# EVALUATION OF THE EFFECTIVENESS OF RISE COREQUISITES ON STUDENT PERFORMANCE IN GATEWAY COURSES

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## Executive Summary

The purpose of this study is to assess the effectiveness of RISE corequisite courses in improving student performance in gateway courses (ENG-111, MAT-110, MAT-121, MAT-143, MAT-152, and MAT-171), along with the effect of having both corequisite and gateway courses taught by the same instructor. This study employs a quasi-experimental design with propensity score matching on students from 2014-2023 Fall semesters, before and after RISE implementation. The control group (students who access gateway courses via direct placement or after successful completion of pre-requisite developmental education courses) is drawn from 2014-2018 Fall semesters, while the treatment group (students taking corequisites alongside gateway courses) is drawn from 2019-2023 Fall semesters. Control and treatment groups are balanced based on demographic factors and overall academic performance.

Key Findings:

- In general, students who enter Wake Tech with low high school GPAs (2.2 - 2.79) have a **12 percentage point increase** in their likelihood of earning an A, B, or C in their gateway course if they are simultaneously enrolled in the **corequisite** for that course than similar students with low high school GPAs from before RISE was implemented who do not take a corequisite alongside the gateway course (at 99% confidence).
- Students who have the **same instructor** for both their corequisite and gateway courses have a further **7 percentage point increase** in their probability of earning an A, B, or C in their gateway courses (at 99% confidence).
- Students taking **online** gateway courses are **less likely** to achieve success in their gateway courses, by about **10 percentage points** (99% confidence). However, these students still get a boost in their chances of success by taking a corequisite alongside the online gateway of about 5 percentage points..

- The **positive effects** of corequisites on gateway performance are **consistent** across all gateway courses except for MAT-110 and MAT-121, for which the results are statistically inconclusive.
- The treatment group (**corequisites**) **outperforms** the control group (no corequisites) in the **observed** success rate for each individual gateway course except for MAT-110.
- The group of students taking their corequisites with the **same instructor** as their gateway **outperforms** the control group in the **observed** success rate in **every** case (all gateways).

Recommendations:

- Given the **~19 percentage point combined increase** in likelihood of success in gateway courses for students with low high school GPAs taking **corequisites** in the same term and with the **same instructor**, a continuation of gateway and corequisite course pairings seems warranted. Advisers may also consider encouraging students to sign up for corequisite courses taught by their gateway instructor.
- Given the **~10 percentage point reduction** in likelihood of success for students in **online** gateway courses, advisors might consider counseling students who struggle academically to take their gateway courses in person where possible.

## Background

Across the country, higher education professionals and policymakers are reviewing traditional developmental education practices with the aim of providing better education services and closing equity gaps for students who enter college underprepared for college-level coursework. Several studies have called into question traditional practices of placing underprepared students in mandatory prerequisite developmental education courses, pointing out that these additional required courses slow students' progress toward completion, increase their time and money spent in college, and tend to disproportionately affect already disadvantaged students, such as low-income, Black, and Hispanic students. Evidence is mounting that increasing student access to introductory courses at the college level by pairing these courses with corequisite developmental education significantly increases math and English completion rates, contributes to increased graduation rates, and helps narrow equity gaps.[1][2]

For instance, one study employing a randomized controlled trial comparing students assigned to college-level statistics with corequisite developmental education against a group assigned to a traditional algebra developmental education course found that the corequisite treatment group were more likely to pass by 16 percentage points, with the added benefit that they were passing a college-level course as opposed to a traditional developmental education (typically non-credit) course.[3] A further study by these authors found that students receiving corequisite support for college-level mathematics courses enjoyed overall higher mathematics course pass rates, greater

