**Deconstructing Developmental Pathways and Outcomes at Bakersfield College**

by

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**SECTION 1: BACKGROUND, FOCI, AND ORGANIZATION OF THIS REPORT**

Bakersfield College (BC) is engaged in a substantial effort to revise the structure and content of the developmental math and English curriculum with goals of improving the rate and pace of achievement of college-level competency. This study presented here was undertaken to investigate the results of this reform. While the research reported here was in progress, important and relevant legislation was passed by the State of California, referred to commonly as AB705. The current implementation of AB705 by the Chancellor’s Office requires community colleges to make substantial changes both to how they place students in the curriculum and to the standards of success that inform the curriculum that is offered. Hence, this report also seeks to provide insights into the efforts of BC to comply with AB705.

This report deconstructs students’ pathways through developmental education and disentangles the relationships between developmental pathways, student characteristics, student behaviors, and successful attainment of college-level competency, variously defined. A central focus of the study is the educational outcomes of students who entered the math curriculum or English curriculum at BC through a current developmental math or English course, and especially certain sets of courses that may be conceived of as parallel points of entry to the math curriculum or English curriculum. The study also compares the outcomes of students who began math or English in developmental education with the outcomes of students who had similar levels of academic achievement in high school but began math or English in transfer-level coursework.

With respect to developmental math, this study focuses primarily on students who entered the math curriculum through LRNC B530, Math B65, and Math B60. These three courses share the same prerequisite of ACDV B72 or placement into math level 02, and each to some degree provides instruction at the level of beginning algebra. This study also focuses special (but not exclusive) attention on transfer-seeking students and on the outcome of achieving transfer-level quantitative competency, meaning the successful completion of a transfer-level quantitative course. That said, several sections of the analysis of developmental math consider students with a broader range of goals and consider a broader range of outcomes, such as achieving associate degree-level quantitative competency and completing a STEM-track transfer-level math course.

With respect to developmental English, this study focuses primarily on two comparisons: Engl B60 versus Engl B53, and Engl B50 versus LRNC B510. Engl B60 and Engl B53 both begin at the basic writing level, two levels below college composition. Similarly, Engl B50 and LRNC B510 begin at the same level, one level below college composition. The primary outcome of interest is the achievement of transfer-level English competency. Note that, unlike some of the analyses of developmental math, the analyses of developmental English are *not* limited to transfer-seeking students. This is because the courses that satisfy English competency requirements for an associate’s degree at BC also satisfy key English competency requirements for transfer.

Although much of this report focuses on comparisons between students placed in one developmental math or English course versus another, the final section of the report expands these comparisons to consider transfer-level courses as well. In particular, the educational outcomes of students entering the curriculum through the focal developmental courses are compared with the outcomes of students who have similar levels of high school achievement but who entered the curriculum through transfer-level courses.

Section 2, which follows, presents selected terminology and definitions used in this report. Section 3 offers a summary of key findings of this study. Section 4 describes the data used in this study and the samples that were the focus of the analyses. Section 5 presents the results of the analysis of developmental math. The first subsection of Section 5 describes the focus of the analysis, and each subsequent subsection poses a series of research questions and then seeks to answer these questions. Section 6 presents the results of the analysis of developmental English and is organized in a manner similar to Section 5. Section 7 presents analyses of the outcomes of for students entering the curriculum through developmental versus transfer-level coursework, once differences between students in high school achievement and other characteristics are taken into account. Section 8 provides references for works cited. Section 9 contains all of the tables mentioned in the report.

**SECTION 2: SELECTED TERMINOLOGY**

Terminology Pertaining to Students’ Behavior

*Delay* ― the postponement of a student’s first math or English course until after the student’s first term in Bakersfield College

*Developmental Math/English Pathway* ­― the combination of a first developmental math/English course attempted by a student, the outcome of the first attempt of that course (successful versus unsuccessful), and a second math/English course attempted by the student, including repeating the first course if necessary

*Point of Entry* ― the first math/English course attempted by a student

*Repeat* ― attempting a given math or English course an additional (second or third) time after not passing it on the previous attempt

*Success* ― in the context of a student’s outcome in a course, achieving a grade of “C” or higher or a grade of “Pass”

*Term of entry* ― the term in which a student first enrolled in for-credit coursework at Bakersfield College

*Throughput* ― the rate at which students in a given group complete a course or courses at a specified level of competency in math or English within a particular time frame (e.g., one-year throughput of developmental math students to transfer-level math)

Terminology Pertaining to Students

*Historically disadvantaged race/ethnicity* ― a student who reported his/her race/ethnicity at college entry to be Black, Hispanic, Native American, or two or more racial/ethnic categories

*Older* ― a student who entered BC at 20 years of age or older

*Part-time* ― a student whose attempted course credit load in his/her first term in Bakersfield College was fewer than 12 credits if the first term was a regular fall or spring term, or fewer than 6 credits if the first term was a summer term

*Transfer-seeking* ― a student who reported his/her goal at college entry to be transfer to a four-year institution either with or without a credential from Bakersfield College

Terminology Pertaining to the Curriculum

*Associate-level quantitative competency* ― the successful completion of a math, psychology, philosophy, communication, or learning community course that fulfills the quantitative reasoning general education requirement for an associate’s degree at Bakersfield College but not for a baccalaureate degree at a California State University institution. These courses include Comm B5, Phil B7, Phil B9, Psyc B6, Math B70, or the second half of LRNC B530 (LRNC B530*s*).

*Transfer-level quantitative competency* ― the successful completion of a math or psychology course that fulfills the quantitative reasoning general education requirement for an associate’s degree at Bakersfield College and for a baccalaureate degree at a California State University institution. These courses include Math B1A, Math B1B, Math B2, Math B4A, Math B6A, Math B6B, Math B6C, Math B6D, Math B6E, Math B21, Math B22, Math B23, and Psyc B5.

*Transfer-level English competency* ― the successful completion of a course that satisfies the English competency requirement for an associate’s degree at Bakersfield College and also satisfies an English competency requirement for transfer to a California State University institution. These courses include Engl B1A, Engl B1B, Engl B2, Engl B3, or the second half of LRNC B510 (LRNC B510*s*).

**SECTION 3: SUMMARY OF KEY FINDINGS**

**3.1 Key Comparisons in Math**

LRNC B530 versus Math B65 versus Math B60[[1]](#footnote-1)

Once differences in the distribution of student characteristics across entry points to the developmental math curriculum are taken into account, *transfer-seeking students* who enter the curriculum through the first half of LRNC B530 (LRNC B530*f*) are more likely than are transfer-seeking students who enter through Math B65 or Math B60 to:

1. Achieve quantitative competency at the associate- or transfer-level (combined),
2. Achieve quantitative competency at the transfer-level (as distinct from the associate-level), and
3. Complete a STEM-track math course.

In turn, transfer-seeking Math B65 students are more likely to achieve all three of these outcomes than are transfer-seeking Math B60 students.

Limiting the focus to transfer-seeking students *who were successful in the first attempt of their first developmental math course*, students who enter the math curriculum through LRNC B530*f* remain more likely than are their peers who enter through Math B65 or Math B60 to achieve quantitative competency at the associate- or transfer-level (combined) and to complete a STEM-track math course. LRNC B530*f* and Math B65 students are about equally likely to achieve quantitative competency at the transfer-level (distinct from the associate-level), and both are more likely to achieve that outcome than are Math B60 students. However, Math B60 students are the second most likely to achieve quantitative competency at the associate- or transfer-level (combined) and to complete a STEM-track math course, above students who enter the curriculum through Math B65, which is a reversal of what was observed before limiting the analysis to students who were successful in their first math course. This reversal likely is a result of the fact that, although Math B60 students are somewhat less likely to pass their first math course than are Math B65 students, Math B60 students who do so are more likely to attempt a second quantitative course than are successful Math B65 students.

Further limiting the focus to transfer-seeking students who were both successful in the first attempt of their first developmental math course *and also attempted a second course that fit one of the common math pathways defined in this study*, one finds that LRNC B530*f* students who continue into the second half of LRNC B530 (LRNC B530*s*) retain an advantage in the completion of a STEM-track math course over their peers who enter through Math B65 or Math B60. However, in a reversal of the findings described earlier in this section, Math B65 students who continue into Math B22 or Psyc B5 are more likely to achieve associate- or transfer-level quantitative competency (combined) and transfer-level competency (distinct from associate-level) than are LRNC B530*f*-B530*s* students and Math B60 students who continue into Math B70. This change is a consequence of the fact that, on one hand, students who enter the developmental math curriculum through Math B65 are among the *least* likely to attempt a second quantitative course, regardless of whether they pass Math B65 on the first attempt or not. On the other hand, students who do pass Math B65 on the first attempt and then choose to proceed into Math B22 or Psyc B5 are enrolling directly in a transfer-level course, bypassing what is effectively a second developmental course required of students who enter the curriculum through LRNC B530*f* (and what is factually a second developmental course for students who enter the curriculum through Math B60). Thus, at least among the fraction of Math B65 students who pass the course on the first attempt and then advance to Math B22 or Psyc B5, even a low rate of first-attempt success in the second course (as is observed in Math B22) can offer an advantage in the overall rate at which students achieve college-level competency.

Turning to *students pursuing goals other than transfer*, after accounting for differences in the distributions of student characteristics, LRNC B530*f* students are more likely than are Math B65 students or Math B60 students to achieve associate- or transfer-level competency (combined), to achieve transfer-level competency (distinct from associate-level), and to complete a STEM-track math course. In turn, Math B60 students are *much* more likely than are Math B65 students to achieve associate- or transfer-level competency (combined), but modestly *less* likely than are Math B65 students to achieve transfer-level competency. These results hold when the sample includes both students who were successful in their first math course and those who were unsuccessful, and also when the sample is limited just to students who were successful in their first math course.

When the sample is limited to students seeking goals other than transfer, who were successful in their first math course, and who attempted a second course that fit one of the common math pathways identified in this study, comparisons with students who entered the curriculum through B65 are not supported by the regression model because the numbers of students achieving the outcomes of interest are either too low or too high. None of the Math B65-B22 students who passed their first math course on the first attempt achieved any of the three outcomes. None of the Math B65-Psyc B5 students who passed their first math course on the first attempt achieved STEM-track competency, but all of them achieved associate- or transfer-level competency (combined) and transfer-level competency (distinct from associate-level).

Setting aside these exclusions, LRNC B530*f*-B530*s* students are only slightly more likely to achieve associate- or transfer-level competency (combined) than are Math B60-B70 students, and the two groups are about equally likely to achieve STEM-track competency. Conversely, LRNC B530*f*-B530*s* are much more likely than are Math B60-B70 students to achieve transfer-level competency (distinct from associate-level competency).

Developmental versus Transfer-level Math

Taking into account differences in high school achievement and other students characteristics, the highest likelihood of achieving associate- or transfer-level quantitative competency (either or both) within one year of first enrolling in math is found among students who enter the curriculum through Psyc B5, followed by LRNC B530, and then Math B70. These findings hold true across all levels of high school of achievement considered in this analysis.

The highest likelihood of achieving transfer-level quantitative competency (distinct from associate-level) within one year is found among students who enter the curriculum through Psyc B5, followed by Math B22, and then Math B1A. However, among students with the lowest levels of high school achievement, differences between entry points in the likelihood of achieving transfer-level competency within one year are very small, with the sole exception of a comparatively strong likelihood among Psych B5 students.

**3.2 Key Comparisons in English**

Engl B53 versus Engl B60

Taking into account differences in the distributions of student characteristics across entry points to the developmental English curriculum, students who enter the curriculum through Engl B53 are consistently more likely to achieve transfer-level English competency than are students who enter the curriculum through the parallel Engl B60 course. This holds true under each of three tested conditions: (1) without regard to differences in the rate of first-attempt success between Engl B53 and Engl B60, (2) focusing exclusively on students who succeeded in the first attempt of their first English course, but without regard to differences in the rate of continuation into a second English course, and (3) focusing exclusively on students who succeeded in the first attempt of their first English course and proceeded into a second English course, focusing on the following common pairs: Engl B53-B1A versus Engl B60-B50.

LRNC B510 versus Engl B50

Once other factors are controlled, students who enter the developmental English curriculum through the first half of LRNC B510 (LRNC B510*f*) generally are more likely to achieve transfer-level competency than are students who enter through the parallel Engl B50. This advantage of LRNC B510 is driven largely by the comparatively high rate of first-attempt success observed among students in LRNC B510*f* and the comparatively high rate at which students who are successful in LRNC B510*f* continue on to a second course. Once these two factors are taken into account, students who enter the curriculum through LRNC B510 and Engl B50 are approximately equally likely to achieve transfer-level competency.

Developmental versus Transfer-level English

Taking into account differences in high school achievement and other students characteristics, the highest likelihood of achieving transfer-level English competency within one year of first enrolling in English is found among students who enter the curriculum through the transfer-level English course, Engl B1A. The sole exception to this generalization is, counterintuitively, the students with the highest levels of high school achievement, who appear to benefit from the compressed course LRNC B510. Although technically a developmental course, there is no time penalty associated with LRNC B510 because the second half of LRNC B510 is equivalent to Engl B1A. The advantage gained from LRNC B510 may be a result of the unique targeting and curriculum of the course.

**SECTION 4: DATA**

**4.1 Sample**

Data for this study were extracted from BC’s administrative database. The study focuses on students who meet the definition of BC’s *student success cohort*. As defined by BC’s institutional research team, the student success cohort includes students who reported a goal (either informed or uninformed) of a postsecondary credential or transfer to a four-year institution and/or who completed a degree-applicable course in their first full term in college.

Students included in this analysis began college at BC between Summer 2015 and Spring 2017 and had valid (non-missing) information on gender, race/ethnicity, age, citizenship, and goal reported at college entry (a.k.a., uninformed goal). Students’ course enrollments and outcomes were observed from their term of first enrollment in BC through Spring 2018.

**4.2 Subsample for Analysis of Developmental Math**

Analyses of developmental math and developmental English were executed separately. The subsample for the analysis of developmental math included students who attempted a first math course that was developmental in nature and that was among BC’s current developmental offerings. *As the term is used in this report, “developmental” refers to coursework designed for a level of skill below transfer-level*. This definition is debatable because BC, like most community colleges, offers quantitative courses that are below transfer-level but that satisfy quantitative reasoning requirements for an associate’s degree (e.g., Math B70, which is intermediate algebra).

