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An Online Program to Promote the Academic Success of Students

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1. Executive Summary

In 2010, we started creating and testing a program called the Promotion of Academic Success of Students (PASS). The PASS program was designed as an internet-based initiative aimed at increasing the academic success of university students and is based on three pillars of motivational sciences: goal setting, goal planning and goal coping. The PASS program prompts students to reflect upon and write about their interests, values, priorities, motives, thoughts, feelings and motivational strategies. It is divided into three sections:

- **Section one** (goal setting) includes information and activities to systematically help students set meaningful, self-determined, specific and moderately difficult goals with mastery and performance components.

- **Section two** (goal planning) includes information and activities in which the students are asked to create specific implementation plans tailored to facilitate the pursuit of their goals.

- **Section three** (goal coping) includes activities in which the students create mental linkages between potential stressors and task-oriented coping strategies that could be used to better handle negative emotions experienced at school.

Participants also receive an electronic summary of their goals, plans and coping strategies after completing the program.

The PASS program was originally developed in English and evaluated with samples of anglophone undergraduate students recruited between 2011 and 2014. The University of Ottawa is a bilingual university and the PASS program has to be available in both English and French before it can be scaled and made available to all students on campus. The current HEQCO project is a stand-alone, multiyear project (2015–2017) designed to enable the translation of the PASS program into French in order to evaluate it with samples from francophone students.

During the first year of the project (the Fall 2015 semester), we conducted a preliminary study to examine how students were reacting to the translated version of the PASS program ("La promotion académique du succès scolaire") and research material. To successfully pursue this research activity, we translated all the research material in May and June of 2015. Overall, the primary goal in the first year of our HEQCO project was to translate the material (e.g., measurement instruments, intervention script and exercises for the control and the experimental groups) for francophone university students and assess the implementation fidelity of the newly translated program with a small sample of 85 students. Results of implementation fidelity analyses indicated that participants in the experimental PASS group ended up setting academic goals that were significantly more specific, difficult yet realistic, and self-determined. Furthermore, the mean time spent on the PASS program (38 minutes) across the 47 participants of the PASS group was comparable to the expected time to complete the program. After deleting the eight participants who did not reach the minimal compliance, the mean time spent on the PASS program among the 39 compliers was 45 minutes. This number was lowered to 42 minutes after removing two outlier cases who took more than 120 minutes

to complete the program. Overall, 82% of the participants in the PASS experimental group successfully complied with the advertised and expected time needed to complete the program.

During the second year of the project in the Fall 2016 semester, we conducted a small-scale efficacy trial in order to evaluate the educational effects of the PASS program on the grades of students during their first year at university. A sample of 239 first-year undergraduate students, ranging from 16 to 45 years of age, was randomized into (a) the PASS program, (b) the Student Academic Success Service (SASS) control group or (c) the LIKE/DISLIKE control group. Further details about the two control groups can be found in section 4.2.2. First, results of our process evaluation survey indicated that the PASS program was perceived as more useful and satisfying than the task given to the LIKE/DISLIKE control group. We expected that the SASS control group would be too-strong of a control group because it contains active ingredients similar to the PASS program, which might contaminate our evaluation of PASS's educational effectiveness and this was proven to be the case. Therefore, future studies will only include the LIKE/DISLIKE control group. Second, we found a small but significant educational effect of the PASS program, which replicated the effect size that we observed in previous studies performed with anglophone university students (Gaudreau, 2010–2014). More precisely, participants randomized in the PASS condition performed significantly better during the first semester than participants in the LIKE/DISLIKE control condition (Cohen's $d = 0.30$, $p < .05$) and marginally better than participants in the SASS control condition (Cohen's $d = 0.24$, $p < .10$). Although not statistically significant, the difference between the PASS and the LIKE/DISLIKE control condition during the second semester (Cohen's $d = 0.22$, $p < .15$) was comparable to the effect observed in our previous studies conducted with anglophone students. These findings provided support for the primary hypothesis of this study (described in section 4.1). Finally, results of a multi-group piecewise growth model showed that the significant decrease in grades from pre-university to the first semester was marginally weaker ($p < .10$) for students in the PASS condition (slope = -1.08, $p < .01$) compared to the LIKE/DISLIKE condition (slope = -1.47, $p < .01$). Overall, this finding indicates that the PASS program can attenuate the "academic shock" commonly experienced by students during their first year at the university.

Data collection for year three of our project started in October 2017 with the goal of recruiting a sample of 450–500 first-year, undergraduate, francophone students. Participants will be randomized into the PASS condition and the LIKE/DISLIKE control condition in order to re-evaluate the educational effects of the PASS program. They will also complete followup surveys in November and December of 2017. During year three, we will also continue the analyses of the data collected during the first two years of this project.

2. Introduction

If Canada is to successfully face the challenges set forth by an aging workforce while also remaining competitive in the global economy, it is crucial that Canadian students are able to achieve academic success in postsecondary education. Workforce projections indicate that university credentials will become even more crucial when attempting to secure and maintain employment in the global knowledge-based economy (Hecker, 2004). At both the societal and individual levels, higher education is a pivotal component of increased tax revenues, decreased demand for social services and reduced criminality, as well as reduced rates and lengths of unemployment (Pascarella & Terenzini, 2005). Yet, succeeding in postsecondary education remains challenging. For example, one study indicates that 22% of undergraduate students who enrol in Ontarian universities fail to complete their program and 13% are abandoning postsecondary

education after their first year (CUDO, 2009). In addition, data from public American universities shows that only 29% of students are completing their degrees in the expected four years (Aud et al., 2010). Historically, universities have focused on academic support programs geared toward improving learning strategies such as study skills and mnemonic devices. Although proven to be effective (Hattie, Biggs, & Purdie, 1996), research indicates that this approach may be limited because it doesn't take into account the capacity to regulate one's behaviours, thoughts and feelings with effective motivational skills, skills which play an equally important role in predicting student performance and graduation rates (Robbins et al., 2004). Thus far, knowledge from motivational science has rarely been translated into preventive programs that have undergone rigorous randomized field trials (Torgerson & Torgerson, 2008). The overarching goal of this research program — which is grounded in educational psychology, and more specifically motivational science — is to bring together motivational and preventive sciences by creating, piloting and testing a prevention program to bolster the academic success of undergraduate students. A first phase of this research program was conducted with financial support from the Social Sciences and Humanities Research Council (SSHRC) between 2010 and 2014 during which time we created and tested a program called the Promotion of Academic Success of Students (PASS) with anglophone undergraduate students. A second phase of this research program, funded by the Higher Education Quality Council of Ontario (HEQCO), translated the PASS into French and evaluated the program with samples of francophone undergraduate students from the University of Ottawa. The HEQCO project is a stand-alone, multiyear project (2015–2017) with three main activities:

Year One (Fall 2015): Translate the material (i.e., measurement instruments, script and exercises for the control and experimental groups) for francophone university students and assess the implementation fidelity of the newly translated la *Promotion Académique du Succès Scolaire* (PASS) program with a small sample of students (*N* = 120). This part of the project is completed; for more information, see interim report 1.

