



Does a Goal-oriented Writing Exercise Improve College Student Outcomes?

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Executive Summary

Overview and Motivation

Enrolment rates in postsecondary education (PSE) increased in Canada between 2000 and 2016; however, improving persistence in PSE is still a challenge both for PSE institutions and policy-makers. Different types of programs and services (e.g., remedial courses, targeted student-advising services, orientation programs, goal-setting workshops, etc.) are offered by PSE institutions to help students better acclimate to college or university life and succeed.

Motivated by previous findings on the effectiveness of goal-setting writing exercises for improving student outcomes and their relatively easy implementation and low costs compared to other interventions (e.g., cash awards, advising, coaching, etc.), the Education Policy Research Initiative (EPRI) and Mohawk College piloted a study in which Mohawk College administered a randomized experiment that incorporated an online guided written goal-setting exercise into its first-year orientation program.¹

The first set of findings for this experiment was published in 2017 (Finnie et al., 2017). This report presents the final set of findings on the effectiveness of this writing exercise in improving students' outcomes (retention, graduation and grades). Specifically, this report investigates whether students who were offered this writing exercise (treatment group) have lower leaving rates by the end of the first term, the first year and the second year; higher graduation rates within three years of entry; and higher grades compared to those who were not offered this exercise (control group).

Using this kind of writing-intensive approach to goal setting in orientation and transition programs has not been tested previously in a college context. This study contributes to the literature by filling this gap.

¹ See Morisano, Hirsh, Peterson, Pihl and Shore (2010), and Schippers, Scheepers and Peterson (2015) for positive effects of writing-intensive goal-setting exercises on grades and full-time course load.

The Goal-oriented Writing Exercise and Evaluation of Effects

The experiment was carried out by randomly assigning approximately half of first-year students attending a summer orientation program in 2015 to a writing workshop, where they were encouraged to reflect on, in writing, their personal aspirations, the future they wish to avoid and specific goals to attain their ideal future, and to formulate a plan on how to achieve the goals (treatment group). The other half was offered the usual college workshop, which consists of small-group activities and individual planning exercises related to goal setting and college success (control group), and does not include a writing component.

The analysis presented in this report involves evaluating the *intention-to-treat* (ITT) effects of the writing exercise, which represent the effects of the offer of the writing exercise or the assignment to the treatment group. Since assignment to the treatment group is random due to the experimental design, the estimated ITT effects have a clear causal interpretation.

Summary of the Findings

The main findings of the analysis can be summarized as follows:

- Overall, the writing exercise improves one-term (i.e., first-term) leaving by 3.9 percentage points, compared to a 13.6% leaving rate for the control group, but the effects do not seem to last beyond the first term.
- Average grades also improve, but only in the first and fifth terms by small margins (by 2.1 points compared to a 71.1 GPA for the control group for the first term and by 3.2 points compared to a 72.6 GPA for the control group for the fifth term).
- Broken down by gender, males show large and statistically significant effects over the first term and year — with the effects being larger in the first term — while the effects are generally very small and not statistically significant for females. Male retention is improved by 6.2 and 8.5 percentage points for both the first term and first year, and average first-term GPA is improved by 3.8 points. The only statistically significant effect for females is for average grades in the fifth term, with average grades 4.2 points higher for the treatment group than the control group GPA of 73.7.
- For males, the writing exercise appears to be most effective in improving one-term and one-year (i.e., first-year) retention for those who are older (23 and above), did poorly in high school (below-70 high school average), and who scored lower on the writing assessment test.

- The effects for males persist into the second year for those who did poorly in high school and even into third year for those who scored lower on the writing assessment test, with two-year leaving decreasing and three-year graduation rates improving.
- The writing exercise helps keep male advanced diploma and certificate students enrolled for one more term following the exercise, but it does not affect their outcomes in the longer run (i.e., one-year and two-year leaving, and three-year graduation). While one-year retention improves for male diploma students, other outcomes are unaffected.
- The effects on first-term grades for males are driven by those who are older, did worse in high school, are advanced diploma students, scored within the second quartile of the reading score distribution and scored from 0–4 or 5 on the writing assessment test.
- The writing exercise shows large effects on one-term leaving for females who did poorly in high school, but no statistically significant effects on other leaving, graduation or grades outcomes. The effect on the average grades in the fifth term seen for females overall is mostly driven by those who are below 18 years of age (and in part by those who are 19–22), did poorly in high school, are advanced diploma students and scored the highest on the writing assessment test.

In sum, the findings suggest that offering a one-time online writing-intensive goal-setting exercise may provide a low-cost and effective approach to improving student outcomes in a college context in Canada, especially for male retention, with the effects being greater for those with lower high school averages and writing assessment scores. However, the effects of the writing exercise appear to be short lived for most students, although they persist into the second year for males with low high school averages and even into the third year for males who scored lower on the writing assessment test.

Directions for Future Work

Further research is needed to test the effects of writing exercises in other contexts to better understand the reasons for differences in the effects when compared to the previous findings in the literature (Dobronyi, Oreopoulos & Petronijevic, 2017; Oreopoulos & Petronijevic, 2018). These could include:

- I. Testing the exercise with a broader group of incoming students where possible (e.g., the entire first-year cohort or multiple cohorts of students including second and later years)
- II. Offering the exercise to students again in the second year or later years

- III. Implementing and testing the exercise at other colleges and universities
- IV. Offering writing exercises like this to generally vulnerable groups such as Indigenous students
- V. Using different kinds of writing exercises (e.g., a shorter exercise that requires only setting and describing goals)

Implications for practice include consideration for extending the writing exercise to a broader and more diverse sets of students at the college to maximize the potential improvements to retention, graduation and grades. As an online exercise, there is the potential to provide this as an orientation intervention for all students to do at home (rather than at the college), as a resource for advisers and counsellors, or perhaps as a key class assignment in specific first-semester courses across programs, depending on the resources available.

A good place to start might be by targeting students who seem most likely to benefit from the exercise, including those in male-dominated programs or those with poorer outcomes. While more research is necessary to replicate and validate the significance of the effects on males and students with traditionally poorer outcomes (i.e., retention, graduation, grades), the potential for an intervention making such a difference is important, especially since Mohawk College has observed that males and those who have low high school averages typically have lower retention/graduation rates, and average grades compared to their counterparts.

The results in this report are intriguing and may point to an effective, low-cost intervention with significant potential to improve students' outcomes in the short term. But we need to better understand these kinds of goal-oriented writing exercises and their effects before such programs can be rolled out on a wider basis.

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Introduction

Enrolment rates in postsecondary education (PSE) increased in Canada between 2000 and 2016; however, improving persistence in PSE is still a challenge for both PSE institutions and policy-makers.² In Ontario, 23% of college students leave their programs without graduating or switching to another program within three years, while university students leave at much lower rates (6% and 7%) over the course of the first three and four years, respectively (Finnie, Childs & Qiu, 2012).

Postsecondary institutions offer different types of programs and services to help students better acclimate to college or university life and succeed. These include remedial courses for academically unprepared students, targeted student advising services, orientation programs and goal-setting workshops. New initiatives designed to help improve student success (e.g., increased retention, credits earned and GPA) have been tested by researchers to identify feasible and efficient ways to improve student outcomes (See Scott-Clayton, 2011; Mayer, Patel, Rudd & Ratledge, 2015; Bettinger & Baker, 2014; Oreopolous & Petronijevic, 2018; Finnie, Childs & Qiu, 2012; Barrow, Richburg-Hayes, Rouse & Brock, 2014; Angrist, Oreopoulos & Williams, 2014; van Lent and Souverijn, 2016; Morisano et al., 2010; Schippers et al., 2015).

Motivated by the evidence pertaining to the positive effects of writing-intensive goal-setting exercises on academic performance, their relatively easy implementation and low cost compared to other types of interventions, the Education Policy Research Initiative (EPRI) and Mohawk College piloted a study in which Mohawk College administered a randomized experiment that incorporated an online guided written goal-setting exercise into its first-year orientation program.³

In this study, approximately half of first-year students who chose to attend a summer orientation program in 2015 were offered an opportunity to participate in a workshop where they were encouraged to reflect, in writing, on their personal aspirations, the future they wish to avoid, specific goals to attain their ideal future, and a plan on how to achieve their goals (treatment group). The other half was offered the usual workshop offered by the college, which consisted of small-group activities and individual planning exercises related to goal setting and college success (control group).

2 The postsecondary enrolment rate in Canada relative to the population of those who are 18–24 years old, has increased from 48% in 2000 to 63% in 2016 (Statistics Canada CANSIM Tables 477-0019 and 051-0001).

3 See Morisano et al. (2010) and Schippers et al. (2015) for positive effects of writing-intensive goal-setting exercises on grades and full-time course load. van Lent and Souverijn (2016) show significant effects of goal setting on grades, although, there is no writing component to that experiment, unlike the ones studied in Morisano et al. (2010) and Schippers et al. (2015). In contrast, Dobronyi, Oreopoulos & Petronijevic (2017) do not find any effects of goal-setting exercises on student success (e.g., grades, registration status).

This report presents an analysis of the effects of this intervention and investigates whether students who were offered this writing exercise had lower leaving rates by the end of the first term, the first year and the second year; higher graduation rates within the first three years after entry; and higher grades compared to those in the control group. This kind of writing-intensive approach to goal setting in orientation and transition programs has not been tested previously in an Ontario college context. This study contributes to the literature by filling this gap.

The findings show statistically significant effects of the writing exercise on leaving and grades, with the effects being generally larger for groups who tend to have poorer student outcomes. For the most part, the writing exercise affects only the short-term outcomes (i.e., one-term or one-year leaving, first-term GPA), but for a couple of specific groups the effects on leaving (and graduation) continue into the later years.

The report begins by putting the study in context and providing a brief literature review. This is followed by a detailed description of the writing exercise and the experimental design; a description of the data, sample selection, and variables used in the analysis; the presentation of the results; and, finally, the conclusion, which summarizes the main findings, provides a discussion of the results and how they relate to the findings in the literature, and suggests directions for future work.

Literature Review

Research on Student Success Initiatives in a PSE Context

Previous research on PSE outcomes such as academic performance, retention, and graduation have examined the effectiveness of financial incentives (Scott-Clayton, 2011; Mayer et al., 2015), intensive or proactive support services (Bettinger & Baker, 2014; Castleman & Meyer, 2016; Oreopoulos & Petronijevic, 2018; Finnie et al., 2017), as well as the combination of incentives and support services (Barrow et al., 2014; Angrist, Lang & Oreopoulos, 2009; Angrist et al., 2014). Some of these studies show that merit and performance-based scholarships and awards are found to have positive effects on student outcomes such as number of credits earned, graduation, retention, fraction enrolled as full time and grades (Scott-Clayton, 2011; Barrow et al., 2014; Mayer et al., 2015; Angrist et al., 2009; Angrist et al., 2014).

Coaching, tutoring, and proactive advising are also found to be effective for improving student outcomes.⁴ Students who were coached by telephone were approximately 5 percentage points more likely to persist in PSE with the effects continuing into subsequent years, and four-year graduation rates increased by 4 percentage points (Bettinger & Baker, 2014). Combining comprehensive advising, tutoring and career services increased the proportion of students enrolled full time and in the second semester and the average number of credits earned, with sizeable two- and three-year effects on enrolment and credits earned (Scrivener & Weiss, 2013; Scrivener et al., 2015). Moreover, personal coaches were found to be more effective than following up with students via email or text message (Oreopoulos & Petronijevic, 2018).⁵

Finnie et al. (2017) provide further evidence on the effects of availability of support services: offering one-to-one and group advising services before the start of the first semester improved retention of males by approximately 4–5 percentage points over the first semester and year, while retention of females was essentially unaffected.⁶

Despite the evidence of the positive effects of financial incentives and continued one-to-one support services on student outcomes, implementing these strategies as usual practice in colleges and universities is likely unfeasible due to limited staffing resources. One type of intervention that is less costly compared to personal coaching and providing performance-based scholarships is encouraging students to set goals. Coaching, as in Bettinger and Baker (2014), may involve an element of goal setting, but it also provides further encouragement and support in terms of information and tips on how to progress toward achieving these goals, which potentially makes these types of support services costly.

Goal-setting Interventions

Relatively little research has focused on the effects of solely setting goals as well as goal-setting writing exercises on academic performance and student retention such as the one presented in this report.

4 Except for Angrist et al. (2009), who do not find any statistically significant effect of support services alone on academic performance

5 The sample of students used by Oreopoulos and Petronijevic (2018) includes all students across the three University of Toronto campuses who are enrolled in first-year economics classes.

6 The one-to-one advising services studied in Finnie et al. (2017) differed from coaching services in that the students were encouraged via email (up to three times) and phone (if there was no response to emails) to meet with their advisers before the term started. However, once students met with their advisers in person, the next contact had to be initiated again by the student, unlike the coaching services studied by Bettinger and Baker (2014) and Oreopoulos and Petronijevic (2018), where coaches regularly monitored students' progress, and provided support and encouragement via email or phone or in person.

The first example comes from the field of psychology, where Locke and Latham (1979) used field experiments to show that setting goals improved employee performance. Since then, a number of studies have examined the effects of goal setting in the context of postsecondary education (Morisano et al., 2010; Schippers et al., 2015; Travers, Morisano & Locke, 2015; van Lent & Souverijn, 2016; Oreopoulos & Petronijevic, 2018).⁷

Using a sample of first-year economics students, van Lent and Souverijn (2016) show that students who were merely encouraged to set target grades for specific courses attained significantly better grades.⁸

Some institutions have implemented interventions that were designed based on traditional student development theories and behavioural psychology, which combined self-authorship with goal setting. Students who were invited to participate in an online, guided, writing-intensive goal-setting exercise attained higher grades, earned more credits, and enrolled full time at higher rates compared to their peers in the control group (Morisano et al., 2010; Schippers et al., 2015).

Using a sample of students from McGill University who were on academic probation, Morisano et al. (2010) found that GPAs and the fraction of students who maintained a full course load improved as a result of participating in an online writing exercise.⁹

Schippers et al. (2015) tested a similar writing exercise on first-year college students at a large European business school and found that the number of credits earned and retention rate improved as a result of participating in the writing exercise, with the effects being largest for ethnic minority males (credits earned increased by 44% and retention rate increased by 54%). In contrast to these findings, however, Dobronyi et al. (2017) and Oreopoulos and Petronijevic (2018) do not find any significant effects for a one-time online writing-intensive goal-setting exercise.^{10, 11}

7 Travers et al. (2015) provide qualitative evidence on the potential effects of goal setting on academic performance. For experimental studies on goal-setting effects in other contexts such as management science, see Goerg and Kube (2012), Dalton, Gonzalez and Noussair (2016) and Corgnet, Gómez-Miñambres and Hernán-Gonzalez (2015).

8 The authors also find that grade effects are driven mainly by females and that asking students to raise their goals does not improve their academic performance.

9 The numbers of students in the treatment and control groups in Morisano et al. (2010) are 45 and 40, respectively.

10 Other types of interventions that were also designed based on the social psychology field (e.g., expectancy value, growth mindset of intelligence, social belonging and value affirmation) are also shown to potentially improve student performance, but these are mostly outside the postsecondary education context (Harackiewicz, Rozek, Hulleman & Hyde, 2012; Blackwell, Trzesniewski & Dweck, 2007; Walton & Cohen, 2011; Yeager et al., 2014; Yeager et al., 2016; Paunesku et al., 2015; Cohen, Garcia, Purdie-Vaughns, Apfel & Brzustoski., 2009; Sherman et al., 2013).

11 The sample used by Dobronyi et al. (2017) includes all students at the Mississauga campus of the University of Toronto who are enrolled in first-year economics classes.