In order to be included in the subsample for the developmental math analysis, students must have attempted their first math course no later than Spring 2017. Furthermore, students must have valid (non-missing) information about how they were placed in the math curriculum, whether through multiple measures or a standardized placements test.

**4.3 Subsample for Analysis of Developmental English**

The subsample for the analysis of developmental English is comparable to that of math. Students must have attempted a first English course that was developmental in nature and among BC’s current developmental offerings, must have attempted this first English course between their term of initial enrollment and Spring 2017, and must have valid information about how they were placed in the English curriculum.

**4.4 Subsample for the Comparison of Developmental and Transfer-Level Math**

To compare the outcomes of students whose first quantitative course was developmental in nature with the outcomes of students whose first quantitative course was transfer-level, the subsample used for the analysis of developmental math (see section 4.2) was expanded to include students whose first quantitative course was Math B1A, Math B22, or Psyc B5. Conversely, students whose first math course was ACDV B72 (the lowest level of developmental math) were dropped (removed) from the subsample. In addition, students who were missing information on cumulative high school grade point average or scaled high school assessment score were dropped. As with the other subsamples, students must have entered BC between Summer 2015 and Spring 2017, have attempted a first quantitative course no later than Spring 2017, and have valid (non-missing) information on gender, race/ethnicity, age, citizenship, goal reported at college entry, and assessment method. Students’ course enrollments and outcomes again were observed through Spring 2018.

**4.5 Subsample for the Comparison of Developmental and Transfer-Level English**

The subsample used to compare outcomes of students whose first English course was developmental versus students whose first English course was transfer-level was defined in a manner comparable to that of math. Students whose first English course was Engl B1A were added to the developmental English sample (see section 4.3), while students whose first English course was ACDV B80 were excluded. Students who were missing information on cumulative high school grade point average, scaled high school assessment score, gender, race/ethnicity, age, citizenship, goal reported at college entry, and assessment method were dropped. Students must have entered BC between Summer 2015 and Spring 2017 and have attempted a first English course no later than Spring 2017; course enrollments and outcomes again were observed through Spring 2018.

**SECTION 5: DEVELOPMENTAL MATH PATHWAYS**

**5.1 Analytical Focus**

BC currently offers five developmental math courses:

* ACDV B72 – basic arithmetic and pre-algebra
* Math B60 – beginning algebra
* Math B70 – intermediate algebra
* Math B65 – intermediate algebra for statistics
* LRNC B530 – a compressed course consisting of beginning algebra followed by intermediate algebra, offered in succession in a single term

*This study focuses primarily on students who entered the math curriculum through LRNC B530, Math B65, and Math B60.* These three courses may be considered parallel entry points to the math curriculum, sharing the same prerequisite of ACDV B72 or placement into math level 02, and providing instruction (at least to some extent) at the level of beginning algebra. One should note, however, that Math B65 differs from LRNC B530 and Math B60 in its exclusive focus on preparing students for transfer-level statistics (Math B22 or Psyc B5), as opposed to serving as a prerequisite to a broader range of transfer-level quantitative courses, such as pre-calculus (Math B1A) and finite mathematics (Math B23), but also including statistics.

Although the study focuses primarily on LRNC B530, Math B65, and Math B60, results frequently are presented for students who entered the developmental math curriculum through Math B70 and ACDV B72 ― the two other developmental math courses that BC currently offers. Math B70 is a higher-skill entry point to the math curriculum than are LRNC B530, Math B65, and Math B60, while ACDV B72 is a lower-skill entry point.

*This study also focuses heavily on the outcome of achieving transfer-level quantitative competency.* That said, other outcomes are considered in several parts of the analysis, including the achievement of associate degree-level quantitative competency and, separately, the completion of a STEM-track transfer-level math course.

**5.2 Students’ Point of Entry to the Math Curriculum**

Questions

This section seeks to address the following questions:

1. What is the nature of the relationship between a student’s entry point to the math curriculum (i.e., a student’s first math course) and:
	1. the delay of this first math course until after a student’s first term in college?
	2. the likelihood of passing this first math course on the first attempt?
	3. the likelihood of eventually demonstrating quantitative competency, whether for an associate’s degree or for transfer to a four-year institution?
2. Among students who eventually *complete a transfer-level quantitative course successfully*, how does the average length of time to achieve transfer-level quantitative competency differ across entry points to the math curriculum?

Delaying First Math

Table 1 presents selected statistics for students who entered BC’s math curriculum through a current developmental math offering. One observes here that students who enter the math curriculum through the first half of LRNC B530 (LRNC B530*f*) are much more likely than are students who begin with Math B60 to delay their first math course until after their first term in college (68% vs. 46%), which can be consequential for their time to achieve college-level quantitative competency. Students who begin with Math B65 are less likely to delay their first math course (52%) than are students who begin with LRNC B530*f* but more likely than students who begin with Math B60.

As an alternative to treating delay of first math as a simple dichotomy, delay also can be quantified as the number of terms between the first term in BC and the term of first math enrollment. In that case, students who enroll in their first math course in their first term in college would be assigned a value of zero (no delay), while students who enroll in their first math course in the term following their first term in BC would be assigned a value of one (a delay of one term), and so on. This quantification of delay confirms the conclusion that students who begin with Math B60 have a shorter average delay of first math than do students who begin with Math B65 (0.6 terms versus 0.8 terms), while students who begin with LRNC B530*f* exhibit the longest average delay of first math (1.1 terms).

First-Attempt Success

A student’s success (or not) in the first attempt of a given math course is a strong predictor of whether the student will continue to advance toward college-level quantitative competency or not (Bahr, 2012). Hence, it is important to examine associations between entry point to the math curriculum and rate of first-attempt success.

In Table 1, we observe that students who begin math with LRNC B530*f* have an especially strong first-attempt success rate, with more than five in six students (85%) passing the course on the first attempt.[[2]](#footnote-2) Course success is defined here and throughout this report as a grade of C or higher or a grade of “Pass”. In comparison, three-fifths (59%) of students who enter through Math B65 pass the course on the first attempt, and just over half (54%) of students who begin with Math B60 do so.

Demonstrating Quantitative Competency

Students at BC can demonstrate quantitative competency in several different ways, depending on their goals. Students who are seeking an associate’s degree can complete Rhetoric and Argumentation (Comm B5), Introduction to Logic (Phil B7), Critical Thinking and Advanced Composition (Phil B9), or Research Methods for the Behavioral and Social Sciences (Psyc B6). For the purposes of this study, completing any of these four courses will be described as demonstrating *associate-level quantitative competency by completing a qualifying* *non-math course*.

Alternatively, students seeking an associate’s degree could complete either Intermediate Algebra (Math B70) or the second half of LRNC B530 (LRNC B530*s*), which also is Intermediate Algebra. Completing either of these two courses will be described as demonstrating *associate-level quantitative competency by completing a qualifying* *math course*. These courses position students to continue to a transfer-level quantitative course if they choose to do so.

Finally, BC offers a range of course through which students can demonstrate *transfer-level quantitative competency*. Among these are Math B1A, Math B22, Math B23, Psyc B5, and others.

Table 2 provides that percentage of students who entered the math curriculum through a particular course and subsequently demonstrated quantitative competency through one of the methods described here, or else did not demonstrate quantitative competency. Note that each student is assigned to only one category of quantitative competency, with preference given to the highest competency demonstrated by each student. For example, a student who completed both Math B70 and Math B1A would be counted as having demonstrated *transfer-level quantitative competency* (as opposed to associate-level competency). A student who completed both Math B70 and Comm B5 would be counted as having demonstrated associate-level quantitative competency by completing *a qualifying math course* (as opposed to a qualifying non-math course).

The only developmental entry points through which a majority of students achieve quantitative competency are LRNC B530*f* and Math B70. More than two-thirds of students (69% and 68%, respectively) who enter the math curriculum through LRNC B530*f* or Math B70 achieve quantitative competency. Of the two entry points, LRNC B530*f* students are more likely to demonstrate transfer-level competency (38% versus 30%), while Math B70 are more likely to demonstrate quantitative competency at the associate-level by completing a qualifying math course (34% versus 25%).

The outcomes are less favorable for students entering through Math B60 and Math B65. Three in five Math B60 students (60%) and more than two-thirds of Math B65 students (69%) do *not* demonstrate quantitative competency. Comparing the two entry points, Math B65 students are more likely to demonstrate transfer-level quantitative competency (22% versus 13%), while Math B60 students are much more likely to demonstrate associate-level quantitative competency by completing a qualifying math course (23% versus 1%).

Time to Transfer-Level Quantitative Competency

In Table 3, I present the average time to demonstrate transfer-level quantitative competency by entry point to the math curriculum. This table includes only those transfer-seeking students who ultimately completed a transfer-level quantitative course. Students who did not attempt a transfer-level quantitative course or who attempted one or more such courses but never completed one successfully are excluded from Table 3.

Note that results for two different measures of time are presented in Table 3. The first is the average number of terms *from the term that a student enters BC* to the term in which the first transfer-level quantitative course was completed successfully, counting both regular and summer terms. The second is the average number of terms *from the term that a student attempts his/her first quantitative course* to the term in which the first transfer-level quantitative course was completed successfully, again counting both regular and summer terms. The first measure is consistent with a common understanding of the amount of time required for a typical student to achieve transfer-level quantitative competency. It also parallels time to achieve college-level competency as understood in the student success funding formula. The value of the second measure is that it removes from consideration the average differences in delay of first math enrollment that were noted in Table 1. Further, it is more consistent with how time to transfer-level competency is measured in the implementation of AB705.

Among students who complete a transfer-level quantitative course, Math B65 students demonstrate transfer-level competency more quickly, on average, than do LRNC B530*f* students and Math B60 students. This holds true even after accounting for (removing) the greater average delay of first math enrollment found among LRNC B530*f* students (see the last column of figures in Table 3). When counted from the term of first math enrollment, Math B65 students achieve transfer-level competency one-third of one term earlier than do LRNC B530*f* students and more than one and one-half terms earlier than do Math B60 students, on average. In turn, LRNC B530*f* students achieve transfer-level competency more quickly than do Math B60 students, and this holds true regardless of the greater average delay of first math enrollment observed among LRNC B530*f* students.

Importantly, only Math B65 and LRNC B530*f* have average times to transfer-level competency that are less than the time specified in the implementation of AB705. The reader will note that an average of three terms from first attempted math course is equivalent to the two *regular* terms specified in the implementation of AB705 because the analysis reported here counts summer terms.

**5.3 Operationalizing Math Pathways**

Questions

The analysis in the previous section demonstrated marked differences by first developmental math course in the rate at which students complete their first math course successfully on the first attempt and the rate at which students ultimately achieve various levels of quantitative competency. Prior research demonstrates a strong relationship between students’ success (or not) in their first math course and whether they eventually achieve transfer-level quantitative competency (Bahr, 2010). This relationship can be understood as a series of decisions that students make to continue (or not) in math beyond the first math course, whether advancing to a second math course or reattempting the first math course if necessary, and then to continue (or not) from the second math course to a third, and so on.

This section poses two questions. *Focusing exclusively on transfer-seeking students*, and taking into account students’ particular first math course and their outcome (successful versus unsuccessful) in their first attempt of that first math course:

1. How likely are students to attempt a second math course, including repeating the first math course if necessary?
2. Among students who attempt a second math course, what are the most common second courses?

Table 4 provides the distribution of students’ second attempted math course, if any, by first math course and outcome in the first attempt of their first math course, whether a successful outcome (grade of “C” or better or a grade of “Pass”) or an unsuccessful outcome (grades of “D” or below, grades of “No Pass”, and withdrawals). Note that Table 4 is limited to students who indicated a goal of transfer to a four-year institution, with or without completing an intermediate postsecondary credential. Furthermore, note that comparatively rare combinations of first and second math courses were collapsed together into a category named *Other*. A rare combination was defined as follows: given a group of students (*G*) who share a particular first math course (*X*) and a particular outcome (*Y*) in the first attempt of that first math course, second math courses (*Z*) attempted by fewer than 30 of the students in group *G* were deemed to be rare and collapsed together into a single *Other* category. The one exception is instances in which the percentage of *G* students who attempted second course *Z* was equal to or greater than 20%, in which case the second course was deemed rare and collapsed into the *Other* category only if the number of *G* students attempting the course was fewer than 15.

Defining Common Math Pathways

Of the transfer-seeking students who entered BC’s math curriculum through a math course that is among the current developmental offerings and who had valid information on key variables of interest in this study (discussed earlier), 57% completed their first math course successfully on the first attempt, and 60% attempted a second math course (including repeating the first course if necessary). Of the students who were *successful* in the first attempt of their first math course, 76% attempted a second math course. In contrast, 39% of students who were *unsuccessful* in their first attempt of their first math course attempted a second math course (including repeating the first course).

Table 4 provides the information necessary to define a series of common math pathways, combining information about first math course attempted, the outcome in this first math course, and second math course attempted. In turn, defining such pathways will aid efforts to understand students’ navigation of the developmental math curriculum and achievement of college-level quantitative competency. Note that not attempting a second math course is counted and reported as a potential choice of students in a given group (*G*) who share a particular first math course (*X*) and a particular outcome (*Y*) in the first attempt of that first math course, but it is not included among the pathways defined here regardless of the number or fraction of *G* students who elected this choice. Likewise, second math courses that are collapsed into the *Other* category are counted and reported in Table 4 but not included among the pathways as defined here.

Eleven common math pathways were identified. Together, the eleven pathways account for 1,370 students, which is 53% of the 2,602 transfer-seeking students included in Table 4. However, it is 87% of the subset of 1,566 students in Table 4 *who attempted any second math course*, including repeating the first course.

Eight of the math pathways pertain to students who successfully completed their first math course on the first attempt. These eight pathways account for 1,038 students: 70% of the 1,474 students who were successful in their first math course, but 92% of the subset of 1,127 students who were successful in their first math course *and* attempted any second math course.

The remaining three pathways pertain to students who were unsuccessful in the first attempt of their first math course. These pathways account for 332 students: 29% of the 1,128 students who were unsuccessful in their first math course, but 76% of the subset of 439 students who were unsuccessful in their first math course *and* attempted any second math course (counting as a possible “second course” the repeating of the first math course).

Students who Succeed in their First Math Course

Among students who are *successful* in the first attempt of their first math course, students who enter the math curriculum through the first half of LRNC B530 (LRNC B530*f*) are the most likely to continue into a second course, with 100% of them doing so. Nearly all (98%) of these students continue into the second half of LRNC B530 (LRNC B530*s*, equivalent to Math B70).