[1] Bickerstaff, Susan, et al. (2022). Five Principles for Reforming Developmental Education: A Review of the Evidence. Report: Center for the Analysis of Postsecondary Readiness.
[2] Miller, Trey and Paco Martorell. (2022). Using Corequisite Remediation to Help Students Progress to College-Level Courses. Brief: MDRC.
[3] Logue, A. W., Mari Watanabe-Rose, and Daniel Douglas. (2016). Should Students Assessed as Needing Remedial Mathematics Take College-Level Quantitative Courses Instead? A Randomized Controlled Trial. *Educational Evaluation and Policy Analysis*, 38(3), 578-598.

success in other disciplines, and higher graduation rates. Additional quasi-experimental analysis using propensity score matching found a 22- to 53-percentage-point increase in pass rates for college-level mathematics courses for students receiving corequisite developmental education.[4]

The benefits of corequisite developmental education also appear to extend beyond mathematics. A study on community colleges in Texas followed cohorts of first-time-in-college students, finding that corequisite developmental education contributed to a 24-percentage-point increase in the probability of these students completing a first college-level English course within one year, and by 18 percentage points for completion within two years.[5] Similarly, a study on Tennessee community colleges employed a regression discontinuity design to estimate the effects of corequisite developmental education compared with both traditional prerequisite developmental education and direct placement into college-level courses. This study found that for students entering college with a low level of academic readiness, those taking corequisite developmental education had a 15-percentage-point increase in their likelihood of passing gateway mathematics courses and a 13-percentage-point increase in their likelihood of passing gateway English courses within one year of enrollment when compared with students placed into prerequisite developmental education.[6]

[4] Logue, A. W., Daniel Douglas, and Mari Watanabe-Rose. (2019). Corequisite Mathematics Remediation: Results Over Time and in Different Contexts. *Educational Evaluation and Policy Analysis*, 41(3), 294-315.
[5] Miller, Trey, Lindsay Daugherty, Paco Martorell, and Russell Gerber. (2021). Assessing the Effect of Corequisite English Instruction Using a Randomized Controlled Trial. *Journal of Research on Educational Effectiveness*, 15(1), 78-102.
[6] Ran, Florence Xiaotao and Yuxin Lin. (2022). The Effects of Corequisite Remediation: Evidence From a Statewide Reform in Tennessee. *Educational Evaluation and Policy Analysis*, (44)2.

Given that national trends in higher education show a steady shift away from traditional prerequisite developmental education towards a corequisite approach,[7] an evaluation of Wake Tech's own corequisite developmental education program is warranted. Reinforced Instruction for Student Excellence (RISE) was first implemented in the North Carolina Community College System in Spring of 2019 and at Wake Tech in the Fall semester of 2019. This system-wide program required students entering Wake Tech with a high school GPA between 2.2 and 2.799 to take a corequisite course aimed at improving fundamental skills alongside their gateway courses (foundational courses in English and mathematics: ENG-111, MAT-110, MAT-143, MAT-152, MAT-121, and MAT-171). Following a legislative mandate, the RISE program is slated to be replaced system-wide, presenting a need for Wake Tech to develop a replacement program to shore up the shortcomings of RISE and build upon its strengths.

To that end, this study investigates whether RISE corequisites were successful in improving student performance in gateway courses over direct placement of students into gateways. Additionally, this study further explores the effect of corequisite courses by examining differences in outcomes between corequisites taught by the same instructor as the gateway course and those taught by a different instructor.

[7] Litschwartz, Sophie, Dan Cullinan, and Vivianna Plancarte. (2023). Multiple Measures Assessment and Corequisite Courses: Alternate Ways to Place and Prepare New College Students. Brief: MDRC.

