Growth & Goals: A course-integrated open education resource to help students increase learning skills

[authors and institution]

Abstract

We developed and launched an online, course-integrated module called Growth & Goals aimed to help students learn to use evidence-based learning concepts. The module focuses on four main concepts: self-regulated learning, goal-setting, metacognition, and mindset (growth versus fixed). Growth & Goals is an open education resource available for download at no cost to any instructor through [website]. The module is available in both French and English and can be customized to any university course. The module conveys the four aforementioned concepts through a combination of text and video. The text and video are interspersed with interactive activities that students can use to practice the skills they have learned in the module. Growth & Goals is intended to help students effectively manage the challenges they may encounter as they progress through their postsecondary academic career and beyond. Since 2017, the module has been implemented in more than ten university courses and has been used by over 2000 students. The preliminary evaluation of Growth & Goals has been largely positive indicating that the module has been well received by both students and instructors.

Keywords

Self-regulated learning, metacognition, growth mindset, open education resource, goal-setting, postsecondary

Introduction

Making student learning a University priority

The [institution details] is a strategic plan by which the school endeavours to "offer an unparalleled university experience and, through outstanding teaching and research, play a vital role in defining the world of tomorrow" ([institution], 2005). This plan comprises four separate goals; the first goal, which supports the work discussed herein, is to provide "a rich, inspiring student experience". As part of this goal, the university established Chairs in University Teaching to (i) Promote innovative teaching and learning practices that will benefit the wider University community as grounded in a scholarly framework/model, (ii) recognize the value of educational leadership and excellence in university teaching and learning, and (iii) support professors committed to the scholarly investigation of teaching and learning, translating to University wide transformation of instructional practices ([institution and details], 2019). In 2016, a Chair in University Teaching was awarded to the corresponding author. Herein, we describe the initiative developed for the Chair's main project: a learning initiative called the Growth & Goals module, which is an open education resource (OER) that can be integrated in any postsecondary course.

Addressing three problems that university students face

Attending university can introduce a number of new challenges into students' lives. They must navigate learning in various and often new formats (*e.g.*, lecture, online, blended, flipped, labs) while simultaneously managing many expectations both in school and more generally in life (*e.g.*, part-time jobs, clubs, sports, volunteer work, family). Compounding these stressors is the

fact that the postsecondary experience is often the first time students have lived away from their family and have had to manage all their responsibilities on their own (Conley, Kirsch, Dickson, & Bryant, 2014; Schulenberg, Sameroff, & Cicchett, 2004). Through this project, we aimed to address three specific problems that university students may be facing for the first time:

Problem 1. Learning to manage course and life goals,

Problem 2. Identifying what they need to learn and how best to learn it, and

Problem 3. Dealing with failure.

Equipping students to better manage these three problems can impart greater control over their academic success which in turn can help alleviate some of the stress of this transitional time (Abouserie, 1994; Bandura, 1978; Zimmerman, 2000).

These three problems are also at the core of two of the six Undergraduate Degree Level Expectations (UDLEs) as outlined by the Ontario Council of Academic Vice-Presidents (OCAV) in the Quality Assurance Framework (Woolcott, 2008) (Table 1): Awareness of limits of knowledge (UDLE 5) and Autonomy and professional capacity (UDLE 6).

The UDLEs are learning outcomes (LOs) that students at any publicly assisted university in Ontario are expected to achieve regardless of their chosen course of study. The UDLEs are intended to provide society at large with the assurance that individuals who are educated at an Ontario university will have the skills necessary to become productive members of society and compete with university graduates from anywhere in the world (Woolcott, 2008). While the first four UDLEs are achieved through completing the assessments required to receive a given degree, currently, few programs, courses, or online resources explicitly address the final two UDLEs

(Centre for University Teaching, 2015). Regardless, students are expected to acquire these skills in the process of completing their education.

Table 1. *Ontario Council of Academic Vice Presidents' Undergraduate Degree Level Expectations (UDLEs).*

Number	Expectation
1	Depth and breadth of knowledge
2	Knowledge of methodologies
3	Application of knowledge
4	Communication skills
5	Awareness of limits of knowledge
6	Autonomy and professional capacity

The goal of this work was to produce an OER that could be used in and customized to a variety of classrooms to address these identified education gaps in the postsecondary curriculum. The OER needed to be relevant to any context into which it would be adopted, easy to share and use, and engaging and relevant to the students who would be using it. Most importantly, the content of the OER had to be effective in helping students address the three problems identified above and achieve UDLEs 5 and 6.

Our approach

The three identified problems overlap with UDLEs 5 and 6

To achieve UDLE 5 (awareness of limits of knowledge), *Problem 2* (identifying what and how to learn) must be addressed. Achieving UDLE 5 relates to gaining perspective with regards to the state of one's own learning and, in the same vein, overcoming *Problem 2* requires that students learn how to take stock of what applicable knowledge and skills they do and do not already possess and strategize towards the successful pursuit of a goal.

To achieve UDLE 6 (autonomy and professional capacity), all three problems must be addressed. An employer needs be able to trust that a university graduate will be capable of learning and performing the role for which they have been hired. In addition to the specific requirements of a job, an employee, more generally, must able to manage tasks or goals (*Problem 1*: learning to manage course and life goals) and have the ability to make sound decisions about how to approach those tasks (*Problem 2*: identifying what they need to learn and how best to learn it) even in the face of setbacks and challenges. Failure, whether in school or in the workplace, is inevitable (*Problem 3*: dealing with failure), but it is students' (and future employees') approach to managing and recovering from failure that is important (Boss & Sims, 2008). Students must learn to recognize that failure is essentially unavoidable in the pursuit of success (Dweck, 2010). An employee who can take and incorporate a lesson from failure into a more effective plan to move forward is more valuable to an employer than one who is frozen by failure.

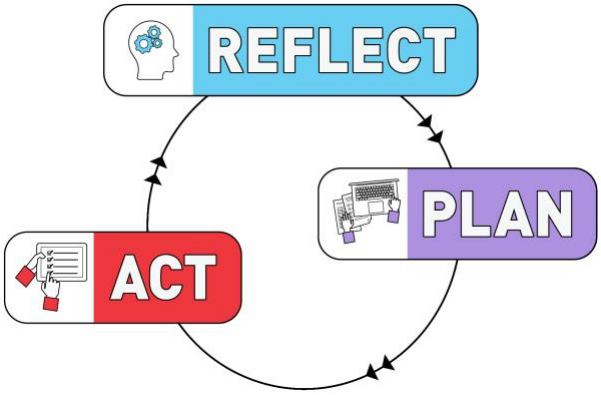
To address the three problems (and thus UDLEs 5 and 6), we identified four interrelated frameworks: self-regulated learning (SRL), goal-setting, metacognition, and growth mindset.