Students who enter the curriculum through Math B60 and complete this course successfully on the first attempt are the next most likely to continue into a second course, with 86% doing so. Most of these students continue into Math B70.

Math B65 students who complete their first math course successfully on the first attempt are the least likely to continue into a second math course, with less than three in five students (57%) doing so. However, the students who continue enroll primarily in a transfer-level quantitative course, mainly Math B22 or Psyc B5.

Students who are Unsuccessful in their First Math Course

Among students who are *unsuccessful* in the first attempt of their first math course, students who start in LRNC B530*f* have the best rebound rate. All of these students (100%) attempted a second math course, compared with 37% of unsuccessful Math B60 students and 29% of unsuccessful Math B65 students. To be clear, however, Table 4 includes only six students who enrolled in LRNC B530*f* as their first course and did not pass this course on the first attempt.

**5.4 Relationships Between Math Pathways and Selected Outcomes**

Questions

This section seeks to address the following questions. Among transfer-seeking students in the common math pathways, what is the nature of the relationship between students’ math pathway (as defined in this study) and:

1. the likelihood of passing their second math course[[3]](#footnote-3) on the first attempt?
2. the likelihood of eventually demonstrating transfer-level quantitative competency?
3. the average length of time to achieve transfer-level quantitative competency?

To address questions 1 and 2, Table 5 presents the percentage of students in the focal pathways who passed their second math course on the first attempt and the percentage of students who eventually demonstrated transfer-level quantitative competency, by math pathway. Note that the figures reported in Table 5 are limited to transfer-seeking students. Note also that the second math course is defined such that it may be the second attempt of the first math course. Thus, students who attempt their first math course a second time and pass this “second course” on the first attempt could be more accurately described as having passed their first math course on the second attempt.

Table 6 addresses question 3, presenting the average time to demonstrate transfer-level quantitative competency for students who completed a transfer-level quantitative course successfully. Like Table 5, Table 6 is limited to transfer-seeking students.

Students who Succeed in their First Math Course

As noted earlier, the majority of transfer-seeking students in the common math pathways who succeed in their first developmental math course continue into a second course. Of those who do, the highest rate of success in the second course is found among students whose second course is Psyc B5, Elementary Statistics for the Behavioral and Social Sciences. This high rate of success holds true whether students began with Math B65 (88% successful in their first attempt of Psyc B5) or Math B70 (90% successful in their first attempt of Psyc B5).

Much lower rates of first-attempt success are found among students who transition to Math B22, Elementary Probability and Statistics. Students who transition to Math B22 after completing Math B65 have a 42% chance of first-attempt success, while those who transition to Math B22 from Math B70 have a 50% chance of first-attempt success. Of note, for students who begin with Math B70, the rate of first-attempt success in Math B1A (51%), which is Pre-Calculus, is nearly identical to the 50% rate of first-attempt success observed among Math B70 students who transition to Math B22.

Nearly three-fifths (58%) of students who transition from the first half of LRNC B530 (LRNC B530*f*) to the second half of LRNC B530 (LRNC B530*s*) are successful in this second course. A similar but slightly smaller percentage of students who transition from Math B60 to Math B70 are successful in Math B70 (55%).

With respect to eventual achievement of transfer-level quantitative competency, the highest likelihood is found among students who transition to Psyc B5 from either Math B65 (88%) or Math B70 (93%). The next highest likelihood is found among students whose first math course is Math B70 and who then enroll in either Math B22 (76%) or Math B1A (71%).

A markedly lower rate of attainment of transfer-level quantitative competency (53%) is observed among students who transition from Math B65 to Math B22. This is troubling given the intended role of Math B65 in preparing students for transfer-level statistics, but it is unsurprising given the low rate of first-attempt success in Math B22 for students who began in Math B65, as detailed earlier. A similarly low rate of attainment of transfer-level quantitative competency (47%) is observed among students who transition to LRNC B530*s* after completing LRNC B530*f*, and a still lower rate (28%) is found among students who transition from Math B60 to Math B70.

In Table 6, one observes that, *relative to their term of first enrollment in college*, students who begin in Math B65 or Math B70 and ultimately achieve transfer-level quantitative competency do so in similar average times (3.3 to 3.8 terms) regardless of their second course. Average times from college entry to transfer-level competency are higher among students on the LRNC B530*f*-B530*s* pathway (4.2 terms) and Math B60-B70 pathway (5.0 terms). In the case of LRNC B530, this is not surprising because students who begin with LRNC B530*f* have longer average delays of first math than do their peers who enter the developmental math curriculum through other courses (see Table 1).

*When counted from the term of first math enrollment*, Math B65 students have the shortest average time to transfer-level competency, with a range of 2.2 to 2.5 semesters. Students who enter through LRNC B530*f* or Math B70 have similar average times, ranging from 2.8 to 3.1 semesters from first math enrollment. These times are near or below the two semesters specified in the AB705 implementation, keeping in mind that the figures reported in Table 6 count summer terms (i.e., a figure of three terms in Table 6 would indicate two regular terms). On the other hand, students who begin with Math B60 and ultimately achieve transfer-level competency do so more slowly than students who begin with Math B65, Math B70, or LRNC B530*f* ― an average of 4.2 terms after first math.

Students who are Unsuccessful in their First Math Course

Transfer-seeking students in the focal pathways who do not succeed in the first attempt of their first math course are at great risk of not achieving transfer-level quantitative competency. As noted earlier, three-fifths (61%) of these students do not attempt a second math course. Those who do attempt a second math course have a likelihood of success that typically is similar to the likelihood of success experienced by students taking the course for the first time. For example, students attempting Math B60 for the first time have a 54% rate of first-attempt success (Table 1), and those repeating the course a second time have a 58% rate of success (Table 5). The parallel numbers for Math B70 are 53% and 50%, respectively.

Not surprisingly then, few students who repeat a math course achieve transfer-level competency. One-in-six students (17%) who repeat Math B70 achieve transfer-level competency, and just over one-in-twenty students (6%) who repeat Math B60 do so.

**5.5 Continuing into a Third Math Course**

Questions

This section seeks to address the following questions. For a given group of students in a particular common math pathway who achieved a particular outcome in their second quantitative course:

* 1. How likely are the students to attempt a third quantitative course?
	2. What are the most common third courses?
	3. How likely are the students to attempt a STEM-oriented math course (e.g., Pre-Calculus)?

Table 7 presents the distribution of *third* quantitative course, if any, by math pathway and outcome in the *second* quantitative course. Again, only transfer-seeking students are included. Comparatively rare combinations of first, second, and third math courses are again collapsed into the *Other* category, using the consolidation rules described earlier.

Students who Succeed in their First and Second Quantitative Courses

Fifty-seven percent of students in the focal pathways who pass both their first and second quantitative courses on the first attempt continue into a third quantitative course. Table 7 reveals that students in certain pairs of first and second courses are especially *unlikely* to attempt any third quantitative course. These include Math B65-B22 (0% attempting a third quantitative course), Math B65-Psyc B5 (0%), and Math B70-Psyc B5 (5%). A larger but still minority share of students in the Math B70- B22 pair continues into a third course (42%), with a significant fraction enrolling in Math B23, Finite Math.

In contrast, the majority of students who are successful in the LRNC B530*f-*B530*s* pair and in the Math B60-B70 pair continue into a third course (84% and 61%, respectively). Although not transparent in Table 7, a reasonably similar share of students in the two pairs continue into Math B22 (28% and 22%, respectively) and Psyc B5 (16% and 15%, respectively). However, a much larger share of students in the LRNC B530*f-*B530*s* pair (40%) continue into Math B1A (Pre-Calculus I), as compared with students in the Math B60-B70 pair (21%).

Also of note, a majority of students in the Math B70-B1A pair (68%) continue into a third course. Most of these students enroll in Math B1B (Pre-Calculus II).

Students who Succeed in their Second Quantitative Course after an Unsuccessful First Course

About three in five students (56%) in the common pathways who are unsuccessful in their first quantitative course but continue and succeed in a second course (including repeating the first successfully) ultimately continue into a third course. Students who repeat Math B60 successfully are especially likely to continue into a third course, with two-thirds (67%) doing so.

Students who are Unsuccessful in their Second Quantitative Course

One will note in Table 7 that very few students in the common pathways who have two consecutive unsuccessful attempts in quantitative courses make additional attempts of any quantitative course.[[4]](#footnote-4) In other words, the occurrence of two consecutive unsuccessful attempts strongly predicts the end of a student’s quantitative course-taking, with just 11% of students making a third attempt of any quantitative course.

On the other hand, a little more than half (54%) of students in the common pathways who are *successful* in the first attempt of their first quantitative course but who are *unsuccessful* in the first attempt of their second quantitative course ultimately attempt a third course. The majority of these third courses are repeats of the second course.

**5.6 Structural Characteristics versus Student Characteristics**

Question

It is clear that there are marked differences in outcomes between students who enter the developmental math curriculum through different courses. However, none of the analyses presented in this report up to this point have been able to determine the extent to which these differences are due to the characteristics of students who tend to select particular entry points as opposed to the structure of the curriculum itself, the nature of instruction, and other related institutional factors. Said another way, one could ask whether the students who enter through a given course *A* achieve favorable outcomes at a higher rate than do students who enter through another course *B* because students with advantageous characteristics that predispose them to achieve favorable outcomes tend more often to choose *A* over *B*, or whether differences in outcomes are due to course, curricular, or structural factors that differ between *A* and *B*. To differentiate between the two explanations, one needs to measure (1) the association between entry points and outcomes while accounting for (2) associations between student characteristics and entry points and (3) associations between student characteristics and outcomes.

Moreover, although the achievement of transfer-level quantitative competency is an important outcome, the courses that fulfill this outcome differ in the subsequent educational opportunities that they provide. Chief among these differences is the opportunity to pursue advanced studies in science, mathematics, and engineering. Advanced studies of this sort typically require students to complete one or more calculus courses, and the gateway for calculus at BC is the pre-calculus series. Thus, we are led to ask whether some developmental math entry points or pathways better support readiness for advanced STEM-track mathematics once differences in the characteristics of students are taken into account.

Analytic Strategy

To address these questions, I used logistic regression to analyze natural variation in the likelihood of three separate outcomes among students who entered the developmental math curriculum through Math B60, Math B65, the first half of LRNC B530 (LRNC B530*f*), or Math B70. The three outcomes include:

1. Completing successfully any course that satisfies associate-level quantitative competency or transfer-level quantitative competency.
2. Completing successfully any course that satisfies transfer-level quantitative competency.
3. Completing successfully a STEM-track transfer-level math course, including Math B1A, Math B1B, Math B6A, Math B6B, Math B6C, Math B6D, or Math B6E.

Data for six subsamples were used to regress each of the three outcomes on point of entry to the developmental math curriculum and a set of selected covariates, resulting in a total of 18 regression models. In the cases of subsample #3 and subsample #6, the three outcomes were regressed on math pathways, which incorporate point of entry. The six subsamples were defined by combinations of self-reported goal, outcome in first quantitative course, and second quantitative course, if any. The subsamples are as follows:

1. All transfer-seeking students who entered the curriculum through one of the focal courses, regardless of whether they passed this course on the first attempt or not, and regardless of whether they attempted a second course or not.
2. All transfer-seeking students who entered the curriculum through one of the focal courses *and passed it on the first attempt*, but may or may not have attempted a second course.
3. All transfer-seeking students who entered the curriculum through one of the focal courses, passed it on the first attempt, and then attempted a second course that, in combination with the first course and the outcome of the first course, placed them in one of the common math pathways identified in this study.
4. All students pursuing a goal other than transfer who, like the students in subsample #1 above, entered the developmental math curriculum through one of the focal courses, but may or may not have passed it on the first attempt, and may or may not have attempted a second course.
5. All students pursuing a goal other than transfer who, like the students in subsample #2 above, entered the curriculum through one of the focal courses *and passed it on the first attempt*, but may or may not have attempted a second course.
6. All students pursuing a goal other than transfer who, like the students in subsample #3 above, entered the curriculum through one of the focal courses, passed it on the first attempt, and then attempted a second course that, in combination with the first course and the outcome of the first course, placed them in one of the common math pathways identified in this study.

Selected covariates were included in each of the regression models as statistical controls. These are as follows:

* + Part-time enrollment in the student’s first term of for-credit course-taking at BC (treated as dichotomous)
	+ Age at college entry (treated as dichotomous and coded to distinguish between students who were less than 20 years of age at college entry versus those who were 20 years of age or older)
	+ Self-reported gender (treated as dichotomous)
	+ Self-reported race/ethnicity (treated as dichotomous and coded to distinguish historically advantaged and disadvantaged groups, with the latter defined as Black, Hispanic, Native American, or two or more racial/ethnic categories)
	+ Method of assessment for placement in the math curriculum (treated as dichotomous and coded to reflect multiple measures placement versus placement test only)
	+ Term of entry to BC (coded with six categories, including Summer 2015, Fall 2015, Spring 2016, Summer 2016, Fall 2016, and Spring 2017)

Predicted Probabilities

In Table 8, I present predicted probabilities of achieving the three outcomes for each of the six subsamples. These predicted probabilities were derived from the results of the logistic regression models (not shown), which, by design, account for differences in the distribution of student characteristics across the math entry points and pathways. To derive the predictions, other variables included in the model must be held constant at specified values. Changing the values at which covariates are held constant affects the absolute differences between entry points in the predicted probabilities of the various outcomes, but it does not affect the order of entry points with respect to the probability of achieving a given outcome of interest. Thus, the entry point associated with the highest probability of a given outcome will remain the highest regardless of the values at which covariates are held. In this case, predictions were calculated for a male student under the age of 20 years at entry to BC who is not of a historically disadvantaged racial/ethnic group, who enrolled in BC for the first time in Fall 2016, who enrolled in a full-time course load in his first term, and who was assessed for placement into the math curriculum using multiple measures.