The writing exercise tested in this project is similar to the one examined by Schippers et al. (2015), but it differs in two ways. First, it was offered as part of a summer orientation program offered to new students at Mohawk College, whereas the initiative studied by Schippers et al. (2015) was delivered as part of the curriculum. Second, the writing exercise examined by Schippers et al. (2015) consisted of three stages with the last stage requiring students to come up with a one-sentence statement capturing their goals and ambitions, which was then accompanied by a professional personal photo, while the writing exercise implemented at Mohawk College did not include this stage.¹²

The Goal-oriented Writing Exercise and the Experimental Design

The writing exercise tested in this project is the Future Authoring program, an online application that combines narrative therapy and goal setting designed to improve student outcomes.¹³ It is inspired by research on narrative therapy and goal setting, which finds writing thoughtfully about the uncertainties and threats in the present, past and future improves mental and physical health (Pennebaker & Beall, 1986; Pennebaker, 2000; Graybeal, Sexton & Pennebaker, 2002; Ramírez-Esparza & Pennebaker, 2006). Additionally, it finds setting goals and working toward achieving these goals leads to improved task and academic performance (Locke & Latham, 1979; Sheldon & Houser-Marko, 2001).

The writing exercise consists of two main stages. Stage I involves writing a positive personal vision and a negative counter-vision. For the positive vision, participants were asked to consider and write briefly about important domains of their lives — such as career, family, intimate relationships, health, and personal pursuits — as part of an initial warm-up exercise. They then wrote for 15 or 20 minutes, without undue concern for grammatical niceties, about what their lives could look like three to five years in the future if they took care of themselves properly.

For the negative counter-vision, participants were asked to spend the same amount of time writing about what undesired future consequences might occur if bad habits and undesirable behaviours were allowed to predominate in their lives. The combination of creating a vision and counter-vision provides participants with a clearly defined approach to goal setting and the avoidance of negative outcomes, thus increasing their motivation and decreasing stressful uncertainty.

¹² Schippers et al. (2015) note that the motivation for this stage was to enhance goal commitment.

¹³ See <https://www.selfauthoring.com/future-authoring.html>

Stage II of the exercise involves the analysis and organization of the positive vision developed in Stage I and the formulation of a detailed plan for implementation and self-monitoring. Participants were asked, among other things, to title and rank-order their goals; to justify each of them from a personal, familial and social perspective; to consider potential obstacles and how they might be overcome; and to formulate a personal progress monitoring process.

The process requires a substantial amount of thinking and writing on the part of the participants, but can be implemented effectively with the provision of very little contextual information. Participants merely needed to be provided with a username and password so that they could access the exercise on their own time. After watching a brief, introductory video that provides an overview of the process, or by being introduced to the writing exercise by trained Mohawk staff, they could complete the exercise wherever and whenever they had access to a computer, and could work through it in several sessions for up to 30 days after registration.

Mohawk College implemented this goal-oriented writing exercise by modifying the curriculum of its first-year orientation program (Start Smart).¹⁴ Start Smart is promoted and made available to all applicants who have confirmed their offer of admission and plan on attending Mohawk College in the fall semester. Students who participated in the Start Smart program were recruited into this study as part of that program. This is a full-day orientation program providing new students with resources and information to promote their success as they begin their postsecondary careers.

All students participating in the Start Smart program were provided with the opportunity to participate in a goal-setting workshop called “Building Your Future Ready Plan” immediately after the large-group welcome session in the morning. Upon arrival, all students engaged in a registration process where they signed in, confirmed their student information, and were provided with their resource package for the day. In addition, all participants were given a personalized schedule, which randomly placed them into two equally-sized streams; one half was directed into labs for the goal-oriented writing exercise (treatment group), while the other half was directed into other classrooms for Mohawk’s usual goal-setting workshop (control group). Both groups received the same information pamphlets, but their activities differed. For instance, while the treatment group completed the online writing exercise, the control group engaged in small-group activities and individual planning exercises related to goal setting and college success.

¹⁴ Some students received different types of outreach emails about the student advising services available and were offered to take up advising services before the term starts (i.e., proactive advising) as part of another experiment implemented by the college in the same year. The results of the analysis do not change when accounting for whether a student was assigned to any of the pro-advising treatment groups.

Data and Methodology

Sample Selection

The data for this study comes from Mohawk College records and contains information on term-by-term enrolment records (i.e., enrolment status, credential, program, term-GPA) of full-time students who attended the Start Smart orientation program offered to new students in summer 2015 as well as time-constant student characteristics (i.e., gender, age, entry reading and writing assessment tests, indicator for assignment to the treatment group and other information related to the writing exercise such as students' essays, goals, the time they started and ended the writing exercise, and high school course grades).

There are 791 students in the original data received from the college. Students who were previously enrolled, did not register by day 10 of the fall semester, or with missing gender or enrolment information on day 10 of any given semester are excluded from the sample, leaving 759 students in the final sample with 390 in the treatment group and 369 in the control group.¹⁵

Outcome Variables: Leaving, Graduation and Grades

Main Outcomes

The outcomes of interest are leaving, graduation and term-GPA. Four leaving and graduation outcomes are generated: one-term, one-year and two-year leaving, and three-year graduation. All leaving measures are based on enrolment information as of the 10th day of a given term. One-term leaving captures whether a student was enrolled in winter 2016.

Similarly, one-year leaving indicates that a student was not enrolled in fall 2016 and has not graduated. The enrolment statuses of students in interim terms (winter and spring 2016) are also checked to ensure there was a degree of continuity in students' attendance at the college throughout their first academic year. That is, those who were enrolled in fall 2016, but not enrolled in either the winter or spring 2016 are considered leavers.¹⁶

¹⁵ The data received from the college includes only students who gave consent to be included in the study.

¹⁶ Results are similar when a change in fall-to-fall enrolment status, without controlling for winter/spring enrolment, is used to calculate the one-year leaving measure.

Similarly, two-year leaving indicates that the student is not enrolled in fall 2017 and has not graduated. Similar to the one-year leaving measure, enrolment statuses in the interim terms are checked. Students who are enrolled in fall 2017, but not enrolled for at least three terms between winter 2016 and spring 2017 are considered leavers.¹⁷

The analysis also considers whether a student graduated from the college within three years of their entry.

The other main outcomes of interest are fall 2015, winter 2016, fall 2016 and winter 2017 GPAs. The zero GPAs are treated as missing as they indicate that students did not officially withdraw from their courses.

Additional Outcomes

The additional outcomes are fall 2017, winter 2018 and fall 2018 GPAs.¹⁸ The results for these additional outcomes are presented in Appendix B: Tables for the Additional Outcomes and Explanatory Variables.

Explanatory (Control) Variables

Main Explanatory Variables

All the models include a treatment group indicator, which is 1 if a student is assigned to the writing exercise and 0 if not, to estimate the effect of the writing exercise on the outcomes. In addition to the treatment group indicator, the variables used in the analysis are gender, age, credential, school (generated from program codes), high school average, and reading and writing assessment scores.¹⁹ The credential and school information used in the final analysis sample reflect the credential and school at the start of the fall 2015 term.

The programs are categorized into seven schools: Business, Community and Justice Studies, Health Sciences, Interdisciplinary Studies, Media and Entertainment, Skilled Trades, and Technology.

17 Two alternative versions of the two-year leaving measure are used to check to see if the results are affected: one where the condition of attendance is limited to at least two terms between winter 2016 and spring 2017 and another without any conditions; that is, it checks retention from fall to fall. The findings are very similar when these versions of the two-year leaving measure are used.

18 The incidence of missing term-GPA increased in fall 2017, which is likely not only due to students deciding not to come back for the term, but also due to more students dropping out sometime during the term as a result of the college strikes in Ontario. Around 65% of those who were registered by day 10 of the fall 2017 term were missing their term-GPA, which left 191 students in total with a non-missing fall 2017 GPA.

19 Incoming Mohawk College students typically undertake writing, reading and mathematics assessments before the start of their first semester. Only the reading and writing assessment scores were available for the data received for this project. Based on data from another study (Finnie et al., 2017), the proportion of students who take the math assessment test at Mohawk is typically around 30%.

High school average is calculated by taking the average of all course grades over the third and fourth years.

The reading assessment scores range from 27–120 and are categorized into four approximately equal-sized groups (quartiles): 27–63, 64–78, 79–94 and 95–120. The writing assessment scores range from 0–8, and are categorized into three groups: 0–4, 5 and 6–8. A separate category for those whose assessment scores are missing is created for both reading and writing assessment score variables.

Additional Explanatory Variables

This report also uses the total number of words written during the writing exercise instead of the treatment indicator. The word count variable, which is available only for those who were assigned to the writing exercise, is categorized into three equally sized groups (i.e., terciles), and then it is incorporated into a new variable with those who were assigned to the control group comprising a separate category for this new variable.²⁰

Another explanatory variable used is the time taken to finish the writing exercise (in minutes). Similar to the number of words written, this variable is also categorized into terciles. Those who were assigned to the control group are put into a separate category.²¹

It is important to note that the differences between the groups do not represent the causal effect of how much effort is put into the writing exercise on student outcomes, as the numbers of words written and time taken are endogenous variables, which are potentially driven by unobservable factors (e.g., motivation, ability). The estimates from the models including the number of words written or the time taken to finish the writing exercise merely provide a disaggregated version of the overall treatment effect (identified by the coefficient estimate on the treatment indicator, as explained below) and how the number of words written or time taken by those who were assigned to the treatment group are correlated with the student outcomes.

20 Specifically, the categories of this new word count variable used in these additional models are as follows: those who were assigned to the control group, those who were assigned to the treatment group and wrote between 0 and 499 words, those who were assigned to the treatment group and wrote between 500 and 808 words, and those who were assigned to the treatment group and wrote between 809 and 5,551 words. The coefficient estimates on the three word count categories (the first category is the control group, which is the base category, so not shown in the regression results) show the differences between the mean outcomes for the control group and those who wrote within the respective word count tercile.

21 The categories are 0–34.96, 35.03–47.86, and 47.95–25,311 minutes. The maximum number of minutes taken is 25,311, which is followed by 6,298, 5,173, 3,808, and 89.62 minutes. The minutes are in two decimal places, as the raw data received from the college included the hour, minute and second of the time started and finished, which is used to calculate the total minutes taken to finish by dividing total seconds by 60. The coefficient estimates on the three time categories show the differences between the mean outcomes for the control group and those who spent minutes within the respective minute tercile.

The results for these models are not a part of the main analysis, which is to examine the total intention-to-treat effects of the writing exercise (explained below), and are presented in Appendix B: Tables for the Additional Outcomes and Explanatory Variables.

Evaluation of Effects

In this paper, we focus on the intention-to-treat (ITT) effects of the writing exercise. The ITT effects are the effects of the offer of treatment or assignment to the treatment group. Since assignment to the treatment group is random due to the experimental design explained in the previous section, the estimated ITT effects have a clear causal interpretation.

Alternatively, the effect of the writing exercise on those who actually participated in this writing exercise (average treatment effect on the treated – ATET) could also be estimated.²² If receiving the treatment is defined as having written down at least one word for either the essay, goal or for both sections of the exercise, then the ATET effects would be very close to the ITT effects as there are very few students who were assigned to the treatment group, but did not write anything (see Table 2). Therefore, we do not include the ATET estimates in this report, and we refer to the estimated ITT effects as the treatment effects or effects of the writing exercise throughout the report.

Linear regression models are used to estimate the effects on leaving and graduation outcomes and term-GPA.²³ The models are as follows:

$$y_i = \beta_0 + \beta_T T_i + \beta_1 X_{1i} + \dots + \beta_K X_{Ki} + \epsilon_i,$$

where y_i is the outcome (e.g., one-term, one-year leaving, fall 2015 GPA, etc.) for student i , T_i is an indicator for assignment to the treatment group, X_{1i}, \dots, X_{Ki} are the different control variables (i.e., gender, age, credential, school, high school average, and reading and writing assessment), ϵ_i represents the unobserved factors that affect the outcome, y_i , and the parameter β_T represents the treatment effect.

22 The estimation of these effects relies on using instrumental variables to control for self-selection regarding the decision to write the exercise. Using the indicator for assignment to the treatment group as the instrumental variable, the ATET is a multiple of the ITT, where the multiplier is the reciprocal of the fraction of students who decided to write down their goals and aspirations (Bloom, 1984; Angrist & Pischke, 2008). Therefore, by definition, the ITT effects are always smaller in magnitude compared to the ATET estimates.

23 Binary outcome variables can be modelled using models that yield predictions that lie between 0 and 1 (e.g. logit, probit). However, when the main goal is to compute the average marginal effects of a program rather than producing individual level predictions, the linear probability models have the advantage of “simplicity, automation, and comparability across studies” (Angrist & Pischke, 2008, p. 197; Wooldridge, 2010, Chapter 15). The results are very similar when logistic regression models are used to estimate the treatment effects.

We estimate the models for the whole sample, separately for males and females, and then the treatment effects are allowed to vary by different student and program characteristics by including interaction terms between T_i and the relevant variable (e.g., high school average).

Summary Statistics and Writing Exercise Completion

Summary Statistics

Table 1 shows the distribution of characteristics of students in the control and treatment groups for the full sample and separately for males and females.

Half of the control sample is female, almost 40% of the students are 18 years old, 54% of students are in diploma programs, followed by advanced diploma programs (28%). Around half the students are enrolled in programs in the schools of Community and Justice Studies (24%) and Technology (24%), and 50% of the students have a high school average between 70 and 84.

The randomization into control and treatment groups appears to be successful in general as the distribution of student and program characteristics is similar across the control and treatment groups.

Table 1: Distributions (%) of Characteristics for Control and Treatment Groups

	All		Males		Females	
	Control	Treatment	Control	Treatment	Control	Treatment
<i>Gender</i>						
Female	50.4	51	0	0	100	0
Male	49.6	49	100	0	0	0
<i>Age</i>						
Below 18	10.0	11.8	9.8	9.9	10.2	13.6
18	37.1	34.1	38.8	37.2	35.5	31.2
19	15.7	18.7	19.1	20.9	12.4	16.6
20–22	15.7	11.0*	14.2	9.4	17.2	12.6
23–26	5.4	10.0**	5.5	8.9	5.4	11.1**
27 and above	15.7	14.4	12.0	13.6	19.4	15.1
Missing	0.3	0	0.5	0	0	0
<i>Credential</i>						
Advanced Diploma	28.2	29.2	33.9	38.2	22.6	20.6
Certificate	15.2	10.8*	10.4	7.3	19.9	14.1
Degree	0.8	0.8	0.5	0.5	1.1	1.0
Diploma	53.9	55.9	53.6	51.3	54.3	60.3
Graduate Certificate	0.5	2.1*	0	2.1**	1.1	2.0
Missing	1.4	1.3	1.6	0.5	1.1	2.0
<i>School</i>						

	All		Males		Females	
	Control	Treatment	Control	Treatment	Control	Treatment
Business	14.1	13.3	6.6	8.9	21.5	17.6
Community and Justice Studies	24.4	29.2	14.8	19.9	33.9	38.2
Health Sciences	5.1	6.9	0.5	3.1*	9.7	10.6
Interdisciplinary Studies	8.4	6.4	2.7	2.6	14.0	10.1
Media and Entertainment	11.9	11.0	13.7	12.0	10.2	10.1
Skilled Trades	10.8	6.7**	20.2	12.6**	1.6	1.0
Technology	23.8	25.1	39.9	40.3	8.1	10.6
Missing	1.4	1.3	1.6	0.5	1.1	2.0
<i>High School Average</i>						
Below 65	11.9	11.3	14.2	13.6	9.7	9.0
65–69	14.1	11.8	16.4	10.5*	11.8	13.1
70–74	19.2	19.0	19.7	21.5	18.8	16.6
75–79	16.0	20.8*	14.8	20.9	17.2	20.6
80–84	15.2	14.4	12.6	14.7	17.7	14.1
85–89	5.7	6.7	3.3	3.1	8.1	10.1
90 and above	1.9	1.5	0.5	1.0	3.2	2.0
Missing	16.0	14.6	18.6	14.7	13.4	14.6
<i>Reading Assessment Score Quartiles</i>						
First	20.3	23.1	14.8	17.8	25.8	28.1
Second	21.7	21.3	20.8	22.5	22.6	20.1
Third	20.3	19.5	20.8	20.4	19.9	18.6
Fourth	21.4	19.5	27.3	23.0	15.6	16.1
Missing	16.3	16.7	16.4	16.2	16.1	17.1
<i>Writing Assessment Score</i>						
0–4	23.8	25.9	29.0	31.4	18.8	20.6
5	33.1	32.6	30.6	27.7	35.5	37.2
6–8	43.8	24.4	24.0	24.1	29.6	24.6
Missing	16.3	17.2	16.4	16.8	16.1	17.6
Number of Observations	759		374		385	

* and ** denote statistical significance at the 5% and 10% levels, respectively, for the hypothesis tests of difference between control and treatment group distributions. The difference between the two distributions is tested by running linear regressions of each variable on an indicator for whether students are assigned to the writing exercise and testing whether the coefficient on the indicator is statistically significant.