## Methods

This study follows previous research in employing a quasi-experimental design along with propensity score matching to determine whether significant differences in course outcomes exist between students with low high school GPAs who take corequisites alongside their gateway courses and those who do not. The control group is drawn from students with low high school GPAs taking gateway courses in the Fall semesters of 2014-2018. The control group students accessed gateway courses through direct placement or after successful completion of pre-requisite developmental education courses. The treatment group is made up of students with low high school GPAs taking gateway courses alongside corequisites in the Fall semesters of 2019-2023, the period in which RISE has been active. This approach provides a balanced sample between control and treatment groups in terms of semesters represented. Students who did not take corequisites alongside their gateway courses in RISE years (2019-2023) were excluded, as these students have a range of exceptions and accommodations that preclude meaningful comparison with the corequisite takers. Students who attempted to take a corequisite but withdrew are also excluded, as it is difficult to say whether they received the full treatment.[8]

Both control and treatment groups were analyzed to ensure a mostly even distribution of HS GPAs being represented with no gaps. The High School GPA distribution for students in the control group (2014-2018 FA students not taking corequisites alongside their gateway courses) are presented in Figure 1 below, with the distribution of the treatment group (2019-2023 FA students taking corequisites) presented in Figure 2 below.

[8] Different sample selection specifications are discussed in Appendix A. The effect of corequisites on the retention rate for gateway courses is analyzed in Appendix B.

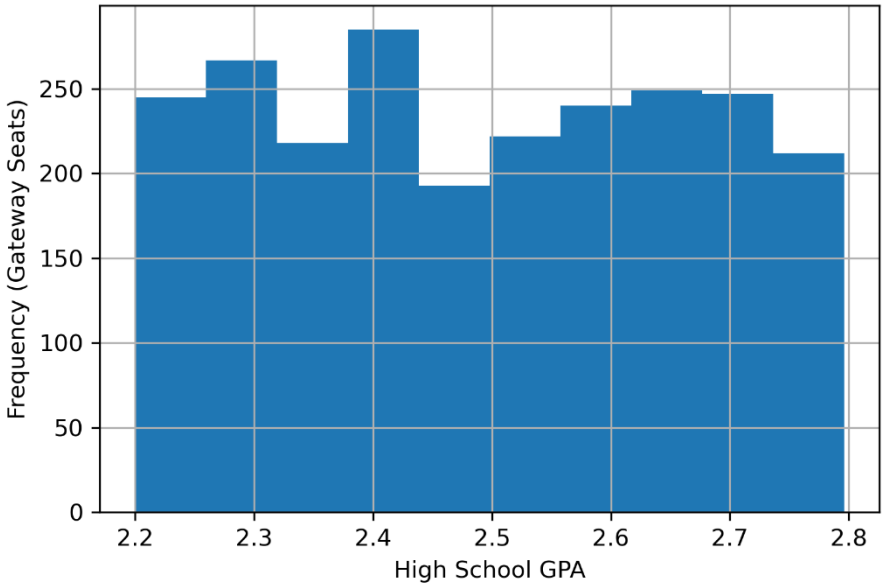


*Figure 1: High School GPA Distribution for Control Group (Not Taking Corequisites, 2014-2018)*