Transfer-seeking Students

The predictions for subsample #1 compare outcomes for transfer-seeking students across entry points without accounting for differences between entry points in the likelihood of first-attempt success, the association between first-attempt success and attempting a second quantitative course, and choice of which second quantitative course among those students who continue in math after their first course. Comparing the three focal entry points, one observes that students who enter through the first half of LRNC B530 (LRNC B530*f*) students are more likely than are Math B65 students to achieve all three quantitative competency outcomes: competency at the associate- or transfer-level (combined), competency at the transfer-level (as distinct from associate-level only), and STEM-track competency. The differences in the first and third outcomes are particularly pronounced, with LRNC B530*f* students experiencing a sizeable advantage over students entering the curriculum through Math B65 or Math B60. In turn, Math B65 students are more likely to achieve all three outcomes than are Math B60 students.

When the sample is limited to transfer-seeking students who *completed their first developmental math course successfully on the first attempt* (subsample #2), the picture remains much the same with two exceptions. First, LRNC B530*f* and Math B65 students are about equally likely to achieve transfer-level quantitative competency. Second, Math B60 students have a moderate advantage over Math B65 students in the likelihood of achieving associate- or transfer-level quantitative competency (combined) and the achievement of STEM-track quantitative competency. This likely is a result of the fact that, though Math B60 students are somewhat less likely to pass their first math course than are Math B65 students (Table 1), Math B60 students who do pass their first math course are more likely to attempt a second quantitative course (Table 4). Still, LRNC B530*f* students retain an edge over Math B60 students on all three outcomes.

The picture with respect LRNC B530*f* and Math B65 changes when the analytical sample is further limited to subsample #3: transfer-seeking students who succeeded in their first attempt of their first math developmental course *and then attempted a second quantitative course that, in combination with the first course, placed them on a common math pathway*, as defined in this study. Specifically, the results indicate that Math B65 students are more likely to achieve associate- or transfer-level quantitative competency (combined) and transfer-level competency (separate from associate-level) than are LRNC B530*f* students.

These changes in the results from subsample #2 to subsample #3 are a consequence of the fact that, on one hand, students who enter the developmental math curriculum through Math B65 are among the *least* likely to attempt a second quantitative course, regardless of whether they pass Math B65 on the first attempt or not. This is part of the reason that, in subsample #1 and subsample #2, students in LRNC B530*f* generally have superior quantitative competency attainment rates as compared with Math B65 students. On the other hand, students who both pass Math B65 on the first attempt *and* proceed into a second quantitative course are very likely to enroll in Math B22 or Psyc B5, which are transfer-level quantitative courses. Psyc B5, in particular, has a very high first-attempt pass rate, high enough that students in the Math B65-Psyc B5 pathway cannot be included in the regression model addressing associate- and transfer-level quantitative competency (combined). Moreover, students on the Math B65-Psyc B5 pathway have a predicted probability of achieving transfer-level competency (excluding associate-level competency) that is 0.88, more than twice the probability of 0.37 found among students who attempt LRNC B530*f*, pass it on the first attempt, and then continue into LRNC B530*s*. Math B65 students who transition into Math B22 also have the advantage over LRNC B530*f*-B530*s* students in the first two competency outcomes, though to a lesser extent. Still, LRNC B530*f*-B530*s* students maintain an advantage in the achievement of STEM-track quantitative competency over students on either of the Math B65 pathways, with both Math B65 pathways having so few students achieving STEM-track competency that the two pathways cannot be included in the regression model.

Students Pursuing Goals Other Than Transfer

The results for students seeking goals other than transfer parallel those for transfer-seeking students in some respects but, in other respects, contradict those results. The analyses of subsample #4 (all non-transfer-seeking students entering through the focal math courses) and subsample #5 (same as subsample #4 but limited to students who were successful in the first attempt of their first math course) indicate that LRNC B530*f* students are more likely to achieve associate- or transfer-level quantitative competency (combined) and more likely to achieve transfer-level competency (separate from associate-level competency) than are Math B65 students and Math B60 students. Also, Math B65 students again have a very low rate of STEM-track quantitative achievement, so low that they were dropped from the regression models for this outcome for subsamples #4 and #5. LRNC B530*f* students continue to have a meaningful advantage over Math B60 students in STEM-track quantitative achievement. However, Math B60 students are much more likely than are Math B65 students to achieve associate- or transfer-level competency (combined), which contradicts the modest differences between these two entry points observed among transfer-seeking students.

Subsample #6 includes non-transfer-seeking students who were successful in the first attempt of their first math course and took a second course that, in combination with the first course, placed them on a common math pathway, as defined in this study. Students who entered through Math B65 were excluded from all of these regression models because the numbers of students achieving the outcomes of interest were either too low or too high to support the analysis. None of the Math B65-B22 students who passed their first math course on the first attempt achieved any of the three outcomes. None of the Math B65-Psyc B5 students who passed their first math course on the first attempt achieved STEM-track competency, but all of them achieved associate- or transfer-level competency (combined) and transfer-level competency (separately from associate-level).

Setting aside these exclusions, one observes that LRNC B530*f*-B530*s* students who passed their first math course on the first attempt are only slightly more likely to achieve associate- or transfer-level competency (combined) than are Math B60-B70 students, and the two groups are about equally likely to achieve STEM-track competency. Conversely, LRNC B530*f*-B530*s* are much more likely than are Math B60-B70 students to achieve transfer-level competency (separate from associate-level competency).

**SECTION 6: ANALYSIS OF DEVELOPMENTAL ENGLISH PATHWAYS**

**6.1 Analytical Focus**

BC currently offers five developmental English courses:

* ACDV B80 – Foundations of College Composition and Reading (three levels below transfer-level)
* Engl B60 – Basic Writing Skills (two levels below transfer-level)
* Engl B50 – Introduction to College Composition (one level below transfer-level)
* Engl B53 – Reading, Reasoning, and Writing (an accelerated course covering Engl B60 and Engl B50 in a single term)
* LRNC B510 – a compressed course consisting of Engl 50 and Engl B1A (transfer-level Expository Composition), offered in succession in a single term

This study focuses primarily on two comparisons: *(1) students who entered the English curriculum through Engl B60 versus Engl B53, and (2) students who entered the English curriculum through Engl B50 versus LRNC B510.* Note that, unlike some of the analyses of developmental math, the analyses of developmental English presented here are *not* limited to transfer-seeking students. This is because the courses that satisfy English competency requirements for an associate’s degree at BC also satisfy key English competency requirements for transfer. For the purposes of this analysis, the achievement of transfer-level English competency is defined as the successful completion (a grade of C or better or a grade of “Pass”) of Engl B1A, Engl B1B, Engl B2, Engl B3, or the second half of LRNC B510 (LRNC B510*s*).

**6.2 Students’ Point of Entry to the English Curriculum**

Questions

This section seeks to address the following questions:

1. What is the nature of the relationship between a student’s entry point to the English curriculum (i.e., a student’s first English course) and:
	1. the delay of this first English course?
	2. the likelihood of passing this first English course on the first attempt?
	3. the likelihood of eventually achieving transfer-level English competency?
2. Among students who eventually *complete a transfer-level English course successfully*, how does the average length of time to achieve transfer-level English competency differ across entry points to the English curriculum?

Delaying First English

In Table 9, I present selected statistics for students who entered BC’s English curriculum through a current developmental English offering. One observes that students who enter the curriculum through Engl B53, Engl B50, and the first half of LRNC B510 (LRNC B510*f*) all are reasonably similar in their likelihood of delaying their first English course (42-47%) and have similar average delays (0.6-0.7 terms). Only students who enter through Engl B60 have a meaningfully lower average delay of first English, with 28% delaying first English and an average delay of 0.4 terms.

First-Attempt Success

Students who enter through LRNC B510*f* have a meaningfully higher likelihood of passing their first English course on the first attempt (59%) than do their counterparts who enter through Engl B60, Engl B53, or Engl B50, all of whom experience a similar likelihood of first-attempt success (38-44%).

Demonstrating Transfer-Level English Competency

Noticeable differences are observed in the likelihood of achieving transfer-level English competency depending on a student’s entry point to the curriculum. Students who enter through Engl B53 are more likely to achieve transfer-level competency than are students who enter through Engl B60 (25% versus 15%). Likewise, students who enter through LRNC B510*f* are more likely to achieve transfer-level competency than are students who enter through Engl B50 (48% versus 33%).

Time to Transfer-Level English Competency

In Table 10, I present the average time to demonstrate transfer-level English competency by entry point to the English curriculum. This table includes only those students who ultimately completed a transfer-level English course.

Of the students who achieve transfer-level English competency, students who enter the curriculum through LNRC B510*f* achieve transfer-level English competency much faster than do students who enter through other courses, in an average of 1.3 terms from college entry and 0.7 terms from first English enrollment. At the other end of the continuum, students who enter through Engl B60 have the slowest time to transfer-level English competency, with an average of 4.1 terms from college entry and 3.6 terms from first English enrollment. All of the entry points except Engl B60 have average times to transfer-level competency that are less than the time specified in the implementation of AB705. As was the case with math, the reader will note than an average of three terms from first attempted English course is equivalent to the two *regular* terms specified in the implementation of AB705 because the study reported here counts summer terms.

**6.3 Operationalizing Common English Pathways**

This section poses two questions. Taking into account students’ particular first English course and their outcome (successful versus unsuccessful) in the first attempt of their first English course:

1. How likely are students to attempt a second English course, including repeating the first course if necessary?
2. Among students who attempt a second English course, what are the most common second courses?

Table 11 provides the distribution of students’ second attempted English course, if any, by first English course and outcome in the first attempt of first English (successful versus unsuccessful). As with math, second English courses attempted by fewer than 30 of the students who entered the English curriculum through a given course and experienced a given outcome in that course were deemed to be rare and collapsed together into a category named *Other*. Also like math, the only exceptions to this consolidation rule were instances in which the percentage of such students who attempted the given second course was equal to or greater than 20%, in which case the second course was deemed rare and collapsed into the *Other* category only if the number of students attempting the course was fewer than 15.

Defining Common English Pathways

Of the students who entered BC’s English curriculum through an English course that is among the current developmental offerings and who had valid information on key variables of interest in this study (discussed earlier), 42% completed their first English course successfully on the first attempt, and 59% attempted a second English course (including repeating the first course if necessary). Of the students who were *successful* in the first attempt of their first English course, 84% attempted a second English course, while 42% of students who were *unsuccessful* in their first attempt of their first English course attempted a second English course (including repeating the first course).

Comparable to the analysis of developmental math, Table 11 provides the information necessary to identify common English pathways, combining information about first English course attempted, the outcome in this first English course, and second English course attempted. As with math, not attempting a second English course is counted and reported as a potential choice of students who entered the curriculum through a given first English course and experienced a given outcome in that course, but it is not included among the pathways as defined here regardless of the number or fraction of students who elected this choice. Likewise, second English courses that are collapsed into the *Other* category are counted and reported but not included among the pathways as defined here.

Twelve common English pathways were identified. Together, the twelve pathways account for 1,833 students, which is 52% of the 3,502 students included in Table 11. However, it is 88% of the subset of 2,082 students in Table 11 *who attempted any second English course*, including repeating the first course.

Six of the pathways pertain to students who successfully completed their first English course on the first attempt. These six pathways account for 1,180 students: 79% of the 1,486 students who were successful in their first English course, and 95% of the subset of 1,242 students who were successful in their first English course *and* attempted any second English course.

The remaining six pathways pertain to students who were unsuccessful in the first attempt of their first English course. These pathways account for 653 students: 32% of the 2,016 students who were unsuccessful in their first English course, and 78% of the subset of 840 students who were unsuccessful in their first English course *and* attempted any second English course (counting as a possible “second course” the repeating of the first English course).

Students who Succeed in their First English Course

Among students who were *successful* in the first attempt of their first English course, students who entered the English curriculum through LRNC B510*f* were the most likely to continue into a second course, with 98% of them doing so. Nearly all of these students continued into the second half of LRNC B510 (LRNC B510*s*, equivalent to Engl B1A).

Students who entered the curriculum through Engl B50 or Engl B53 and completed the course successfully on the first attempt were the next most likely to continue into a second course, with continuation rates of 84% and 85%, respectively. Nearly all of these students continued into Engl B1A.

Engl B60 students who completed their first English course successfully on the first attempt were somewhat less likely to continue into a second English course, with about three in four students (77%) doing so. Most enrolled in Engl B50, although a meaningful number continued into an *Other* course, the most common of which was Engl B53. This represents a repetition of course content because Engl B53 combines Engl B60 and Engl B50 into a single accelerated course.

Students who are Unsuccessful in their First English Course

Among students who were *unsuccessful* in the first attempt of their first English course, students who started in LRNC B510*f* have the best rebound rate, with 49% of these students attempting a second English course. Although this figure is troublingly low, it is superior to the rebound rates observed among students who were unsuccessful on their first attempt of other first English courses: Engl B50 (43% attempting a second course), Engl B53 (42%), and Engl B60 (38%).

Unsuccessful LRNC B510*f* students who attempt a second English course largely shift to Engl B50, rather than repeating LRNC B510*f*. Students in the other developmental English courses are more likely to repeat the course that they did not pass on the first attempt, although a sizeable minority of unsuccessful Engl B60 students shifts to Engl B53.

**6.4 Relationships Between English Pathways and Selected Outcomes**

Questions

This section seeks to address the following questions. What is the nature of the relationship between students’ English pathway (as defined in this study) and:

1. the likelihood of passing their second English course[[5]](#footnote-5) on the first attempt?
2. the likelihood of eventually demonstrating transfer-level English competency?
3. the average length of time to achieve transfer-level English competency?

Table 12 presents the percentage of students who passed their second English course on the first attempt and the percentage of students who eventually demonstrated transfer-level English competency, by English pathway. Just as with math, the second English course is defined such that it may be the second attempt of the first English course. Thus, students who attempt their first English course a second time and pass this “second course” on the first attempt could be more accurately described as having passed their first English course on the second attempt. Table 13 presents the average time to demonstrate transfer-level English competency for students who completed a transfer-level English course successfully.

Students who Succeed in their First English Course

Among students who succeeded in the first-attempt of their first English course and advanced into a second course, the highest rate of first-attempt success in the second course is found among students who advanced from LRNC B510*f* to LRNC B510*s* (71% first-attempt success in the second-half of LRNC B510). LRNC B510*s* is equivalent to Engl B1A. The next highest rate is found among students who advanced from Engl B50 to Engl B1A (66% first-attempt success). Students who advanced from Engl B53 to Engl B1A had an appreciably lower rate of first-attempt success in Engl B1A (59%). Likewise, students who advanced from Engl B60 to Engl B50 had a similarly low rate of success in Engl B50 (59%).

