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Supporting the Whole Community College Student: The Impact of Nudging for Basic Needs Security

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EXECUTIVE SUMMARY

Even after decades of improvement efforts, completion rates at community colleges remain low, particularly among students who need developmental education. Food and housing insecurity – referred to as basic needs insecurity – contribute to low completion rates. Community college students face higher rates of basic needs insecurity than other students. Yet basic needs insecurity often goes unaddressed, particularly at these colleges, due to resource constraints.

Community colleges have started to support students' basic needs in multiple ways. Campus-based hubs offering services like public benefits access, emergency aid, food pantries and case management have become increasingly popular. However, limited evidence exists on whether connecting with these hubs improves academic success.

The Advocacy and Resource Center (ARC) at Amarillo College (AC) in Texas is a well-established example of how a college can care for its students. In 2018, The Hope Center published a detailed case study of the college's approach to AC's "culture of caring" embodied by the ARC.¹ At the time, the ARC served 13% of Amarillo College students, well short of the estimated two-thirds who endured basic needs insecurity. This report details our partnership with the college to conduct an evaluation advancing two institutional goals:

- Increase utilization of the ARC, particularly among students most at risk of leaving college, with a low-cost technology-enabled approach
- Estimate the academic impacts of connecting students to the ARC

We identified students who might benefit from the ARC: those from low-income households and those enrolled in developmental education coursework. Placement in developmental education signals insufficient K-12 preparation and/or gaps in enrollment, both of which are associated with poverty. We targeted personalized emails to a randomly selected group of these students informing them of and inviting them to the ARC for support. These emails had positive impacts on students at AC:

- Rates of visiting the ARC more than doubled from 22% to 56%
- Developmental education students were 20% more likely to pass developmental education courses, a crucial milestone

However, we did not find clear evidence that nudged students completed more credits, received higher grades, or passed other courses at higher rates. While we saw promising trends regarding retention and graduation, they may be due to chance.

As community colleges across the nation work to improve student success and help students recover from the pandemic, this evaluation offers two lessons:

- Insufficient information about existing basic needs supports keeps students from getting the help they need. The information barrier may be effectively overcome with personalized nudging, a low-cost solution
- Connecting students to basic needs supports helps students make academic progress, particularly those in need of developmental education

INTRODUCTION

Improving academic success rates at American community colleges is a longstanding challenge and is particularly critical in a post-pandemic economy. Students from lower-income households, those from racially minoritized communities, and students with less robust academic preparation are especially likely to attend community college. Certificate and degree completion offer high economic and social returns.² Yet, less than 40% of students entering community college complete a certificate or degree over the subsequent six years, leaving many with debt and little opportunity for social mobility or stability.³

Developmental education poses a barrier to completion. Students must often complete and pay for non-credit bearing courses before becoming eligible for credit-bearing coursework.⁴ In fact, many never reach college-level coursework after being placed into developmental education.⁵ A meta-analysis of existing research shows an association between placement into developmental education and sizable negative academic outcomes.⁶ Typical solutions focus on helping students navigate college or changing the academic coursework to which they are exposed.⁷ For example, efforts to help improve rates of access to college-level coursework include revising how developmental education is taught or eliminating it entirely.⁸

In addition, some still frame community colleges as “relatively affordable,” despite high and rising net prices that rival those of public four-year colleges and universities.⁹ A misconception of cost impacts persistence and completion because students do not expect the real time and associated costs to complete a degree. College affordability and associated basic needs insecurity affect community college students across the nation. Strong theory and prior evidence connect basic needs insecurity to academic challenges, suggesting that students must meet their basic needs in order to succeed academically.¹⁰

Since 2015, The Hope Center has surveyed 370 community colleges in 42 states and found that roughly 60% of students experienced basic needs insecurity.¹¹ Roughly one in seven community college student experience homelessness.¹² A 2018 U.S. Government Accountability Office report concluded that despite billions of dollars invested annually in the forms of grants and loans, “many low-income college students struggle to meet their basic needs, including obtaining the food that they need, and may drop out of college as a result.”¹³ According to The Hope Center’s most recent report, the number of students with basic needs insecurity either remained steady or grew during the COVID-19 pandemic.¹⁴



We use the term "basic needs" to denote adequate and equitable access to:

- nutritious and sufficient food;
- safe, secure, and adequate housing (to sleep, study, cook, and shower);
- healthcare to promote sustained mental and physical well-being;
- affordable transportation;
- affordable technology;
- resources for personal hygiene care; and
- family care and related needs.

