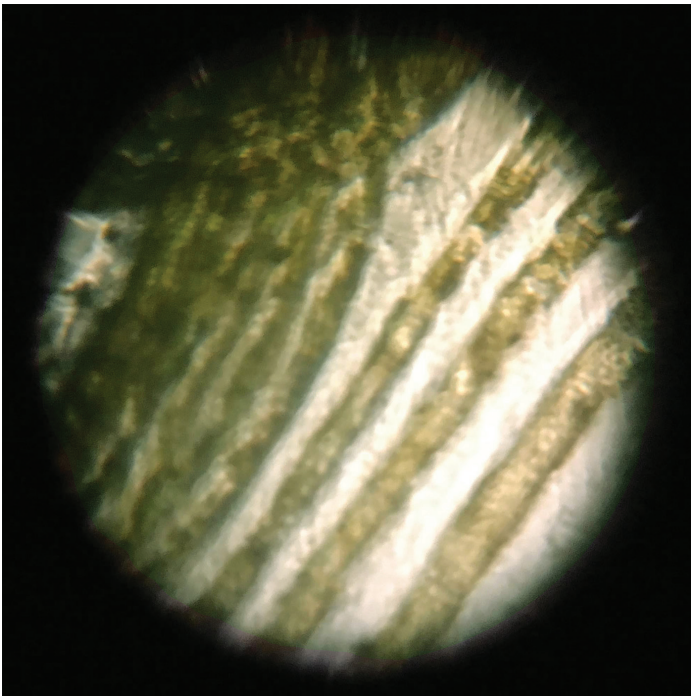


Figure 3. Filamentous algae (species unknown) as viewed through a Foldscope; whole mount, magnification 140X. Photo by Amanda Lawless; used with permission.

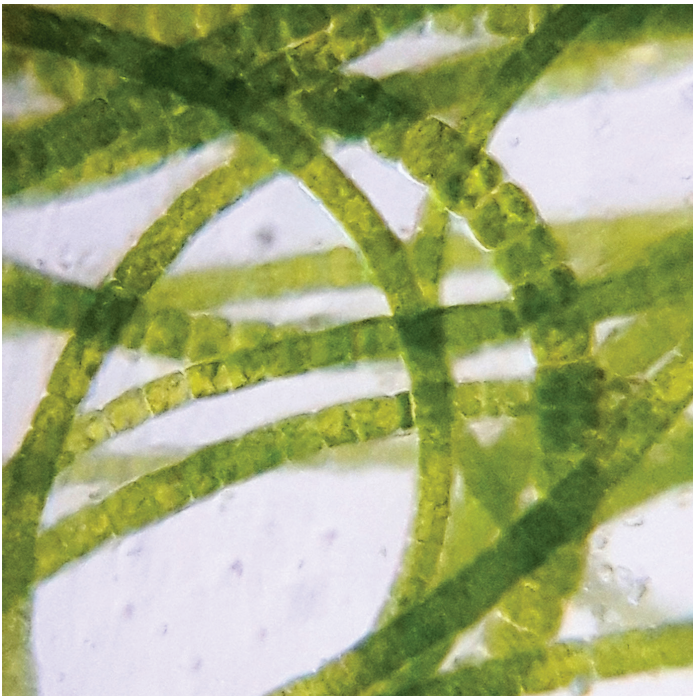


Figure 4. Filamentous algae (species unknown) as viewed through a Foldscope; whole mount, magnification 140X. Photo by Joe Schell; used with permission.

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## Acknowledgements

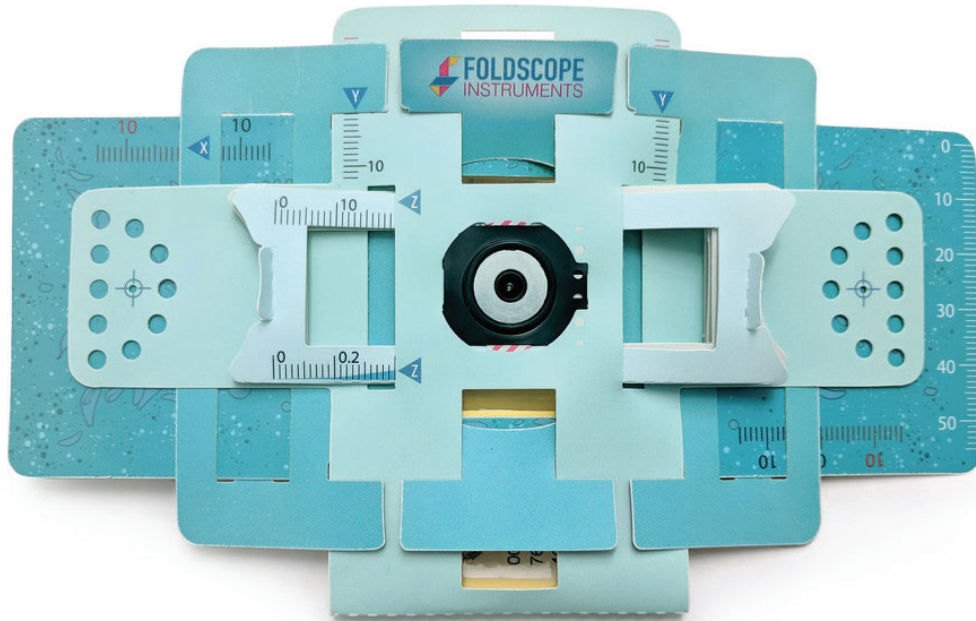
The Foldscope labs were developed by Jennifer Van Dommelen and Jacob Fletcher, supported by a Teaching and Learning Enhancement Grant from the Centre for Learning and Teaching. Sessional instructors Beverly Hymes and Herb Vandermeulen offered valuable input on early drafts of the Chloroplast Diversity Lab. The Department of Biology provides Foldscopes to the students of BIOL 1020/21 at no charge.