Students on the LRNC B510*f*- B510*s* and Engl B50-B1A pathways are equally likely to achieve transfer-level English competency (75%), but students on the LRNC B510*f*- B510*s* pathway who achieve transfer-level English competency do so about two terms faster than do students on the Engl B50-B1A pathway, on average. Students on the Engl B53-B1A pathway are much more likely to achieve transfer-level English competency (67%) than are students on the Engl B60-B50 pathway (40%). Among students who achieve transfer-level English competency, students on the Engl B53-B1A pathway do so 1.5 to 1.6 terms faster than do students on the Engl B60-B50 pathway, on average. The LRNC B510*f*- B510*s*, Engl B50-B1A, and Engl B53-B1A pathways all offer average times to transfer-level competency that are consistent with the implementation of AB705, given the inclusion of summer terms in the definition of time applied here.

Students who are Unsuccessful in their First English Course

Students who do not succeed in the first attempt of their first English course and who take a second course, including repeating the first course, generally have a risk of not passing their second course that is equal to or greater than the risk that they faced in their first course. The exception is unsuccessful Engl B50 students who repeat Engl B50. Such students have a likelihood of passing their second course (53%) that is modestly higher than the likelihood of success among students taking the course for the first time (44%).

The depressed rates of success in second courses (including second attempts of first courses) contributes to the low likelihood of achieving transfer-level English competency observed among students who do not succeed in the first attempt of their first English course. The highest rates (22%) are observed among students on the LRNC B510*f*-Engl B50 pathway and students repeating Engl B50.

**6.5 Structural Characteristics versus Student Characteristics**

Question

Just as with math, it is clear that there are some marked differences in outcomes between students who enter the developmental English curriculum through one course versus another. Yet, the analyses up to this point have not distinguished the influence that student characteristics have on these observed differences. This section addresses the question of whether students who enter the curriculum through a given course *A* achieve transfer-level competency at a higher rate than do students who enter through a given course *B* because students with characteristics that predispose them to achieve transfer-level competency tend more often to choose *A* over *B*. The counter-explanation is that instructional or structural differences between *A* and *B* are the main reason for differences in outcomes.

Analytic Strategy

To address this question, I used logistic regression to analyze natural variation in the likelihood of completing a transfer-level English course. Data for three subsamples were used to regress this outcome on point of entry to the developmental English curriculum or, in the case of subsample #3, on English pathway (which incorporates point of entry), resulting in three separate regression models. The three subsamples were defined by combinations of outcome in first English course and second English course, as follows:

1. All students who entered the curriculum through one of the focal English courses, regardless of whether they passed this course on the first attempt or not, and regardless of whether they attempted a second course or not.
2. All students who entered the curriculum through one of the focal English courses *and passed it on the first attempt*, but may or may not have attempted a second course.
3. All students who entered the curriculum through one of the focal English courses, passed it on the first attempt, and then attempted a second English course that, in combination with the first course and the outcome in the first course, placed them in one of the common English pathways identified in this study.

Selected covariates were included in each of the regression models as statistical controls, as follows:

* + Self-reported goal of transfer to a four-year institution (treated as dichotomous and coded to distinguish between students who reported transfer either alone or in combination with an intermediate postsecondary credential versus all other goals)
	+ Part-time enrollment in the student’s first term of for-credit course-taking at BC (treated as dichotomous)
	+ Age at college entry (treated as dichotomous and coded to distinguish between students who were less than 20 years of age at college entry versus those who were 20 years of age or older)
	+ Self-reported gender (treated as dichotomous)
	+ Self-reported race/ethnicity (treated as dichotomous and coded to distinguish historically advantaged and disadvantaged groups, with the latter defined as Black, Hispanic, Native American, or two or more racial/ethnic categories)
	+ Method of assessment for placement in the English curriculum (treated as dichotomous and coded to reflect multiple measures placement versus placement test only)
	+ Term of entry to BC (coded with six categories, including Summer 2015, Fall 2015, Spring 2016, Summer 2016, Fall 2016, and Spring 2017)

Predicted Probabilities

Paralleling the regression analysis for developmental math, Table 14 provides predicted probabilities of achieving transfer-level English competency for students in each of the three subsamples. These predictions were derived from the results of the logistic regression analyses and therefore account for differences in the distributions of student characteristics across entry points.

To calculate the predicted probabilities, other variables included in the model must be fixed at selected values. Changing the values at which covariates are fixed changes the absolute differences in predicted probabilities between entry points, but it does not affect the order of entry points with respect to the probability of achieving transfer-level English competency. Thus, the entry point associated with the highest probability of achieving transfer-level competency will remain the highest regardless of the values at which the covariates are held. In this case, predictions were calculated for a transfer-seeking male student under the age of 20 years at entry to BC who is not of a historically disadvantaged racial/ethnic group, who enrolled in BC for the first time in Fall 2016, who enrolled full-time in his first term, and who was assessed for placement into the English curriculum with multiple measures.

Comparing Engl B53 with Engl B60

Taking into account differences in the distributions of student characteristics across entry points to the developmental English curriculum (and, in the case of subsample #3, across common developmental English pathways), students who enter the curriculum through Engl B53 are consistently more likely to achieve transfer-level English competency than are students who enter the curriculum through the parallel Engl B60 course. This advantage holds true without exception across all three subsamples considered here.

Comparing LRNC B510 with Engl B50

Once other factors are controlled, students who enter the developmental English curriculum through the first half of LRNC B510 (LRNC B510*f*) generally are more likely to achieve transfer-level competency than are students who enter through Engl B50. This holds true across the first two subsamples.

The exception is the third subsample that compares the following two groups:

* + - 1. students who entered the curriculum through LRNC B510*f*, completed it successfully on the first attempt, and then attempted LRNC B510*s*,
			2. students who entered through Engl B50, completed it successfully on the first attempt, and then attempted Engl B1A.

Subsample #3 excludes students who did not pass their first English course on the first attempt or who passed it and then elected an alternative (off-path) second English course. Once these exclusions are implemented, one observes no meaningful difference in the achievement of transfer-level English competency between students on the LRNC B510*f*-B510*s* pathway and the Engl B50-B1A pathway. This suggests that the higher rate of achievement of transfer-level English competency among LRNC B510 students in subsamples #1 and #2 is driven largely by the comparatively high rate of first-attempt success observed among students in the first half of LRNC B510 and the comparatively high rate at which students who are successful in the first half of LRNC B510 continue on to a second course.

**SECTION 7: DEVELOPMENTAL VERSUS TRANSFER-LEVEL ENTRY POINTS**

Question

The results of the Multiple Measures Assessment and Placement (MMAP) research and AB705 have focused attention on the important role of high school achievement in assessing students’ readiness for math and English coursework. In turn, it is important to consider how students of similar levels of high school achievement fair when they enter the math or English curriculum at different levels of coursework, whether developmental or transfer-level. In the two sections that follow, I compare selected outcomes of students who entered the math or English curriculum through developmental versus transfer-level entry points, while controlling for differences in high school achievement.

**7.1 Mathematics**

Questions

This section poses the following questions:

1. How is high school achievement associated with entry point to the math curriculum, focusing specifically on cumulative high school grade point average (GPA) as the measure of high school achievement?
2. How does the one-year throughput[[6]](#footnote-6) rate to associate- or transfer-level quantitative competency (combining associate- and transfer-level into a single outcome) vary across entry points to the curriculum when students’ high school achievement is held constant?
3. How does the one-year throughput rate to transfer-level quantitative competency (distinct from associate-level competency) vary across entry points to the curriculum when students’ high school achievement is held constant?

Analytic Strategy

I used logistic regression to analyze the associations between entry point to the mathematics curriculum (i.e., first quantitative course) and two separate outcomes. The first outcome is achieving associate- or transfer-level quantitative competency (either or both) within one calendar year of when a student began his/her first quantitative course at BC. The second is achieving transfer-level competency (as distinct from associate-level) within one calendar year of when a student began his/her first quantitative course at BC. The sample employed to analyze these two outcomes was described earlier in Section 4.4.

The basic model employed in this analysis is presented below.

$$ln\left(\frac{P\left(Outcome\right)}{1-P\left(Outcome\right)}\right)=α+β\_{k}\left(First Quant Course\right)+γ\_{k}\left(First Quant Course\*HSGPA\right)$$

$$+δ\_{k}\left(First Quant Course\*Math Scaled Score\right)+θ\left(Controls\right)$$

The left-hand side of the equation is the logged odds of the probability of the outcome of interest, with each of the two outcomes analyzed separately. The likelihood of each outcome is assumed to be, in part, a function of students’ first quantitative course (*k*). First quantitative courses considered in the analysis include the following: Math B60, Math B65, LRNC B530, Math B70, Math B1A, Math B22, and Psyc B5.

Cumulative high school grade point average (HSGPA) also is assumed to influence the likelihood of the outcome, and this effect is allowed to vary by first quantitative course. In other words, the relationship between the likelihood of the outcome and high school GPA can be stronger or weaker for one curricular point of entry (a particular first quantitative course) than it is for another. In a comparable manner, the model includes students’ scaled high school assessment score in mathematics, and the relationship between this scaled score and the likelihood of the outcome is allowed to vary by first quantitative course.

Finally, the models incorporate a number of statistical controls, including:

* + Self-reported goal of transfer to a four-year institution (treated as dichotomous and coded to distinguish between students who reported transfer either alone or in combination with an intermediate postsecondary credential versus all other goals)
	+ Part-time enrollment in the student’s first term of for-credit course-taking at BC (treated as dichotomous)
	+ Age at college entry (treated as dichotomous and coded to distinguish between students who were less than 20 years of age at college entry versus those who were 20 years of age or older)
	+ Self-reported gender (treated as dichotomous)
	+ Self-reported race/ethnicity (treated as dichotomous and coded to distinguish historically advantaged and disadvantaged groups, with the latter defined as Black, Hispanic, Native American, or two or more racial/ethnic categories)
	+ Method of assessment for placement in the math curriculum (treated as dichotomous and coded to reflect multiple measures placement versus placement test only)
	+ Term of entry to BC (coded with six categories, including Summer 2015, Fall 2015, Spring 2016, Summer 2016, Fall 2016, and Spring 2017)

Predicted Probabilities

Although the regression models estimate the relationships between the measures of high school achievement and the outcomes across the whole range of high school achievement, certain bands of high school achievement defined in the AB705 implementation are of special interest. In math, these bands focus specifically on high school GPA and include the following: GPA of less than 2.30, GPA of 2.30 to 2.99, and GPA of 3.00 or greater.

To investigate differences in outcomes by first quantitative course and with attention to these focal bands of high school GPA, I calculated predicted probabilities of achieving each of the two outcomes by entry point at each of three levels of high school achievement within each of the three bands of GPA. To illustrate, for all students whose GPA was less than 2.30 (the lowest band), I calculated the 25th, 50th, and 75th percentiles of *both GPA and math scaled score*. I held the values of these variables fixed at these percentiles, and then fixed all other variables except entry point to the math curriculum at arbitrarily chosen values. Entry point was allowed to vary freely. Finally, I calculated the predicted probability of each of the outcomes for students who entered the curriculum through each of the first quantitative courses considered here. I repeated this process for students with high school GPAs of 2.30 to 2.99 (the middle band), and for students with high school GPAs of 3.00 and above (the highest band).

It is important to note that *a single model was estimated for all levels of high school achievement for each of the two outcomes*. Separate models were not estimated for each band of high school GPA. Thus, estimates within a given band of GPA are able to borrow information (variation) from other bands, which improves the reliability of the estimates considerably.

Also note that the arbitrarily chosen values for the statistical controls result in predictions being calculated for a transfer-seeking male student under the age of 20 years at entry to BC who is not of a historically disadvantaged racial/ethnic group, who enrolled in BC for the first time in Fall 2016, who enrolled full-time in his first term, and who was assessed for placement into the math curriculum with multiple measures. Importantly, because the control variables are not interacted with point of entry to the curriculum, changing the values at which controls are fixed *would* *not affect the order of entry points with respect to the probability of achieving a given outcome*, though the absolute differences in predicted probabilities between entry points would change. Thus, the entry point associated with the highest predicted probability of the outcome would remain the highest regardless of the values at which the controls are held.

Results

Table 15 presents a cross-tabulation of high school GPA band by first quantitative course. Table 16 presents the predicted probabilities of each of the two outcomes for students who entered the curriculum through each of the seven quantitative courses considered here. Within each band of high school GPA, Table 16 presents predictions for students with GPAs and math scaled scores equal to their respective 25th, 50th, and 75th percentiles *within the band*. Thus, these predictions provide a picture of how the likelihood of each outcome varies across the range of high school achievement within a given band of high school GPA.

The reader is reminded that, despite the organization of results by GPA band in Table 16, all of the results presented in Table 16 were derived from two logistic regression equations, one for each of the two outcomes. The reader also should note that the results presented in Table 16 are predictions about the probabilities of the specified outcomes, after adjusting for other factors. The results are *not* observed rates. As a consequence, there are instances in which the predicted probability of achieving the second outcome (transfer-level quantitative competency) is slightly greater than the predicted probability of achieving the first outcome (associate- or transfer-level quantitative competency), which is impossible in actuality because the second outcome is subsumed into the first. This phenomenon is limited mainly to Psyc B5, in which students have an unusually high rate of first-attempt success, and to Math B22 in the highest band of high school achievement. It represents a limitation of model fit to the data and not an error in the data.

Turning to the results, as explained earlier the first outcome is achieving associate- or transfer-level quantitative competency (either or both) within one calendar year of when a student began his/her first quantitative course at BC. Across all three bands of high school GPA and across all levels of high school achievement (GPA and math scaled score) within each band, students who enter the curriculum through Psyc B5 have the highest predicted probability of achieving associate- or transfer-level competency, all else being equal. The second highest probability is found among students who enter the curriculum through the first half of LRNC B530, and, like Psyc B5, this finding holds true across all three bands of GPA and across all three levels of high school achievement within each band.[[7]](#footnote-7) The third highest probability is found among students who enter the curriculum through Math B70, and again this finding holds true across all bands of GPA and all levels of high school achievement within each band.

The second outcome is achievement of transfer-level quantitative competency within one calendar year. Table 16 indicates that the highest probability of achieving transfer-level quantitative competency is found among students who enter the curriculum through Psyc B5, all else being equal. The second highest probability is found among students who enter through Math B22. However, one will note that the predicted probability of the achieving transfer-level quantitative competency among students in the lowest GPA band does not vary much across the four entry points of Math B65, Math B70, Math B1A, and Math B22. Students in the lowest GPA band who enter the curriculum through any of these four courses have similar likelihoods of achieving transfer-level quantitative competency, once other variables are controlled.