There are some exceptions, however, such as the proportion of students aged 20–22 and 23–26, who are enrolled in certificate or graduate certificate (10 students) programs or in the school of Skilled Trades, and who have a high school average between 75 and 79. These differences between the treatment and control groups will be taken into account by including all the explanatory variables in the models. Both the estimates of the treatment effects from models that include explanatory (control) variables and those that do not are presented.

The characteristics distributions for the treatment and control groups are also generally very similar for the male and female samples.

Writing Exercise Completion

Table 2 gives a summary of the completion of the writing exercise sections for the entire treatment group and by gender, where completion of a section is defined by writing down at least one word for the relevant section. Of all students in the treatment sample, 97.7% and 94.7% of the students completed the first and second essay section, respectively, with slightly higher completion rates for females.

At the beginning of the exercise, students are instructed to write down a minimum of six and a maximum of eight goals. Compared to the essay sections, fewer students completed these goal sections. More than half of the students (53.3%) in the treatment group did not complete any goal sections. The total number of goal sections completed was 2.3 on average for both males and females. Almost all students wrote down at least one word for the whole exercise.

In sum, while the completion rates for the essay sections are very high, the response rates on the goal sections are fairly low. The low response rates in the goal sections do not affect the analysis that is presented in this report, as the analysis examines the intention-to-treat effect; that is, the effect of being offered the writing exercise.

Table 2: Writing Exercise Completion by Section

	All	Males	Females
<i>Essay section</i>			
Essay 1 - Positive vision	97.7	96.9	98.5
Essay 2 - Negative counter-vision	94.9	94.2	95.5
Essays 1 and 2	94.9	94.2	95.5
<i>Goal section</i>			
Did not write any goals	53.3	53.4	53.3
Wrote one goal	8.2	8.4	8.0
Wrote two goals	3.6	3.1	4.0
Wrote three goals	1.8	1.0	2.5
Wrote four goals	2.8	3.1	2.5
Wrote five goals	2.8	2.1	3.5
Wrote six goals	16.2	20.4	12.1
Wrote seven goals	2.1	1.0	3.0
Wrote eight goals	9.2	7.3	11.1
Total number of goals written	2.3	2.3	2.3
<i>The entire writing exercise</i>			
Wrote at least one word	99.2	99.0	99.5

The instruction sheet for the writing exercise indicated a minimum number of six and a maximum number of eight goals to be written down. In the table, completion of each goal subsection is defined by writing down at least one word for each field on title, description and analysis fields for a given goal.

Results

Treatment Effects at the Overall Level and by Gender

Table 3 presents estimates of the effects of the writing exercise on one-term, one-year and two-year leaving and fall 2015, winter 2016, fall 2016, and winter 2017 GPAs both at the overall level and by gender.

For the leaving and graduation outcome measures, the effect estimates — given in the respective “Treatment Effect” rows — represent the percentage-point difference between the mean leaving/graduation of the treatment group and the control group (the control group mean is indicated in the corresponding row). For the GPA outcomes, the treatment effect represents grade-point differences in the mean GPA between the treatment and control groups and, again, the control group mean for each outcome variable is given in rows labelled “Control Group Mean.”

The “No controls” columns present the treatment effect estimates from a linear regression model of the relevant outcome variable on the treatment indicator (i.e., whether the student is assigned to the treatment group). The coefficient estimate on the treatment indicator gives the raw difference of the mean of the outcome variable between the control and treatment groups. The column “All controls” presents the treatment effect estimates from a linear regression model that includes the treatment indicator and all other explanatory (control) variables (i.e., gender, age, credential, school, high school average and writing and reading assessment scores).

The treatment effect estimates from the models including no controls (“No controls” column) and those from the models including all controls (“All controls” column) in Table 3 are generally similar. This points to the randomization of students into the experimental groups (control and treatment) being successful.

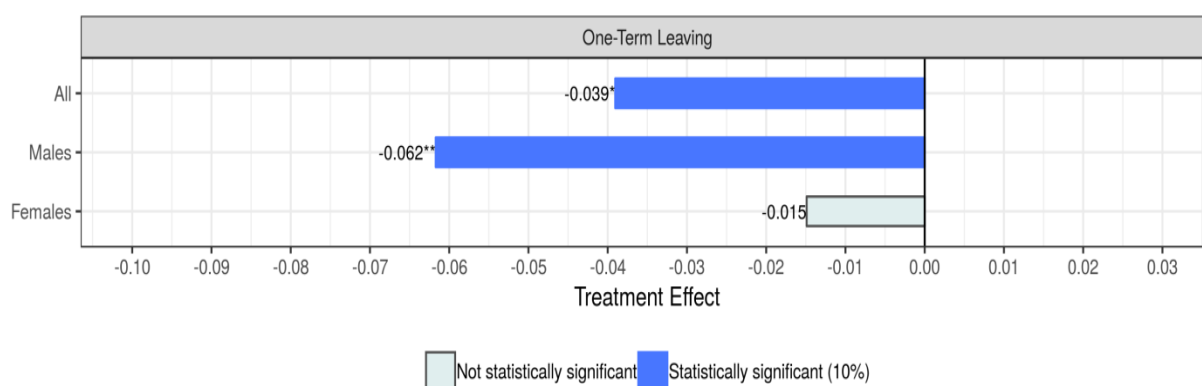
To facilitate easier readability of the results, Figures 1A–1D and Figure 2 show the treatment effects from the column “All controls” in Table 3 for leaving, graduation and term-GPAs, respectively. Statistically significant coefficients will be indicated by asterisks and the corresponding bar will be in dark blue.

One-Term Leaving

Figure 1A–1D show that accounting for differences in student and program characteristics, high school average and assessment scores, the estimated difference in leaving rates between the control and treatment groups is 3.9 percentage points (compared to the 13.6% leaving rate for the control group in Table 3: Treatment Effects on Leaving, Graduation and Grades).²⁴

Males in the control group have higher leaving rates than females, with 16.4% and 10.8% of males and females, respectively, leaving before their second term (Table 3). Including all controls, while the males in the treatment group have a one-term leaving rate that is 6.2 percentage points lower (statistically significant at the 5% level) than their counterparts in the control group, females show only a 1.5 percentage point writing exercise effect (i.e., difference in leaving rates between the treatment and control groups). In sum, the writing exercise seems to close the gender gap in one-term leaving rates.

Figure 1A: Treatment Effects on One-Term Leaving



The estimates are the intention-to-treat effect estimates reported under column "All controls" in Table 3. The asterisks ***, **, and * denote statistical significance at the 1%, 5%, and 10% levels, respectively.

²⁴ As mentioned earlier, some students in the sample were also assigned to treatment groups of another experiment carried out by the college in 2015. The results of the analysis do not change when accounting for whether a student was assigned to any of those treatment groups.

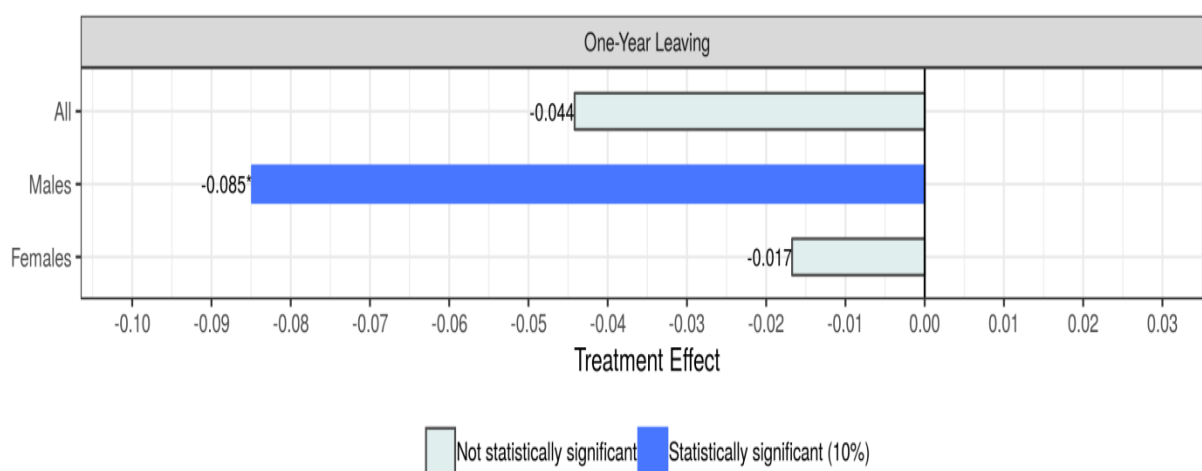
One-Year Leaving

Students in the control group have a one-year leaving rate of 28.2% (Table 3). Figure 1B shows that those who are in the treatment group leave at a rate 4.4 percentage points lower than those in the control group when the model includes all controls. However, this difference is not statistically significant.

Again, males leave at higher rates than females (32.2% versus 24.2% in Table 3), but the writing exercise affects the one-year leaving rate of males to a larger degree.²⁵ Including all controls, males who were assigned to the writing exercise leave before their second year at rates 8.5 percentage points lower than those in the control group, while this difference is only around 1.7 percentage points for females and the effect estimate for females is, again, not statistically significant.

The treatment effects on one-year leaving are relatively small compared to the one-term effects (e.g., for males, an 8.5 percentage-point difference compared to a 32.2% one-year leaving rate for the control group versus a 6.2 percentage-point difference compared to a 16.4% one-term leaving rate). This suggests that most of the writing exercise effects are concentrated in the shorter term (i.e., the one-term leaving).

Figure 1B: Treatment Effects on One-year Leaving



The estimates are the intention-to-treat effect estimates reported under column "All controls" in Table 3. The asterisks ***, **, and * denote statistical significance at the 1%, 5%, and 10% levels, respectively.

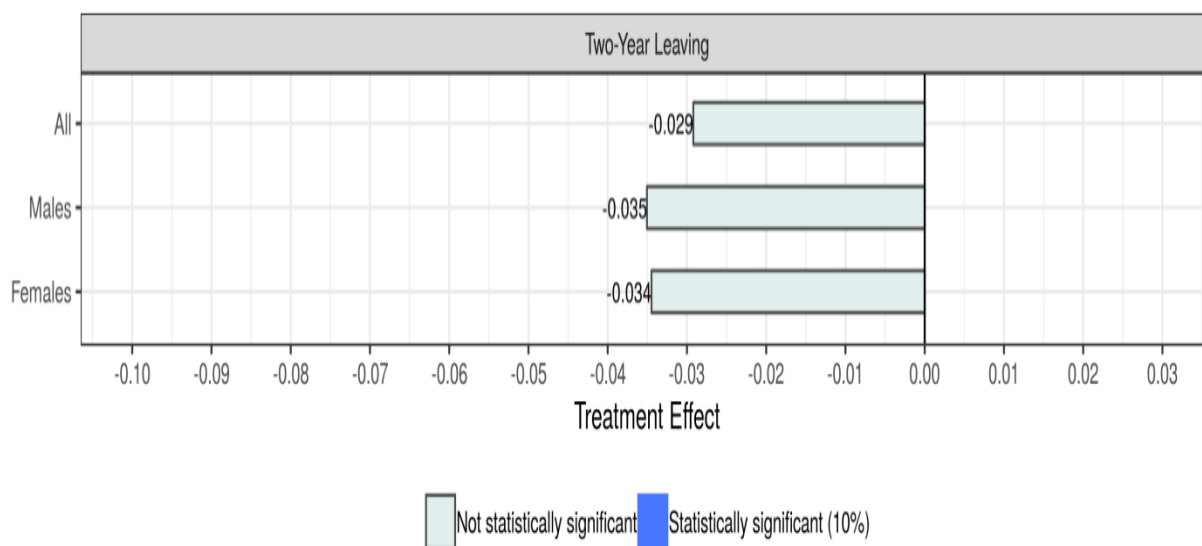
²⁵ The differences in the treatment effects on leaving (one-term or one-year) for males and females are not statistically significant.

Two-Year Leaving

The writing exercise effect on two-year leaving is relatively small compared to the one-term and one-year effects, further reinforcing the theory that the effects of the writing exercise are strongest in the short term. The model estimates in Figure 1 show that those who were offered the writing exercise have a two-year leaving rate 2.9 percentage points lower than those in the control group who have a leaving rate of around 34.1% (Table 3: Treatment Effects on Leaving, Graduation and Grades), but this difference is not statistically significant.

Unlike one-term and one-year leaving, there is no large difference in the two-year leaving rates for males and females in the control group: 35.5% of males and 32.8% of females leave the college before the start of their third year. Figure 1A: Treatment Effects on One-Term Leaving shows that both males and females assigned to the treatment group have lower leaving rates (by 3.5 and 3.4 percentage points, respectively) than those in the control group; however, none of these estimates are statistically significant. This suggests that the effects on leaving fade in the longer term.

Figure 1C: Treatment Effects on Two-Year Leaving



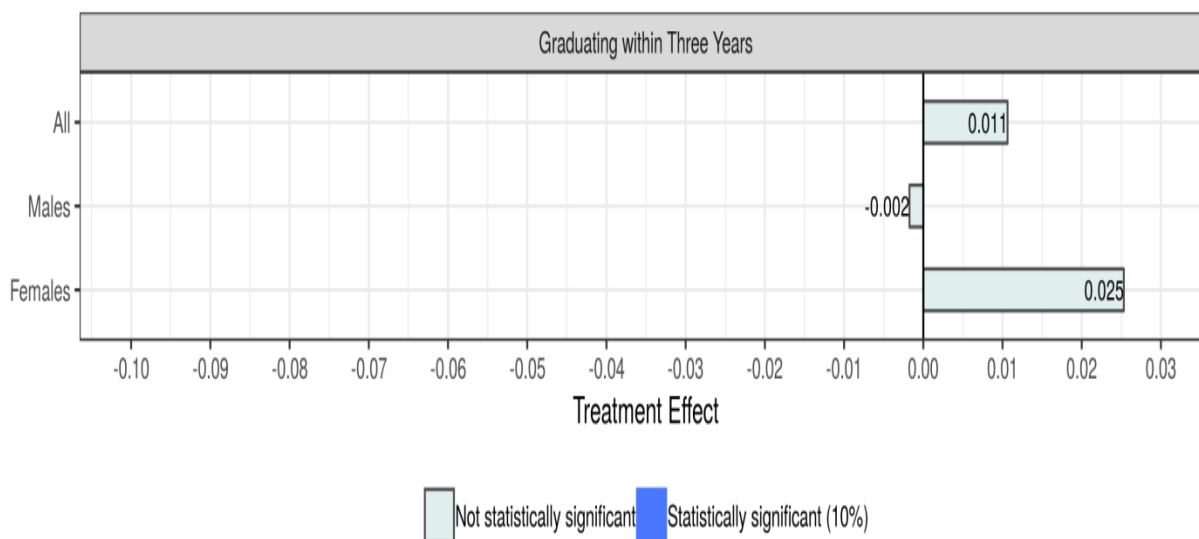
The estimates are the intention-to-treat effect estimates reported under column "All controls" in Table 3. The asterisks ***, **, and * denote statistical significance at the 1%, 5%, and 10% levels, respectively.