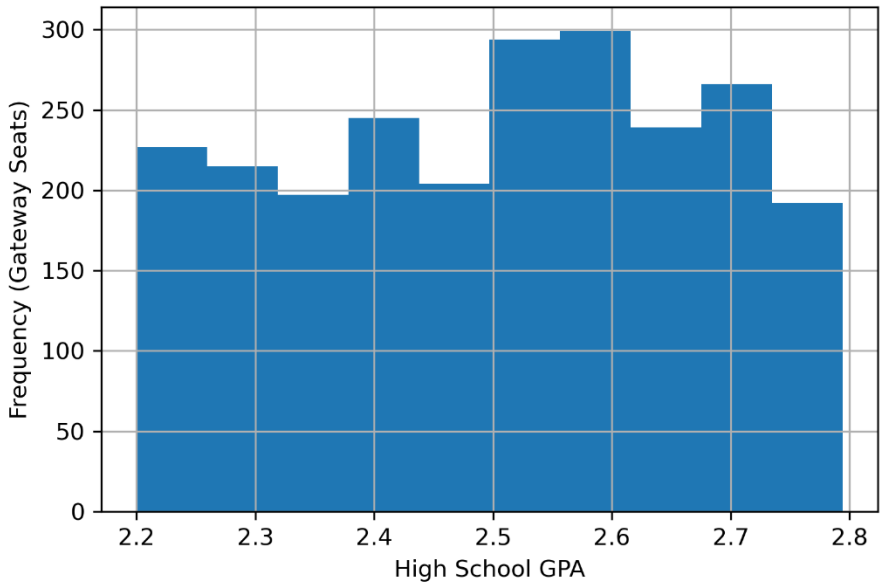


*Figure 2: HS GPA Distribution for Treatment Group (Taking Corequisites, 2019-2023)*

Propensity score matching is conducted to balance the samples along covariates of *High School GPA, Previous Developmental Education* enrollment, *Female* sex*, Pell Award* status, *Economic Health Index (EHI)* score, *Black or Hispanic* race, and *WTCC GPA*. The effect of the treatment (taking corequisite courses) on the likelihood of a student earning an A, B, or C in their gateway courses is estimated alongside the effects of the control variables using logistic regression. Interaction terms are included for each of the demographic control variables to test the effect of corequisites on each demographic group. Additionally, the logistic models include an indicator for students who take their corequisite course with the *Same Instructor* as their gateway course, and an indicator for students taking an *Online Gateway* course.

## Findings

The results of the logistic regression and estimates of the marginal effects on the likelihood of students with low high school GPAs being successful in their gateway courses are presented in Table 1 below. Respective results are provided for the full set of all gateway courses together, ENG-111, and all MAT courses together.

### Results for Full Data Set (All Gateway Courses)

*Table 1: Estimated Effects of Corequisites and Control Variables on Student Likelihood of Earning an A, B, or C in Gateway Courses (All Gateways Combined)*

| Variable | Marginal Effects Estimate |
|---|---|
| Corequisite | 0.119***<br>(0.022) |
| Same Instructor | 0.049**<br>(0.023) |
| Online Gateway | -0.114***<br>(0.023) |
| Corequisite * Online Gateway | 0.039<br>(0.030) |
| Previous Dev Ed | 0.126<br>(0.105) |
| Female | 0.033*<br>(0.018) |
| Corequisite * Female | -0.024<br>(0.026) |
| Pell Award | 0.012<br>(0.018) |
| Corequisite * Pell Award | -0.042<br>(0.026) |
| Black or Hispanic | -0.021<br>(0.018) |
| Corequisite * Black or Hispanic | 0.008<br>(0.026) |
| Economic Health Index (EHI) | -0.003<br>(0.005) |
| High School GPA | 0.114***<br>(0.037) |

| | |
|---|---|
| **WTCC GPA** | 0.245***<br>(0.006) |
| Note: *** p < 0.01, ** p < 0.05, * p < 0.10 | N = 4756 |

First, *Corequisite* has an estimated marginal effect of 0.119, significant at 99% confidence. This effect suggests that students with low high school GPAs who take corequisites alongside their gateway courses enjoy an almost 12 percentage point increase in their likelihood of earning an A, B, or C in their gateway courses than similar students who do not take the corequisites.

Having the *Same Instructor* for corequisites and gateways provides an additional 4.9 percentage point increase in the likelihood of a student earning an A, B or C in their gateway course (95% confidence). Taken together, the effects of *Corequisite* and *Same Instructor* suggest that a student taking a corequisite with the same instructor as their gateway course is more likely to earn an A, B, or C in their gateway course by around 17 percentage points compared to similar students not taking corequisites. These findings are in line with the theoretical expectations behind the RISE program, namely that students who get additional academic support through corequisites perform better than their peers with similar high school GPAs, and provide evidence that this effect is even more pronounced when the same instructor teaches both the gateway and the corequisite.