Questions to Consider in Future Research

The analysis presented here presumes that throughput to a given level of quantitative competency is the primary consideration when comparing the various points of entry to the curriculum. The analysis also presumes that focal outcomes should be measured within an observation period defined by one year from the beginning of a student’s first quantitative course. The differences in the results for the two outcomes highlight several areas of potential investigation pertaining to possible downsides of a singular focus on one particular definition of throughput and to the comparatively short time in which throughput is measured.

Consider as an illustration the comparison of Math B70 and Math B22, focusing exclusively on the predictions for students in the 2.30 to 2.99 GPA band and particularly the predictions for students within this band who had GPAs and math scaled scores equal to the 50th percentile (the students with mid-level readiness in the middle GPA band). Fixing the control variables to the characteristics described earlier, students who enter the curriculum through Math B70 have a predicted 46% chance of achieving associate- or transfer-level competency (combined) within one year and a 9% chance of achieving transfer-level competency (distinct from associate-level) with one year. Their peers with equivalent high school achievement who enter the curriculum through Math B22 have a 35% chance of achieving associate- or transfer-level competency and a 27% chance of achieving transfer-level competency. So, we see that, for students with the specified level of high school achievement, Math B70 offers a superior one-year throughput to associate- or transfer-level competency (combined), while Math B22 offers a superior one-year throughout to transfer-level competency.

Math B70 is one level below transfer-level competency. Therefore, one could surmise that the 37-percentage-point difference between the 46% chance of achieving associate- or transfer-level competency (combined) and the 9% chance of achieving transfer-level competency is composed primarily of students who succeeded in Math B70 after one or more attempts but, within the one-year time frame, *did not advance* in the math curriculum to a transfer-level course or who *advanced but did not succeed* in a transfer-level course. Given the one-year time frame, one could assume that the 9% of students who achieved transfer-level competency are those who succeeded in Math B70 on the first attempt and advanced immediately (in the next regular term) to a transfer-level quantitative course. Conversely, one should note that 54% of students with the specified characteristics who begin in Math B70 are expected to end the first year following (beginning with) their first quantitative course without having completed an associate- or transfer-level quantitative course.

Unlike Math B70, Math B22 is a transfer-level course. Therefore, the predicted 27% rate of transfer-level achievement among Math B22 students represents the percentage of students who, within the one-year time frame, passed this course after one or more attempts, or never passed it but transitioned into another transfer-level quantitative course (e.g., Math B1A) and passed that course. Thus, we would conclude that 73% of the students with this particular level of high school achievement (and with the other characteristics as specified) who enter the curriculum directly through Math B22 would be expected to fail or withdraw from Math B22 and also fail to complete any other transfer-level quantitative course within the one-year time frame.

What percentage of these unsuccessful Math B22 students navigate backwards in the curriculum to a quantitative course at the associate-level but below the transfer-level, within the one-year time frame? This question is answered by the 8-percentage-point difference between the 35% chance of achieving associate- or transfer-level competency (combined) and the 27% chance of achieving transfer-level competency (distinct from associate-level). The predictions indicate that about 11% of students with the specified characteristics who begin in Math B22 and who do not succeed in this or any other transfer-level quantitative course are expected to navigate backwards to complete a course that satisfies associate-level but not transfer-level competency within the one-year time frame.[[8]](#footnote-8) Therefore, 89% of students who begin in Math B22 and do not complete this course or any other transfer-level quantitative course successfully are expected to end the year beginning with their first quantitative course without completing any associate- or transfer-level quantitative course successfully. Overall, 65% of the students with the specified characteristics who enter the curriculum through Math B22 are expected to end the first year completing neither an associate-level nor a transfer-level quantitative course successfully.

Considering this example, one potential line of research concerns any unforeseen consequences to the elevated risk of course failure faced by minimally or modestly prepared students who begin in certain transfer-level quantitative courses. Clearly, the best chance of achieving transfer-level quantitative competency for these students is to start with a transfer-level course. However, the limited evidence presented here suggests that an elevated risk of course failure also may increase their chances of completing neither a transfer-level nor an associate-level quantitative course, at least within the one-year time frame. Indeed, it is not inconceivable that a change in placement practices could *simultaneously* (1) elevate students’ chances of completing a transfer-level quantitative course, (2) elevate their chances of experiencing a course failure or obligatory withdrawal in anticipation of course failure, resulting in an elevated risk of completing neither a transfer-level nor associate-level course. Thus, further research is needed on the extent to which placing students with the goal of maximizing one-year throughput to transfer-level quantitative competency may increase the proportion of students who experience a course failure in their academic career, and, in turn, any consequences of such an increase if it is found to be occurring.

That said, it is important to note that this study is retrospective in nature, using data that largely preceded the implementation of AB705. The implementation of AB705 calls for transfer-level placement *with academic or concurrent support* for minimally or moderately prepared students. To the extent that these supports are implemented effectively, one would expect them to mitigate any elevated risk of course failure. The many ways in which these supports may be implemented and the resulting effects on students’ chances of success constitute a rich line of future inquiry.

Another potential line of research is investigating how limiting the observation of outcomes to a one-year time frame may distort conclusions drawn from analyses such as that presented here. In particular, the illustration of Math B70 versus Math B22 indicated a very low rate of achievement of associate-level competency among students who begin in Math B22 but do not complete it successfully. However, the one-year observation window for outcomes may artificially depress observed rates of achievement among students who did not succeed in their first quantitative course, with a greater share of them eventually completing an associate- or transfer-level course if a sufficient observation window is allowed. Investigating outcomes over one year plus one regular term, and also over two years, would be informative for understanding the experiences and outcomes of students who do not succeed in their first quantitative course.

Finally, this study did not account for the possibility that some of the students who were observed to have not achieved a given outcome (a given level of competency) may have left BC during the first year following (beginning with) their first quantitative course in order to transfer to a four-year institution. Some also may have completed a postsecondary certificate and sought immediate employment. These successful outcomes would be counted as unsuccessful outcomes in the analysis presented here. Future research should investigate the extent to which such alternative successful outcomes occur in lieu of the achievement of particular levels of quantitative competency. Likewise, future analyses should account and adjust for these alternative successful outcomes.

**7.2 English**

Questions

This section poses the following questions:

1. How is high school achievement associated with point of entry to the English curriculum, focusing specifically on cumulative high school grade point average (GPA) as the measure of high school achievement?
2. How does the one-year throughput rate to transfer-level English competency vary across entry points to the curriculum when students’ high school achievement is held constant?

Analytic Strategy

The analytic strategy for English parallels that of math described in Section 7.1, with the exception that only a single outcome is considered, namely achieving transfer-level English competency within one calendar year of when a student began his/her first English course at BC. As detailed elsewhere in this report, the achievement of transfer-level English competency is defined as the successful completion of any of the following courses: Engl B1A, Engl B1B, Engl B2, Engl B3, or the second half of LRNC B510 (LRNC B510*s*). The sample employed to analyze this outcome was described earlier in Section 4.5.

The basic model employed to analyze the achievement of English competency parallels that of math:

$$ln\left(\frac{P\left(Outcome\right)}{1-P\left(Outcome\right)}\right)=α+β\_{k}\left(First Engl Course\right)+γ\_{k}\left(First Engl Course\*HSGPA\right)$$

$$+δ\_{k}\left(First Engl Course\*Engl Scaled Score\right)+θ\left(Controls\right)$$

The left-hand side of the equation is the logged odds of the probability of achieving transfer-level English competency, which is assumed to be, in part, a function of students’ first English course (*k*). First English courses considered in the analysis include the following: Engl B60, Engl B53, LRNC B510, Engl B50, and Engl B1A. The other features of the model are the same as that of math, excepting only that students’ scaled high school assessment score in English is used in place of scaled assessment score in math.

Predicted Probabilities

The logistic regression model was used to estimate the relationships between the measures of high school achievement and achievement of transfer-level English competency across the whole range of high school achievement. However, as with math, certain bands of high school achievement defined in the AB705 implementation are of special interest. In English, these bands focus specifically on high school GPA and include the following: GPA of less than 1.90, GPA of 1.90 to 2.59, and GPA of 2.60 or greater.

To investigate differences in outcomes by first English course while attending to these focal bands of high school GPA, I calculated predicted probabilities of achieving transfer-level English competency by entry point at each of three levels of high school achievement within each of the three bands of GPA. Further information about the calculation of these predictions can be found under “Predicted Probabilities” in Section 7.1. It is important to note here, though that *a single model was estimated for all levels of high school achievement*. Separate models were not estimated for each band of high school GPA. Thus, estimates within a given band of GPA are able to borrow information (variation) from other bands, which improves the reliability of the estimates considerably.

Also note that, as explained in Section 7.1, the arbitrarily chosen values for the statistical controls result in predictions being calculated for a transfer-seeking male student under the age of 20 years at entry to BC who is not of a historically disadvantaged racial/ethnic group, who enrolled in BC for the first time in Fall 2016, who enrolled full-time in his first term, and who was assessed for placement into the math curriculum with multiple measures. Importantly, because the control variables are not interacted with point of entry to the curriculum, changing the values at which the controls are fixed *would* *not affect the order of entry points with respect to the probability of achieving transfer-level English competency*, though the absolute differences in predicted probabilities between entry points would change. Thus, the entry point associated with the highest predicted probability of the outcome would remain the highest regardless of the values at which the controls are held.

Results

Table 17 presents the a cross-tabulation of high school GPA band by first English course. Table 18 presents the predicted probabilities of achieving transfer-level English competency for students who entered the curriculum through each of the five English courses considered here. Within each band of high school GPA, Table 18 presents predictions for students with GPAs and English scaled scores equal to their respective 25th, 50th, and 75th percentiles *within the band*. Thus, these predictions provide a picture of how the likelihood of achieving transfer-level English competency varies across the range of high school achievement within a given band of high school GPA.

The findings presented in Table 18 indicate that students with cumulative high school GPAs that place them in the low or mid-level GPA bands experience the highest probability of achieving transfer-level English competency when they enter the curriculum through Engl B1A, a transfer-level course. Only students with cumulative high school GPAs that place them in the highest GPA band experience an advantage by entering through another course, namely LRNC B510. This course technically is developmental in nature, but it is unique in its targeting and curriculum, and students who are successful in the compressed sequence achieve transfer-level competency in a single term just as do students who enter the curriculum through Engl B1A.

**SECTION 8: REFERENCES**

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**SECTION 9: TABLES**

Table 1: Selected course-taking behaviors by first math course attempted

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | *N* | % delayed first math | average number of terms from college entry to first math | % successful in first math (first attempt) |
|  |  |  |  |  |
| ACDV B72 | 1,070 | 46% | 0.8 | 61% |
| Math B60 | 1,435 | 46% | 0.6 | 54% |
| Math B65 | 146 | 52% | 0.8 | 59% |
| LRNC B530 (Math B60) | 68 | 68% | 1.1 | 85% |
| Math B70 | 938 | 44% | 0.6 | 53% |
|  |  |  |  |  |

Table 2: Selected outcomes by first math course attempted

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  |  |  | % demonstrated associate-level quantitative competency |  |  |
|  | *N* | % did not demonstrate quantitative competency | by completing a qualifying non-math course | by completing a qualifying math course | % demonstrated transfer-level quantitative competency | Total |
|  |  |  |  |  |  |  |
| ACDV B72 | 1,070 | 85% | 4% | 8% | 3% | 100% |
| Math B60 | 1,435 | 60% | 5% | 23% | 13% | 100% |
| Math B65 | 146 | 69% | 8% | 1% | 22% | 100% |
| LRNC B530 (Math B60) | 68 | 31% | 6% | 25% | 38% | 100% |
| Math B70 | 938 | 32% | 4% | 34% | 30% | 100% |
|  |  |  |  |  |  |  |

Note: Each student is assigned to only one category of demonstrating (or not demonstrating) quantitative competency.

Table 3: Average number of terms to achieve transfer-level quantitative competency among students who did so, by first math course attempted

|  |  |  |
| --- | --- | --- |
|  |  | average number of terms to first successfully completedtransfer-level quantitative course |
|  | *N* | from college entry | from first attempted math course |
|  |  |  |  |
| ACDV B72 | 35 | 5.6 | 4.5 |
| Math B60 | 180 | 4.9 | 4.2 |
| Math B65 | 32 | 3.8 | 2.6 |
| LRNC B530 (Math B60) | 26 | 4.3 | 2.9 |
| Math B70 | 283 | 3.7 | 3.1 |
|  |  |  |  |

Table 4: Distribution of second math course attempted by first math course attempted and outcome in first attempt of first math course, either successful or unsuccessful (transfer-seeking students only)

|  |  |  |
| --- | --- | --- |
|  |  | Second Math |
|  | *N* | No Second Math | Repeat | Math B60 | Math B70 | LRNC B530 (Math B70) | Math B1A | Math B22 | Psyc B5 | Other | Total |
|  |  |  |  |  |  |  |  |  |  |  |  |
| Successful in First Attempt of First Math |  |  |  |  |  |  |  |  |  |  |  |
| ACDV B72 | 376 | 32% | ----- | 53% | ----- | ----- | ----- | ----- | ----- | 15% | 100% |
| Math B60 | 576 | 14% | ----- | ----- | 84% | ----- | ----- | ----- | ----- | 2% | 100% |
| Math B65 | 74 | 43% | ----- | ----- | ----- | ----- | ----- | 26% | 23% | 8% | 100% |
| LRNC B530 (Math B60) | 44 | ----- | ----- | ----- | ----- | 98% | ----- | ----- | ----- | 2% | 100% |
| Math B70 | 404 | 28% | ----- | ----- | ----- | ----- | 31% | 28% | 10% | 3% | 100% |
|  |  |  |  |  |  |  |  |  |  |  |  |
| Unsuccessful in First Attempt of First Math |  |  |  |  |  |  |  |  |  |  |  |
| ACDV B72 | 241 | 74% | 23% | ----- | ----- | ----- | ----- | ----- | ----- | 3% | 100% |
| Math B60 | 475 | 63% | 27% | ----- | ----- | ----- | ----- | ----- | ----- | 11% | 100% |
| Math B65 | 45 | 71% | ----- | ----- | ----- | ----- | ----- | ----- | ----- | 29% | 100% |
| LRNC B530 (Math B60) | 6 | ----- | ----- | ----- | ----- | ----- | ----- | ----- | ----- | 100% | 100% |
| Math B70 | 361 | 50% | 42% | ----- | ----- | ----- | ----- | ----- | ----- | 8% | 100% |
|  |  |  |  |  |  |  |  |  |  |  |  |

NOTE: Cells with few students were collapsed together into the *Other* column. As a result, cells marked "-----" do not necessarily indicate that zero students attempted a given combination of first and second courses. Rather, these cells simply had too few students to warrant further analysis at this time.