Self-Regulated Learning: Providing students with a framework to approach challenges

SRL is a process by which learners take control of their actions and motivations, seize opportunities, and overcome challenges in an effort to achieve desired goals (Järvelä & Hadwin, 2013; Zimmerman, 2008). We focussed on Zimmerman's model of SRL (1989, 2008) to address the first of the three problems (learning to manage course and life goals). This model is based in the social cognitive theory of learning. In social cognitive theory, people seek to gain control over their lives through learning from the consequences of a given behaviour (Bandura, 1986). Social cognitive theory postulates that learning is either enactive or vicarious (Bandura, 1986). Enactive learning is learning from the consequences of one's own actions while vicarious learning is learning from observation of the consequences resulting from others' actions (others may be peers, mentors, teachers, fictional characters, celebrities, *etc.*). SRL depends largely on enactive learning (Zimmerman, 1989). Zimmerman's model is an iterative, cyclical approach consisting of three phases: forethought, performance, and self-reflection (Zimmerman, 1990b, 1998, 2000, 2002; Zimmerman, Bonner, & Kovach, 1996). The cycle gives students an organized, methodical framework for approaching their goals and overcoming the challenges they will face both in school and in their lives beyond academia. The learner is encouraged to plan an approach to reach their goals (forethought), act out that plan (performance), and then take a step back to see what needs to be adjusted either in their plan or in the content of their goals (self-reflection). This action and subsequent reflection constitute the use of enactive learning. The cycle then begins another iteration with the learner modifying their plan in accordance with what they learned from their self-reflection and then enacting their new plan and so on, with each iteration getting the learner closer to their goal. In the module, we modify the

cycle's names to become verbs and ask students to enter the cycle at the Reflect phase (Fig. 1), described in more detail in the "The Growth & Goals Module" section, below.

Figure 1. *The Growth & Goals self-regulated learning cycle consists of three phases beginning with the Reflect Phase, followed by the Plan Phase, and then the Act Phase before the user starts the cycle again.*



The use of self-regulatory strategies has been significantly positively correlated with course performance (Isaacson & Fujita, 2006; Pintrich, Smith, Garcia, & Mckeachie, 1993; Zimmerman, 2008; Zimmerman & Pons, 1986). Academically accomplished students tended to be more naturally self-regulated than their lower performing peers (Richardson, Abraham, & Bond, 2012; Zimmerman & Martinez-Pons, 1990). Although self-regulation does not come naturally to all students, the skills required for self-regulation can be learned (Dörrenbächer & Perels, 2016; Hofer & Yu, 2003; Schmitz & Wiese, 2006; Zimmerman, 2002). Academic self-regulation is "the self-directive process by which learners transform their mental abilities into academic skills." (Zimmerman 2002, p. 65) Because SRL is a process with well-defined phases, students can learn to follow its steps.

SMART goals

One of the main focuses of SRL is goal setting (Zimmerman, 1989, 1990a) thus, students need to learn how to set well-defined, appropriate goals. For students to work towards goals in an efficient manner, goals need to be fine-grained enough for students remain motivated (Bandura & Schunk, 1981). When a goal is too big, it can difficult to gauge progress. Conversely, when a goal is broken down into sub-goals, students can complete tasks and thus closely monitor their progress toward their larger goal. In addition, an actionable plan can more easily be constructed around smaller goals. Goal setting theory and research on goal setting has shown that productivity and motivation increase when a specific goal has been set (Bandura & Schunk, 1981; Latham, 2004)

To aid students in formalizing their goals, we presented them with framework for setting course-related goals within the module. We wanted a framework that would be memorable and readily applicable to most goals so students could take it and use it in aspects of their lives beyond the course. To this end, we chose the SMART goal framework (Fig. 2). SMART is an acronym that, in our case, stands for Specific, Measurable, Accountable, Reachable, and Time-specific.

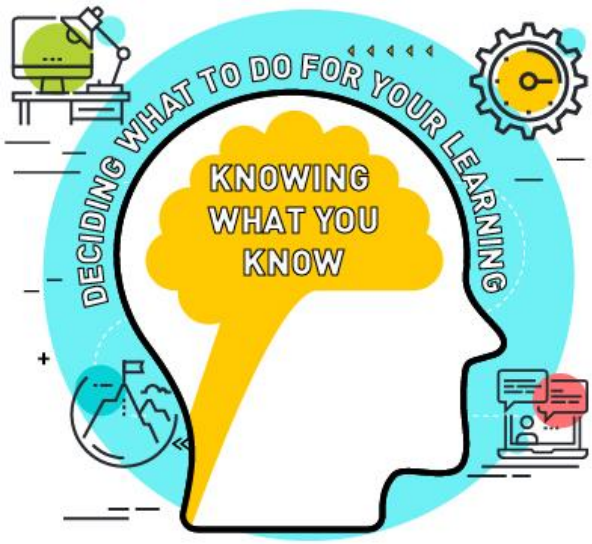
Figure 2. *SMART Goals, a framework for students to construct detailed, well-developed goals as a focus for SRL.*

Metacognition: Self-monitoring is crucial for effective learning

Simply put, metacognition is thinking about thinking and consists of two main parts: metacognitive knowledge and metacognitive control and regulation (Flavell, 1979; Pintrich, Wolters, & Baxter, 2000) (Fig. 3). The success of SRL is inextricably linked to the metacognitive skill of the student (Butler & Winne, 1995; Garcia & Pintrich, 1994; Perry, Lundie, & Golder, 2018). Self-regulation without a solid understanding of where one is within the learning process will be inefficient at best and ineffective at worst (Tobias & Everson, 2002). Beyond that, metacognition is essential for instructional (*i.e.*, classroom-style) learning (Tobias & Everson, 2002). Highly metacognitive students know where they stand in relation to the successful completion of a challenge (metacognitive knowledge) and they can also identify what strategies and resources will work best for them to achieve their learning goals (metacognitive

control and regulation) (Hacker, Bol, Horgan, & Rakow, 2000; Isaacson & Fujita, 2006). Those with greater metacognitive skill tend to be higher achievers (Hartwig, Was, Isaacson, & Dunlosky, 2012) and better self-regulated learners (Isaacson & Fujita, 2006; Pintrich et al., 2000). Metacognitively skilled students also tend to have the motivation and ability to control their behaviour in pursuit of goals, which is essential for SRL (Järvelä & Hadwin, 2013).

Figure 3. *Metacognition has two main parts: metacognitive knowledge and metacognitive control and regulation.*



Like SRL, there is evidence that metacognitive practices can be learned through introducing students to metacognitive strategies (Perry et al., 2018; Schraw, 1998) thus there is a need for effective classroom interventions that will educate students on the concept of and the approaches to metacognition (Nietfeld, Cao, & Osborne, 2005). For our purposes, we approached *Problem 2* by creating an OER that teaches students how to be more metacognitive.

Growth Mindset: Students' beliefs about intelligence can impact academic achievement

Finally, we included the concept of growth mindset as well as its complimentary but opposite concept, fixed mindset (Fig. 4). A person who holds a growth mindset is one who believes that

intelligence is malleable and can be increased though appropriate effort and resilience in the face of failure, conversely, a person with a fixed mindset believes that intelligence is hardwired and cannot be increased; its presence (or lack thereof) can only be measured (Dweck 2006; Dweck and Leggett 1988; Robins and Pals 2002). Importantly, growth and fixed mindsets exist on a continuum and can vary from one aspect of a person's life to another (Corradi, Nicolaï, & Levrau, 2018; Dweck & Leggett, 1988). For example, a visual artist may feel strongly that their artwork improves through dedicated practice (growth mindset) but at the same time believe that they are incapable of ever understanding mathematics (fixed mindset). Additionally, those on the growth side of the mindset continuum tend to have better academic results (Corradi et al., 2018). Beyond the student's own mindset, even the mindset of their instructor can have an effect on the student's performance (Canning, Muenks, Green, & Murphy, 2019).