A previous impact study on RISE found that corequisites did not have a significant effect on student performance in online gateway courses.[9] This present study draws from a much wider range of records (a ten-year span from 2014-2023) than the previous study and finds that all students enjoy a boost to their likelihood of success from corequisites regardless of modality. However, we also find that students taking

[9] Sumithran, Suganya. "RISE Impact Study". Internal Wake Tech research note.

*Online Gateway* courses are less likely by 11.4 percentage points to be successful in their gateways in general (at 99% confidence). Online students would still enjoy the 12 percentage point boost in likelihood of success from taking a corequisite (relative to other online students like themselves), but given the nearly 12 percentage point drop in likelihood of success associated with taking a gateway online, online students taking corequisites appear to end up roughly as likely to succeed in a gateway as traditional students not taking a corequisite. This also explains the lack of an effect for corequisites found in the previous impact study.

Taking a *Previous Developmental Education* course does not appear to have an impact on a student's likelihood of success in their gateway. A student is counted as having taken a *Previous Developmental Education* course if they took a course below the 100-level in the appropriate field (ENG or MAT) prior to the term in which they took their gateway for this study.

These results also suggest that student demographics have a small impact on the likelihood of gateway success. *Female* students are 3.3 percentage points more likely to earn an A, B, or C in their gateway course than male students (at 95% confidence). There is no further effect of sex on student performance for students taking corequisites. Similarly, *Pell Award* status has no bearing on student performance in gateway courses within this sample of students.

The effect of *High School GPA* on performance in the gateway course is small and statistically insignificant, as expected due to the selection of students for the study based on their low high school GPA range (2.2 - 2.79). This finding suggests that within this group there are no further meaningful differences in performance explained by high school GPA. However, *WTCC GPA* has a large and significant effect on the likelihood of success in a gateway course. Students with demonstrated academic strengths at Wake Tech can expect higher levels of success in other courses than students with lower WTCC GPAs.

## Results for ENG-111

*Table 2: Estimated Effects of Corequisites and Control Variables on Student Likelihood of Earning an A, B, or C in an English Gateway (ENG-111)*

| Variable | Marginal Effects Estimates |
|---|---|
| **Corequisite** | 0.155***<br>(0.027) |
| **Same Instructor** | 0.032<br>(0.032) |
| **Online Gateway** | -0.078***<br>(0.029) |
| **Corequisite * Online Gateway** | 0.021<br>(0.037) |
| **Previous Dev Ed** | -0.097<br>(0.149) |
| **Female** | 0.062***<br>(0.022) |
| **Corequisite * Female** | -0.041<br>(0.032) |
| **Pell Award** | 0.021<br>(0.023) |
| **Corequisite * Pell Award** | -0.062*<br>(0.033) |
| **Black or Hispanic** | -0.050**<br>(0.023) |
| **Corequisite * Black or Hispanic** | 0.024<br>(0.032) |
| **Economic Health Index (EHI)** | -0.007<br>(0.006) |
| **High School GPA** | 0.120**<br>(0.046) |
| **WTCC GPA** | 0.241***<br>(0.006) |
| Note: *** p < 0.01, ** p < 0.05, * p < 0.10 | N = 2904 |

The results for Model 2, focusing only on students taking ENG-111, are mostly like the results from the full data set. All else being equal, students taking a corequisite (ENG-011 in this case) are 15.5 percentage points more likely to earn an A, B, or C in ENG-111, significant at 99% confidence. This result is close to the 12-percentage point

increase seen in the full data set. However, the effect of taking the corequisite with the *Same Instructor* as the gateway is not as clear in the case of ENG-111. The results show a 3.2 percentage point increase in odds of success for students with the same instructor for both ENG courses, though this effect is not statistically significant.

The effect of taking ENG-111 as an *Online Gateway* is similar to that seen above in the full dataset, along with the effect of taking a corequisite alongside the online gateway. Students taking online gateways are about 8 percentage points less likely to succeed than peers in traditional seated gateways. Corequisites provide the same boost to likelihood of success for online gateways as they do for traditional gateways (about 15.5 percentage points), but all else being equal a student is still more likely to succeed in a traditional seated gateway than an online gateway.