Year Two (Fall 2016): Conduct a small-scale efficacy trial (*N* = 250) to evaluate the causal effect of the program on key educational indicators of academic success and retention. Further details on this portion of the project are included in this report.

Year Three (Fall 2017): Conduct a large-scale efficacy trial (*N* = 500) to evaluate the causal effect of the program on key educational indicators of academic success and retention. Additionally, explore the psychological mechanisms (i.e., mediating effects) by which the preventive program leads to academic success and retention across different subgroups of students (i.e., moderating effects). Recruitment for this phase of the project started in October 2017

3. Literature Review

The overarching purpose of this project is to create, pilot and test an inexpensive and widely accessible internet-based preventive program. Computerized programs can be an effective method of promoting healthy behaviours (Norman et al., 2007) and they have also received promising support in the field of education (Hattie et al., 1996; Morisano, Hirsh, Peterson, Pihl, & Shore, 2010). The internet is the ideal platform to reduce the cost of preventive programs, synchronize the delivery of a program within a short period of time, and reach larger and more diverse groups of students who might otherwise not participate in

such initiatives (Griffiths, Lindenmeyer, Powell, Lowe, & Thorogood, 2006). In this program, students will be trained to (1) set personal goals, (2) plan for their successful pursuit and (3) cope with the negative emotions experienced at school. The following sections delineate the three empirically driven motivational principles that serve as building blocks for the current project.

3.1 Principle #1: Goal Setting Improves Academic Performance

Goals can be defined as mental representations of what a person has committed to accomplish in a particular life context (Elliot & Niesta, 2009). More than 400 correlational and experimental studies, inspired by goal-setting theory (Latham & Locke, 2007), have indicated that setting goals that are specific and difficult/realistic can improve performance. Results of a meta-analytical review (Mento, Steel, & Karren, 1987) revealed that setting difficult (d = 0.58) and specific goals (d = 0.44) has a medium effect on performance.

Autonomous goal motivation occurs when individuals are pursuing goals that are closely aligned with their values, interests and priorities. This is in opposition to controlled goal motivation, which occurs when goals are derived from self-imposed and social pressure. On the basis of self-determination theory (Deci & Ryan, 2002), results of a meta-analytical review showed that autonomous goal motivation has a medium effect (d = 0.41) at increasing the likelihood of making significant progress in the pursuit of personal goals (Koestner, Otis, Pelletier, & Gagnon, 2008) and a medium-to-large effect (d = 0.60) at increasing the amount of effort allocated for the pursuit of a goal (Gaudreau, Carraro, & Miranda, 2012).

The specific content of a goal, as investigated in achievement goal theory (Harackiewicz, Barron, Pintrich, Elliot, & Thrash, 2002), is another important aspect of goal setting. In mastery-approach goals, the student is focused on attaining task-based competence by learning and understanding the material as much as possible. In performance-approach goals, the student is centered on attaining normative-based competence by performing better than other students. Both types of goals play a complementary yet facilitating role in school performance. Results of meta-analytical reviews revealed that mastery goals yield medium increases in intrinsic motivation (Rawsthorne & Elliott, 1999), school enjoyment (Hulleman, Schrager, Bodmann, & Harackiewicz, 2010) and learning (Payne, Youngcourt, & Beaubien, 2007) whereas performance goals are

associated with significant increases in performance (Hulleman et al., 2010). Both types of goals should be considered in a comprehensive goal-setting intervention.

3.2 Principle #2: Implementation Planning Improves Academic Performance

After setting a goal, it is useful to create a clear plan of action to determine how, when and where one has to work on the goal-related activities. This strategy, known as implementation planning, has been found to boost the efficacy of goal-setting interventions across 94 studies in a variety of domains (Gollwitzer & Sheeran, 2006). More specifically, the nine studies in the school domain revealed that implementation planning has a large effect on academic goal attainment (d = 0.72). Implementation planning can also increase class attendance (Webb, Christian, & Armitage, 2007) while eliminating planning fallacy (Koole & Van't Spijker, 2000) — a systematic underestimation of the time needed to complete a task. Implementation planning is an essential component of a comprehensive goal-setting intervention.

3.3 Principle #3: Coping with Stress Improves Academic Performance

The road to academic success and graduation is filled with distractions and stressful situations both inside and outside of school. However, students can manage their stress by using several task-oriented coping strategies such as effort expenditure, logical analysis, thought control, relaxation, mental imagery and seeking support. Several studies have associated task-oriented coping with medium-to-large increases in the likelihood of success in the pursuit of personal goals (e.g., Soucy Chartier, Gaudreau, & Fecteau, 2011; Van Yperen, 2009). Of foremost importance, students can learn to become proactive by identifying stressors and negative emotions that could potentially hinder the likelihood of school success. After identifying a potential stressor, students can create "if-then" plans linking the stressful situation with task-oriented coping strategies like this one: "If I feel overwhelmed while studying, then I will take a short break to refocus and put myself in a more positive state of mind." This form of coping plan has been found to generate medium-to-large effects at improving performance in experimental studies (Achtziger, Gollwitzer, & Sheeran, 2008; Bayer, Gollwitzer, & Achtziger, 2010). Coping is certainly an important part of goal-setting interventions.

3.4 Building Bridges between Motivation and Prevention Sciences

These empirically supported principles provide a strong rationale for the pressing need to create a preventive program that combines goal setting, goal planning and goal coping in an effort to increase academic success and graduation rates of university students. Programs articulated around these three pillars have been found to be effective in the promotion of other behaviours that people may find challenging, such as increasing physical activity (Sniehotta, 2009).

In 2010, we started creating and testing a program based on these three motivational principles called the Promotion of Academic Success of Students (PASS). The PASS program was designed as a one-time, internet-based, 40-minute preventive program aimed at increasing the academic success of university students. The program was developed in English and was created as a universal program to target all first-year undergraduate students (Hunter et al., 2009; Robbins, Le, & Lauver, 2005). A universal primary prevention approach was selected as a springboard to facilitate the generalization of our findings while also allowing our subsequent studies to examine the effectiveness of the program with specific subgroups of students who were known to have a high risk of academic difficulties (e.g., first-year students, those with low-admission GPA, first-generation students).

Improving the quality of the student experience requires a collaborative effort. Therefore, the PASS program was created in close collaboration with one postdoctoral fellow and five doctoral students. After receiving extensive training in program design, planning and evaluation, students worked in pairs to create drafts of the scripts, exercises/activities and tools to be incorporated in the program. Undergraduate students and volunteers provided input to maximize the usefulness, relevance and user-friendliness of the program. The six-month development process involved several rounds of group feedback and brainstorming to prepare a high-quality preliminary version of the PASS program.