Figure 4. *Fixed and growth mindsets exist on two extremes of a mindset continuum.*

A person's mindset will often first become apparent upon encountering a challenge. Students entering university are often faced with academic challenges that are more difficult than that to which they are accustomed (Aronson, Fried, & Good, 2002; Dweck, 1986, 2000; Robins & Pals, 2002). For some students, this increased challenge can prove to be a critical moment in academic

strategy choice. Often, strategy choice is based in part on how they view intelligence. Those with a fixed mindset tend to approach challenges and the potential for failure as a threat to their intelligence and see the need to exert effort as something that might expose their inadequacies; in contrast, those with a growth mindset see effort (as well as failure) as necessary means to achieving success and welcome a challenging task as a chance to learn something new (Blackwell, Trzesniewski, & Dweck, 2007; Dweck & Leggett, 1988; Fink, Cahill, McDaniel, Hoffman, & Frey, 2018). These differences in mindset become especially apparent under challenging circumstances such as the transition to university (Blackwell et al., 2007; Dweck, 2000; Dweck & Leggett, 1988). A student for whom academic achievement in elementary and secondary school has come easily has never had their intelligence threatened. When they get to university, however, they are likely to encounter more difficult challenges that can expose shortcomings in their knowledge. Their approach to these challenges can shine a light on their mindset. High achieving students with a fixed mindset may begin to falter as they are presented with concepts that do not come easily to them. Because they see failure as evidence of lacking intelligence rather than a sign that they need to focus their efforts, they may prefer not to exert any effort rather than have the experience of failure (Dweck & Leggett, 1988). Clearly, this is a roadblock on the path to academic success. Conversely, a high achiever with a growth mindset will face the challenge unencumbered by the thought that showing their ignorance will label them as “less smart”. They understand that pushing through the challenge will result in increased knowledge and they welcome the experience. Because cultivating a growth mindset can teach students to accept rather than fear failure, we include this concept in our OER to address *Problem 3*.

Changing one's mindset is not easy work. Receiving criticism can be emotionally taxing but will ideally be viewed as a chance to improve rather than as a personal attack (Dweck 2006, ch. 8, p. 234). Furthermore, a person cannot simply declare they have a growth mindset and instantly become an "A" student. A learner must actively recognize when their fixed mindset is predominating and then work towards transforming their reaction to one that will cultivate a growth mindset (Dweck, 2006). Oversimplifying the process (either by the instructor or the learner) can actually be detrimental; learners may become discouraged when they do not experience an immediate change in academic achievement or motivation. It is, therefore, crucial to instil in learners that having a growth mindset is not about words and intentions but about actions, practice, and time. While there has been much positive attention on growth mindset as a tool to improve learning, a recent double meta-study of growth mindset has indicated that the effectiveness of interventions aimed at increasing growth mindset may have been overstated (Sisk, Burgoyne, Sun, Butler, & Macnamara, 2018). The meta-study did however indicate that for academically at-risk students and students from low socioeconomic status homes, there was a significant effect of intervention. This finding may not be surprising since members of these populations often hold a more fixed mindset in the first place thus have more room to move towards a growth mindset (Claro, Paunesku, & Dweck, 2016). Despite this tempered view of growth mindset interventions, we believe that these effects do warrant the inclusion of the concept of growth mindset in the Growth & Goals module. Interventions that have any effect at all on academic achievement are difficult to find let alone low-cost interventions.

Many interventions have resulted in increased student beliefs in the malleable nature of intelligence and have resulted in increased academic motivation, and in some cases, increased

results (Fink et al., 2018; Paunesku et al., 2015; Sriram, 2014) and this increase is generally more pronounced for at-risk groups (Sarrasin et al., 2018; Sisk et al., 2018). There are many characteristics that contribute to academic performance; socioeconomic status (Sewell & Shah, 1967) and minority status (Ogbu, 1990) have been found to be important predictors of success. A large study (Claro et al., 2016) looked at the socioeconomic background of almost 170,000 public school children in Chile and compared it with their standardized test scores and mindset tendencies. Although socioeconomic status showed a strong positive correlation with academic performance, when a child from a low socioeconomic status home (10th percentile for household income) held growth mindset beliefs, their performance was similar to that of a child with fixed mindset from a very wealthy home (90th percentile for household income). In response to the long-standing discrepancy in grades between African American and White university students in the United States, another study examined the effects of teaching students that intelligence is malleable (Aronson et al., 2002). The African American students who were exposed to the treatment condition showed significant improvement in academic enjoyment, academic engagement, and grades when compared to their control group counterparts. The White students showed similar results but to a lesser non-significant degree.

The literature outlining the importance of SRL (Pintrich, 1995; Zimmerman, 2008), metacognition (Hartwig et al., 2012; Isaacson & Fujita, 2006; Nietfeld et al., 2005), and growth mindset (Aronson et al., 2002; Paunesku et al., 2015; Sriram, 2014; David Scott Yeager & Dweck, 2012a) for university students is abundant and presents important opportunities to better equip students for academic, personal, and professional success. However, existing interventions

and available resources to teach students about these concepts proved difficult to find, as described in the next section.

Existing interventions

The existing research on SRL, metacognition, and growth mindset skills suggests that students who already possess these skills are more likely to achieve academic success and show resilience in the face of failure than those who do not (Dörrenbächer & Perels, 2016; Nietfeld et al., 2005; David Scott Yeager & Dweck, 2012b; Zimmerman & Pons, 1986). Furthermore, studies have reported that these skills are teachable (Aronson et al., 2002; de Bruin, Kok, Lobbestael, & de Grip, 2017; Fink et al., 2018; Louis, 2011; Miller & Geraci, 2011; Perry et al., 2018; Pintrich, 1995; Zimmerman, Moylan, Hudesman, White, & Flugman, 2011). Numerous examples of promising experimental interventions exist and have been tested in classrooms.

SRL interventions have been quite varied. One study of university based peer-led training groups to introduce students to more effective study strategies which lead trainees to have increased feelings of academic self-efficacy and better study strategy choice (Bergey, Parrila, Laroche, & Deacon, 2019). Students in a math course in a community college had higher academic, metacognitive, and time-management scores than a control group after a three week in-class SRL cycle intervention (Bol, Campbell, Perez, & Yen, 2016). Similarly, a study in which students in a remedial math class at a technical college received SRL training on self-reflection showed large positive effects on academic outcomes over the control group (Zimmerman et al., 2011). In another study, civil engineering students were required to complete weekly questions and exercises in a diary. At the end of the study the students were found to have significantly higher

SRL skills (Schmitz & Wiese, 2006). Finally, a study reviewing a semester-long "learning-to-learn" course at the university level found that students who completed the course had significantly higher SRL abilities than they did initially (Hofer & Yu, 2003).

Metacognition interventions are also diverse in their format. Some effective interventions asked students for brief reflections about what they had learned in class. Reflections included how they could apply what they had learned and what content they did and did not understand (Baliram & Ellis, 2019; Wagener, 2016), another used a computer game to increase metacognitive reflections of students (including those on the autism spectrum) (Maras, Gamble, & Brosnan, 2019). In another study, students who were taught the difference between surface and deep learning as well as metacognitive strategies increased their metacognitive behaviour (Zhao, Wardeska, McGuire, & Cook, 2014). Another intervention asked students a "trick question" that appeared complicated but was actually very simple, this was used as starting point to begin group discussions on metacognition (Sandi Urena, Cooper, & Stevens, 2011).