Table 5: Selected outcomes by math pathway (transfer-seeking students only)

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| First Math | Outcome in First Math | Second Math | *N* | % successful in second math (on first attempt) | % achieved transfer-level quantitative competency |
|  |  |  |  |  |  |
| ACDV B72 | Successful | Math B60 | 198 | 49% | 8% |
| Math B60 | Successful | Math B70 | 483 | 55% | 28% |
| Math B65 | Successful | Math B22 | 19 | 42% | 53% |
| Math B65 | Successful | Psyc B5 | 17 | 88% | 88% |
| LRNC B530 (Math B60) | Successful | LRNC B530 (Math B70) | 43 | 58% | 47% |
| Math B70 | Successful | Math B1A | 124 | 51% | 71% |
| Math B70 | Successful | Math B22 | 113 | 50% | 76% |
| Math B70 | Successful | Psyc B5 | 41 | 90% | 93% |
|  |  |  |  |  |  |
| ACDV B72 | Unsuccessful | ACDV B72 | 55 | 45% | 0% |
| Math B60 | Unsuccessful | Math B60 | 126 | 58% | 6% |
| Math B70 | Unsuccessful | Math B70 | 151 | 50% | 17% |
|  |  |  |  |  |  |

Table 6: Average number of terms to achieve transfer-level quantitative competency among students who did so, by math pathway (transfer-seeking students only)

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  |  |  |  | average number of terms to first successfully completedtransfer-level quantitative course |
| First Math | Outcome in First Math | Second Math | *N* | from college entry | from first attempted math course |
|  |  |  |  |  |  |
| ACDV B72 | Successful | Math B60 | 15 | 5.5 | 5.1 |
| Math B60 | Successful | Math B70 | 134 | 5.0 | 4.2 |
| Math B65 | Successful | Math B22 | 10 | 3.5 | 2.5 |
| Math B65 | Successful | Psyc B5 | 15 | 3.7 | 2.2 |
| LRNC B530 (Math B60) | Successful | LRNC B530 (Math B70) | 20 | 4.2 | 2.8 |
| Math B70 | Successful | Math B1A | 88 | 3.3 | 2.9 |
| Math B70 | Successful | Math B22 | 86 | 3.8 | 3.1 |
| Math B70 | Successful | Psyc B5 | 38 | 3.8 | 2.8 |
|  |  |  |  |  |  |
| ACDV B72 | Unsuccessful | ACDV B72 | 0 | ----- | ----- |
| Math B60 | Unsuccessful | Math B60 | 8 | 6.3 | 5.8 |
| Math B70 | Unsuccessful | Math B70 | 25 | 5.3 | 4.6 |
|  |  |  |  |  |  |

Table 7: Distribution of third math course by first and second math courses and outcomes in first attempts of first and second math courses (transfer-seeking students only)

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| First Math | Outcome inFirst Math | Second Math | Outcome inSecond Math | *N* | No Third Math | Repeat | Math B70 | Math B1A | Math B1B | Math B22 | Psyc B5 | Other | Total |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| ACDV B72 | Successful | Math B60 | Successful | 98 | 26% | ----- | 72% | ----- | ----- | ----- | ----- | 2% | 100% |
| Math B60 | Successful | Math B70 | Successful | 265 | 39% | ----- | ----- | 21% | ----- | 22% | 15% | 3% | 100% |
| Math B65 | Successful | Math B22 | Successful | 8 | 100% | ----- | ----- | ----- | ----- | ----- | ----- | ----- | 100% |
| Math B65 | Successful | Psyc B5 | Successful | 15 | 100% | ----- | ----- | ----- | ----- | ----- | ----- | ----- | 100% |
| LRNC B530 (Math B60) | Successful | LRNC B530 (Math B70) | Successful | 25 | 16% | ----- | ----- | ----- | ----- | ----- | ----- | 84% | 100% |
| Math B70 | Successful | Math B1A | Successful | 63 | 32% | ----- | ----- | ----- | 56% | ----- | ----- | 13% | 100% |
| Math B70 | Successful | Math B22 | Successful | 57 | 58% | ----- | ----- | ----- | ----- | ----- | ----- | 42% | 100% |
| Math B70 | Successful | Psyc B5 | Successful | 37 | 95% | ----- | ----- | ----- | ----- | ----- | ----- | 5% | 100% |
|  |  |  |  |  |  |  |  |  |  |  |  |   |  |
| ACDV B72 | Unsuccessful | ACDV B72 | Successful | 25 | 48% | ----- | ----- | ----- | ----- | ----- | ----- | 52% | 100% |
| Math B60 | Unsuccessful | Math B60 | Successful | 73 | 33% | ----- | 64% | ----- | ----- | ----- | ----- | 3% | 100% |
| Math B70 | Unsuccessful | Math B70 | Successful | 75 | 53% | ----- | ----- | 20% | ----- | ----- | ----- | 27% | 100% |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| ACDV B72 | Successful | Math B60 | Unsuccessful | 100 | 58% | 57% | 35% | ----- | ----- | ----- | ----- | 8% | 100% |
| Math B60 | Successful | Math B70 | Unsuccessful | 218 | 38% | 41% | 58% | ----- | ----- | ----- | ----- | 1% | 100% |
| Math B65 | Successful | Math B22 | Unsuccessful | 11 | 82% | 73% | ----- | ----- | ----- | ----- | ----- | 27% | 100% |
| Math B65 | Successful | Psyc B5 | Unsuccessful | 2 | 100% | 100% | ----- | ----- | ----- | ----- | ----- | ----- | 100% |
| LRNC B530 (Math B60) | Successful | LRNC B530 (Math B70) | Unsuccessful | 18 | 33% | 50% | ----- | ----- | ----- | ----- | ----- | 50% | 100% |
| Math B70 | Successful | Math B1A | Unsuccessful | 61 | 49% | 44% | 36% | ----- | ----- | ----- | ----- | 20% | 100% |
| Math B70 | Successful | Math B22 | Unsuccessful | 56 | 40% | 34% | 50% | ----- | ----- | ----- | ----- | 16% | 100% |
| Math B70 | Successful | Psyc B5 | Unsuccessful | 4 | 60% | 50% | ----- | ----- | ----- | ----- | ----- | 50% | 100% |
|  |  |  |  |  |  |  |  |  |  |  |  |   |  |
| ACDV B72 | Unsuccessful | ACDV B72 | Unsuccessful | 30 | 97% | 97% | ----- | ----- | ----- | ----- | ----- | 3% | 100% |
| Math B60 | Unsuccessful | Math B60 | Unsuccessful | 53 | 83% | 89% | ----- | ----- | ----- | ----- | ----- | 11% | 100% |
| Math B70 | Unsuccessful | Math B70 | Unsuccessful | 76 | 87% | 87% | ----- | ----- | ----- | ----- | ----- | 13% | 100% |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |

NOTE: Cells with few students were collapsed together into the *Other* column. As a result, cells marked "-----" do not necessarily indicate that zero students attempted a given combination of first and second courses. Rather, these cells simply had too few students to warrant further analysis at this time.

Table 8: Predicted probabilities of achieving each of three quantitative competency outcomes for six subsamples of developmental math students, based on estimates derived from logistic regression analyses (not shown)

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  |  |  |  |  | **Predicted Probability** |
| **Subsample** | **Transfer****Seeking** | **First Math** | **Outcome in First Attempt of First Math** | **Second Math** | **Achieving Associate-Level or Transfer-Level Quantitative Competency** | **Achieving Transfer-Level Quantitative Competency** | **Completing STEM-Track Math Course** |
|  |  |  |  |  |  |  |  |
| 1 | Yes | Math B60 | Any | Any or None | 0.32 | 0.09 | 0.03 |
|  |  | Math B65 | Any | Any or None | 0.34 | 0.24 | 0.02 |
|  |  | LRNC B530 (Math B60) | Any | Any or None | 0.63 | 0.27 | 0.17 |
|  |  | Math B70 | Any | Any or None | 0.59 | 0.20 | 0.11 |
|  |  |  |  | **N** | **1,985** | **1,985** | **1,985** |
|  |  |  |  |  |  |  |  |
| 2 | Yes | Math B60 | Successful  | Any or None | 0.59 | 0.19 | 0.07 |
|  |  | Math B65 | Successful  | Any or None | 0.51 | 0.38 | 0.04 |
|  |  | LRNC B530 (Math B60) | Successful  | Any or None | 0.70 | 0.37 | 0.24 |
|  |  | Math B70 | Successful  | Any or None | H | 0.44 | 0.23 |
|  |  |  |  | **N** | **694** | **1,098** | **1,098** |
|  |  |  |  |  |  |  |  |
| 3 | Yes | Math B60 | Successful  | Math B70 | 0.61 | 0.20 | 0.06 |
|  |  | Math B65 | Successful  | Math B22 | 0.67 | 0.53 | L |
|  |  | Math B65 | Successful  | Psyc B5 | H | 0.88 | L |
|  |  | LRNC B530 (Math B60) | Successful  | LRNC B530 (Math B70) | 0.63 | 0.37 | 0.19 |
|  |  | Math B70 | Successful  | Math B1A | H | 0.65 | 0.61 |
|  |  | Math B70 | Successful  | Math B22 | H | 0.69 | 0.06 |
|  |  | Math B70 | Successful  | Psyc B5 | H | 0.89 | 0.02 |
|  |  |  |  | **N** | **545** | **840** | **804** |
|  |  |  |  |  |  |  |  |
| 4 | No | Math B60 | Any | Any or None | 0.38 | 0.08 | 0.05 |
|  |  | Math B65 | Any | Any or None | 0.08 | 0.11 | L |
|  |  | LRNC B530 (Math B60) | Any | Any or None | 0.58 | 0.42 | 0.13 |
|  |  | Math B70 | Any | Any or None | 0.66 | 0.26 | 0.26 |
|  |  |  |  | **N** | **602** | **578** | **553** |
|  |  |  |  |  |  |  |  |
| 5 | No | Math B60 | Successful  | Any or None | 0.68 | 0.18 | 0.13 |
|  |  | Math B65 | Successful  | Any or None | 0.19 | 0.23 | L |
|  |  | LRNC B530 (Math B60) | Successful  | Any or None | 0.82 | 0.63 | 0.20 |
|  |  | Math B70 | Successful  | Any or None | H | 0.56 | 0.49 |
|  |  |  |  | **N** | **219** | **294** | **282** |
|  |  |  |  |  |  |  |  |
| 6 | No | Math B60 | Successful  | Math B70 | 0.84 | 0.15 | 0.14 |
|  |  | Math B65 | Successful  | Math B22 | L | L | L |
|  |  | Math B65 | Successful  | Psyc B5 | H | H | L |
|  |  | LRNC B530 (Math B60) | Successful  | LRNC B530 (Math B70) | 0.88 | 0.61 | 0.13 |
|  |  | Math B70 | Successful  | Math B1A | H | 0.81 | 0.89 |
|  |  | Math B70 | Successful  | Math B22 | H | 0.58 | 0.19 |
|  |  | Math B70 | Successful  | Psyc B5 | H | H | L |
|  |  |  |  | **N** | **162** | **202** | **202** |
|  |  |  |  |  |  |  |  |

Note: First math courses (or math pathways) marked “H” were excluded automatically from the given regression because *all* of the students in that course for that subsample achieved the specified outcome. Conversely, first math courses (or math pathways) marked “L” were excluded automatically from the given regression because *none* of the students in that course for that subsample achieved the specified outcome.

Table 9: Selected course-taking behaviors and outcomes by first English course attempted

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | *N* | % delayed first English | average number of terms from college entry to first English | % successful in first English(first attempt) | % achieved transfer-level English competency |
|  |  |  |  |  |  |
| ACDV B80 | 147 | 36% | 0.8 | 39% | 7% |
| Engl B60 | 641 | 28% | 0.4 | 39% | 15% |
| Engl B53 | 754 | 42% | 0.7 | 38% | 25% |
| Engl B50 | 1,703 | 47% | 0.7 | 44% | 33% |
| LRNC B510 (Engl B50) | 257 | 43% | 0.6 | 59% | 48% |
|  |  |  |  |  |  |

Table 10: Average number of terms to achieve transfer-level English competency among students who did so, by first English course attempted

|  |  |  |
| --- | --- | --- |
|  |  | average number of terms to first successfully completedtransfer-level English course |
|  | *N* | from college entry | from first attempted English course |
| ACDV B80 | 10 | 3.4 | 2.6 |
| Engl B60 | 96 | 4.1 | 3.6 |
| Engl B53 | 190 | 3.1 | 2.4 |
| Engl B50 | 558 | 3.2 | 2.4 |
| LRNC B510 (Engl B50) | 124 | 1.3 | 0.7 |

Table 11: Distribution of second English course attempted by first English course attempted and outcome in first attempt of first English course, either successful or unsuccessful

|  |  |  |
| --- | --- | --- |
|  |  | Second English Course |
|  | *N* | No Second English | Repeat | Engl B60 | Engl B53  | Engl B50 | LRNC B510(Engl B1A) | Engl B1A | Other | Total |
|  |  |  |  |  |  |  |  |  |  |  |
| Successful in First Attempt of First English Course |  |  |  |  |  |  |  |  |  |  |
| ACDV B80 | 58 | 31% | ----- | 26% | 26% | ----- | ----- | ----- | 17% | 100% |
| Engl B60 | 247 | 23% | ----- | ----- | ----- | 60% | ----- | ----- | 17% | 100% |
| Engl B53 | 288 | 15% | ----- | ----- | ----- | ----- | ----- | 84% | 1% | 100% |
| Engl B50 | 742 | 16% | ----- | ----- | ----- | ----- | ----- | 83% | 0% | 100% |
| LRNC B510 (Engl B50) | 151 | 2% | ----- | ----- | ----- | ----- | 95% | ----- | 3% | 100% |
|  |  |  |  |  |  |  |  |  |  |  |
| Unsuccessful in First Attempt of First English Course |  |  |  |  |  |  |  |  |  |  |
| ACDV B80 | 89 | 73% | ----- | ----- | ----- | ----- | ----- | ----- | 27% | 100% |
| Engl B60 | 394 | 62% | 23% | ----- | 9% | ----- | ----- | ----- | 7% | 100% |
| Engl B53 | 466 | 58% | 30% | ----- | ----- | ----- | ----- | ----- | 12% | 100% |
| Engl B50 | 961 | 57% | 32% | ----- | 4% | ----- | ----- | ----- | 7% | 100% |
| LRNC B510 (Engl B50) | 106 | 51% | ----- | ----- | ----- | 34% | ----- | ----- | 15% | 100% |
|  |  |  |  |  |  |  |  |  |  |  |

NOTE: Cells with few students were collapsed together into the *Other* column. As a result, cells marked by "-----" do not necessarily indicate that zero students attempted a given combination of first and second courses. Rather, these cells simply had too few students to warrant further analysis at this time.