The PASS program is divided into three sections in which students reflect upon and write about their interests, values, priorities, motives, thoughts, feelings and motivational strategies. The first section includes

information and activities to systematically help students set meaningful, self-determined, specific and moderately difficult goals with mastery and performance components (i.e., goal setting). Students are informed about evidence-based principles to optimize their goal setting through a PowerPoint presentation (with audio description). They then complete online exercises to help them set optimal academic goals for the semester. The second section includes information and activities that help students create specific implementation plans tailored to facilitate the pursuit of their goals (i.e., goal planning). Students are informed about evidence-based principles to optimize their goal planning through a second PowerPoint presentation (with audio). They then complete online exercises to help them create plans to pursue their goals during the semester. The final section includes activities in which the students create mental linkages between potential stressors and task-oriented coping strategies that can be used to better manage negative emotions at school. Participants also receive an electronic summary of their goals, plans and coping strategies after completing the program. Table 1 includes the goals, plans and coping strategies written by one student who participated in the PASS program.

Table 1: Example of Writing from a Participant in the PASS Program

Component	Examples
Goal #1	I want to achieve a 70% average first year.
Goal #2	I want to be able to balance social life and academic life.
Plan #1	What? Focus on work and leave little time for socializing. I will prioritize my time and make sure that the content is going in my head. When? It would be convenient to do this every day for 2 hours or so. Where? It would be most convenient at the library.
Plan #2	What? Prioritize my time and make sure I have time to study as well have a social life. When? I plan to do this every day. Where? I plan to work at the library, then go to my friends place and hang out with them for an hour or two.
Coping	IF I am too sad and depressed THEN I WILL relax every once and a while and ask for help

Results of studies conducted with samples of anglophone university students have provided initial evidence for the potential effectiveness of the program. For example, a study published in a doctoral dissertation (Thompson, 2015) revealed that students who learned how to effectively cope with their academic stress increased their time spent studying, made more progress on their academic goals and experienced fewer negative emotions such as stress, anxiety, anger and hopelessness (Thompson & Gaudreau, 2015). The preliminary analyses from two other studies of anglophone university students (Gaudreau, 2010–2014) indicated that the PASS program is associated with small but non-negligible effect on the GPA of first-year students (Cohen's d = 0.20 to 0.30). Overall, the PASS program appears to offer some small but beneficial effects to university students.

3.5 The HEQCO Project: A Stand-alone Project to Translate and Test the PASS Program for Francophone University Students

The University of Ottawa is a bilingual university and the PASS program needs to be available in both English and French before it can be made widely available on campus. Thus far, the program has been developed and tested with anglophones. The overarching goal of this HEQCO project was to translate and adapt the PASS program before offering it to samples of francophones at the University of Ottawa and evaluating the results. The translated program "*La promotion académique du succès scolaire* (PASS)" could be an integral part of ensuring that all francophones have access to a prevention program that has already proven to be effective with anglophone students.

Hence, the primary goal of the first year of the HEQCO project was to translate the material (i.e., measurement instruments, control group, experimental group) for francophone university students and assess the implementation fidelity of the newly translated program with a small sample of students (*N* = 120). More information about this work can be found in our first interim report.

4. Year Two Small-scale Efficacy Trial

4.1 Goals and Hypotheses

A small-scale efficacy trial was conducted during the fall semester of 2016 in order to assess the educational effects of the translated program with a small sample of students (*N* = 250).

In our past studies with both anglophone and francophone students, we observed an “academic shock” in which the grades of students significantly decreased from high school to the first semester at the university and then again from the first to the second semester (see Figure 1). Fortunately, this decrease in semester GPA was less pronounced for some students than others. Of particular importance, results of two experimental studies showed that anglophone students randomly assigned to the PASS program were experiencing a significantly weaker academic shock during their second semester on campus than students who were not assigned to the program. While participation in PASS did not appear to alter the academic shock experienced during the first semester, it did, however, seem to attenuate the academic shock experienced during the second semester (see Figure 2).

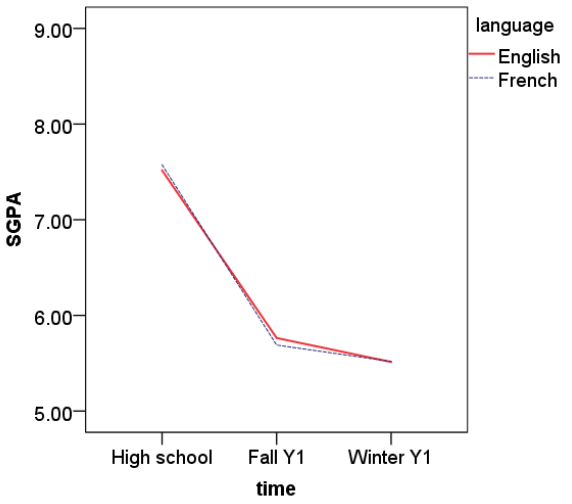
Hypothesis 1: We expected that students in the PASS program would obtain significantly higher semester GPA than students in the control conditions.

Hypothesis 2a: We expected that the achievement of students (semester GPA) would significantly decrease during the first semester (compared to their admission GPA).

Hypothesis 2b: We expected that the achievement of students (semester GPA) would significantly decrease during the second semester (compared to their first semester).

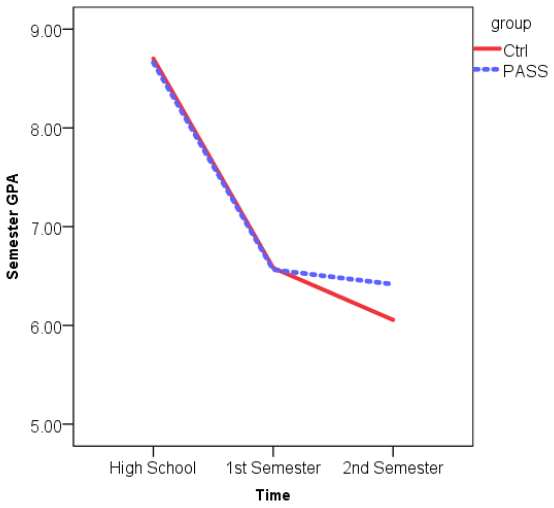
Hypothesis 2c: We expected that the decrease in achievement would be significantly attenuated (weaker) for participants randomly assigned to the PASS program as compared with participants randomly assigned to control groups.

Figure 1: Longitudinal Trajectory of Academic Achievement of Anglophone Students



(*N* = 3168) and Francophone (*N* = 881)
Gaudreau & Verner-Filion (2017)

Figure 2: Results of PASS Program with Anglophone Students



Gaudreau (2010–2014), Study funded by SSHRC

4.2 Methodology

4.2.1 Participants

The initial goal was to recruit a sample of 250 first-year, francophone students to participate in this preliminary study. Recruitment is time-bound because ideally participants should complete the PASS program before the midterm period, which starts in mid-October. However, most participants are unwilling to take part before experiencing the challenges of preparing and dealing with the adversity of exams. Hence, our recruitment period was extended and students participated in the study between September 26 and October 30, 2016.

A total of 261 participants started our baseline questionnaire. Of those, 249 finished the questionnaire and were electronically randomized into the SASS control group (*n* = 87), the LIKE/DISLIKE control group (*n* = 87), or the experimental PASS group (*n* = 72). Seven of the 72 PASS participants failed to complete at least one of the three modules and were excluded from the following analyses. Three participants ended up participating in two conditions (i.e., randomization errors) and were excluded from the analyses.