Many growth mindset interventions asked participants (students) to read passages describing the malleability of intelligence and answer questions on that passage; some of these interventions went on to ask the participants to write advice to other students based on what they had learned with increases in growth mindset demonstrated in the experimental participants (Aronson et al., 2002; Fink et al., 2018). One intervention used older mentors to teach the participants about growth mindset (Good, Aronson, & Inzlicht, 2003). An intervention targeted at psychology statistics students consisted of a 75-minute interactive workshop that showed an increase in growth mindset scores and a decrease in course related anxiety (Smith & Capuzzi, 2019).

Another successful growth mindset intervention—a 45-minute online course—was administered to a large heterogeneous sample of students (N = 1594) at 13 different schools to test the validity of implementing an intervention on a large scale and in various real-life settings (Paunesku et al., 2015). A recent large blind study of over 12,000 American ninth grade students demonstrated an increase of 3% in the number of students who were on track for graduation after receiving a 50-minute growth mindset intervention compared to a control group who received an intervention that was similar in structure but contained no information on the malleability of intelligence (David S. Yeager et al., 2018). These experimental interventions discussed here are only a few of the many that can be found in the literature.

Although experimental interventions are abundant, we found few resources that have been made available to instructors to support them in implementing student learning skills initiatives. Furthermore, of the few widely available resources we did find, none were customizable to a course or addressed each of skills described: SRL, goal-setting, metacognition, and growth mindset. We compare the available resources we found against the module we developed (Growth & Goals) in **Table 2**.

Table 2. *Comparison of existing resources with the Growth & Goals module.*

	Resource				
Features	Growth & Goals	The Learning Portal (Ontario College Libraries)[a]	CompleteStudent.ca[b]	Brainology[c]	Developing Self-regulating Learners[d]

1	Open Education Resource (OER)	x	x	x		
2	English	x	x	x	x	x
3	French	x				
4	Interactive	x			x	
5	Customizable	x				
6	Self-Regulated Learning	x				x
7	Metacognition	x				
8	Growth Mindset	x			x	
9	Goal setting	x				
10	Study strategies	x	x	x		
11	Scheduling	x	x	x		
12	Research backed	x			x	
13	Postsecondary level	x	x	x		x
14	Student focused	x				
15	Instructor focused					x

a. tlp-lpa.ca/home

b. completestudent.ca/

c. mindsetworks.com/programs/brainology-for-schools

d. catalogue.pearsoned.ca/educator/product/Developing-Selfregulating-Learners/9780133906905.page

This apparent lack of resources might be due to the fact that instruction on learning itself is not traditionally part of a curriculum but rather a skill that students are expected to come equipped with when they enter a course. Compounding this shortcoming in curricula, instructors–

especially at the postsecondary level–may not have the expertise or extra course preparation time to dedicate to teaching what could potentially amount to a course-within-a-course (Hofer & Yu, 2003). These reasons–lack of accessible, open, and adaptable resources, lack of instructor time and support, and the demonstrated effectiveness of the concepts–drove us to develop the Growth & Goals module.

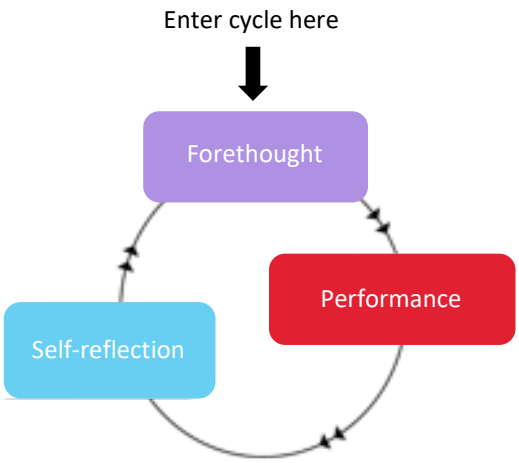
The Growth & Goals Module

In response to the three problems we sought to address, we developed an open-source, online, interactive module to help students learn skills related to SRL, goal-setting, growth mindset, and metacognition, called the Growth & Goals Module (Fig. 5). “Growth” references both the growth mindset that we advocate students adopt as well as the growth students will experience over their university career. “Goals” references students’ pursuit of their academic goals through implementation of the concepts in the module. The module becomes part of the course, is adaptable to each course’s context (discipline, pedagogical approach, level), includes the course’s intended LOs, is available in French and English, conforms to the Accessibility for Ontarians with Disabilities Act (AODA), and can be delivered through a learning management system (LMS), a website, or as hard copies.

Figure 5. *Growth & Goals logos for English and French versions of the module.*

For the module, we modified Zimmerman's SRL cycle in two ways (Fig. 6): we renamed the phases to make them verbs and also make them more accessible and meaningful to students: forethought became the *Plan Phase*, performance became the *Act Phase*, and self-reflection became the *Reflect Phase*. We direct students to enter the cycle at the *Reflect Phase* rather than the *Plan Phase* as in Zimmerman's SRL cycle. This modification allows students to reflect on past knowledge and experiences and situate themselves in the course material. During the *Reflect Phase*, we also prompt them to formalize their goals for the semester through a reflection activity that focuses on their values and priorities. Next, we instruct them to move onto the *Plan Phase* where we direct them to select appropriate study strategies, schedule their time, and determine what resources they need in order to achieve their goals. Finally, they move onto the *Act Phase* where the students are encouraged to put their plan in motion.

Figure 6. *Zimmerman's (2008) SRL cycle. Compared with Growth & Goals SRL Cycle (Figure* ***1****): Growth & Goals requires users enter the cycle at self-reflection (called the Reflect Phase) rather than forethought, then it moves on to forethought (called the Plan Phase) and then to performance (called the Act Phase) before repeating.*



The module addresses metacognition both specifically and as it relates to SRL. Specific to metacognition, we ask students to rate their own abilities against the course's intended LOs to encourage metacognitive thinking patterns. As part of the SRL cycle, we ask them to decide on what strategies will be most effective for their learning and we ask students to complete a thorough reflection on what they already know about the subject and their priorities and goals for the course going forward.

The module focuses on explaining the concepts of growth and fixed mindset then showing students how to recognize when they are being governed by a fixed mindset and how to cultivate a growth mindset in response.

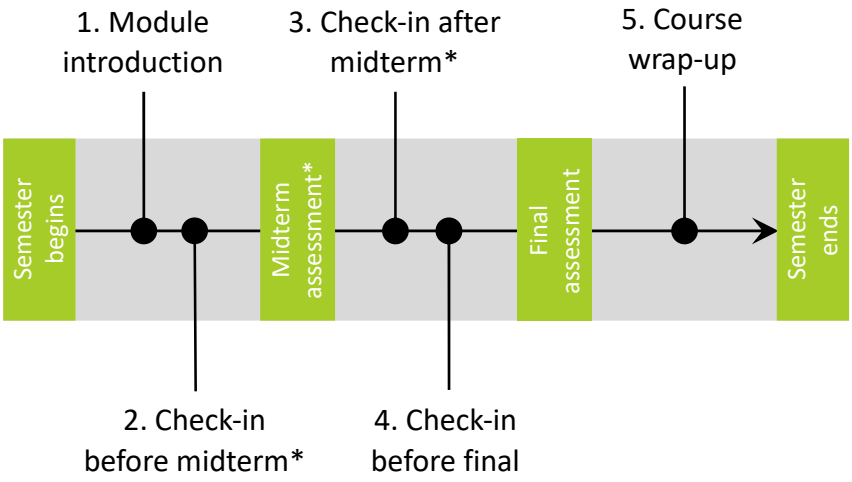
While SRL is a procedure aimed at attaining well-defined goals (Zimmerman, 2002) and metacognition is a practice that facilitates that procedure (Garcia & Pintrich, 1994), growth

mindset is the belief that action (in this case, the use of SRL, goal setting, and metacognition) can positively impact academic performance (Paunesku et al., 2015). If SRL, goal-setting, and metacognition help answer the question of *how* to increase academic performance, then growth mindset answers the question of *why*–even in the face of failure–we should bother to try (Paunesku et al., 2015).