Graduating within Three Years

The graduation rates within the first three academic years are 51.5% at the overall level and 41.5% and 61.3% for males and females, respectively (Table 3: Treatment Effects on Leaving, Graduation and Grades). Figure 1D shows that the effects of the writing exercise are negative, but small and not statistically significant for males, while the effects are positive for females, but again they are not statistically significant.

Again, the treatment effect on leaving disappears in the long term, with most of the effects concentrated in the very short term (i.e., the first term following the writing exercise). In other words, the writing exercise seems to be effective in keeping students (especially males) enrolled just a little longer (one term or year), but eventually those who were retained due to the writing exercise decide to drop out before their third year or do not end up graduating within the first three years at the college.

Figure 1D: Treatment Effects on Three-Year Graduation



The estimates are the intention-to-treat effect estimates reported under column "All controls" in Table 3. The asterisks ***, **, and * denote statistical significance at the 1%, 5%, and 10% levels, respectively.

Grades

Students in the control group have an average GPA of 71.1 during the fall 2015 term (first term following the writing exercise) with males recording lower GPAs than females (67.8 versus 74.4 in Table 3: Treatment Effects on Leaving, Graduation and Grades).²⁶ Overall, the writing exercise appears to have had a positive effect on fall 2015 GPA, but it seems mainly driven by the effects on male GPAs (Figure 2: Treatment Effects on Grades). Males who are assigned to the writing exercise record, on average, GPAs 3.8 points higher than those in the control group, whereas, for females, this difference is estimated at 0.9 points and is not statistically significant.

The estimated effects of the writing exercise on winter and fall 2016 GPAs are not statistically significant (and even negative for the winter 2016, but very small in magnitude). Females in the control group attained higher GPAs than males during these terms as well. None of the gender-specific effects are statistically significant.

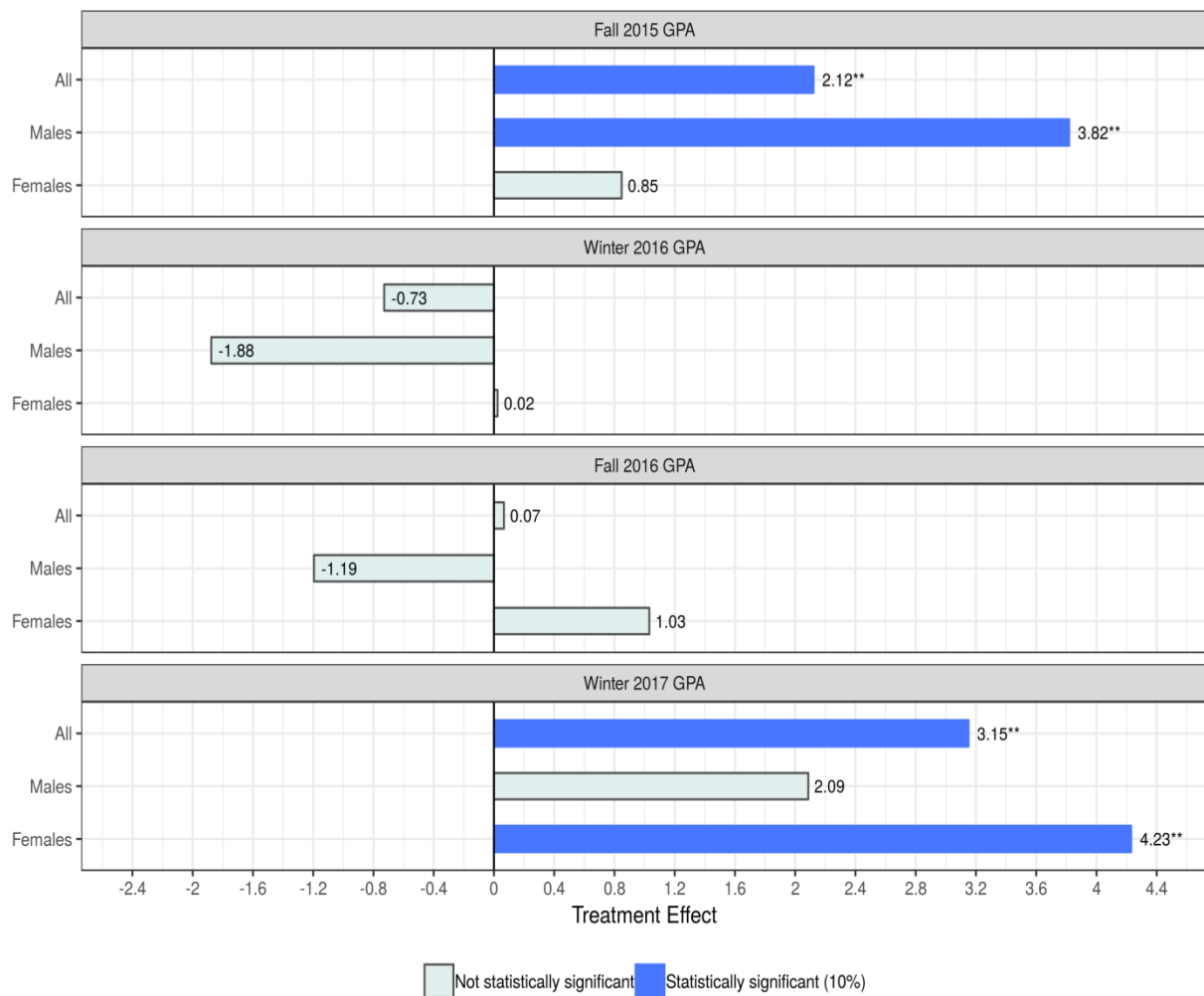
Overall, the average winter 2017 GPA (fifth term following the writing exercise) for students in the treatment group is 3.2 points higher than those in the control group. Males and females who were invited to participate in the writing exercise have winter 2017 GPAs 2.1 and 4.2 points, respectively, higher than those in the control group. Only the female effects are statistically significant.

In sum, the effects of the writing exercise on grades are concentrated in the shorter run (i.e., the first term following the writing exercise) for males, while they only appear in the longer run for females (the fifth term following the writing exercise).²⁷

²⁶ The sample size for the fall 2015 GPA results are smaller than those for the leaving and graduation outcomes as some of the students who leave the college have missing GPAs.

²⁷ The effects on term-GPA for females disappear after fall 2017 (see Table B1: Treatment Effects on the Additional Grade Outcomes).

Figure 2: Treatment Effects on Grades



The estimates are the intention-to-treat effect estimates reported under column "All controls" in Table 3. The asterisks ***, **, and * denote statistical significance at the 1%, 5%, and 10% levels, respectively.

Treatment Effects by Student and Program Characteristics and High School Average

Tables 4–8 and Figures 3–12 show the leaving, graduation and grades effect estimates while allowing for differences in the effects by age, high school average, credential, reading and writing assessment scores.

Effects by Gender and Age

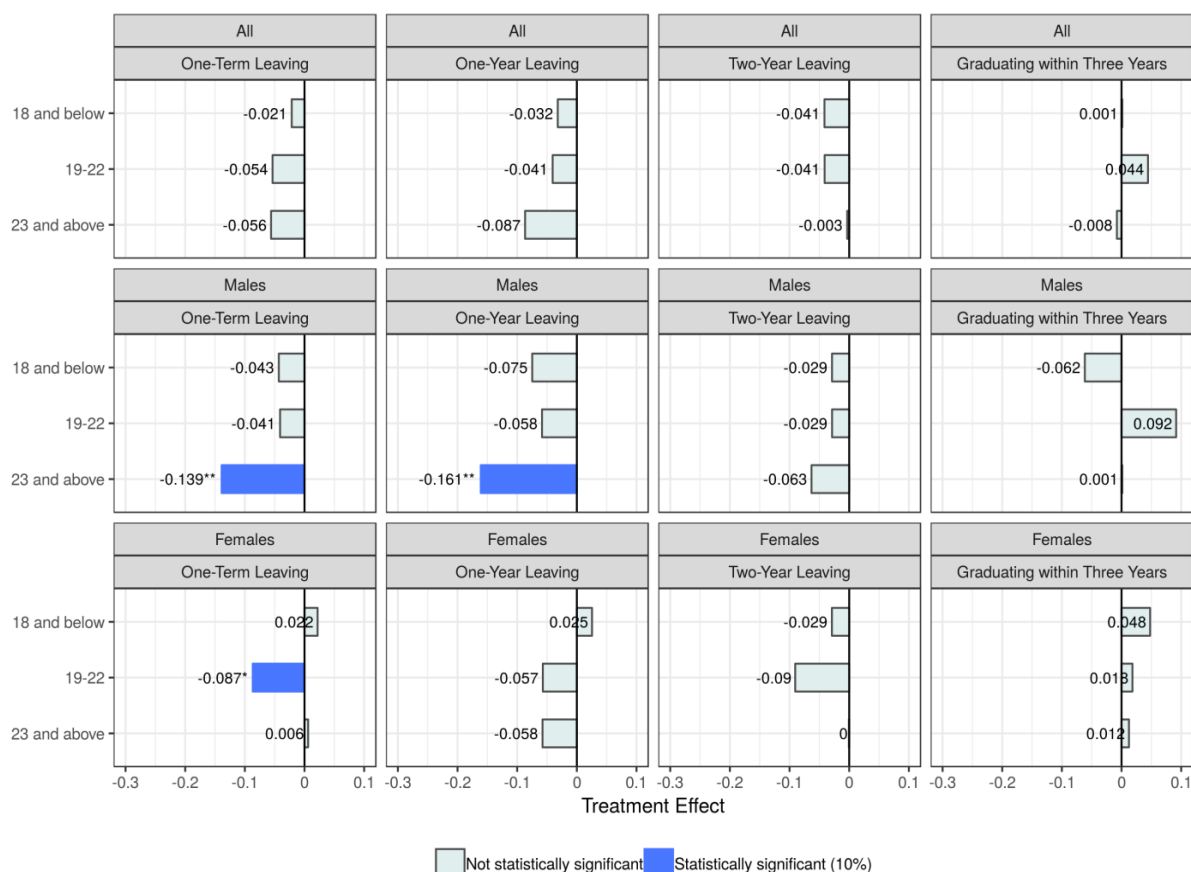
The results by gender and age are given in Figure 3. There are no statistically significant age-specific effects of the exercise overall. For males, the treatment effects on one-term and one-year leaving shown in Figure 1A and Figure 1B seem to be driven mostly by older students (23 and above). Males who are 23 and above and assigned to the treatment group leave at rates 13.9 and 16.1 percentage points lower during the first and second year, respectively, compared to their counterparts in the control group. Older females who were assigned to the treatment group also show one-term leaving rates that are lower (by 8.7 percentage points) than those in the control group.

Similarly, Figure 4 shows that the treatment effects on fall 2015 GPA for older male students (23 and above) are larger than those who are younger (7.6 points versus 2.3–3.2, with the latter not being statistically significant).

The overall winter 2017 GPA (fifth term following the exercise) effect seen for females is driven mostly by those who are below 18 (and, in part, by those who are 19–22, but the estimate is not statistically significant).

Figure 4 and Table 4, where each model adds the interaction terms between the age variable (categorized into three groups as “Below 18,” “19–22,” and “23 and above”) and the treatment indicator (i.e., being invited to participate in the writing exercise) to the models presented in Table 3.²⁸

²⁸ The results for the statistical tests for whether the differences in treatment effects across age groups, high school average, credential, and reading and writing assessment scores are not presented in the tables to make them easier to read.

Figure 3: Treatment Effects on Leaving and Graduation by Age

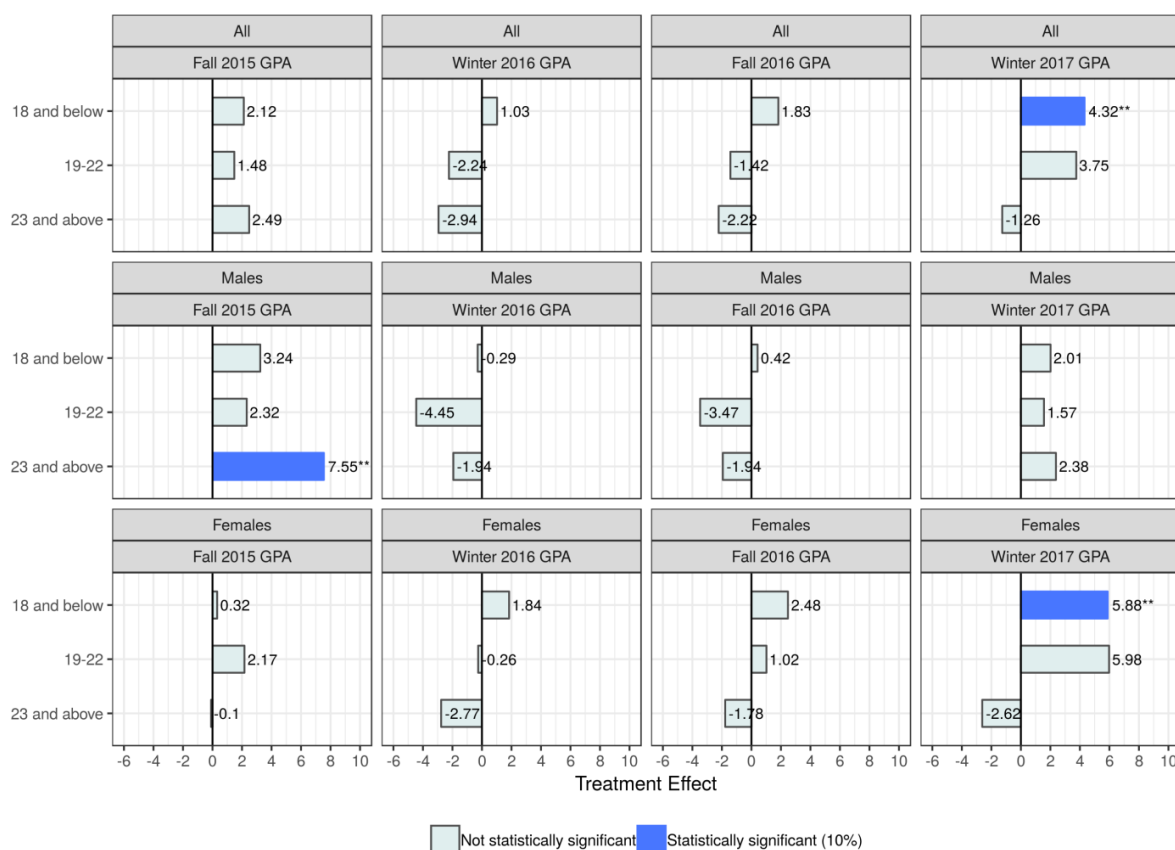
The estimates are the intention-to-treat effect estimates reported under column "All controls" in Table 4. The asterisks ***, **, and * denote statistical significance at the 1%, 5%, and 10% levels, respectively.