The final sample consisted of 239 undergraduate students (79.1% female) ranging from 16 to 45 years of age (*M* = 18.85, *SD* = 3.47), with 93% of the sample being 21 years old or younger. A total of 223 students

(93.3%) described themselves as first-year students and 16 (6.7%) described themselves as second-year students because they had already completed one year of postsecondary education in a CÉGEP or college. Nonetheless, all participants were in their first year at the university. A total of 188 participants (79%) listed their first language as French while the remainder listed their first language as either English (12.2%) or other (8.8%). Nonetheless, all participants described themselves as francophone students for the purposes of their university career. Students reported living with their parents (53.1%), in an apartment (23.8%), or at a residence (23.0%). A total of 84.9% reported having either a full (9.6%) or partial scholarship (75.3%) and a total of 44.4% reported having to work outside of school during the semester. The majority of students were Caucasian (56.9%) while other students described themselves as Arabic (7.5%), African-Canadian (18%), Asian (5.4%), Hispanic (2.5%), Aboriginal (1.3%) or other (6.7%). A majority of students (64.7%) reported that at least one of their parents earned at least an undergraduate diploma from a university. All participants were enrolled in at least four courses during the semester (i.e., full-time students). Characteristics of the sample were evenly distributed across the experimental/PASS group and the two control groups.

4.2.2 Procedure

We used two modes of recruitment. First, participants were recruited using the School of Psychology Integrated System of Participation in Research (ISPR) as part of the first-year introduction to psychology course. Participants received one point toward their introduction psychology class for participating in the baseline survey, one point for completing the November followup and $20 to complete the December followup. Second, participants were recruited from across campus and they received a monetary compensation for completing the baseline ($10), the November followup ($10) and the December followup ($20).

The procedure and design of the study is depicted in Table 2. Participants received a confidential participation code. They completed an electronic consent form to participate in the study and an electronic consent form to authorize access to their grades in their official student dossier. They completed a baseline questionnaire to assess their sociodemographic information (see section 4.2.1). The baseline questionnaire also contained instruments to evaluate the psychological experience of the participants (see Table 2). Following the baseline questionnaire, participants were randomized into one of two control conditions or the experimental PASS condition. Participants in the PASS condition completed the goal-setting, goal-planning and coping modules of the PASS program (see section 3.4). Participants in the control groups spontaneously reported the academic goals they were pursuing during the semester without receiving specific information or guidance regarding optimal goal-setting methods. In contrast, participants in the SASS control condition were asked to visit the SASS resources site. After searching the content of this web toolkit for approximately 10–15 minutes, participants were asked to write down five important things that they learned from the online toolkit. Participants in the LIKE/DISLIKE control condition were asked to write three things they liked and three things they did not like about their first weeks on campus. The activities of the control groups were meant to create a "business-as-usual" control condition that would orient the attention of the students toward the resources that naturally exist on campus. They were also meant to ensure that participants in both the experimental and control conditions were participating for a comparable amount of time.

Participants in both the experimental and control groups completed two followup questionnaires in November and December. The purpose of these 15-minute followup surveys was to assess the extent to which students were making progress on their academic goals as well as to find out more about their experience at school (see Table 2). The content of these followup questionnaires is not specifically reported on or analyzed in this interim report.

Table 2: Overview of the Design of the Small-scale Trial from Year Two

Mid-September to end of October		Follow-ups		Semester outcomes		Multi-year outcomes
Informed consent (to participate + access to student's record) **Baseline** (from student's record) **Baseline measures**	**Randomized PASS vs Ctrl**	**Mid-November**	**Mid-December**	**Fall Year 1**	**Winter Year 1**	**Y2 – Y7**
- Name of high school, working hrs, financial support, birth order, ethnicity, first generation student, giftedness. - Goal grade - Self-efficacy - Entity beliefs - Instrumental value - Intrinsic value - Autonomous motives - Controlled motives - Conscientiousness - Perfectionism - Perceived overload - Exhaustion - Perceived stress - Academic coping - Attention control - Planning skills - Disorganized study skills	PASS: - Structured goal setting - Goal planning - Goal coping Control: - Unstructured goal setting - SASS Students Toolkits (online) - REFLEX (like and don't like)	Primary outcomes: - Academic goal progress - Perceived learning - Perceived performance - Academic satisfaction Other variables: - Dropout intentions - Intentions to change program & school - Perceived overload - Exhaustion - Perceived stress - Autonomous motivation - Controlled motivation		**Data from student's dossier (extracted by registrar's office)**		
				Each semester: - SGPA - # courses failed - Relative grades (compared to group) - Retention after first semester		Each semester: - SGPA - # courses failed - Relative grades (compared to group) Multi-year: - Retention after each year - # years to graduate - Dropout

4.3 Results

4.3.1 Process Evaluation

Participants were asked nine questions to evaluate their degree of satisfaction with the activity they had just completed on a rating scale from 1 (*not at all*) to 7 (*totally*). Overall, participants in the PASS and the SASS groups had very comparable ratings, which were higher than the ratings of the participants in the LIKE/DISLIKE group. However, as expected, participants perceived that the instructions were clearer in the PASS program, most likely because it is the only condition in which the written instructions are supplemented with verbal instructions.

Overall, these findings provided initial evidence to support our impression that the SASS might be too strong of a control condition because it is perceived as equally useful as the PASS program. Both the PASS and the SASS conditions appear to be socially acceptable insofar as a majority of students at least strongly recommended implementation in first-year classes (58%), on the SASS website (90%), or as a first-week workshop for new students (81%).

Table 3: Descriptive Statistics and Mean Comparison of Process Evaluation Ratings

	1 PASS	**2 SASS**	**3 LIKE/DISLIKE**	**ANOVA**
Useful strategies	5.03 (1.24)	4.95 (1.37)	4.09 (1.16)	1 & 2 > 3
Learned new things	4.77 (1.39)	4.90 (1.36)	4.20 (1.19)	1 & 2 > 3
Satisfaction with things learned	4.98 (1.23)	4.93 (1.23)	4.22 (1.10)	1 & 2 > 3
Would recommend to first-year students	5.30 (1.24)	5.36 (1.25)	4.89 (1.25)	2 > 3
Clarity of instructions	5.83 (1.17)	5.37 (1.25)	5.31 (1.37)	1 > 2 & 3
Likely to help you attain your goals	5.17 (1.40)	5.19 (1.18)	4.53 (1.09)	1 & 2 > 3
Should be taught in first-year course	5.08 (1.64)	4.85 (1.60)	4.45 (1.56)	1 > 3
Should be available on SASS website	6.08 (1.07)	5.87 (1.08)	5.27 (1.23)	1 & 2 > 3
Should be given as a first-week workshop	5.63 (1.52)	5.76 (1.22)	5.16 (1.43)	1 & 2 > 3

Note: Standard deviations are reported in parentheses.