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## Endnotes

1. [www.foldscope.com](http://www.foldscope.com)
2. [www.padlet.com](http://www.padlet.com)
3. iNaturalist is a crowdsourced international online field guide; <https://www.inaturalist.org/pages/about>.
4. <http://microcosmos.foldscope.com/>
5. BioBlitzes are events where teams of volunteers work in a particular area to identify as many species as possible in a short period of time and share their observations in iNaturalist. Dalhousie hosted a BioBlitz on the Studley Campus in 2016 (<https://www.inaturalist.org/projects/dalhousie-university-bioblitz-2016>), and on the Studley and Agricultural Campuses in 2018 (<https://www.inaturalist.org/projects/dalhousie-university-studley-campus-bioblitz-2018> and <https://www.inaturalist.org/projects/dalhousie-university-agricultural-campus-bioblitz-2018>, respectively).





[Photograph of Foldscopes paper microscope]. Retrieved from <https://www.foldscope.com/>

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# Active Learning with a Pause

Les T. Johnson, PhD  
Educational Developer (eLearning)



In Winter 2018, I taught Gender and Diversity, an introductory Gender and Women’s Studies course here at Dal. We met twice a week in Ondaatje Theatre, a 495-capacity auditorium in the McCain building. Day one, my 200 students found a spot in the auditorium and sat, facing forward, in seats bolted to the floor.

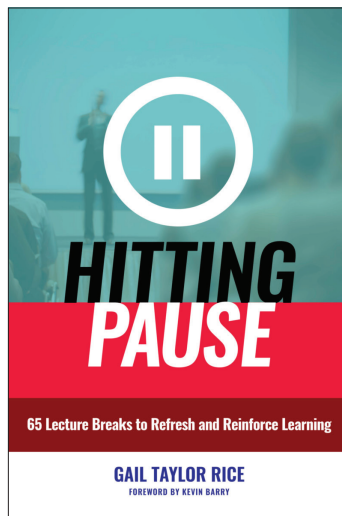
Many prepared for my lecture by getting out notebooks or readying their computers with a blank Word document.

But I did not lecture that day... nor any other day that semester. Instead, I chose to use pedagogical strategies grounded in active learning. My hope was this student-centred practice would allow my students to engage with course content—beyond passive listening and recall of information—and use it to construct their own knowledge and understanding (Hammer, & Giordano, 2012). I knew active learning, as opposed to more traditional teaching approaches, had the potential to improve my students’ engagement and achievement of learning outcomes (Armbruster, Patel, Johnson, & Weiss, 2009; Hyun, Ediger, & Lee, 2017; Weasel & Finkel, 2016).

The first day of class, I talked with my students about active learning, and assigned their first *Application, Reflection, or Investigation Activity (ARIA)*, which asked them to take (or find) a photograph that represented “diversity.” We used their submissions to launch into a semester of learning, full of activities that asked them to apply, reflect on, or investigate further the class content. In response to readings, handouts, short presentations, and videos, students engaged in in-class activities where they wrote poems, analyzed diagrams, had small and large group discussions, curated media, and more. Although I felt implementing active learning was

successful and the right choice for me and my students, conceiving of these 20 classroom activities was a daunting task that took a lot of effort and time.

Fortunately, with the 2018 publication of *Hitting Pause: 65 Lecture Breaks to Refresh and Reinforce Learning* by Gail Taylor Rice, now instructors can integrate active learning into their classes quickly and easily, without rewriting their lectures, redesigning their course, switching pedagogical approaches, or reworking PowerPoint presentations. The book proposes instructors insert pauses into lectures at key points: at the beginning, halfway through, or at the end of a class session. These pauses allow students to engage with lecture content through small-group discussion, application, analysis, collaboration, or reflection, while giving the instructor a minute or two to catch their breath, gather their thoughts, or look over their notes.



The first part of the book introduces the concept of pausing. The second part delves into the cognitive science behind learning and the benefits of breaking lectures into smaller chunks through pauses. Part three includes classroom narratives that illustrate use of the Starting Pause, Midpause, and Closing Pause.

The remainder of the book (more than half of the total pages) is appendices that detail 65 pausing techniques, including ones named Twitter Start; Dump Bucket; Quiz, Quiz, Trade; and Tic-Tac-Know.

Each pause featured in the appendix includes an introduction, ideal classroom setting, the process for using the pause, suggestions for implementation, ideas for adapting to online instruction, and related references.

If you’ve been wanting to integrate active learning into your lecture-based course, without redesigning it from scratch, I highly recommend you flip through *Hitting Pause* (Rice, 2018) for some easy-to-implement ideas. ■

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### **Get in the Game! Developing Pre-Clinical Simulation Scenario Games to Increase Student Confidence and Preparedness**

Shelley Cobbett and Kelly Lackie, School of Nursing, Faculty of Health  
Amount: \$3000

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Matthew Schnurr  
Amount: \$2970.24

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