There are no statistically significant age-specific effects of the exercise overall. For males, the treatment effects on one-term and one-year leaving shown in Figure 1A and Figure 1B seem to be driven mostly by older students (23 and above). Males who are 23 and above and assigned to the treatment group leave at rates 13.9 and 16.1 percentage points lower during the first and second year, respectively, compared to their counterparts in the control group. Older females who were assigned to the treatment group also show one-term leaving rates that are lower (by 8.7 percentage points) than those in the control group.

Similarly, Figure 4 shows that the treatment effects on fall 2015 GPA for older male students (23 and above) are larger than for those who are younger (7.6 points versus 2.3–3.2, with the latter not being statistically significant).

The overall winter 2017 GPA (fifth term following the exercise) effect seen for females is driven mostly by those who are below 18 (and, in part, by those who are 19–22, but the estimate is not statistically significant).

Figure 4: Treatment Effects on Grades by Age



The estimates are the intention-to-treat effect estimates reported under column "All controls" in Table 4. The asterisks ***, **, and * denote statistical significance at the 1%, 5%, and 10% levels, respectively.

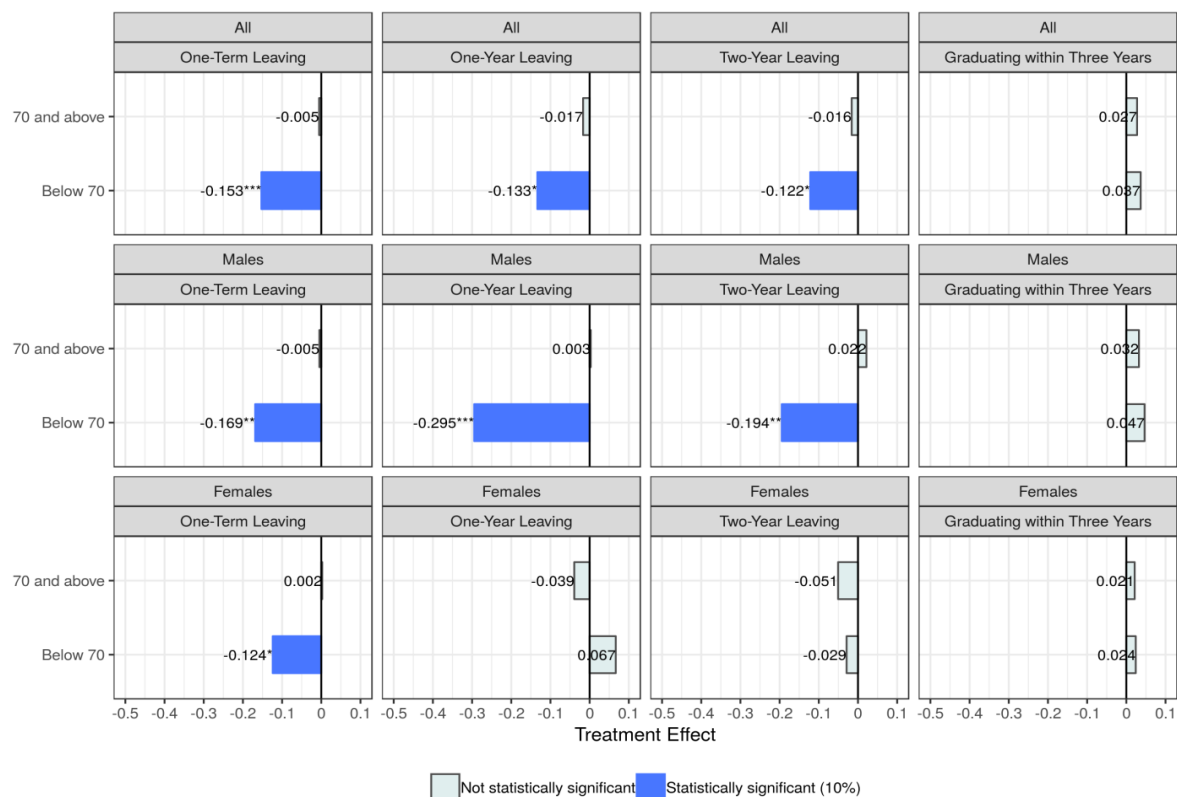
Effects by High School Average

The estimates by gender and high school average are shown in Figure 5, Figure 6 and Table 5, where the models include only high school interaction terms instead of age interactions. The high school average variable is categorized into "Below 70" and "70 and above."

Students who did poorly in high school generally show large treatment effects on leaving outcomes. The graduation effects are generally small and not statistically significant. Students who are assigned to the treatment group and with an average below 70 have one-term, one-year and two-year leaving rates of 15.3, 13.3 and 12.2 percentage points lower, respectively, than those in

the control group. In contrast, those with an average of 70 and above show effects that are relatively small and not statistically significant. Those with missing high school average information generally do not show any statistically significant effects, except for the graduation outcome.²⁹

Figure 5: Treatment Effects on Leaving and Graduation by High School Average



The estimates are the intention-to-treat effect estimates reported under column "All controls" in Table 4. The asterisks ***, **, and * denote statistical significance at the 1%, 5%, and 10% levels, respectively.

The large effects on leaving seen for those who did worse in high school are driven by large effects on outcomes for males. Males in the treatment group who have an average below 70 leave before their second term, second year and third year at rates 16.9, 29.5, and 19.4 percentage points lower than those in the control group. In contrast, none of the effects are statistically significant for those with an average of 70 and above.

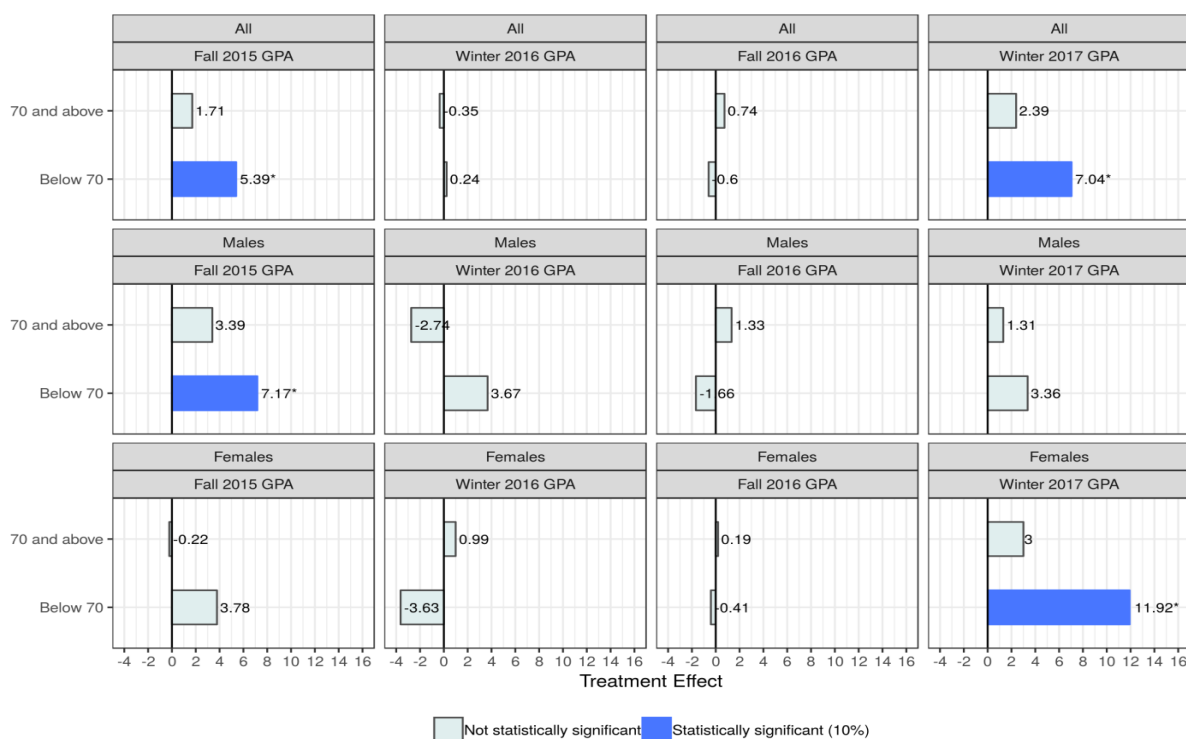
²⁹ The effect estimates for fall 2015 GPA, winter 2016 GPA, and fall 2016 GPA outcomes for males with missing high school average information are negative and statistically significant. The sample sizes for this particular group range between 48 and 60 depending on the type of GPA variable.

Similarly, for females, while there are large effects on one-term leaving for those who did poorly in high school, there is no statistically significant effect of the writing exercise for those who did better in high school (12.4 versus 0.2 percentage points). There are no statistically significant effects of the writing exercise on the other leaving and graduation outcomes for females.

While those who did worse in high school show statistically significant effects of the exercise on fall 2015 (first term following the exercise) and winter 2017 (fifth term) GPAs, students who did better do not show any statistically significant effect. Those in the treatment group with below-70 average in high school have GPAs 5.4 and 7 points higher, on average, during fall 2015 and winter 2017 compared to those in the control group, whereas the effect estimates for those with a high school average of 70 and above are 1.7 and 2.4, respectively, but they are not statistically significant. The winter 2017 GPA effects seen for females at the overall level are driven by large effects on the winter 2017 GPA of those who did worse in high school (11.9 points).

The effect estimates for winter and fall 2016 GPAs are small, and sometimes even negative, but not statistically significant.

Figure 6: Treatment Effects on Grades by High School Average



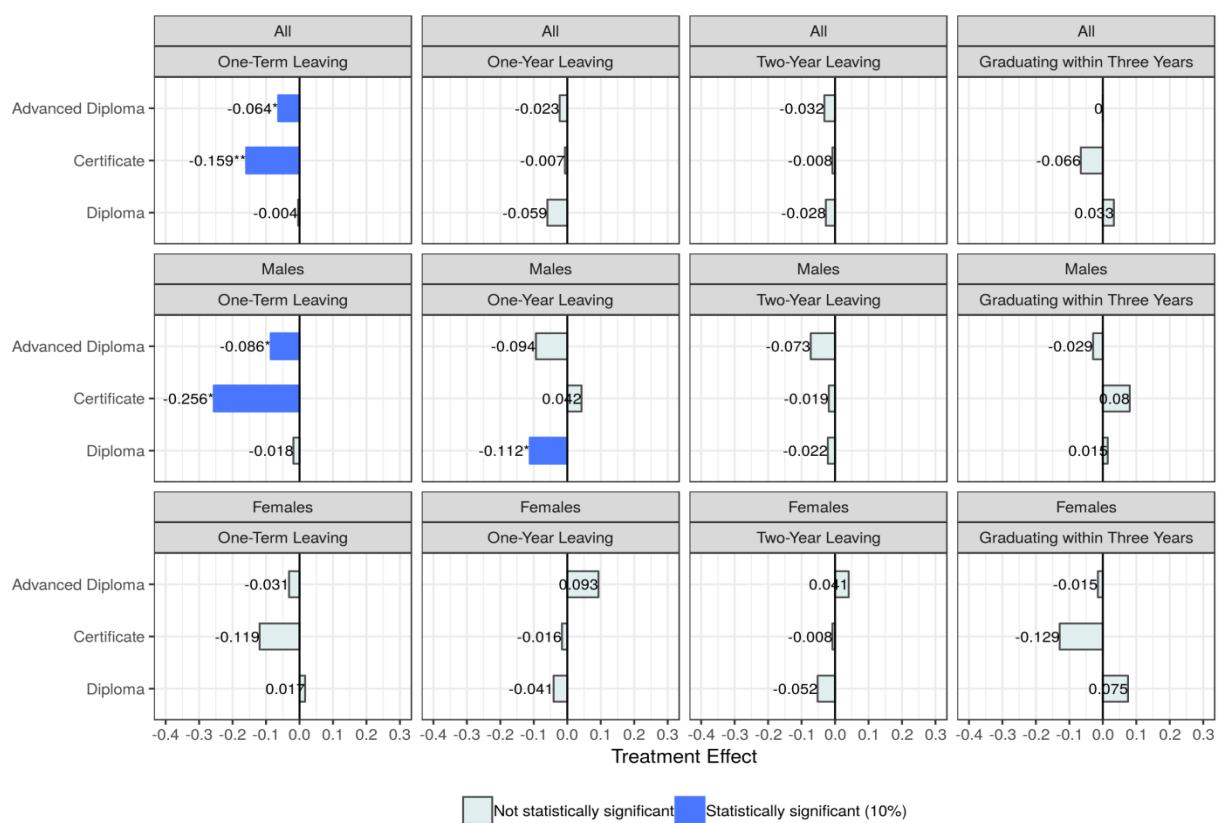
The estimates are the intention-to-treat effect estimates reported under column "All controls" in Table 5. The asterisks ***, **, and * denote statistical significance at the 1%, 5%, and 10% levels, respectively.

Effects by Credential

Figure 7, Figure 8 and Table 6 show the treatment effect estimates by credential. Only advanced diploma and certificate students show statistically significant one-term leaving effects of the writing exercise. The effect estimates for the certificate students are larger than those for the advanced diploma students (15.9 versus 6.4 percentage points, respectively).³⁰ The same pattern holds for males and females, but none of the estimates for females are statistically significant.

Overall, for one-year leaving, diploma students appear to benefit more from the offer of the writing exercise, but other students do not. Male diploma students show statistically significant effects, while other students do not. None of the female credential effects are statistically significant. As for two-year leaving and graduation, there are no statistically significant effects by credential.

Figure 7: Treatment Effects on Leaving and Graduation by Credential



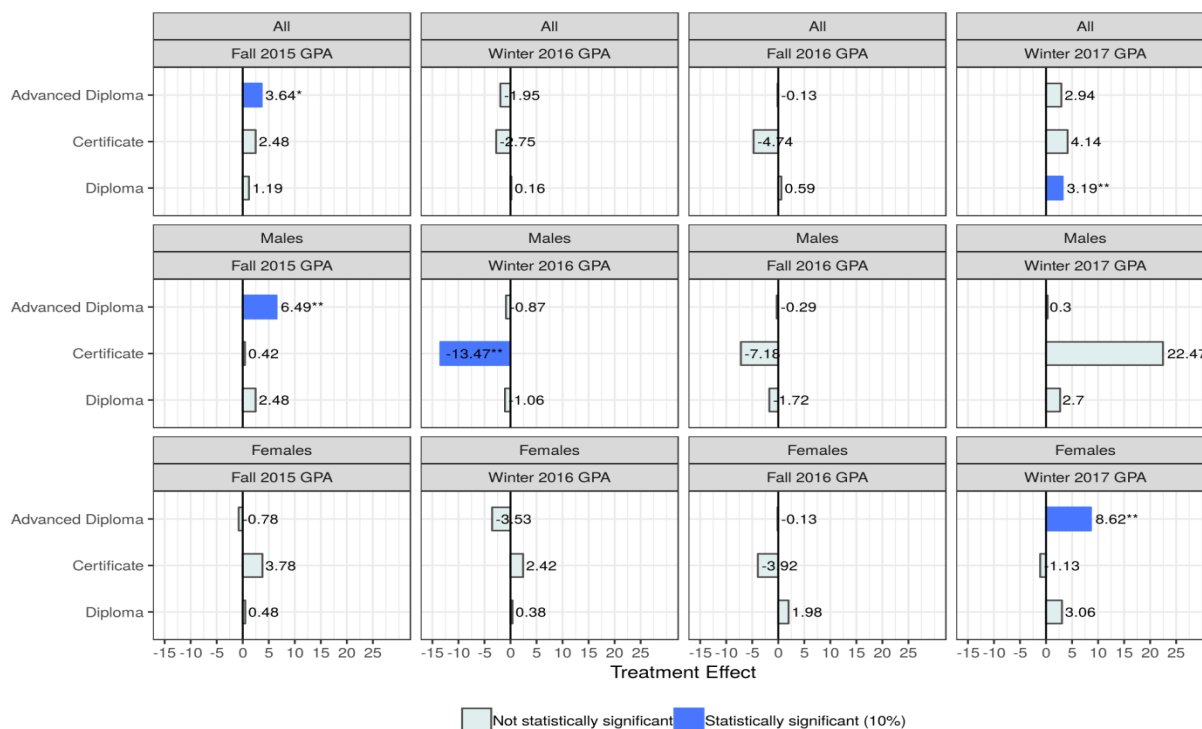
The estimates are the intention-to-treat effect estimates reported under column "All controls" in Table 6. The asterisks ***, **, and * denote statistical significance at the 1%, 5%, and 10% levels, respectively.