Also as in the full data set, *Previous Developmental Education* does not have an effect on ENG-111 gateway performance. *Female* students are again slightly more likely to achieve success in ENG-111 than males (6.2 percentage point increase at 99% confidence).

Students with a *Pell Award* are not any more or less likely than their peers to be successful in a gateway, all else being equal within this sample. However, the negative sign on the interaction term for *Pell Award* and *Corequisite* (-0.062 at 90% confidence) suggests that while Pell students enjoy a boost to their chances of gateway success from taking a corequisite, this boost is smaller than the boost experienced by non-Pell students. *Black or Hispanic* students are 5 percentage points less likely to be successful in ENG-111 overall (95% confidence), though they still enjoy the same boost to their chances of success from corequisites that other students receive.

*Economic Health Index* had no significant impact on student performance once all other factors were controlled for. Both *High School GPA* and *WTCC GPA* had a positive effect on likelihood of gateway success, as expected.

## Results for All MAT Courses Combined

*Table 3: Estimated Effects of Corequisites and Control Variables on Student Likelihood of Earning an A, B, or C in a Math Gateway (All MAT Gateways Combined)*

| Variable | Marginal Effects Estimates |
|---|---|
| **Corequisite** | 0.137***<br>(0.033) |
| **Same Instructor** | 0.099***<br>(0.035) |
| **Online Gateway** | -0.114***<br>(0.043) |
| **Corequisite * Online Gateway** | -0.014<br>(0.054) |
| **Previous Dev Ed** | 0.214*<br>(0.127) |
| **Female** | 0.001<br>(0.028) |
| **Corequisite * Female** | -0.038<br>(0.042) |
| **Pell Award** | 0.040<br>(0.030) |
| **Corequisite * Pell Award** | -0.072*<br>(0.043) |
| **Black or Hispanic** | -0.102***<br>(0.030) |
| **Corequisite * Black or Hispanic** | 0.081*<br>(0.043) |
| **Economic Health Index (EHI)** | -0.013*<br>(0.008) |
| **High School GPA** | -0.022<br>(0.060) |
| **WTCC GPA** | 0.278***<br>(0.011) |
| Note: *** p < 0.01, ** p < 0.05, * p < 0.10 | N = 1852 |

In Model 3, results for all MAT courses (MAT-110, MAT-121, MAT-143, MAT-152, and MAT-171) combined are again in line with expectations from the full data set. Students taking a *Corequisite* alongside their MAT gateway are more likely by 13.7 percentage points to achieve success, significant at 99% confidence. Unlike in the case of ENG-111, students in MAT courses receive a substantial boost of 10 percentage points to their chances of success by taking their corequisite with the *Same Instructor* as their gateway, significant at 99% confidence. This bump in likelihood of success is nearly twice as large as that seen in the full data set, indicating that having the same instructor is especially helpful for MAT students.

That said, taking MAT gateway courses *Online* results in a 11.4 percentage point drop in likelihood of success, similar to results for ENG-111 and the full data set. Online students would still enjoy the same 13.7 percentage point boost to chances of success from corequisites as their peers, but would only end up about as likely to succeed as a traditional student not taking a corequisite after factoring in the drop in likelihood of success from being online.

*Previous Developmental Education* has a large significant effect here, providing a 21.4 percentage point boost to chances of gateway success. *Pell Award* students are no more or less likely to succeed in MAT gateway courses than their non-Pell peers in this sample when controlling for the other variables. However, *Pell Award* students experience a smaller boost to their likelihood of success from corequisites than non-Pell students (smaller by 7 percentage points, 90% confidence).