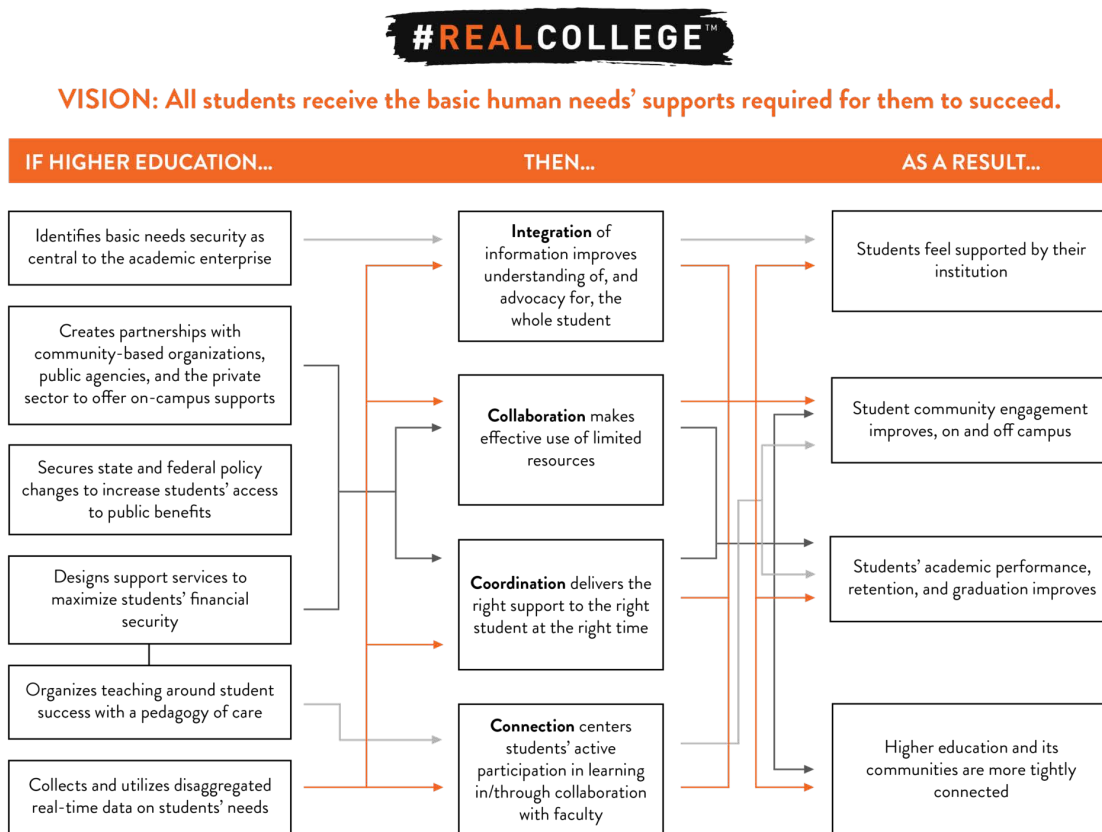
When basic needs are satisfied, students are basic needs secure. Meeting students' basic needs requires an ecosystem where multiple systems work together to support students. Collaboration across domains allows individuals to achieve basic needs security and thrive academically. Basic needs insecurity indicates a shortcoming in the ecosystem. Failed ecosystems do not address the whole college student. An ecosystem's shortcomings may threaten the improvement of students' economic stability and other life outcomes with established connections to desired academic outcomes.¹⁵

HOW BASIC NEEDS HUBS ADDRESS BASIC NEEDS INSECURITY

Over the last decade basic needs hubs, or one-stop centers, became an increasingly common approach to creating an ecosystem to support students' basic needs.¹⁶ The approach draws inspiration from centers throughout the nation that support dislocated workers and other low-income individuals seeking work and other basic needs supports. The 1998 Workforce Investment Act created these centers. [American Jobs Centers](#) continue under the Workforce Investment and Opportunity Act.