4.3.2 Preliminary Analyses

Admission GPA (0–100%) was converted to the 0 to 10 rating scale used at the University of Ottawa:

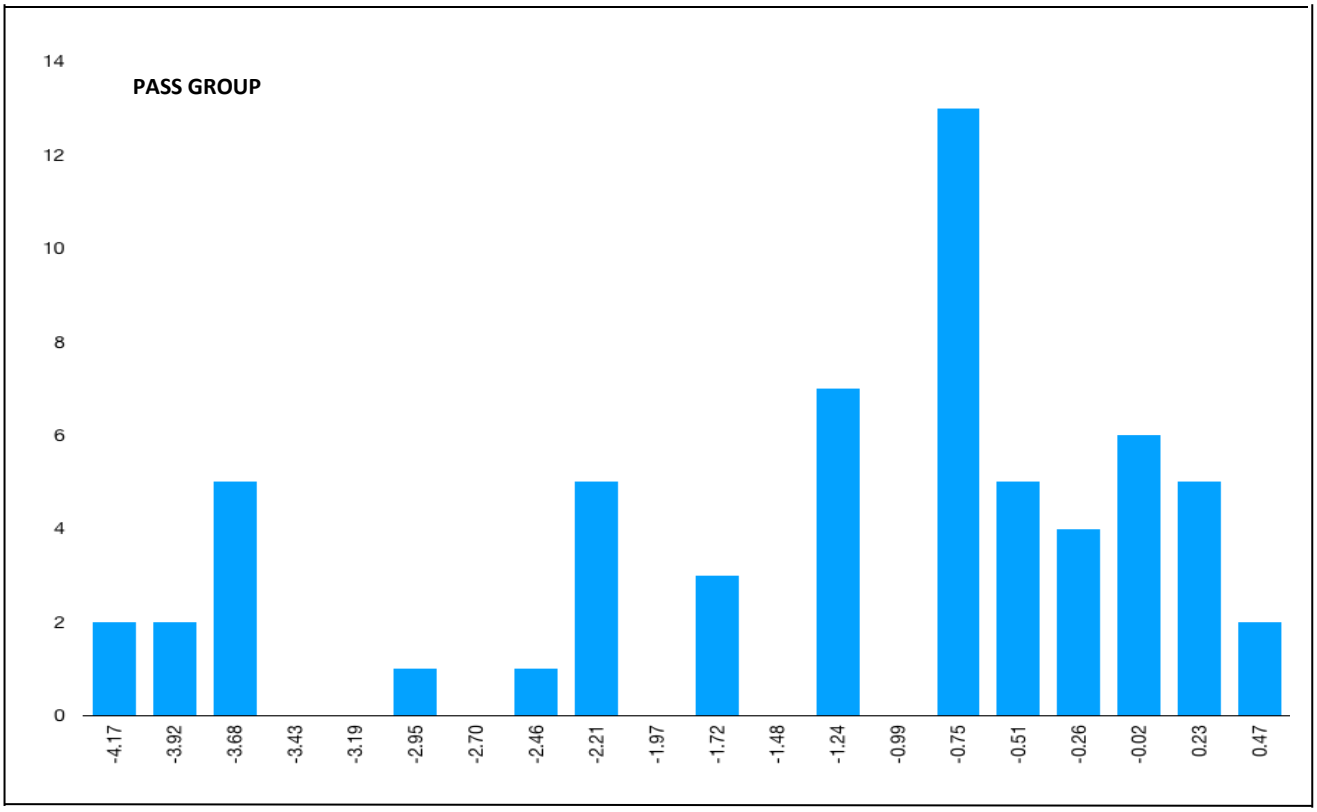
0 = F (0–39%)	6 = B (70–74%)
1 = E (40–49%)	7 = B+ (75–79%)
2 = D (50–54%)	8 = A- (80–84%)
3 = D+ (55–59%)	9 = A (85–89%)
4 = C (60–64%)	10 = A+ (90–100%)
5 = C+ (65–69%)	

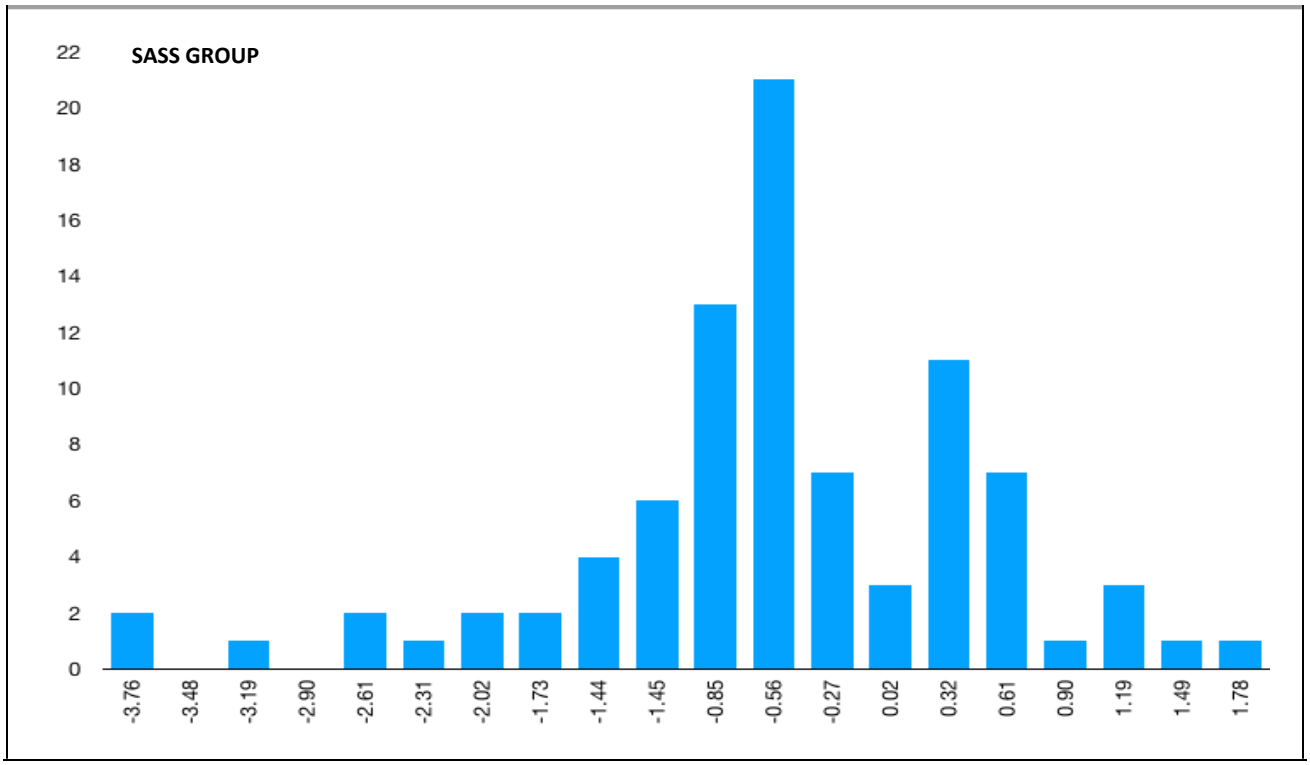
Out of 239 participants, 201 (84%) authorized us to access their official admission GPA and semester GPA for the purposes of this study. This participation rate is comparable to other studies we conducted at the University of Ottawa (e.g., Gareau & Gaudreau, 2017; Kljajic, Gaudreau, & Franche, 2017). It is important to note that consent was obtained before randomizing participants into conditions to minimize potential biases. A total of 9.2% from the PASS, 19.5% from the SASS and 17.2% from the LIKE/DISLIKE did not authorize access to their grades; the differences were statistically non-significant ($\chi^2 = 3.14$, $df = 2$, $p = .21$). The age (18.58 versus 18.90; $F = 0.27$, $p = .62$) and self-reported admission GPA (9.03 versus 9.33; $F = 1.40$, $p = .24$) did not significantly differ across the two groups. Gender (female = 16.4%; male = 14%; $\chi^2 = 0.17$, $df = 1$, $p = .68$) and first language (French = 14.9%; English = 20.7%; other = 19%; $\chi^2 = 0.79$, $df = 2$, $p = .67$) did not influence the decision to authorize access to grades. Overall, all participants were included in the analyses