Table 12: Selected outcomes by English pathway

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| First English | Outcome in First English | Second English | *N* | % successful in second English (on first attempt) | % achieved transfer-level English competency |
|  |  |  |  |  |  |
| ACDV B80 | Successful | Engl B60 | 15 | 67% | 7% |
| ACDV B80 | Successful | Engl B53 | 15 | 47% | 27% |
| Engl B60 | Successful | Engl B50 | 148 | 59% | 40% |
| Engl B53 | Successful | Engl B1A | 241 | 59% | 67% |
| Engl B50 | Successful | Engl B1A | 617 | 66% | 75% |
| LRNC B510 (Engl B50) | Successful | LRNC B510 (Engl B1A) | 144 | 71% | 75% |
|  |  |  |  |  |  |
| Engl B60 | Unsuccessful | Engl B60 | 91 | 42% | 8% |
| Engl B60 | Unsuccessful | Engl B53 | 34 | 32% | 18% |
| Engl B53 | Unsuccessful | Engl B53 | 142 | 32% | 13% |
| Engl B50 | Unsuccessful | Engl B53 | 38 | 45% | 18% |
| Engl B50 | Unsuccessful | Engl B50 | 312 | 53% | 22% |
| LRNC B510 (Engl B50) | Unsuccessful | Engl B50 | 36 | 28% | 22% |

Table 13: Average number of terms to achieve transfer-level English competency among students who did so, by English pathway

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  |  |  |  | average number of terms to first successfully completedtransfer-level English course |
| First English | Outcome in First English | Second English | *N* | from college entry | from first attemptedEnglish course |
|  |  |  |  |  |  |
| ACDV B80 | Successful | Engl B60 | 1 | 5.0 | 4.0 |
| ACDV B80 | Successful | Engl B53 | 4 | 4.3 | 3.3 |
| Engl B60 | Successful | Engl B50 | 59 | 4.2 | 3.6 |
| Engl B53 | Successful | Engl B1A | 162 | 2.7 | 2.0 |
| Engl B50 | Successful | Engl B1A | 464 | 2.9 | 2.0 |
| LRNC B510 (Engl B50) | Successful | LRNC B510 (Engl B1A) | 108 | 0.8 | 0.1 |
|  |  |  |  |  |  |
| Engl B60 | Unsuccessful | Engl B60 | 7 | 6.1 | 6.1 |
| Engl B60 | Unsuccessful | Engl B53 | 6 | 4.7 | 4.3 |
| Engl B53 | Unsuccessful | Engl B53 | 19 | 5.1 | 4.5 |
| Engl B50 | Unsuccessful | Engl B53 | 7 | 4.4 | 3.9 |
| Engl B50 | Unsuccessful | Engl B50 | 70 | 5.2 | 4.5 |
| LRNC B510 (Engl B50) | Unsuccessful | Engl B50 | 8 | 5.9 | 5.3 |
|  |  |  |  |  |  |

Table 14: Predicted probabilities of achieving transfer-level English competency for three subsamples of developmental English students, based on estimates derived from logistic regression analyses (not shown)

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Subsample** | **Transfer****Seeking** | **First English** | **Outcome in First Attempt of First English** | **Second English** | **Predicted Probability of Achieving Transfer-Level English Competency** |
|  |  |  |  |  |  |
| 1 | Any | Engl B60 | Any | Any or None | 0.16 |
|  |  | Engl B53 | Any | Any or None | 0.26 |
|  |  | Engl B50 | Any | Any or None | 0.33 |
|  |  | LRNC B510 (Engl B50) | Any | Any or None | 0.49 |
|  |  |  |  | **N** | **3,355** |
|  |  |  |  |  |  |
| 2 | Any | Engl B60 | Successful  | Any or None | 0.29 |
|  |  | Engl B53 | Successful  | Any or None | 0.53 |
|  |  | Engl B50 | Successful  | Any or None | 0.59 |
|  |  | LRNC B510 (Engl B50) | Successful  | Any or None | 0.71 |
|  |  |  |  | **N** | **1,428** |
|  |  |  |  |  |  |
| 3 | Any | Engl B60 | Successful  | Engl B50 | 0.34 |
|  |  | Engl B53 | Successful  | Engl B1A | 0.61 |
|  |  | Engl B50 | Successful  | Engl B1A | 0.71 |
|  |  | LRNC B510 (Engl B50) | Successful  | LRNC 510 (Engl B1A) | 0.70 |
|  |  |  |  | **N** | **1,150** |
|  |  |  |  |  |  |

Table 15: Cross-tabulation of cumulative high school GPA by first quantitative course

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | **< 2.30** | **2.30-2.99** | **3.00-4.00** | **Total** |
|  |  |  |  |  |
| Math B60 | 274 | 445 | 96 | 815 |
| Math B65 | 31 | 72 | 7 | 110 |
| LRNC B530 | 8 | 12 | 4 | 24 |
| Math B70 | 82 | 245 | 112 | 439 |
| Math B1A | 5 | 36 | 47 | 88 |
| Math B22 | 6 | 62 | 97 | 165 |
| Psyc B5 | 1 | 13 | 17 | 31 |
|  |  |  |  |  |
|  |  |  |  |  |
| **Total** | 407 | 885 | 380 | 1,672 |
|  |  |  |  |  |

Table 16: Predicted probabilities of selected quantitative competency outcomes by point of entry to the curriculum and level of high school achievement, based on estimates derived from logistic regression analyses (not shown)

|  |  |  |  |
| --- | --- | --- | --- |
|  |  | **Achievement of Associate-level or Transfer-level Quantitative Competency** | **Achievement of Transfer-level** **Quantitative Competency** |
| **Band of GPA** | **First Course** | 25th PercentileGPA and Math Scaled Score | 50th Percentile GPA and Math Scaled Score | 75th Percentile GPA and Math Scaled Score | 25th Percentile GPA and Math Scaled Score | 50th Percentile GPA and Math Scaled Score | 75th Percentile GPA and Math Scaled Score |
| < 2.30 | Math B60 | 0.09 | 0.12 | 0.17 | 0.00 | 0.00 | 0.01 |
|  | Math B65 | 0.07 | 0.10 | 0.16 | 0.04 | 0.07 | 0.13 |
|  | LRNC B530 | 0.32 | 0.43 | 0.57 | ---------- | ---------- | ---------- |
|  | Math B70 | 0.19 | 0.26 | 0.35 | 0.04 | 0.05 | 0.07 |
|  | Math B1A | 0.13 | 0.18 | 0.26 | 0.04 | 0.07 | 0.13 |
|  | Math B22 | 0.11 | 0.16 | 0.23 | 0.05 | 0.08 | 0.13 |
|  | Psyc B5 | 0.42 | 0.54 | 0.68 | 0.49 | 0.60 | 0.72 |
|  |  |  |  |  |  |  |  |
| 2.30-2.99 | Math B60 | 0.17 | 0.22 | 0.30 | 0.01 | 0.01 | 0.02 |
|  | Math B65 | 0.12 | 0.17 | 0.26 | 0.08 | 0.12 | 0.21 |
|  | LRNC B530 | 0.54 | 0.66 | 0.77 | ---------- | ---------- | ---------- |
|  | Math B70 | 0.36 | 0.46 | 0.57 | 0.07 | 0.09 | 0.12 |
|  | Math B1A | 0.28 | 0.37 | 0.48 | 0.14 | 0.23 | 0.39 |
|  | Math B22 | 0.25 | 0.35 | 0.47 | 0.18 | 0.27 | 0.42 |
|  | Psyc B5 | 0.65 | 0.76 | 0.85 | 0.72 | 0.81 | 0.88 |
|  |  |  |  |  |  |  |  |
| 3.00-4.00 | Math B60 | 0.30 | 0.37 | 0.48 | 0.01 | 0.02 | 0.03 |
|  | Math B65 | 0.21 | 0.29 | 0.41 | 0.14 | 0.23 | 0.36 |
|  | LRNC B530 | 0.77 | 0.84 | 0.90 | ---------- | ---------- | ---------- |
|  | Math B70 | 0.61 | 0.69 | 0.79 | 0.13 | 0.17 | 0.22 |
|  | Math B1A | 0.53 | 0.62 | 0.73 | 0.43 | 0.58 | 0.76 |
|  | Math B22 | 0.52 | 0.62 | 0.74 | 0.54 | 0.65 | 0.79 |
|  | Psyc B5 | 0.84 | 0.90 | 0.94 | 0.89 | 0.93 | 0.96 |

Table 17: Cross-tabulation of cumulative high school GPA by first English course

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | **< 1.90** | **1.90-2.59** | **2.60-4.00** | **Total** |
|  |  |  |  |  |
| Engl B60 | 70 | 193 | 80 | 343 |
| Engl B53 | 75 | 236 | 91 | 402 |
| Engl B50 | 115 | 549 | 228 | 892 |
| LRNC B510 | 13 | 72 | 30 | 115 |
| Engl B1A | 49 | 405 | 916 | 1,370 |
|  |  |  |  |  |
|  |  |  |  |  |
| **Total** | 322 | 1,455 | 1,345 | 3,122 |
|  |  |  |  |  |

Table 18: Predicted probabilities of achieving transfer-level English competency by point of entry to the curriculum and level of high school achievement, based on estimates derived from a logistic regression analysis (not shown)

|  |  |  |
| --- | --- | --- |
|  |  | **Achievement of Transfer-level English Competency** |
| **Band of GPA** | **First Course** | 25th PercentileGPA and Math Scaled Score | 50th Percentile GPA and Math Scaled Score | 75th Percentile GPA and Math Scaled Score |
| < 1.90 | Engl B60 | 0.01 | 0.01 | 0.01 |
|  | Engl B53 | 0.05 | 0.06 | 0.08 |
|  | Engl B50 | 0.09 | 0.12 | 0.15 |
|  | LRNC B510 | 0.11 | 0.12 | 0.14 |
|  | Engl B1A | 0.20 | 0.23 | 0.27 |
|  |  |  |  |  |
| 1.90-2.59 | Engl B60 | 0.01 | 0.02 | 0.04 |
|  | Engl B53 | 0.09 | 0.12 | 0.18 |
|  | Engl B50 | 0.14 | 0.19 | 0.25 |
|  | LRNC B510 | 0.22 | 0.28 | 0.36 |
|  | Engl B1A | 0.30 | 0.37 | 0.44 |
|  |  |  |  |  |
| 2.60-4.00 | Engl B60 | 0.05 | 0.08 | 0.15 |
|  | Engl B53 | 0.21 | 0.30 | 0.41 |
|  | Engl B50 | 0.25 | 0.33 | 0.42 |
|  | LRNC B510 | 0.52 | 0.61 | 0.73 |
|  | Engl B1A | 0.51 | 0.59 | 0.68 |

1. Information brought to light after this study was completed indicated that students enrolled in the first half of LRNC B530 who appear to be struggling to pass the course frequently are counseled out of the course and into a math lab, likely elevating the first-attempt success rate for the course and distorting comparisons with first-attempt success rates in other courses. Nevertheless, many of the comparisons of central interest in this study concern students who are successful in the first attempt of their first course, and those comparisons should remain valid unless the practice of counseling-out struggling LRNC B530 students misidentified some students who would have been successful in the first half of LRNC B530 had they not been counseled-out. [↑](#footnote-ref-1)
2. As noted earlier, information brought to light after this study was completed indicated that students enrolled in the first half of LRNC B530 who appear to be struggling to pass the course frequently are counseled out of the course and into a math lab, likely elevating the first-attempt success rate for the course and distorting comparisons with first-attempt success rates in other courses. Nevertheless, many of the comparisons of central interest in this study concern students who are successful in the first attempt of their first course, and those comparisons should remain valid unless the practice of counseling-out struggling LRNC B530 students misidentified some students who would have been successful in the first half of LRNC B530 had they not been counseled-out. [↑](#footnote-ref-2)
3. For a math course that is repeated, this “second math course” is the second attempt of the first math course, though it is treated in this analysis as a distinct second course. [↑](#footnote-ref-3)
4. Two consecutive unsuccessful attempts of quantitative courses refers to a situation in which a student does not succeed in his/her first quantitative course, attempts a second quantitative course (including the possibility of repeating the first course), and then does not succeed in his/her second quantitative course. [↑](#footnote-ref-4)
5. For an English course that is repeated, this “second English course” is the second attempt of the first English course, though it is treated in this analysis as a distinct second course. [↑](#footnote-ref-5)
6. Recall that *throughput* is defined in this study as the rate at which students in a given group complete a course or courses at a specified level of competency in math or English within a particular time frame. [↑](#footnote-ref-6)
7. It is important to note again that information brought to light after this study was completed indicated that students enrolled in the first half of LRNC B530 who appear to be struggling to pass the course frequently are counseled out of the course and into a math lab, likely elevating the first-attempt success rate for the course and distorting comparisons with other courses. It is unclear how many students in LRNC B530 were affected by this practice. [↑](#footnote-ref-7)
8. Divide [1] the 8-percentage-point gap in the expected achievement of associate- or transfer-level competency (combined) versus achievement of transfer-level competency (distinct from associate-level) for students entering directly through Math B22 by [2] the 73% of students entering directly through Math B22 who are expected to fail or withdraw from Math B22 and also fail to complete any other transfer-level quantitative course. [↑](#footnote-ref-8)