Basic needs hubs use an approach tightly aligned with the #RealCollege theory of change articulated by The Hope Center (Figure 1). The presence of a one-stop hub indicates that the institution understands basic needs security as an academic concern. The hubs bridge on- and off-campus supports via partnerships and financial support services. This, in turn, increases the use of integrated information on the whole student, promotes collaboration, and improves the coordination of supports. Even basic awareness of a hub should help students feel more supported by their institution. Awareness, coupled with receiving services, ought to improve academic outcomes.

Figure 1: #RealCollege Theory of Change



The range in types of basic needs hubs at community colleges has grown over time. In a 2021 report, Paula Umaña and Derek Price document new efforts ranging from [United Way of King County's Benefits Hubs](#) throughout Seattle to homegrown models like the Advocacy and Resource Center (ARC) at Amarillo College, the subject of this report. They note:

Previous traumatic experiences and the complexity of navigating higher education systems interfere with students' timely access to the resources. Based on a human-centered approach, one-stop models seek to consolidate existing campus-level interventions and supports like emergency aid, with public benefits, social services, and other comprehensive assistance bundled in a single on-campus location!⁷

Single Stop started when legal and financial experts volunteered in Philadelphia churches to provide a "one-stop" spot to help residents. Their project grew into a New York-based nonprofit. In 2007, Single Stop established itself as a national organization and launched community sites across the country. By 2014, it held 90 sites in California, Florida, Louisiana, Massachusetts, Mississippi, New Jersey, New York, and Pennsylvania; this included 21 community college campuses in eight states.

That year the Wisconsin HOPE Lab (which later became The Hope Center) conducted an implementation assessment of the community college program.¹⁸ At the time, the Single Stop model offered integrated services including tax preparation, financial counseling, legal services, and case management. They used proprietary technology called the Benefits Enrollment Network to screen students for public benefits. The CEO, Elisabeth Mason, called the approach “high-tech, high touch.” The HOPE Lab’s evaluation showed that Single Stop staff found case management far more useful than their technology at supporting students’ basic needs. At the same time, they struggled to scale supports and reach the students on campus who required help but did not approach the Single Stop.

In 2018, the RAND Corporation published a quantitative evaluation (using a weighted comparison group) of Single Stop sites at four North Carolina community colleges that opened in 2015 and 2016.¹⁹ The same year, Metis Associates released a quasi-experimental study (using propensity score matching) of Single Stop’s Philadelphia site, which opened in 2014.²⁰ The RAND evaluation identified a small positive association with greater credit completion but no improvements in student persistence at the four North Carolina colleges. Less than 20% of students (and often less than 5%) accessed Single Stop services at colleges in RAND’s survey. In contrast, the evaluation of the Philadelphia Single Stop site identified substantial improvements in persistence and graduation rates. Over a three-year period, students who used Single Stop were about six percentage points more likely to have remained in college or graduated.

There are also several other approaches to basic needs hubs. Between 2014 and 2017 the Working Students Success Network (WSSN) supported 19 colleges in four states to offer integrated services. The services included income and work supports; and financial services aimed at addressing students’ basic needs and promoting their financial stability. An implementation study led by DVP-Praxis found that some of these colleges organized those services as hubs, with just one using Single Stop’s approach.²¹ In the DVP-Praxis report, Big Bend Community College in Oregon, Patrick Henry Community College in Virginia, and Highline College in Washington said using the hub approach helped ensure that students never walked through a “wrong door” when trying to access support and created greater integration across departments, helping to reach more students. DVP-Praxis researchers wrote:

The centralized location represent[s] a shift from the past, and introduced a new organizational model of supporting students by providing a suite of services for all students in a single location... [it also provides] a visible signal for the campus and community that addressing students’ basic needs and financial insecurities is the responsibility of the college, and can become a “rallying cry” for administrators, faculty, staff, and students.