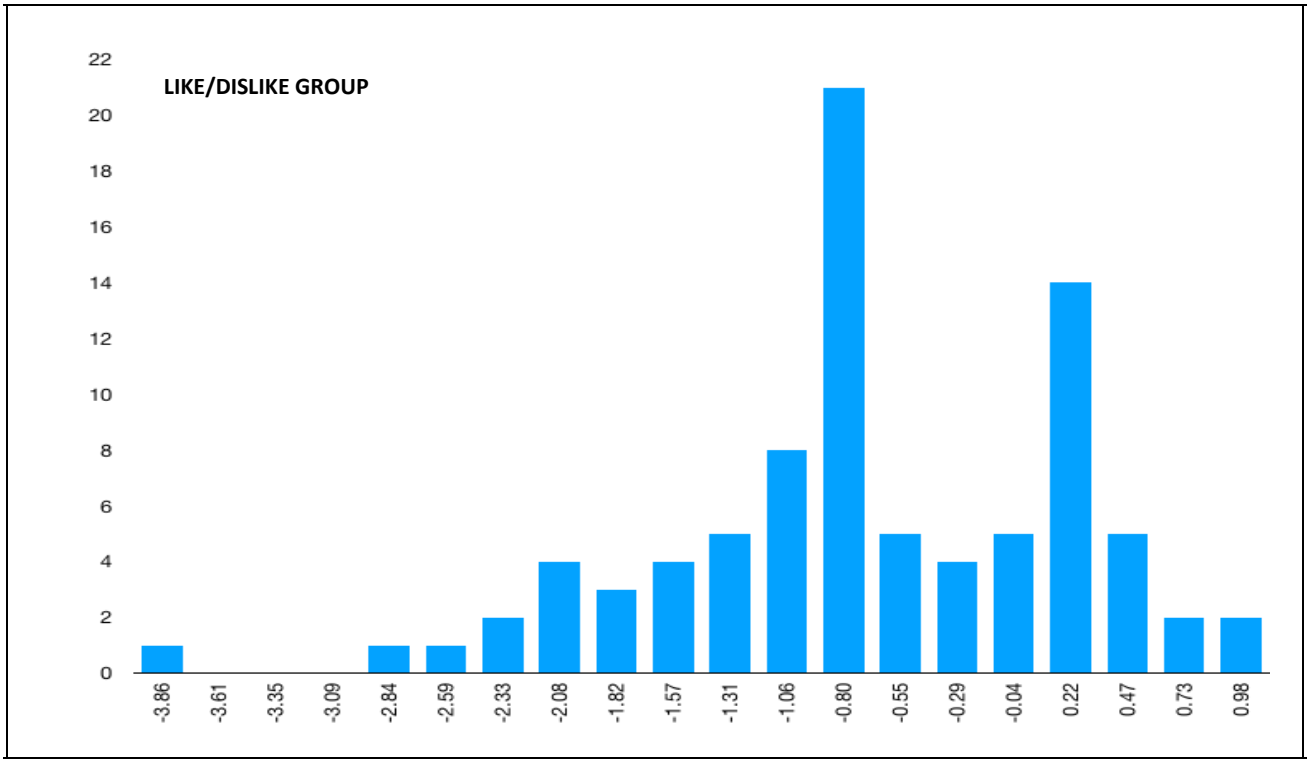
because full information maximum likelihood readily handles missing data in a way that minimizes the biases in parameter estimates and their statistical significance (e.g., Schlomer, Bauman, & Card, 2010).

Before conducting our main analyses, we examined whether the grades of some participants severely deviated from the average longitudinal trajectory observed in the current sample. Most notably, we examined the shape and the strength of the longitudinal trajectory of each participant. Normal distribution of the longitudinal trajectory of achievement is an important assumption and including participants with severe deviation from the average trajectory is likely to distort the parameter estimates, significance testing and overall interpretation of the effects. As shown in Figure 3, 13 participants (PASS, *n* = 9; SASS, *n* = 3; LIKE/DISLIKE, *n* = 1) had a performance trajectory that differed sharply from the distribution of performance trajectory in this sample. On average, these participants were admitted with admission GPA (*M* = 8.00, A-) situated at -0.42*SD* from the sample average and finished their winter semester with a semester grade point average (*M* = 1.16, E) situated at -2.45*SD* from the sample average. As such, exclusion of these outliers was deemed an important precautionary step to minimize the risk of concluding that the educational effect of the program is significant when it is null in the population (i.e., type I error; false positive) or non-significant when it is non-null in the population (i.e., type II error; false negative). Therefore, subsequent analyses were performed on a final sample of 226 participants.

Figure 3: Outliers of Individual Achievement Trajectory across Groups




SASS GROUP
22
20
18
16
14
12
10
8
6
4
2
0
-3.76
-3.48
-3.19
-2.90
-2.61
-2.31
-2.02
-1.73
-1.44
-1.45
-0.85
-0.56
-0.27
0.02
0.32
0.61
0.90
1.19
1.49
1.78


LIKE/DISLIKE GROUP
22
20
18
16
14
12
10
8
6
4
2
0
-3.86
-3.61
-3.35
-3.09
-2.84
-2.59
-2.33
-2.08
-1.82
-1.57
-1.31
-1.06
-0.80
-0.55
-0.29
-0.04
0.22
0.47
0.73
0.98

4.3.3 Mean-level Educational Effect of PASS on Academic Achievement

Estimated mean and standard deviations of the admission GPA and semester GPA are reported in Table 4 for each of the three groups of this study. Participants recruited in this study were admitted with an admission GPA of 8.49 (between A- and A), which is higher than the average student recruited on campus (*M* = 7.65) but comparable to the average student participating in our previous studies to evaluate the PASS program with anglophones (*M* = 8.68). Overall, it appears like the PASS studies are attracting students who are academically stronger at admission than the average student on campus (i.e., selection bias).

Table 4: Estimated Means and Standard Deviations of Academic Achievement

	TOTAL	1 PASS	2 SASS	3 LIKE/DISLIKE
1. Admission GPA	8.49 (1.29)	8.61 (1.24)	8.42 (1.31)	8.49 (1.30)
2. Semester GPA – Fall Year One	7.20 (1.66)	7.53 (1.39)	7.17 (1.62)	7.02 (1.88)
3. Semester GPA – Winter Year One	7.15 (1.74)	7.35 (1.23)	7.22 (1.67)	6.95 (2.15)

Note: Standard deviations are reported in parentheses.
N = 226. PASS, n= 56. SASS, n= 84. LIKE/DISLIKE n= 86.