We designed the content such that the module could easily integrate into any course. Since few instructors could afford to use class time to teach subject matter outside their syllabus (Hofer & Yu, 2003), the module connects its concepts to actual course material, thus taking minimal class or study time away from course content. The module has two main components: an informational component and an interactive component. The informational component is presented as both text and video pieces and the interactive component is a series of online activities that include Likert scale, true/false, multi-select, and long-answer, free-writing style questions. The module is presented to students as a series of PDF documents which contain the written information as well as links to the videos and activities. Instructors can track students' progress through the activities to assign grades by way of an auto-populating online spreadsheet.

Although totally customizable, the module typically has a minimum of five sections: (1) an introduction that interactively presents the four concepts, (2 and 3) check-ins before and after major midterm assessments (such as midterm exams or assignments), (4) a check-in before the final assessment, and (5) a course wrap-up questionnaire (Fig. 7). The two midterm check-in sections may repeat, depending on the number and nature of major midterm assessments.

Figure 7. *Module distribution timeline within a course. *If a course has more than one midterm assessment there will be a separate "check-in before midterm" and "check-in after midterm" associated with each assessment.*



Instructors distribute the module sections to students via email, the institution's LMS, a course website, or as hard-copies as follows: at the beginning of a course, before and after major midterm assessments (*e.g.*, exam), and before and after the final course assessment. The module sections include:

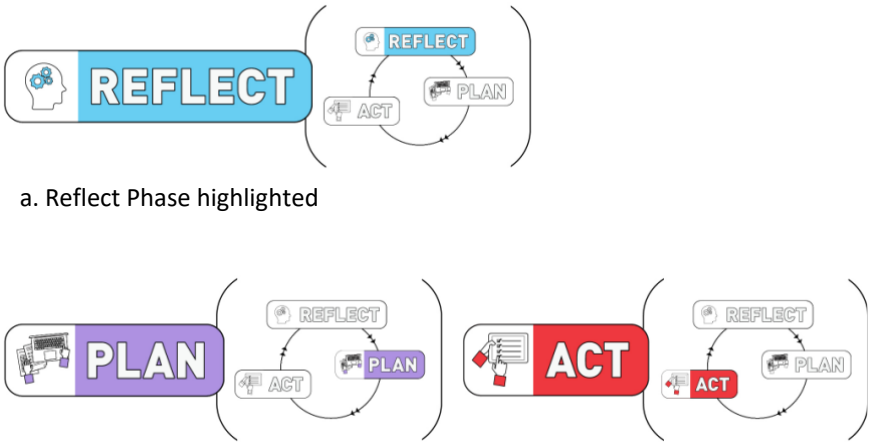
1. "Introduction", distributed at the beginning of the semester,
2. "Check-in before [midterm 1]", released prior to their first major assessment,
3. "How did [midterm 1] Go?", released after the midterm assessment is completed,
4. "Check-in before the final", released right before the end of the semester, and
5. "Course wrap-up", released after the final assessment is completed.

Module Sections:

1. Introduction:

Students complete the first section of the module within one to two weeks of starting the semester. Completion generally takes students anywhere from 2–5 hours. During the introduction, students learn about the concepts of SRL and its three-phase cycle (Reflect - Plan - Act), goal-setting, metacognition, and growth and fixed mindsets. The introduction situates metacognition as a requisite skill for SRL and introduces growth mindset as a belief in the malleability of basic traits that students can work to cultivate in order to remain resilient in the face of challenges. Students are taken through their first iteration of the SRL cycle and they are reminded of where they are within the SRL cycle by cycle phase graphics (Fig. 8) that appear throughout the module PDFs and activities. First, students enter the *Reflect Phase* and are asked to look back on and rate their current knowledge pertaining to the course (by rating their ability on the course's prerequisite LOs) and record their priorities both for the course itself and for their life in general. Using their course-related priorities specifically, students are asked to set goals they want to achieve by the end of the semester and are shown how to transform these goals into SMART goals. The students then move into the *Plan Phase*. The module guides them through creating a detailed weekly schedule, planning study strategies, and identifying resources they need for their learning. After completing this section and its associated activities, students move on to the *Act Phase* where they are encouraged to put their plan into action to carry them to the first major midterm assessment in the course. This marks the completion of the first iteration of the SRL cycle.

Figure 8. *SRL cycle phase graphics act as signposts to remind students where they are within the SRL cycle as they progress through the module's activities. Refer to Figure 1 for full cycle graphic.*



a. Reflect Phase highlighted

b. Plan Phase highlighted

c. Act Phase highlighted

2. Check in before [midterm 1]:

The second section of the module is released to students just before the first major course assessment. By default, the second section is called midterm 1 but the type of assessment and thus the name of the section depends on the course (*e.g.*, term paper, assignment, etc.) and can be readily modified. If a course has more than one major assessment, this section is duplicated for each additional assessment and each duplicate would be customized to the applicable assessment. In this section students enter into their second iteration of the SRL cycle. First, they enter a *Reflect Phase*. They are asked to practice their metacognitive skills by rating their abilities on each of the LOs of the module itself (*i.e.*, how well they have learned the concepts of SRL, metacognition, goal-setting, and growth mindset) and the LOs of the course on which they will be tested in the upcoming assessment. They are then asked to explain how they arrived at the ratings they assigned themselves (*i.e.*, did they base their ratings on feelings, self-tests, etc.). Lower achieving students tend to over-rate their abilities while higher achieving students tend to under-rate their abilities (Hacker et al., 2000; Kruger & Dunning, 1999). The aim of these self-

rating activities is to help students identify and monitor gaps between their perceived and actual mastery of the course concepts. Then, they move onto a *Plan Phase* where they look again at the study strategies they intend to implement in preparation of the upcoming assessment. Finally, they move onto an *Act Phase* in which they do the work to prepare for the assessment.

3. How did [midterm 1] go?:

This section takes students through the next iteration of the SRL cycle and is released after the midterm assessment is completed. As with the previous section, the assessment type and number will depend on how the course is structured. Students are asked how they feel the course is going for them up to this point and how their study strategies are working for them. They are asked to reflect on the goals they set at the beginning of the semester and evaluate how they far they have come in achieving them. Some students will need to amend their goals so they are more realistic, some will need to make them more ambitious, and some will have set goals that need no modifications. Finally, they are asked to think about their current mindset toward the course and whether they need to modify their schedule and their plan for the rest of the semester.