A subsequent quantitative study of WSSN by Mathematica Policy Research found that few of the 19 colleges used the “high touch” hub-based approach.²² Evaluators could not determine whether the hub-based approach or the “lighter touch” approaches integrated services more effectively. However, a regression analysis found a positive association between receipt of high touch supports and both retention and degree completion.

A diverse body of evidence suggests that basic needs hubs could improve academic performance in community colleges. However, only a fraction of students enduring basic needs insecurity access basic needs hubs. Students who access them may have pre-existing advantages or disadvantages, making it difficult to establish whether hubs cause the outcomes. None of the prior evaluations speak to what happens when institutions scale hubs, inform more students about them, and utilization increases.

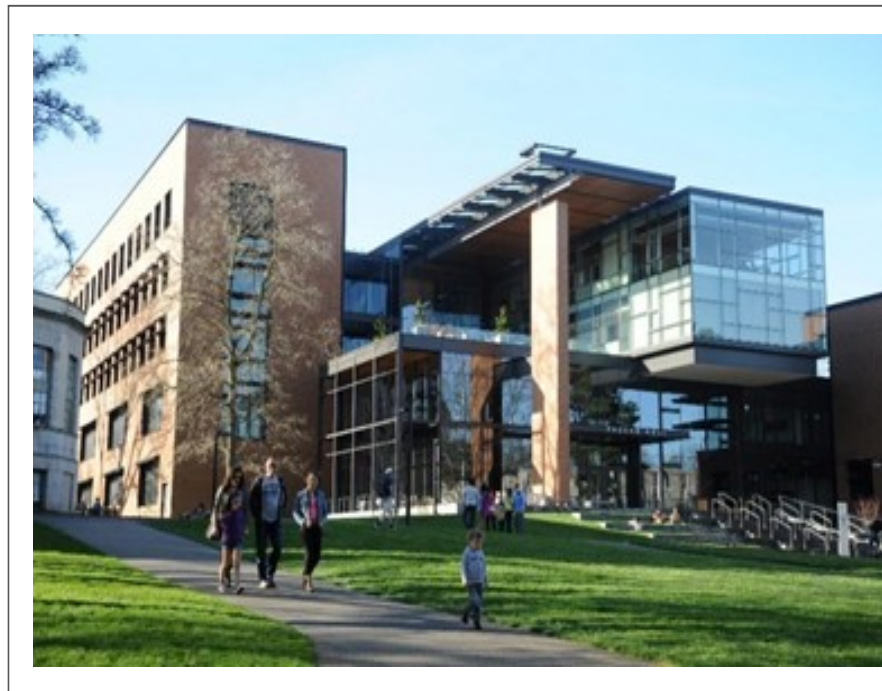
For example, a recent implementation study of the United Way model notes the importance of attending to staff capacity and administrative support as the Benefits Hubs grow.²³ At many colleges where hubs operate, #RealCollege survey data collected by The Hope Center indicates that the prevalence of basic needs insecurity far exceeds current support utilization rates. For example, in the City University of New York system where Single Stop was first located, a 2018 survey found that at least 40% of community college students experiencing basic needs insecurity did not access any supports.²⁴ A Healthy CUNY survey conducted that same year revealed that just seven percent of CUNY undergraduates knew that Single Stop existed.²⁵

These challenges raise an important question: To what extent does addressing the gap in knowledge about basic needs supports increase utilization and promote academic success? That question guides this evaluation.

AMARILLO COLLEGE

Amarillo College (AC) bases its approach to retention and completion in a “culture of caring,” embodied by its Advocacy and Resource Center (ARC).²⁶ Established in 2016, the ARC offers a social services case management program that includes access to emergency aid, public benefits programs, transportation, childcare assistance, coaching, career guidance, textbook lending, and counseling. ARC also offers a food pantry and a clothing closet. It is a field practicum site for the local university social work program. Staff work closely with the counseling center and legal aid clinic, both of which provide free services. Unlike Single Stop, the ARC does not use proprietary technology to screen students for benefits. During the evaluation period, the ARC was a physical hub with offices in the Student Center in the heart of campus. During the COVID-19 pandemic, some services moved online.