³⁰ The differences in the treatment effects between credentials are not statistically significant.

In sum, being offered the writing exercise helps keep male certificate students at the college for one more term, but does not influence their outcomes after that point. On the other hand, the treatment effect on one-year leaving for males shown in Figure 1B (and Table 3) is driven by diploma and advanced diploma students, with only the former showing statistically significant effects.

The writing exercise seems to have a positive effect on the fall 2015 GPA of advanced diploma students, which is driven by males who show an effect size of 6.5 points (Figure 8). In contrast, females do not show any statistically significant effects by credential. Most of the estimated effects on winter and fall 2016 GPAs by credential are negative, but none of these estimates are statistically significant (except for male certificate students). Female advanced diploma students show large effects on the winter 2017 GPA compared to diploma and certificate students (8.62 versus 3.1 and -1.1 points).³¹

Figure 8: Treatment Effects on Grades by Credential



The estimates are the intention-to-treat effect estimates reported under column "All controls" in Table 6. The asterisks ***, **, and * denote statistical significance at the 1%, 5%, and 10% levels, respectively.

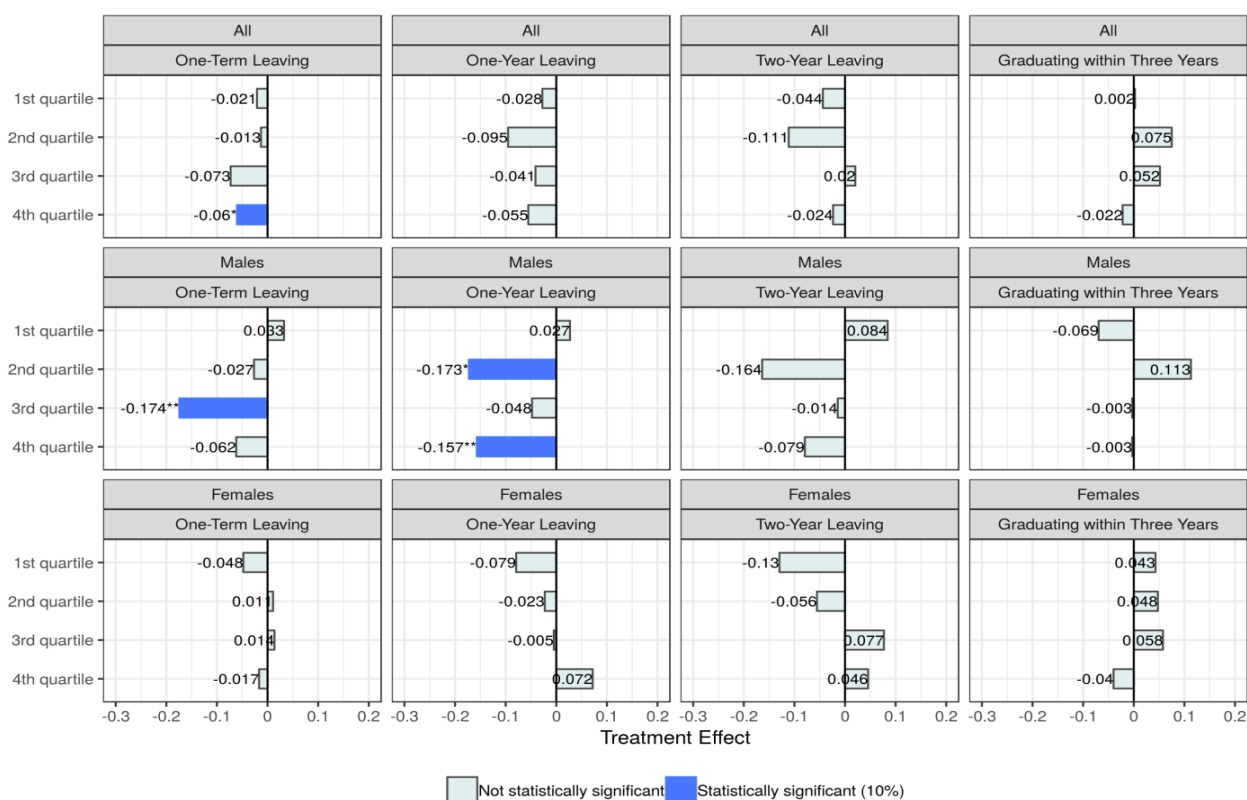
31 The difference in the estimated effects for advanced diploma and diploma students for female students is not statistically significant. There are very few students (i.e., 27) who enrolled in a certificate program at the start of fall 2015 and have non-missing fall 2016 and/or winter 2017 GPAs.

Effects by Reading Assessment Score

Figure 9, Figure 10 and Table 7 show the effect estimates by gender and reading assessment scores. There is no clear pattern of treatment effects on leaving and graduation across different score quartiles (Figure 9). Males who scored in the third quartile show large one-term leaving effects, whereas those in other quartiles do not have any statistically significant effects. As for one-year leaving, males who scored in the second and fourth quartiles show large effects, while those in other quartiles do not appear to have benefited from the writing exercise.³²

None of the effects on two-year leaving and graduating within three years by reading scores for males are statistically significant, and none of the leaving and graduation effects for females are statistically significant.

Figure 9: Treatment Effects on Leaving and Graduation by Reading Assessment Score

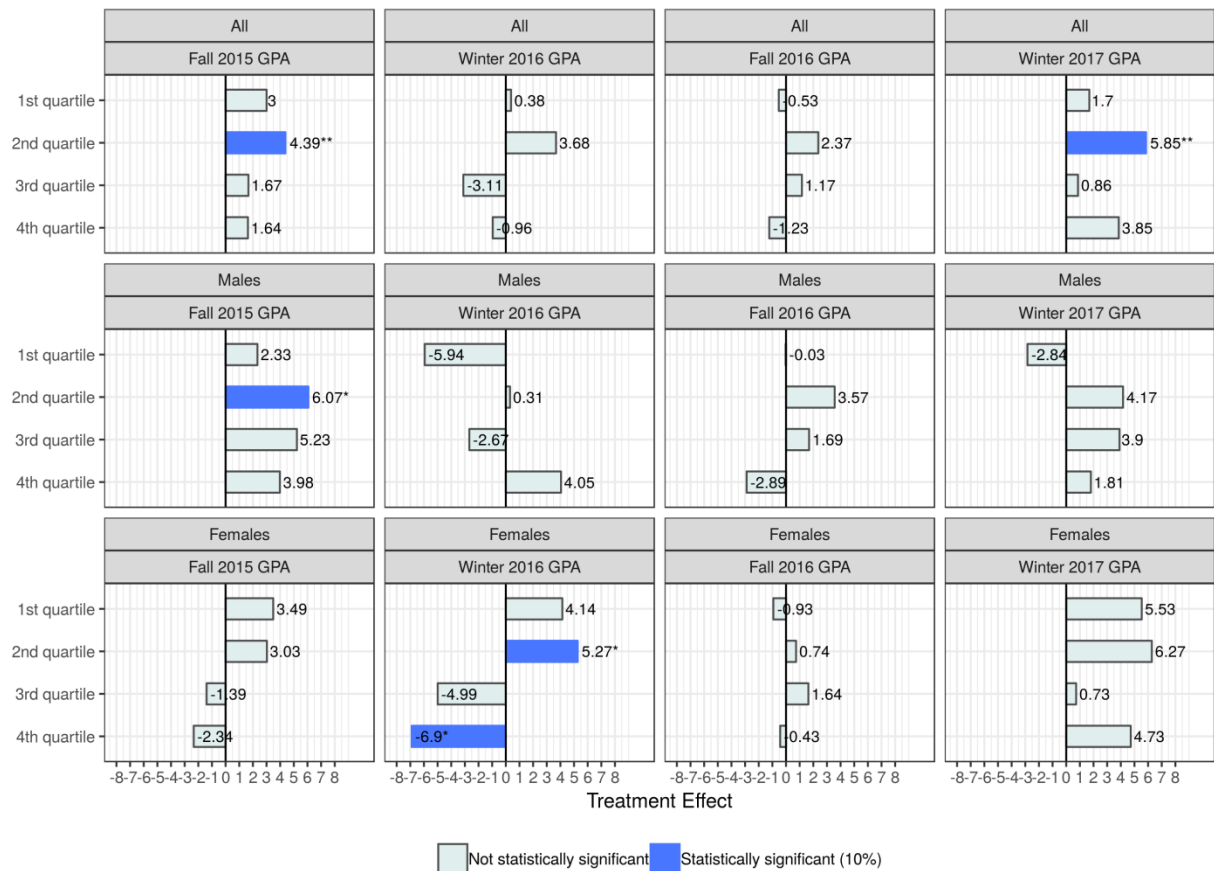


The estimates are the intention-to-treat effect estimates reported under column "All controls" in Table 7. The asterisks ***, **, and * denote statistical significance at the 1%, 5%, and 10% levels, respectively.

³² Males who scored within the second and third quartiles show relatively higher one-year leaving rates compared to others.

Similar to leaving effects, there is no clear pattern in the grades effects by reading score (Figure 10).

Figure 10: Treatment Effects on Grades by Reading Assessment Score



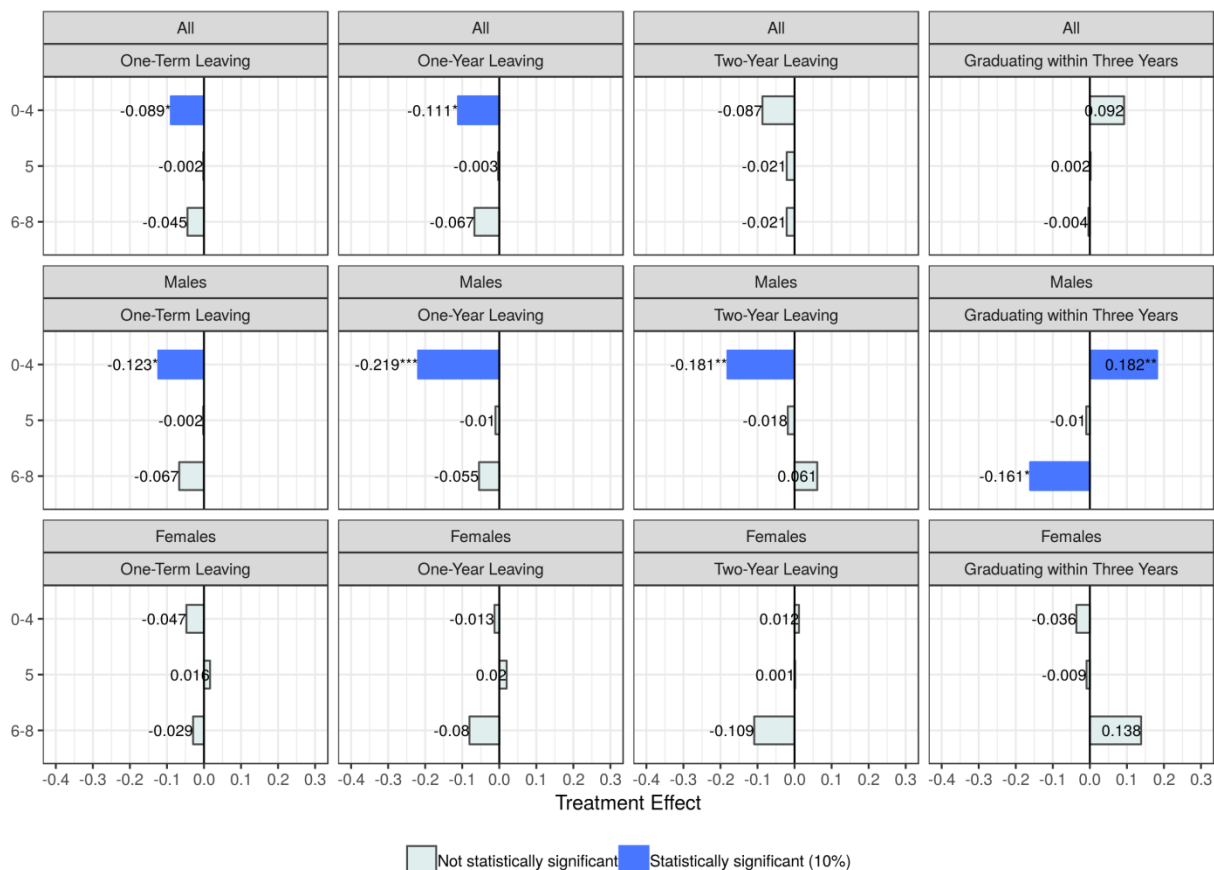
The estimates are the intention-to-treat effect estimates reported under column "All controls" in Table 7. The asterisks ***, **, and * denote statistical significance at the 1%, 5%, and 10% levels, respectively.

Effects by Writing Assessment Score

Figure 11, Figure 12 and Table 8 show the effect estimates by gender and writing assessment scores. Males who scored from 0–4 show large and statistically significant effects of the writing exercise on all leaving and graduation outcomes, whereas other students who did better on the writing assessment test do not show any statistically significant effects, except for negative effects on the graduation outcomes of males who scored from 6–8 (Figure 11).

Males who did poorly in the writing assessment tests typically have higher leaving rates and lower graduation rates compared to others. Therefore, the writing exercise seems to have benefited those who needed more help. There are no statistically significant effects across different writing assessment scores for females.