4. Check in before the [final exam]:

This second-to-last section of the module guides students though their final iteration of the SRL cycle for the course. This section repeats the activities that students encountered in the sections released both before and after midterm assessments. Much like the check in before midterm assessment, the check in before the final assessments asks students to rate themselves on LOs and justify their ratings. Students are then asked to plan their study strategies for the final and identify resources they may need. Additionally, as with the section released right after the midterm, they are asked to reflect on their progress towards their course goals and their mindset

towards the course. At the end of this section, students are encouraged to prepare for the final assessment.

5. Course wrap-up:

This final section contains a short questionnaire that asks students for feedback on their experience with the module. Questions are aimed at discovering if they believed the module helped their learning, whether they would recommend it to a peer, what they would change, what the module taught them, and how they will use the module's concepts in the future. They are also asked if they would consider volunteering to be a student champion for the module (discussed below).

Features

Available for all

The module is available to everyone as an online OER under Creative Commons licensing (CC-BY-NC-SA: Attribution – Non-Commercial – Share Alike) and is designed to integrate with any postsecondary course. The module is available in English and French (through professional translation) which aligns with [institution's] values and mission [details]. The module was also designed to be AODA compliant.

A fully customizable package

The module can be integrated in any course and is easily customizable. We created detailed written instructions for customizing the module. We also produced a series of four videos that guide educators through all aspects of the customization process (Author, 2018a).

Educators decide exactly how the module will fit into the structure of their course, including when activities will be due, whether the module will be worth course marks, bonus marks, or purely voluntary, and which activities will be included. We recommend allocating at least some bonus marks to the module to ensure high participation rates as we have found that courses with no mark incentives have low participation rates. Further customization comes from including details about the course and from providing the course's LOs so that students can rate and track their progress towards these specific outcomes. Instances where course-specific input is needed occur throughout the module (both in the module documents and in the activities) and we have made these instances easy to locate for modification. Once the module is fully customized, the instructor can create PDFs from the documents that will be distributed to students.

Data Collection

The data collected through the Growth & Goals module itself consists of student responses to the activities. Data collection is important for three reasons: (i) instructors use the data to assign grades for module completion (if grades have been allotted), (ii) instructors can review responses to gauge how students are progressing through the module and with respect to their self-rating on course's LOs, and (iii) if shared, the data collected allows us to study the effectiveness of the module (following appropriate Research Ethics Board guidelines and approvals). Using Google Office Suite for the Growth & Goals module allowed for easy and efficient data collection, as discussed further in the Development section of this paper. The output format is easy to use both for instructors and for module evaluation. Alternatively, the module could be adapted to other formats.

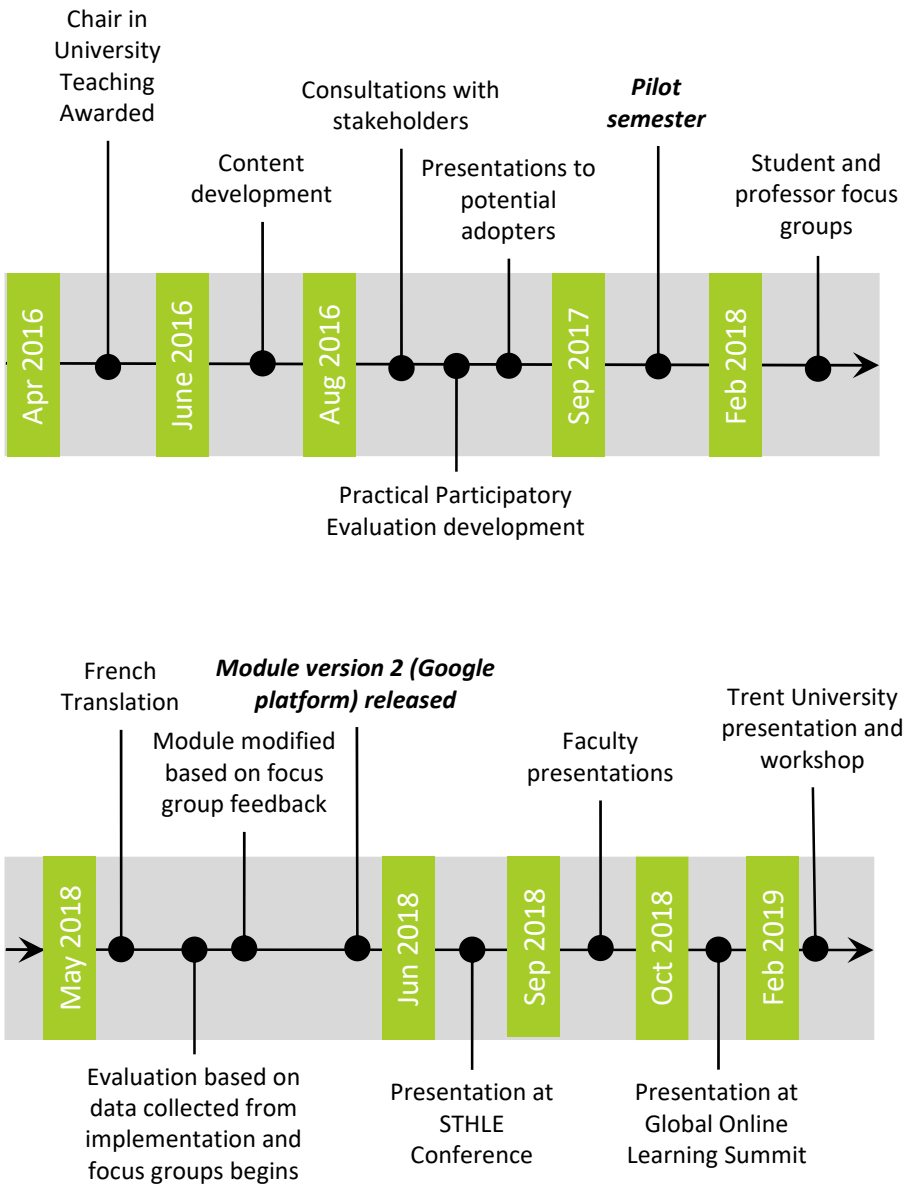
Development

To design the module, we used a variation of an instructional design model known as ADDIE: Analysis, Design, Development, Implementation, and Evaluation (Branch, 2008) and using concepts from cognitive psychology to engage learners and design learning activities (Brien, 1997). Essential to this process was the collaboration between an instructional designer, graphic designer, students, and professors.

An online module integrated into courses

The format of the OER (*i.e.*, a module integrated in courses) was decided through early consultations with students, professors, and e-learning instructional designers using focus groups and meetings (Fig. 9). These consultations revealed that students preferred a resource that was integrated in existing courses rather than other options that would have additional requirements (*e.g.*, workshop, separate course).

Figure 9. *Module development from inception to time of publication.*



Design team

The design team consisted of the Chair in University Teaching (corresponding author), students, an instructional designer from [institution's] Centre for Innovative Pedagogies and Digital Learning, a web programmer, graphic designer, web designer, and professional translator. Many

other people contributed to the project through consultations, including the manager of [institution's] Access services (part of Student Academic Support Service), professors, and students (through additional focus groups).