In addition, AC has shown great interest in addressing the needs of its students placed in developmental education. AC made supporting students in need of remediation a priority in the early 1970s.²⁷ In 2015, Amarillo College received a \$2.6M grant from the U.S. Department of Education to overhaul its approach to developmental education.²⁸ AC clearly needed more support, as up to 60% of students attempting developmental coursework failed to pass.²⁹ AC is a Latinx-serving institution founded in 1929 and located in a city of fewer than 200,000 residents, representing almost half of the population of the Texas Panhandle.



The city of Amarillo is predominantly non-Latinx White (60%), with much of the remaining population Latinx (29%). Almost 8% of Amarillo’s residents are non-citizens, most of whom are from Mexico. The median household income is just less than \$50,000, and 14.5% of the population lives below the poverty line. While high school completion rates in Amarillo resemble the national average (80%), only one in five residents older than 25 holds a bachelor’s degree (compared with one in four nationally).

In 2019, a year after this evaluation began, AC changed its approach to developmental education. Rather than require remedial classes before beginning college-level studies, students who placed into development education received special assistance through an increasingly popular model known as “corequisite mediation.” The mediation can consist of concurrent classes, supplemental instruction, or extra tutoring.³⁰

AC educates just over 10,000 students a year. About two-thirds of AC students are female; 43% are Latinx. President Russell Lowery-Hart often refers to the typical AC student as a “27-year-old Hispanic mother who is a first-generation student going to college part-time while working two jobs.” While she may have little in common with students who attended AC twenty or thirty years ago, Lowery-Hart emphasizes that she is smart, determined, hardworking, and churchgoing. He says that if higher education does not serve her well, then she “will more likely be sitting on the sidelines ... when she desperately wants to earn a living wage.”

In 2018, The Hope Center published a detailed implementation study of Amarillo College’s basic needs supports, including the ARC.³¹ We observed that the students using the supports viewed them positively, and that usage was growing. In fall 2016 the ARC served 5.4% of enrolled students, while in fall 2017 it rose to 13.2% of enrolled students. However, nearly 80% of students coming to the ARC identified as female. We recommended that the college take steps to expand knowledge of the ARC among all students, especially male students, and consider a rigorous evaluation to assess impacts.

EVALUATION DESIGN

With support from the [Trellis Foundation](#), in summer 2018 The Hope Center partnered with Amarillo College to conduct a rigorous evaluation advancing two goals:

- Increase student utilization of the ARC, particularly among students most at risk of leaving college, using a very low-cost, technology-enabled approach.
- Examine the causal impact of referring students to the ARC on their academic success.

The most rigorous form of impact evaluation is the randomized experiment, which separates pre-existing characteristics potentially associated with success and the impact of the ARC itself. However, we find randomizing students to use the ARC and denying services to one group of students unethical. A randomized experiment would change how the ARC typically works and would not produce a realistic understanding of the ARC's impact.

Instead, we used the randomized encouragement approach, which does not disrupt normal programmatic operations or deny access to supports. While the ARC remained open to all students during the evaluation, one randomly selected group of students received personalized email outreach from college staff, nudging them to visit the ARC for support. The other group did not receive the nudges but still had access to the ARC and its supports.

Researchers around the world use randomized encouragement design to study programs serving people living in poverty and in higher education. In this case it allows us to consider two important and related questions:

1. Is it possible to increase utilization of the ARC using a low-cost technology-enabled method? Will this work for males, as well as females?
2. What impact does encouraging students to use the ARC have on their academic performance and persistence?
 - Does it help students in developmental education pass those courses to transition to college-level work?
 - Does it help students in developmental education pass those courses to transition to college-level?
 - What impact does encouraging students to use the ARC have on their academic performance and persistence?

While we cannot directly compare our randomized encouragement approach to prior evaluations, for example both Single Stop studies examine the impact of receiving services, our evaluation makes distinct contributions.