*Black and Hispanic* students are about 10 percentage points less likely to succeed in MAT gateways, all else being equal (99% confidence). However, corequisites have proven especially helpful for this group, boosting the chances of MAT gateway success for Black and Hispanic students a further 8 percentage points beyond the 13.7 percentage point gain experienced by all students from corequisites (90% confidence).

*WTCC GPA* has the expected positive impact seen in other models.

## Discussion and Recommendations

This analysis of corequisite developmental education at Wake Tech provides evidence that corequisites are helping academically underprepared students pass gateway mathematics and English courses at a higher rate than similar students who access gateway courses via direct placement or after successful completion of pre-requisite developmental education courses. These findings are in line with similar studies on the effectiveness of corequisite developmental education, particularly with respect to improvements in gateway completion rates of students placed in corequisite developmental education over direct placement into gateway courses.

As previously discussed, corequisite developmental education provides a number of advantages to students. Students entering college at a lower level of preparedness are more likely to pass their gateway courses when supported by corequisite courses, and especially when both courses are taught by the same instructor. Yet these students also have the advantage of spending less of their time and resources in college on prerequisite remedial courses, allowing them to jump straight into college-level work alongside their peers. These findings also suggest that the corequisite approach to developmental education may reduce equity gaps, as corequisites appear to provide an additional boost to the performance of traditionally disadvantaged students in some cases. Taken together, the results of this and other research suggest that programs featuring corequisite developmental education for students needing academic support are working, and that the national shift towards corequisite support is benefiting students.

At Wake Tech in particular, there is strong evidence here showing that RISE was successful in improving gateway course performance for Wake Tech students with low high school GPAs, and that this effect was even more pronounced for students taking corequisite courses taught by the same instructor as their gateway course. In consideration of a replacement program for RISE, continuation of a program of

pairing corequisites with gateway courses for students with low high school GPAs is warranted. Additional efforts to place students in corequisites taught by their gateway instructors may also be productive. Given the lower success rates experienced by students taking online gateway courses, consideration should be given to advising students who struggle academically to take their gateway courses in person.

The effects of RISE could be further illuminated through studies focused on differences in credit accumulation, retention, and completion rates between RISE students and a control group.

## Further Reading


Bickerstaff, Susan, Katie Beal, Julia Raufman, Erika B. Lewy, and Austin Slaughter. (2022). Five Principles for Reforming Developmental Education: A Review of the Evidence. Report: Center for the Analysis of Postsecondary Readiness. https://postsecondaryreadiness.org/wp-content/uploads/2022/10/capr-synthesis-report-final3.pdf

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Logue, A. W., Daniel Douglas, and Mari Watanabe-Rose. (2019). Corequisite Mathematics Remediation: Results Over Time and in Different Contexts. *Educational Evaluation and Policy Analysis*, 41(3), 294-315. https://journals.sagepub.com/doi/epub/10.3102/0162373719848777

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Sumithran, Suganya. "RISE Impact Study". Internal Wake Tech research note.

## Appendix A: Exploring Alternative Sample Inclusion Criteria

The original model presented in our investigation did not include students who failed or withdrew from their corequisite. We argued that these students were not receiving the full "treatment" of corequisite education, and so could not be used to make inferences about the effectiveness of corequisites when students fully participate in them. This approach was questioned in our research meeting, and so we now explore the results using a broader population including students who failed their corequisites (Analysis 2) and students who either failed or withdrew from their corequisites (Analysis 3), in Table 4 below.

It should be noted that other literature investigating corequisite developmental education tends to label students who withdraw from or otherwise avoid taking their corequisites as "noncompliant" with the treatment (see for instance Miller et al. (2022)). For our purposes, we believe that students who fail the corequisite after attempting it for the entire semester should be included, as they have received a semester's worth of treatment. However, students who withdraw from their corequisite are also automatically withdrawn from their gateway course. We maintain that students who withdraw from their gateway/corequisite are not receiving the full semester's worth of treatment. Nevertheless, we include results from the population containing these withdrawals in Table 4 below as an extra check to ensure we are exploring the data in every meaningful way.