In Table 5, we report the standardized mean difference (Cohen's *d*) between the PASS and SASS groups and between the PASS and LIKE/DISLIKE groups. We also report the one-tail confidence interval of the Cohen's *d* in order to determine if the mean academic achievement significantly differs between the PASS and each control group. A one-tail test was preferred because (a) we anticipated that the PASS program would yield small but unidirectional positive educational effect, (b) we did not observe a negative main effect of the PASS program in our past studies, (c) the current study was a small-scale efficacy trial with a relatively small sample of participants, (d) our statistical power was limited considering that the total sample was randomized in three conditions and (e) we anticipated and showed that the SASS activities created too strong of a control group (see Table 3). Cohen's *d* calculations were performed online.

Table 5: Cohen's d Effect Size and One-tailed 95% Confidence Interval

	PASS vs. SASS	PASS vs. LIKE/DISLIKE
1. Admission GPA	0.148 [-0.136, 0.432]	0.094 [-0.189, 0.377]
2. Semester GPA – Fall Year One	0.235* [-0.050, 0.520]	0.300** [0.015, 0.583]
3. Semester GPA – Winter Year One	0.086 [-0.198, 0.370]	0.217 [-0.066, 0.500]

Note. 95% CI are reported in brackets. *N* = 226. PASS, n= 56. SASS, n= 84.
LIKE/DISLIKE n= 86. ***p* < .05 (one-tailed). **p* < .10 (one-tailed).

On the one hand, our findings revealed no significant difference before the intervention (i.e., admission GPA), thus indicating that our randomization was successful at creating three comparable groups of students. On the other hand, we observed positive but small educational effects for the PASS program — comparable to those observed in our previous studies conducted with anglophone students (*d* = 0.20 to 0.30). Participants randomized in the PASS condition performed significantly better during the first semester than participants in the LIKE/DISLIKE control condition and marginally better than participants in the SASS

control condition. Although not statistically significant ($p < .15$), the difference between the PASS and the LIKE/DISLIKE control condition during the second semester was comparable to the effect observed in our previous studies conducted with anglophones. These findings provide support for the primary hypothesis of this study.

4.3.4 Effect of PASS on Longitudinal Trajectory of Academic Achievement

We performed a multiple-group piecewise growth model (Blackwell, Trzesniewski, & Dweck, 2007; Chou, Yang, Pentz, & Hser, 2004; Curran, Obeidat, & Losardo, 2010) to flexibly estimate the performance trajectory during two segments of the first year of university studies for participants randomized in each of the three groups. A first slope estimated the change in performance from pre-university (i.e., admission GPA) to the first semester of first year (i.e., fall of year one). A second slope estimated the change in performance from the first semester to the second semester of the first year (i.e., winter of year one). All parameters were freely estimated in each of the three groups and were compared using a one-tailed statistical test (see Table 5). The fit of this model was acceptable: $\chi^2 = 24.38$, $df = 16$, $p = .082$, RMSEA = 0.083, CFI = .959, TLI = .953.

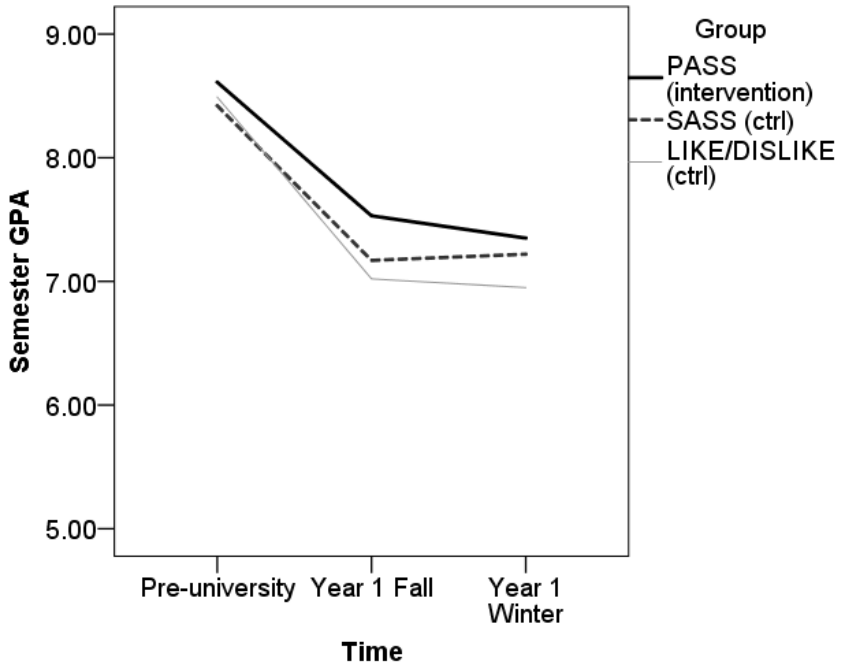
Table 6: Change in Academic Achievement across Groups

	1 PASS	2 SASS	3 LIKE/DISLIKE	Slope differences across groups	
				1 vs. 2	1 vs. 3
Slope 1: Admission vs. Fall	-1.082**	-1.233**	-1.466**	$p = .305$	$p = .090$*
Slope 2: Fall vs. Winter	-0.169	0.029	-0.254	$p = .192$	$p = .342$

Note. N = 226. PASS, n= 56. SASS, n= 84. LIKE/DISLIKE n= 86.
**$p < .05$ (one-tailed). *$p < .10$ (one-tailed).

As shown in Figure 4, results of this multiple-group piecewise growth model indicated that the performance of an average student significantly decreased from pre-university to the first semester of the first year, thus supporting our hypothesis 2a. However, the performance of an average student did not significantly decrease from the first semester to the second semester of the first year, thus disproving our hypothesis 2b. Finally, we compared the slopes across the PASS and each of the control conditions. As shown in Table 6, the decrease from pre-university to the first semester was marginally weaker for students in the PASS condition compared to the LIKE/DISLIKE condition. The decrease from the first semester to the second semester was not significantly different across the three groups. Overall, the findings provided partial support for hypothesis 2c.

Figure 4: Longitudinal Trajectory of Academic Achievement across Groups



4.4 Discussion

Participants randomized in the PASS condition performed significantly better during the first semester than participants in the LIKE/DISLIKE control condition and marginally better than participants in the SASS control condition (see Table 5). Furthermore, the decrease in grades from pre-university to the first semester was marginally weaker for students in the PASS condition compared to the LIKE/DISLIKE condition (see Table 6). Overall, these findings provide some support for the positive yet small educational effects of the PASS program.