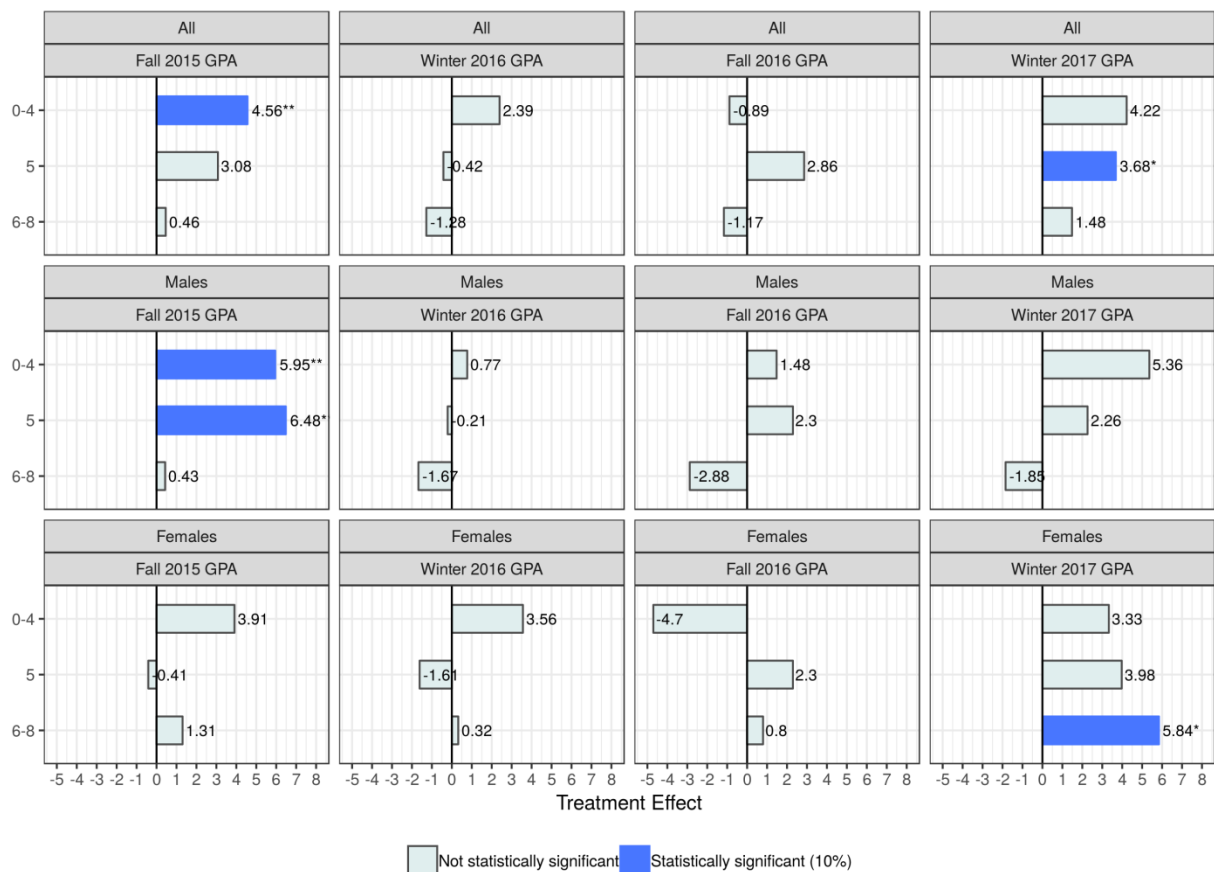
Figure 11: Treatment Effects on Leaving and Graduation by Writing Assessment Score



The estimates are the intention-to-treat effect estimates reported under column "All controls" in Table 8. The asterisks ***, **, and * denote statistical significance at the 1%, 5%, and 10% levels, respectively.

Figure 12 shows that the positive effect of the writing exercise on the fall 2015 GPA (first-term GPA) for males seen in Figure 2 (and Table 3) is driven by males who scored from 0–4 or 5, and the positive effect on the winter 2017 GPA (fifth-term GPA) for females is driven by females who scored in the top writing assessment score category (6–8).

Figure 12: Treatment Effects on Grades by Writing Assessment Score



The estimates are the intention-to-treat effect estimates reported under column "All controls" in Table 8. The asterisks ***, **, and * denote statistical significance at the 1%, 5%, and 10% levels, respectively.

Conclusion

This report has examined the effectiveness of an online goal-oriented writing exercise implemented at Mohawk College to improve student success (retention, graduation and grades) using an experimental research design with random assignment.

The administration of this experiment was motivated by the evidence pertaining to the positive effects of similar writing exercises on academic performance (Morisano et al., 2010; Schippers et al., 2015) and its relatively easy implementation and low costs compared to other types of interventions involving cash rewards, close monitoring of students (coaching) and additional advising services.

Summary of the Findings

Overall, those who were offered the writing exercise have one-term leaving rates that are 3.9 percentage points lower than those who were not offered the exercise (whose leaving rate is 13.6%), but the effects do not seem to last (i.e., no effects on one-year and two-year leaving, or on three-year graduation).

Those who are in the control group have average GPAs in fall 2015 (first term) and winter 2017 (fifth term) of 71.1 and 72.6, respectively, while those who are in the treatment group (i.e., offered the writing exercise) have grades that are 2.1 and 3.2 grade points higher than those in the control group.³³

The results by gender show that the writing exercise has large and statistically significant effects in the short run (i.e., over the first term and year) for males — with the treatment effects being mostly stronger in the first term — while the effects are generally very small and not statistically significant for females. Thus, the exercise appears to keep male students enrolled just a little longer (one term or year) than they would be otherwise, but eventually these students leave before their third year or do not end up graduating.

Males show sizable improvements in one-term and one-year retention, and a modest but statistically significant increase in their grades in the first term (i.e., fall 2015 GPA). Male retention is improved by 6.2 and 8.5 percentage points during the first term and year, and the average first-

33 The samples used to estimate the treatment effects on the fall 2015 and winter 2017 term GPAs are different. Fall 2015 GPA sample includes 300 more students than the winter 2017 GPA sample as students drop out and the incidence of missing GPAs increases over time. Therefore, the size of the point estimates for the two samples cannot be compared as the differences could arise from differences in student characteristics that are not observed in the data available.

term grade (i.e., fall 2015 GPA) for the treatment group is 3.8 points higher than the control group. The only statistically significant effect for females is seen for average grades in the fifth term (i.e., winter 2017 GPA), with average grades 4.2 points higher for the treatment group than the control group GPA of 73.3.

For males, the writing exercise appears to be most effective in improving one-term and one-year retention for those who are older (23 and above), did poorly in high school (below-70 high school average), and who scored lower on the writing assessment test (0–4 points). The effects persist into the second year for males who did poorly in high school, with large effects on two-year leaving, and even into the third year for males who scored lower on the writing assessment test with large increases in three-year graduation rates. Moreover, the writing exercise helps to keep male advanced diploma and certificate students enrolled for the first term following the exercise, but it does not affect their outcomes in the longer run (e.g., one-year and two-year leaving, and three-year graduation). On the other hand, while one-year retention improves for male diploma students, other outcomes are unaffected for these students.

The effects on first-term grades for males are driven by those who are older, did worse in high school, are advanced diploma students, scored within the second quartile of the reading score distribution, and scored between 0 and 4 or 5 on the writing assessment test.

Females who did poorly in high school show large effects on one-term leaving, but no statistically significant effects on other leaving, graduation, or grades outcomes. The effect on the average grades in the fifth term (i.e., winter 2017 GPA) seen for females overall is mostly driven by those who are below 18 (and in part by those who are 19–22), did poorly in high school, are advanced diploma students, and scored higher on the writing assessment test (from 6–8 points).

In sum, the findings suggest that offering a one-time online writing-intensive goal-setting exercise may provide a low-cost and effective approach to improving student outcomes, especially male retention, with the effects being greater for those groups of students with generally higher leaving rates and lower PSE grades (e.g., those who are less academically prepared).

The effects of the writing exercise appear to be short lived for most students, although they persist into the second year for males with low high school averages and even into the third year for males who scored lower on the writing assessment test.

Comparison to Previous Findings

The large effects of the writing exercise for males and small or not statistically significant effects for females are consistent with previous research (Schippers et al., 2015). At the college, males typically exhibit poorer PSE outcomes than females, in the form of higher leaving rates and lower average grades. This may explain why the writing exercise seems to be most effective for males in this study. Improved outcomes, although only in the short term (one-term or one-year outcomes), for males in response to being offered the writing exercise could indicate that most of what male students needed to achieve better outcomes was a one-time intervention to get them to reflect on their future and goals, which in turn could have improved their study habits as well as increased their motivation, sense of belonging and connection to the college.

For females, the story could be a little different. Considering female students already tend to have better PSE outcomes than male students, the potential for the writing exercise to improve their outcomes might have been restricted. In other words, since their outcomes were already good, there is not as much room for improvement as there is for males.³⁴

Other examples of studies reporting gender-specific effects of interventions designed to improve PSE outcomes include Angrist et al. (2009) and Bettinger and Baker (2014). In contrast to the findings presented in this report, Angrist et al. (2009) find large effects on females' academic performance and small and not statistically significant effects on male outcomes of an intervention combining support services (i.e., mentoring by upper-year students) and cash awards. However, it should be noted that the females generally had worse PSE outcomes compared to males (i.e., lower average grades, credits earned, and proportion in good academic standing) in the sample used by Angrist et al. (2009), which is in contrast to the gender patterns in the outcomes seen for the sample used in the analysis undertaken in this study. Therefore, the implications of Angrist et al. (2009) and this report are similar in that underperforming students benefit more.

Bettinger and Baker (2014) find larger effects of coaching services provided by phone on male retention. The coaching services improved six-month retention of males and females by 6.1 and 2.5 percentage points, and 12-month retention by 5.4 and 4.5 percentage points, respectively. Their estimates for males correspond to a 13% drop in six-month and a 9% drop in 12-month leaving rates compared to the control group, smaller than the relative effects found for males in this report

³⁴ The same argument can be made for other subgroups such as those who did well in high school and those who scored higher on the writing assessment test.

(drops by 38% and 26% for four-month [one-term] and 12-month [one-year] leaving rates, respectively).³⁵

In contrast to the findings here, Dobronyi et al. (2017) and Oreopoulos and Petronijevic (2018) do not find any statistically significant effects for a one-time online writing-intensive goal-setting exercise. Instead, Oreopoulos and Petronijevic (2018) find large effects from coaching on grades.

The difference in the results on the effectiveness of online writing exercises on retention (mostly over the first term and first year) presented here and in Dobronyi et al. (2017) and Oreopoulos and Petronijevic (2018) could be explained, at least in part, by the differences in students involved in two studies. The one-year leaving rate for the sample of students in the control group used by Dobronyi et al. (2017) is much lower than that of the sample of students in the control group used in the analysis undertaken here (15% versus 28%). The latter, therefore, potentially consists of students that need more help to persist through their studies compared to the former, thereby leaving more room for the writing exercise to have an impact on student outcomes.

Another reason for the differences in the results could be the differences in the way the exercises were rolled out. The writing exercise tested here was offered to students across all programs of study who chose to attend the summer orientation offered to first-year students. In contrast, the writing exercise examined by Dobronyi et al. (2017) was offered to all students enrolled in a first-year economics course at the University of Toronto at Mississauga. Participation in the online exercise was required and counted for 2% of the final grade.³⁶ Similarly, the writing exercise tested by Oreopoulos and Petronijevic (2018) was offered to all students registered for first-year economics classes at the University of Toronto, who were also required to participate in the online exercise as part of their course requirements (2% of final grade).

Further, while the writing exercise tested here and the exercise tested by Dobronyi et al. (2017) are similar, the exercise tested by Oreopoulos and Petronijevic (2018) is different, with only some of its sections resembling the exercise studied here.³⁷

35 Bettinger and Baker (2014) use US data and the composition of the sample used by these authors differs from the sample used in this paper in terms of age and the types of postsecondary institutions with both two- and four-year institutions pooled in their analysis.

36 The authors provide evidence that their results are similar for the full sample including all students enrolled in first-year economics classes (i.e., first-year students, second-year students or students in upper years) and the sample of first-year students enrolled in first-year economics classes.

37 For example, the exercise studied by Oreopoulos and Petronijevic (2018) includes sections about relating the university (i.e., the University of Toronto) to the student's future, effective time use and learning.

Implications for Practice

Future applications of the writing exercise at the college or at other institutions could include testing the exercise with broader groups of students, such as the entire first-year cohort or multiple cohorts of students including those in their second and later years; re-offering the exercise to students in later years of their programs; targeting the writing exercise specifically on students with characteristics associated with high leaving rates and poorer academic performance; using different kinds of writing exercises (e.g., shorter exercises that merely require setting and describing goals); and using different modes of delivery, such as making it part of the registration process or classroom activities, or alternatively the exercise could be made available as an online tool for students to do on their own time or as a resource for advisers and counsellors to offer to students who they believe would benefit from it.

The findings presented in this report may point to an effective, low-cost intervention with the potential to improve students' outcomes, especially in the short term. But we need to better understand these kinds of goal-oriented writing exercises and their effects before such programs can be rolled out on a wider basis, especially given the diversity of findings on these kinds of exercises reported in the literature.

Main Tables

Table 3: Treatment Effects on Leaving, Graduation and Grades

	All		Males		Females	
	No controls	All controls	No controls	All controls	No controls	All controls
ONE-TERM LEAVING						
Control Group Mean	0.136		0.164		0.108	
Treatment Effect	-0.043* (0.023)	-0.039* (0.020)	-0.075** (0.034)	-0.062** (0.031)	-0.012 (0.031)	-0.015 (0.026)
Observations	759		374		385	
ONE-YEAR LEAVING						
Control Group Mean	0.282		0.322		0.242	
Treatment Effect	-0.054* (0.032)	-0.044 (0.030)	-0.092** (0.046)	-0.085* (0.043)	-0.016 (0.043)	-0.017 (0.042)
Observations	759		374		385	
TWO-YEAR LEAVING						
Control Group Mean	0.341		0.355		0.328	
Treatment Effect	-0.031 (0.034)	-0.029 (0.033)	-0.036 (0.049)	-0.035 (0.046)	-0.026 (0.047)	-0.034 (0.047)
Observations	759		374		385	
GRADUATING WITHIN THREE YEARS						
Control Group Mean	0.515		0.415		0.613	
Treatment Effect	0.003 (0.036)	0.011 (0.033)	-0.007 (0.051)	-0.002 (0.046)	0.01 (0.050)	0.025 (0.047)
Observations	759		374		385	
FALL 2015 GPA						
Control Group Mean	71.1		67.82		74.36	
Treatment Effect	2.09* (1.27)	2.12** (1.04)	3.70* (1.96)	3.82** (1.69)	0.44 (1.57)	0.85 (1.28)
Observations	724		358		366	
WINTER 2016 GPA						
Control Group Mean	71.3		69.62		72.82	
Treatment Effect	-0.97 (1.41)	-0.73 (1.29)	-1.38 (2.14)	-1.88 (2.05)	-0.48 (1.85)	0.02 (1.76)
Observations	647		312		335	
FALL 2016 GPA						
Control Group Mean	74.29		72.82		75.6	
Treatment Effect	-0.58 (1.33)	0.07 (1.17)	-1.72 (1.91)	-1.19 (1.73)	0.64 (1.81)	1.03 (1.62)
Observations	509		246		263	
WINTER 2017 GPA						
Control Group Mean	72.59		71.17		73.73	
Treatment Effect	2.57* (1.49)	3.15** (1.30)	1.19 (2.14)	2.09 (1.96)	4.02** (2.04)	4.23** (1.84)

Observations	424	196	228
Standard errors are given in parentheses. The symbols ** and * denote statistical significance at the 5% and 10% levels, respectively. The estimated effects represent the intention-to-treat (ITT) effects (see Section 4.4), which come from linear probability models for the respective outcome variable. The column “Controls” presents the results from a linear regression model of the relevant outcome variable on the treatment indicator. The column “All controls” presents the coefficient estimate for the treatment indicator from the models including gender, age, credential, school, high school average, reading and writing assessment scores.			