Two versions tested

Pilot Version: Learning Management System

The module was first released using [institution's] learning management system (LMS) as its platform. Using the LMS allowed for easy sharing of the module between instructors at [institution] and with their students. For our purposes, this particular platform faltered in data collection and in sharing the module outside of the institution. Data collection was of paramount importance to allow instructors to track student completion and to gather the data needed to establish the effectiveness of the module both in teaching the intended concepts and in increasing student satisfaction and achievement. After the pilot semester, when we began working with the collected data it became evident that we would need a more appropriate system than what was available through the LMS. Additionally, increasing the module's visibility and sharing it with institutions that did not use the same LMS as [institution] proved difficult. Thus, we decided to migrate the module from the [institution's] LMS to Google Office Suite.

Final Version: Efficient data collection; easily shared

Because the Growth & Goals module was designed as an OER under Creative Commons licensing, it needed a platform that was available to anyone who wished to adopt the module. We selected the Google Office Suite because it is available for use by anyone, anywhere, for free. The module consists of a minimum of five PDF documents (created using Google Docs) through

which students access the module. The documents contain lessons about the three concepts, access to various informational videos (hosted on YouTube.com), and links to the module activities (created using Google Forms) in which students practice the concepts' skills. Instructors can access the shared version of the module and make their own copy by visiting [LINK] and following the link to the module in the language of their choice (English or French). The module files once copied to the user's own Google Drive, are fully editable and can be customized and distributed to students. In addition to the ability to widely share the module, using Google as the platform greatly increased the ease of data collection and the usability of that data.

Knowledge mobilization

Module presentations

As part of the process of sharing our module with potential adopters, we have given multiple presentations in various settings outlining the problems we set out to solve, the approaches we took to addressing these problems, and the early findings of our evaluation (Author, 2018b; Authors, 2018a, 2018b, 2019). Prior to the pilot semester, the module was presented to staff and faculty within the [institution] in order to stimulate interest in implementing the module in their classrooms. Using the preliminary data collected from the first round of implementations, both through actual module data and through student and faculty focus groups, we presented the module and our findings to date at the 2018 STLHE Conference, the 2018 Global Online Learning Summit, and at the Teaching and Learning Support Service at Trent University; we continue to present this work at department meetings and meet one-on-one with interested instructors.

Student champions: Peers sharing their experiences

People tend to be more accepting of adopting a given behaviour (in this case, the use of the Growth & Goals module) when someone from their peer group models the behaviour (Dale H. Schunk & Zimmerman, 1997). In line with this phenomenon, students told us they wanted to see previous users of the module introduce new users to the module. We refer to these module ambassadors as student champions. To recruit champions, we included a question in the final module questionnaire that asks students if they would like to volunteer to be a student champion in the following semester. This question allows instructors to easily follow up with interested students. Prospective champions would have already completed the module and, importantly, have felt they gained valuable skills and insight as a result. The student champions can come to classes at the beginning of the semester and, along with or in place of the instructor, introduce the module to the new students. This initiative was introduced in the latest iteration of the module and the program has yet to start, although one of the student-developers has presented the module to new users in two courses in the Fall of 2018.

Does the module "work"? Preliminary evaluation findings

As of April 2019, the module had been piloted in at least ten classrooms at the [institution] and we are moving forward with the evaluation of the module as we receive data from educators who have adopted the module and students who have completed it.

We are evaluating the module to understand how the module is working and for whom. As with any intervention, we expect that some stakeholders may experience benefit, while some may experience harm (in this context, "harm" could mean student time that could be better spent in

another way or institutional money that could be better spent on other initiatives). Although the design and development process has been based on theory, we still seek to test our assumptions and validate the product of this process—the module (Richey & Klein, 2005, 2008)

We are using a practical-participatory evaluation (P-PE) framework (Cousins & Whitmore, 1998; Cousins, Whitmore, & Shulha, 2012). In this framework, an evaluation team is formed of project stakeholders (*e.g.*, students, instructors, Teaching and Learning Support Service members, Student Academic Support Service Representatives, administrators). Together, the team developed an evaluation framework, which involves developing the major evaluation questions, indicators, data sources, data collection methods, and bases of comparison. A P-PE was appropriate to allow us to bring in and value the voices of various stakeholders, with the intent that the results of the evaluation would be more meaningful, applicable, and result in a better end product. [Collaborator name], a member of [institution's] Faculty of Education and [institute name] joined the evaluation team as a facilitator for the process. The project was deemed ethics exempt by [Institution's] Research Ethics Board, in accordance with Canada's Tri-Council Policy Statement: Ethical Conduct of Research Involving Humans, Section 2.5 (Canadian Institutes of Health Research, Natural Sciences and Engineering Research Council of Canada, & Social Sciences and Humanities Research Council, 2018).

The preliminary findings were very positive (Fig. 10). Before starting the module, 82% of students reported that they believed the module would improve their learning (N = 180). Upon completing the module, 79% of students reported that they would recommend that their peers should also complete the module (N = 34). Completion rates were greater than 75% when

instructors offered an incentive to students for completing the module, even if the incentive was as small as a 1–2% bonus mark. When no incentive was offered, completion rates fell below 30%. For the long answer questions in the activities, we saw thoughtful, detailed responses with a mean word count of 55 words/response (N = 159). The following quote is representative of a student response (58 words):

> "I am taking this course since it is a career requirement. I used to really like chemistry but have had a hard time understanding it in university. Hopefully taking the time to do practice problems will help me improve my understanding in this course. I am expecting to pass but getting a mark over 75% is my goal."

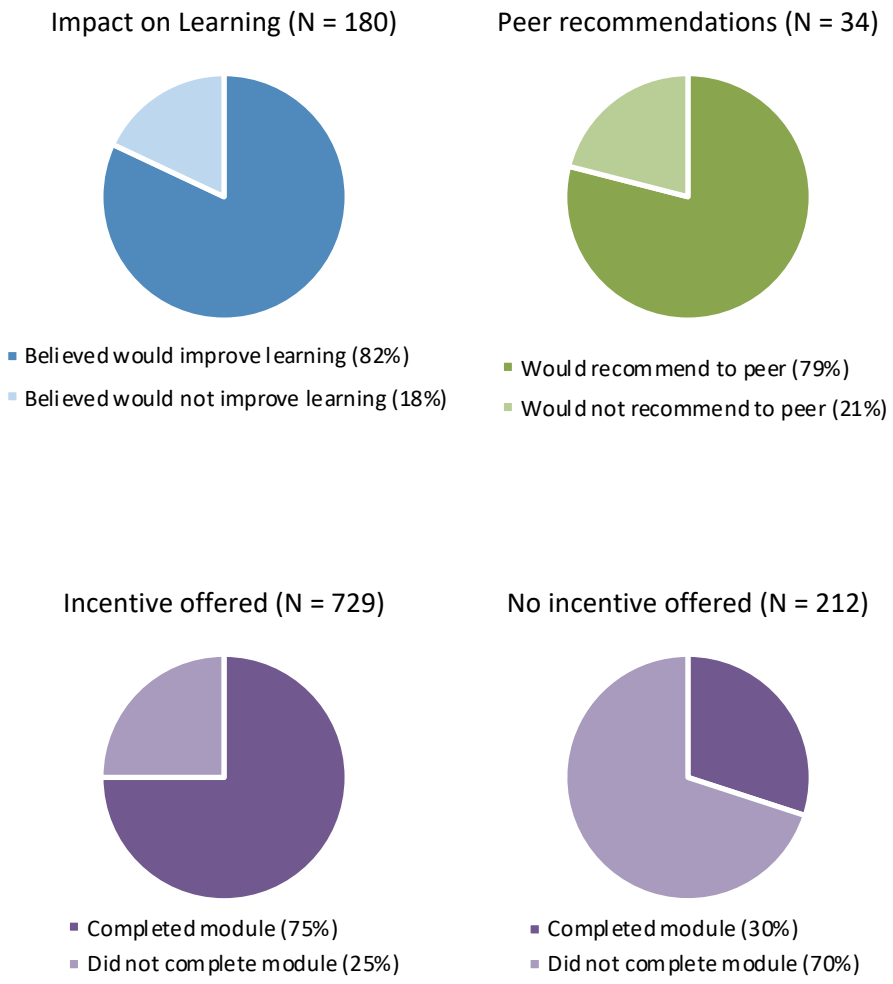
Students who participated in a focus group (N = 27) held after the first pilot semester gave generally positive comments with regards to their experience with the module. Three major themes emerged during the focus group. Below are the emergent themes and representative student quotes to illustrate them:

1. Transferability: "I used it more in other courses than this one, mostly the study techniques, like making a schedule."
2. Value: "It was hard to write down things I wasn't good at. I'm glad I did though, because later in the module I made a plan to improve those things." and
3. Resiliency: "I like that a growth mindset makes you realize that it's okay to make a mistake and fix it later on."

The chief complaint that we heard initially was that there was too much work to do in the module right before midterm assessments when the students preferred to be focusing on learning course content. We adjusted the module to address this comment by moving the relatively time-

consuming goal-related reflections to the post midterm assessment activities and have received no further complaints regarding the length of the module.

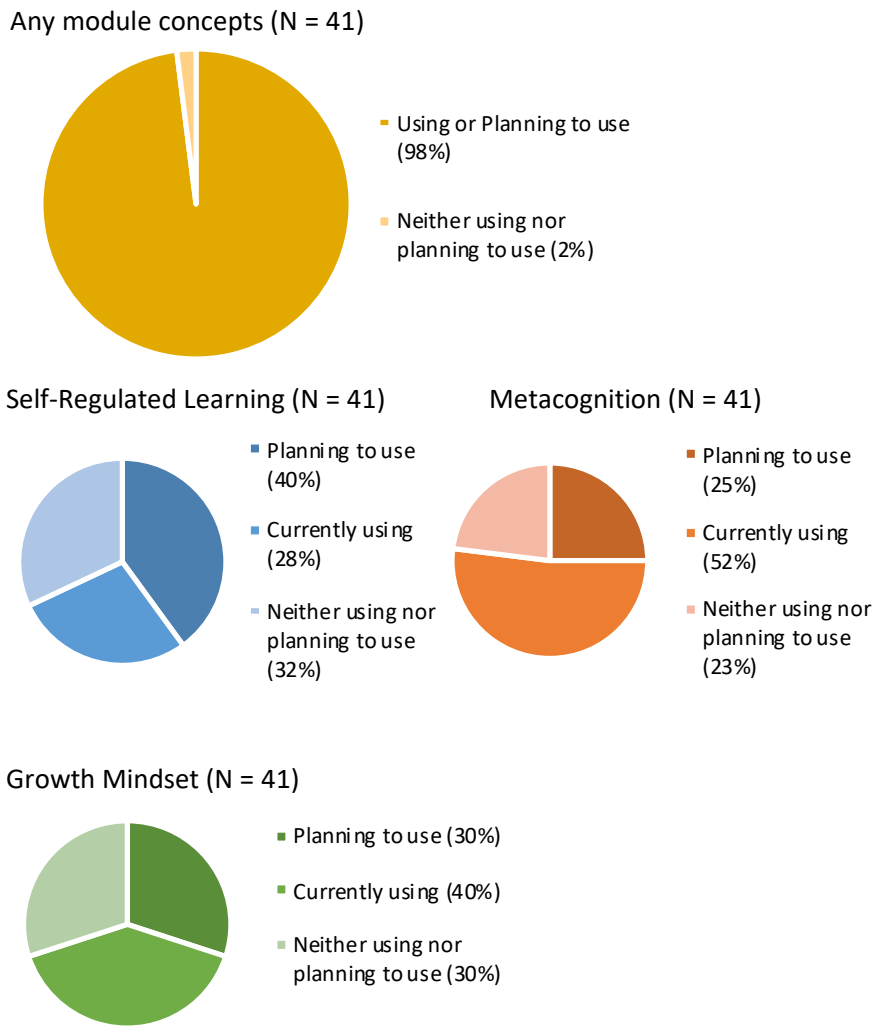
Figure 10. *Very positive preliminary findings.*



To determine if students were still using and benefiting from what they had learned in Growth & Goals, we surveyed students in a Biochemistry course that had Organic Chemistry II as a prerequisite (N = 111, 41% response rate). The [institution] offers three sections of Organic Chemistry II; one in French and two in English. Growth & Goals had been piloted in one of the two English sections of Organic Chemistry II in the semester prior to the biochemistry course

thus we hypothesized that between one third and one half of biochemistry students in the course had been exposed to the module. This classroom provided us with a pseudo-control-experimental design to compare the results of students who completed the module against those who did not; 41 survey respondents reported having used the module while 70 had not. Of the respondents who had been exposed to the module, 98% were either still using or planning to use one or more of the concepts or strategies that they learned from the module (Fig. 11); 28% were using the SRL cycle and 40% were planning to use it; 52% were using metacognition and 25% were planning to use it; and 40% were cultivating a growth mindset and 30% were planning to do so. The high proportion of students still using the module's concepts is an excellent sign that students value the skills they have learned.

Figure 11. *Students are using concepts from the module in subsequent courses.*



Professors reported that the module took 1–4 hours to integrate in their courses initially, then almost no time in subsequent semesters of the same course. At the end of the course 0.5 – 2 hours were needed to collect and analyse the marks, which auto-populate in online spreadsheets. Professors also gave helpful feedback regarding the first iteration of the module, which was incorporated to improve the second, current version.

Conclusion

We created the first open-source, customizable, online learning module to address a gap in the postsecondary education system, called the Growth & Goals module. The module has two aims: (1) to better equip students with the necessary skills to address the three problems: learning to manage course and life goals, identifying what they need to learn and how they can best learn it, and dealing with failure; and (2), to achieve Undergraduate Degree Level Expectations 5 (Awareness of the limits of knowledge) and 6 (Autonomy and professional capacity skills). We used the concepts of SRL, goal-setting, metacognition, and growth mindset to address these aims. The module introduces these concepts through a series of text, video, and interactive activities that are integrated with the content of the course. Students receive sections of the module to complete at various significant time points throughout the semester. Preliminary results from the module's evaluation are extremely positive. The module is available in English and French and can be adapted to any postsecondary context across disciplines (Author, 2018a).

Research involving Human Participants

As a program evaluation, the [Institution's] Research Ethics Board deemed that this project was exempt from full Research Ethics Board Review, based on Canada's Tri-Council Policy Statement: Ethical Conduct for Research Involving Humans (TCPS2), Article 2.5. http://www.pre.ethics.gc.ca/pdf/eng/tcps2/TCPS_2_FINAL_Web.pdf

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Conflict of Interest

The authors declare that they have no conflict of interest.

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Many people contributed to making this module a success and we thank them, including: members of the [Research group], students, professors who adopted the module and gave feedback, [collaborators] and [contributors]. We gratefully acknowledge the [funding source].

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[Authors and details, 5 citations]

[Institution-related citations, 2]

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