The analyses of the year two, small-scale efficacy trial were conducted with a small sample of 239 students. Of these, 13 participants (PASS, *n* = 9; SASS, *n* = 3; LIKE/DISLIKE, *n* = 1) had performance trajectory that differed sharply from the distribution of performance trajectory in this sample. Our treatment of these outliers was consistent with best practices for the identification and handling of outliers (Aguinis, Gottfredson, & Joo, 2013) because we excluded people from both the control and experimental conditions. Hence, this decision minimized the risk of concluding that the educational effect of the program is significant when it is null in the population (i.e., type I error; false positive) or non-significant when it is non-null in the population (i.e., type II error; false negative). Recruiting a larger sample in year three of this project will not exclude the need to pay close attention to potential outliers because several first-year participants (up to 8% of the students' population) typically experience severe performance declines like the ones illustrated in Figure 3.

Two important selection biases limit the external validity of our findings, which are common limitations in intervention literature in higher education (Lazowski & Hulleman, 2016; Permzadian & Credé, 2015). First, the year two, small-scale efficacy trial had a greater proportion of female participants (79.1%) than the proportion of female students on campus (59%). Second, the students who participated in the trial were academically stronger at admission (8.49 versus 7.65) than the average student on campus. These limitations are attributable to convenience sampling in which students are free to participate or not in our study. In university research, first-year students have access to a pool of research initiatives in which they can participate. Hence, students are free to select their participation based on their personal interests, needs and preferences. Random recruitment would minimize such biases but is not a possible option unless research is designed and conducted by the office of institutional research and planning. Therefore, there is nothing we can do to specifically minimize the selection biases in year three of the project. Increasing the sample size offers no guarantee that such selection biases will be totally alleviated. Whether recruiting more female participants and more successful students increases or decreases the observed effect of the PASS intervention remain unknown.

5. Plan for Year Three

5.1 Additional Analyses of Year Two Small-scale Efficacy Trial

As shown in Table 2, followup surveys were administered in November and December of 2016. As initially planned, we are currently preparing databases in order to perform predictive statistical analyses to determine if the psychological experiences of the participants during the first semester can explain their significant decrease in performance during the first semester. Additionally, we will shortly receive the grades obtained by these students during the fall and winter semesters of their second year on campus. Therefore, we will be able to evaluate whether the participants in the PASS and the control conditions performed differently during their second year. We will also obtain information about whether or not students returned for their second year. As initially planned, all of this data will be analyzed during the third year of the HEQCO project.

5.2 Lessons Learned, Challenges and Proposed Changes

The small-scale efficacy trial performed in year two showed that the PASS program yields small but positive educational effects. The size of the educational effect obtained with a sample of francophone students was comparable to the effect already observed with two samples of anglophone students (Gaudreau, 2010–2014). These small educational effects are non-negligible because our study used a randomized field trial in which the program was completed online with minimal restrictions on how, where and when the participants should do the program. Therefore, our minimal control over the experiment is important to estimate the effect size that we should expect to obtain with the PASS program when rolled out with real students in regular services offered outside of the confines of an intervention study.

In the two PASS studies involving anglophone participants (Gaudreau 2010–2014), we rapidly realized that our SASS control condition was potentially too stringent because it contains some "active ingredients" that could minimize the likelihood of finding a significant difference with the experimental condition. During year

two, we decided to add a new control condition in which each participant wrote about three positive (LIKE) and three negative (DISLIKE) experiences as a new university student on campus. Results of our process evaluation (see Table 3) provided evidence to suggest that the SASS control group is indeed too strong of a control group. Students randomized in this control condition are spending 15–20 minutes on the SASS online toolkit. They find this activity to be as useful and satisfying as the PASS program and they would equally recommend it to future students. The toolkit contains information, tactics and advice about study strategies and life-management strategies. Some of the information appears to overlap with what we are trying to teach in the PASS program. Therefore, we are now convinced that the SASS control group should be replaced by a more neutral control condition — the LIKE/DISLIKE condition — in order to avoid the type of cross-contamination that could threaten the internal validity of our comparison between our intervention and our control condition. We do not expect the LIKE/DISLIKE condition to yield desirable or undesirable educational effects, which will provide a better control condition upon which to compare the PASS program in our year three trial.

On statistical grounds, our initial plan was to conduct the year three trial with two groups rather than three groups. Based on *a priori* power calculations, 200 participants per group are often required to detect the type of effect generally observed in randomized field trials (Cohen's d = 0.25, power = 0.80, one tail $p < .05$). Also, I would really like to examine retention. Our second-year retention is 88%. Even with two groups of 250, the number of participants in the "dropout" cell will be very low (i.e., 220 versus 30). Considering our intervention studies seem to attract above-average students (see discussion of selection biases in section 4.4), the number of non-returning students might be even lower in our sample. For various statistical reasons, dividing the sample into two groups is necessary to err on the side of prudence and maximize the effectiveness of the year three project.

One could wonder whether the SASS condition should be considered as a potential stand-alone intervention in future studies. Not enough information is available to support this interpretation at the current time. First, I believe the SASS group acted as a showcase to inform the students about the resources and services offered by the SASS program. I doubt the effect can be attributable to the online exercise performed by the participants in the SASS group. If anything, I would guess that the activity resulted in participants going back to the SASS website from time to time and perhaps even making an appointment with a mentor or a counselor and registering in workshops. Perhaps the "SASS introduction" offered in our SASS condition could be used by the SASS program to reach out more efficiently to first-year students. Second, it would be interesting to present the same information/exercise outside of the SASS website to see if the information (without being associated with an official service provider on campus) would result in the same desirable outcomes. I have doubts because the toolkit was not created and optimized with the specific purpose of being an empirically driven intervention. Overall, for the purpose of the PASS program, deleting the SASS group is the best decision for year three because this control group was not business-as-usual; it actively directed students toward other efficient services available on campus.

Educational effects of the PASS are small. Therefore, a large sample of 450–500 participants will be recruited to ensure that some of our meaningful yet small effects can reach statistical significance. During year three, the statistical power of the analyses will also be improved by randomizing participants into two groups rather than three: PASS versus the LIKE/DISLIKE control condition. Therefore, we could potentially reach 200–250 participants per group, thus maximizing the statistical power of our analyses.

We work with a survey company that allows randomization of participants into conditions. However, we cannot program the randomization process to obtain a 50/50 distribution of participants across the conditions. During year two, we ended up with subgroups of 72, 87 and 87. Unfortunately, the same pattern of randomization is likely to occur again this year because we have decided to keep our contract with this survey company to ensure that our experiments remain comparable across years two and three of this contract. We will cope with this situation by trying to recruit more than our targeted number of 450–500 participants.

We reduced the number of followup surveys completed by participants during the year two study. More precisely, participants completed followup surveys in November and December. Completion rates of the followups were much better this year (82% in November and 74% in December). However, we still think that some participants do not participate in the PASS program because of the burden of having to complete followup questionnaires. To alleviate this burden, we have decided to increase the monetary compensation offered to participate in the baseline questionnaire in which the intervention takes place: Participants will now receive $20 instead of $10. Like last year, they will also receive $10 for the first followup survey in November and $20 for the second followup survey in December.

Finally, we propose to delay interim report 3 until September 1, 2018 because data from the winter term is generally not available for reliable and definitive extraction before July (i.e., too many incomplete courses and deferral exams are still unresolved in the system before July).

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