*Table 4: Comparison of Results across Different Sample Specifications*

| Variable | Analysis 1 | Analysis 2 | Analysis 3 |
|---|---|---|---|
| | *Students excluded from the treatment group (corequisites) if they failed or withdrew from their corequisite course.* | *Students excluded from the treatment group (corequisites) if they withdrew from their corequisite course.* | *Treatment group (corequisites) includes all students taking corequisites, regardless of their grade or retention status.* |
| **Taking a Corequisite (either single or different instructor)** | Increases probability of gateway success by 12-13 percentage points across all gateways. | Increases probability of gateway success by 12-16 percentage points across all gateways. | Increases probability of gateway English success by 4 percentage points.<br>No significant effect for the general model or math gateways. |
| **Single Instructor Corequisite** | Increases probability of success by an additional 7-12 percentage points on top of the general effect of corequisites above (for math and the general model).<br>No effect for ENG-111. | Increases probability of success by an additional 5-9 percentage points on top of the general effect of corequisites above (for math and the general model).<br>No effect for ENG-111. | Increases probability of gateway success by 4-8 percentage points across all gateways. |
| **Online Gateway** | Taking a gateway online lowers probability of success by 10 percentage points across all gateways.<br>Corequisites increase probability of gateway success by 17-19 percentage points for students taking their gateway online. That is, corequisites somewhat ameliorate the negative effects of taking a gateway online. Students taking gateways online with a corequisite would be expected to outperform students in seated gateways not taking corequisites.<br>No extra boost to success probability for corequisites with online math gateways. | Lowers probability of success by 8-11 percentage points across all gateways.<br>No difference in effect of corequisites between online-gateway and seated-gateway students. | Lowers probability of success by 7-12 percentage points across all gateways.<br>No difference in effect of corequisites between online-gateway and seated-gateway students. |

## Summary Findings and Recommendation

- Effects of corequisites and the single instructor model are mostly consistent across all the analyses presented here.
- We believe that the most valid approach is to conduct analysis on the population including Fs but not withdrawals moving forward (Analysis Method 2).
    - This is because it is difficult to say how much of the "treatment" of taking a corequisite a student received before withdrawing.
- We investigate the effect corequisites have on semester retention in a separate analysis (see Appendix B below).

# Appendix B: Effect of Corequisites on Retention Rate for Gateway Courses

The effect that a corequisite has on the withdrawal (retention) rate for a gateway is an important question, though separate from our original analysis. Here, we use withdrawal from a gateway as the outcome variable for the study, and investigate the effects of corequisites and the single instructor model on the withdrawal rate (Table 5 below).

*Table 5: Effect of Corequisites on Probability of Gateway Withdrawal*

| Variable | Effect |
|---|---|
| **Corequisite** | Taking a corequisite makes a student about 6 percentage points less likely to withdraw from ENG-111 than a student not taking a corequisite. |
| | Corequisites do not make a student any more or less likely to withdraw from gateway math. |
| **Single Instructor Corequisite** | Being in a corequisite taught by a single instructor does not make a student any more or less likely to withdraw from a gateway course than being in a corequisite taught by a different instructor. |
| **Online Gateway** | Students taking online gateways are 13-16 percentage points more likely to withdraw than students taking seated gateways. |
| | Corequisites make students taking online gateway math 8 percentage points less likely to withdraw than online gateway math students not taking corequisites. However, online corequisite students are still more likely to withdraw than students taking corequisites for seated math gateways. |

## Summary Findings

- Corequisites give a 6 percentage point increase in the likelihood of a student completing a semester in gateway English, all else being equal.
- No significant effect for math.

- Pell students are more likely to complete a semester in any gateway if they are taking a corequisite, by 5-8 percentage points.
- Black and Hispanic students are 8 percentage points more likely to withdraw from a math gateway if they are taking a corequisite than if they are not.