Table 4: Treatment Effects on Leaving, Graduation and Grades by Age

	One-Term Leaving	One-Year Leaving	Two-Year Leaving	Grad. w/in Three Years	Fall 2015 GPA	Winter 2016 GPA	Fall 2016 GPA	Winter 2017 GPA
ALL								
Below 18	-0.021 (0.033)	-0.032 (0.045)	-0.041 (0.048)	0.001 (0.048)	2.120 (1.578)	1.025 (1.891)	1.826 (1.615)	4.316** (1.912)
19–22	-0.054 (0.036)	-0.041 (0.055)	-0.041 (0.058)	0.044 (0.058)	1.478 (1.925)	-2.237 (2.353)	-1.424 (2.322)	3.754 (2.662)
23 and above	-0.056 (0.036)	-0.087 (0.059)	-0.003 (0.067)	-0.008 (0.069)	2.485 (2.092)	-2.942 (2.661)	-2.221 (2.514)	-1.264 (2.137)
Observations	759	759	759	759	724	647	509	424
MALES								
Below 18	-0.043 (0.049)	-0.075 (0.065)	-0.029 (0.068)	-0.062 (0.067)	3.237 (2.522)	-0.290 (2.988)	0.416 (2.052)	2.013 (2.654)
19–22	-0.041 (0.053)	-0.058 (0.080)	-0.029 (0.083)	0.092 (0.080)	2.320 (2.967)	-4.455 (3.804)	-3.475 (3.447)	1.565 (3.876)
23 and above	- 0.139**	- 0.161*	- -0.063	0.001	7.550**	-1.940	-1.938	2.377
Observations	374	374	374	374	358	312	246	196
FEMALES								
Below 18	0.022 (0.045)	0.025 (0.066)	-0.029 (0.073)	0.048 (0.071)	0.317 (1.938)	1.842 (2.590)	2.477 (2.609)	5.884** (2.796)

19–22	-							
	0.087*	-0.057	-0.090	0.018	2.166	-0.256	1.019	5.979
	(0.050)	(0.078)	(0.084)	(0.088)	(2.535)	(2.945)	(3.264)	(3.856)
23 and above	0.006	-0.058	-0.000	0.012	-0.098	-2.767	-1.777	-2.619
	(0.043)	(0.076)	(0.087)	(0.090)	(2.380)	(3.387)	(2.730)	(2.371)
Observations	385	385	385	385	366	335	263	228

Standard errors are given in parentheses. The symbols ** and * denote statistical significance at the 5% and 10% levels, respectively. The estimated effects represent the intention-to-treat (ITT) effects (see Section 4.4), which come from a linear regression model that includes treatment indicator, interaction terms between the treatment indicator and age categories, and other control variables included in linear form (i.e., gender, age, credential, school, high school average, reading and writing and reading assessment scores).

Table 5: Treatment Effects on Leaving, Graduation and Grades by High School Average

	One-Term Leaving	One-Year Leaving	Two- Year Leaving	Grad. w/in Three Years	Fall 2015 GPA	Winter 2016 GPA	Fall 2016 GPA	Winter 2017 GPA
ALL								
Below 70	-0.153*** (0.054)	-0.133* (0.071)	-0.122* (0.073)	0.037 (0.066)	5.393* (2.797)	0.235 (3.304)	-0.596 (3.712)	7.043* (4.104)
70 and above	-0.005 (0.025)	-0.017 (0.038)	-0.016 (0.042)	0.027 (0.043)	1.706 (1.276)	-0.353 (1.561)	0.735 (1.471)	2.392 (1.545)
Missing	0.026 (0.021)	0.010 (0.062)	0.094 (0.069)	-0.134* (0.081)	-2.401 (2.154)	-4.353 (3.286)	-3.258 (2.707)	-0.714 (2.848)
Observations	759	759	759	759	724	647	509	424
MALES								
Below 70	-0.169** (0.082)	-0.295*** (0.092)	-0.194** (0.096)	0.047 (0.085)	7.167* (4.026)	3.674 (4.907)	-1.664 (4.309)	3.359 (4.985)
70 and above	-0.005 (0.038)	0.003 (0.061)	0.022 (0.064)	0.032 (0.065)	3.390 (2.315)	-2.741 (2.543)	1.331 (2.389)	1.312 (2.436)
Missing	-0.014 (0.026)	0.051 (0.084)	0.123 (0.095)	-0.261** (0.110)	-4.111 (2.756)	-6.922 (5.037)	-9.903** (4.016)	-1.165 (4.075)
Observations	374	374	374	374	358	312	246	196
FEMALES								
Below 70	-0.124* (0.067)	0.067 (0.110)	-0.029 (0.114)	0.024 (0.111)	3.783 (3.667)	-3.631 (4.508)	-0.408 (5.854)	11.924* (6.340)
70 and above	0.002 (0.034)	-0.039 (0.050)	-0.051 (0.058)	0.021 (0.058)	-0.223 (1.445)	0.991 (2.056)	0.195 (1.778)	3.004 (2.114)
Missing	0.044 (0.037)	-0.064 (0.099)	0.015 (0.116)	0.040 (0.124)	1.238 (3.377)	0.025 (4.750)	3.295 (4.517)	-1.830 (3.941)
Observations	385	385	385	385	366	335	263	228

Standard errors are given in parentheses. The symbols ***, ** and * denote statistical significance at the 1%, 5% and 10% levels, respectively. The estimated effects represent the intention-to-treat (ITT) effects (see Section 4.4), which come from a linear regression model that includes treatment indicator, interaction terms between the treatment indicator and high school average categories, and other control variables included in linear form (i.e., gender, age, credential, school, high school average, reading and writing and reading assessment scores).

Table 6: Treatment Effects on Leaving, Graduation and Grades by Credential

	One-Term Leaving	One-Year Leaving	Two-Year Leaving	Grad. w/in Three Years	Fall 2015 GPA	Winter 2016 GPA	Fall 2016 GPA	Winter 2017 GPA
ALL								
Advanced Diploma	-0.064* (0.038)	-0.023 (0.054)	-0.032 (0.057)	0.000 (0.055)	3.639* (2.058)	-1.952 (2.376)	-0.131 (1.867)	2.939 (2.243)
Certificate	-0.159** (0.067)	-0.007 (0.094)	-0.008 (0.093)	-0.066 (0.094)	2.484 (3.404)	-2.748 (3.448)	-4.742 (6.257)	4.144 (5.835)
Diploma	-0.004 (0.027)	-0.059 (0.041)	-0.028 (0.045)	0.033 (0.046)	1.194 (1.290)	0.161 (1.789)	0.591 (1.529)	3.189** (1.611)
Other/Missing	-0.130 (0.141)	-0.248* (0.143)	-0.252* (0.147)	0.200 (0.150)	4.219 (3.854)	7.735* (4.368)		
Observations	759	759	759	759	724	647	509	424
MALES								
Advanced Diploma	-0.086* (0.049)	-0.094 (0.067)	-0.073 (0.072)	-0.029 (0.064)	6.494** (2.965)	-0.868 (3.142)	-0.292 (2.287)	0.298 (2.710)
Certificate	-0.256* (0.137)	0.042 (0.160)	-0.019 (0.148)	0.080 (0.156)	0.418 (7.172)	-13.474** (5.821)	-7.177 (10.987)	22.466 (16.906)
Diploma	-0.018 (0.045)	-0.112* (0.063)	-0.022 (0.068)	0.015 (0.070)	2.475 (2.110)	-1.062 (2.966)	-1.718 (2.606)	2.700 (2.622)
Other/Missing	-0.264 (0.286)	0.093 (0.236)	0.044 (0.262)	-0.086 (0.244)				
Observations	374	374	374	374	358	312	246	196
FEMALES								
Advanced Diploma	-0.031 (0.058)	0.093 (0.089)	0.041 (0.102)	-0.015 (0.099)	-0.781 (2.593)	-3.532 (4.014)	-0.131 (3.391)	8.621** (4.024)
Certificate	-0.119 (0.073)	-0.016 (0.122)	-0.008 (0.120)	-0.129 (0.125)	3.784 (3.661)	2.422 (4.318)	-3.924 (7.264)	-1.126 (5.308)
Diploma	0.017 (0.034)	-0.041 (0.054)	-0.052 (0.062)	0.075 (0.064)	0.476 (1.585)	0.381 (2.174)	1.979 (1.896)	3.064 (2.296)
Other/Missing	-0.077 (0.177)	-0.335* (0.191)	-0.364** (0.181)	0.279 (0.193)	5.182 (5.257)	8.381 (6.133)		
Observations	385	385	385	385	366	335	263	228

Standard errors are given in parentheses. The symbols ** and * denote statistical significance at the 5% and 10% levels, respectively. The estimated effects represent the intention-to-treat (ITT) effects (see Section 4.4), which come from a linear regression model that includes treatment indicator, interaction terms between the treatment indicator and credential categories, and other control variables included in linear form (i.e., gender, age, credential, school, high school average, reading and writing and reading assessment scores).

high school average, reading and writing and reading assessment scores). The degree, graduate certificate students and those with missing credential information are categorized as “Other/Missing” due to very small sample sizes.

Table 7: Treatment Effects on Leaving, Graduation and Grades by Reading Assessment Score

	One-Term Leaving	One-Year Leaving	Two-Year Leaving	Grad. w/in Three Years	Fall 2015 GPA	Winter 2016 GPA	Fall 2016 GPA	Winter 2017 GPA
ALL								
1 st quartile	-0.021 (0.057)	-0.028 (0.075)	-0.044 (0.079)	0.002 (0.076)	3.004 (2.573)	0.381 (2.958)	-0.530 (2.760)	1.695 (3.141)
2 nd quartile	-0.013 (0.040)	-0.095 (0.066)	-0.111 (0.074)	0.075 (0.070)	4.386** (2.107)	3.681 (2.299)	2.366 (2.277)	5.848** (2.607)
3 rd quartile	-0.073 (0.050)	-0.041 (0.071)	0.020 (0.073)	0.052 (0.075)	1.673 (2.367)	-3.113 (3.710)	1.166 (2.810)	0.863 (2.701)
4 th quartile	-0.060* (0.032)	-0.055 (0.060)	-0.024 (0.064)	-0.022 (0.070)	1.636 (2.001)	-0.960 (2.640)	-1.229 (2.440)	3.851 (2.983)
Missing	-0.030 (0.044)	0.011 (0.065)	0.031 (0.070)	-0.075 (0.075)	-1.335 (2.796)	-5.577* (2.871)	-2.262 (3.552)	3.248 (3.783)
Observations	759	759	759	759	724	647	509	424
MALES								
1 st quartile	0.033 (0.094)	0.027 (0.116)	0.084 (0.124)	-0.069 (0.120)	2.334 (4.328)	-5.944 (5.260)	-0.029 (4.110)	-2.841 (4.557)
2 nd quartile	-0.027 (0.060)	-0.173* (0.101)	-0.164 (0.109)	0.113 (0.094)	6.070* (3.343)	0.311 (3.604)	3.565 (3.089)	4.165 (2.804)
3 rd quartile	-0.174** (0.077)	-0.048 (0.105)	-0.014 (0.104)	-0.003 (0.102)	5.227 (4.088)	-2.675 (5.825)	1.692 (4.772)	3.905 (4.293)
4 th quartile	-0.062 (0.051)	-0.157** (0.079)	-0.079 (0.090)	-0.003 (0.102)	3.979 (3.042)	4.047 (3.672)	-2.886 (3.895)	1.808 (4.425)
Missing	-0.048 (0.081)	-0.007 (0.091)	0.075 (0.090)	-0.098 (0.112)	-0.714 (4.897)	-12.525** (4.985)	-12.621** (5.473)	1.796 (6.339)
Observations	374	374	374	374	358	312	246	196
FEMALES								
1 st quartile	-0.048 (0.070)	-0.079 (0.096)	-0.130 (0.100)	0.043 (0.100)	3.491 (3.238)	4.144 (3.721)	-0.930 (3.575)	5.534 (4.293)
2 nd quartile	0.011 (0.056)	-0.023 (0.088)	-0.056 (0.105)	0.048 (0.105)	3.028 (2.571)	5.271* (3.053)	0.737 (3.546)	6.274 (4.410)
3 rd quartile	0.014 (0.061)	-0.005 (0.097)	0.077 (0.107)	0.058 (0.112)	-1.393 (2.490)	-4.993 (4.684)	1.640 (3.501)	0.728 (3.668)
4 th quartile	-0.017 (0.035)	0.072 (0.090)	0.046 (0.097)	-0.040 (0.106)	-2.337 (2.329)	-6.897* (4.006)	-0.428 (3.119)	4.730 (3.657)
Missing	-0.023 (0.055)	0.002 (0.094)	-0.049 (0.106)	-0.011 (0.104)	-1.050 (3.113)	-0.757 (3.697)	6.014 (4.491)	2.647 (4.378)
Observations	385	385	385	385	366	335	263	228

Standard errors are given in parentheses. The symbols ** and * denote statistical significance at the 1%, 5% and 10% levels, respectively. The estimated effects represent the intention-to-treat (ITT) effects (see Section 0), which come from a linear regression model that includes treatment indicator, interaction terms between the treatment indicator and reading assessment score categories, and other control variables included in linear form (i.e., gender, age, credential, school, high school average, reading and writing and reading assessment scores).

Table 8: Treatment Effects on Leaving, Graduation and Grades by Writing Assessment Score

	One-Term Leaving	One-Year Leaving	Two- Year Leaving	Grad. w/in Three Years	Fall 2015 GPA	Winter 2016 GPA	Fall 2016 GPA	Winter 2017 GPA
ALL								
0–4	-0.089* (0.053)	-0.111* (0.064)	-0.087 (0.070)	0.092 (0.067)	4.562** (2.221)	2.394 (2.786)	-0.885 (2.730)	4.224 (2.846)
5	-0.002 (0.033)	-0.003 (0.056)	-0.021 (0.059)	0.002 (0.059)	3.077 (1.916)	-0.422 (2.209)	2.859 (1.942)	3.681* (2.040)
6–8	-0.045 (0.033)	-0.067 (0.056)	-0.021 (0.062)	-0.004 (0.063)	0.460 (1.706)	-1.278 (2.634)	-1.165 (2.068)	1.484 (2.374)
Missing	-0.029 (0.044)	0.011 (0.065)	0.030 (0.070)	-0.075 (0.075)	-1.319 (2.796)	-5.538* (2.870)	-2.186 (3.555)	3.274 (3.772)
Observations	759	759	759	759	724	647	509	424
MALES								
0–4	-0.123* (0.067)	-0.219*** (0.081)	-0.181** (0.089)	0.182** (0.081)	5.950** (3.002)	0.772 (3.615)	1.478 (3.502)	5.362 (3.409)
5	-0.002 (0.059)	-0.010 (0.087)	-0.018 (0.090)	-0.010 (0.087)	6.482** (3.172)	-0.210 (3.283)	2.297 (2.869)	2.264 (3.087)
6–8	-0.067 (0.049)	-0.055 (0.084)	0.061 (0.090)	-0.161* (0.095)	0.431 (3.014)	-1.675 (4.778)	-2.877 (3.679)	-1.847 (4.138)
Missing	-0.051 (0.081)	-0.016 (0.091)	0.067 (0.090)	-0.092 (0.112)	-0.657 (4.896)	-12.179** (4.966)	-12.625** (5.477)	1.923 (6.342)
Observations	374	374	374	374	358	312	246	196
FEMALES								
0–4	-0.047 (0.086)	-0.013 (0.105)	0.012 (0.115)	-0.036 (0.117)	3.907 (3.292)	3.564 (4.702)	-4.702 (3.993)	3.331 (4.566)
5	0.016 (0.038)	0.020 (0.073)	0.001 (0.080)	-0.009 (0.082)	-0.413 (2.268)	-1.615 (2.989)	2.296 (2.808)	3.976 (2.650)
6–8	-0.029 (0.050)	-0.080 (0.077)	-0.109 (0.088)	0.138 (0.085)	1.306 (2.041)	0.323 (3.016)	0.799 (2.719)	5.843* (3.473)
Missing	-0.023 (0.055)	-0.001 (0.093)	-0.052 (0.105)	-0.006 (0.103)	-1.019 (3.113)	-0.730 (3.687)	6.109 (4.477)	2.860 (4.330)
Observations	385	385	385	385	366	335	263	228

Standard errors are given in parentheses. The symbols ***, ** and * denote statistical significance at the 1%, 5% and 10% levels, respectively. The estimated effects represent the intention-to-treat (ITT) effects (see Section 4.4), which come from a linear regression model that includes treatment indicator, interaction terms between the treatment indicator and writing assessment score categories, and other control variables included in linear form (i.e., gender, age, credential, school, high school average, and reading and writing and reading assessment scores).

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