First, from a policy perspective, a college can only encourage students to seek services, it cannot mandate that students access services, making this evaluation more realistic. Related, the randomized encouragement provides a more efficient and cost-effective approach to implementation for institutions with limited resources. Second, while quasi-experimental approaches like those in the Single Stop studies try to generate clean causal estimates, they cannot account for unobserved differences among students such as motivation or confidence that may help them to receive services. Thus, they may still over-state impacts. Alternatively, because benefits hubs target students with the most need, unobserved differences like experiences with trauma may lead evaluators to under-state the program's true effects. The experimental design in this evaluation mediates against that possibility.³²

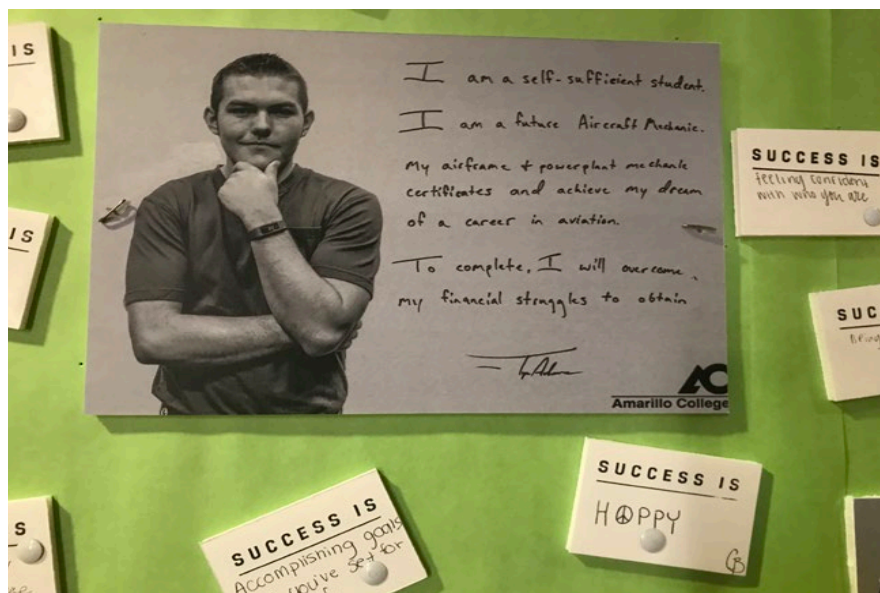
Behavioral scientists, especially those studying higher education, increasingly use a method of encouraging individuals to use programs called “nudging”, in their studies. Researchers have examined the impact of nudges on FAFSA filing, sometimes identifying positive effects.³³ On the other hand, two FAFSA completion messaging campaigns delivered across the nation found that nudging did not improve students’ outcomes.³⁴

Alternatively, a nudging campaign at Western Michigan University that employed text messages to encourage students to use food pantries increased retention rates by 12 percentage points and eased food insecurity.³⁵ The Hope Center is also examining the efficacy of nudging for basic needs insecurity programs in [Dallas College](#), and the sites of several [UWKC Benefits Hubs](#).

At Amarillo College, ARC staff used personalized email messages to nudge students throughout the 2018-2019 academic year. Once per month from September through March, staff sent emails to students that had the following characteristics aligned with best practice (see below for an example):³⁶

Emails:

- were personalized, addressed to a student’s first name;
- included content tied to particular academic junctures. For example, staff welcomed students to campus or back to campus, mentioned the start of new class sessions or holidays or events;
- described supports available to all students (overcoming perceived ineligibility);
- emphasized that many supports exist (countering concerns about resource scarcity);
- were offered in addition to, not instead of, many other supportive messages across the institution. For example, as part of AC’s broader culture of caring, AC regularly reminded students they belonged at the college and that AC encouraged help-seeking behaviors.



SAMPLE NUDGE EMAIL SENT BY ADVOCACY & RESOURCE CENTER STAFF

Dear STUDENT,

On behalf of the Advocacy & Resource Center (The ARC), we would like to wish you GOOD LUCK as you begin another semester here at Amarillo College. If this is your first semester here, WELCOME! We are excited to have you here!

I wanted to reach out to you and invite you to come in and get some additional information about resources and services that are available to you as an Amarillo College Student.

Inside of the Advocacy & Resource Center, you will find the following programs:

- Amarillo College Food Pantry: Access this service twice a month for food, hygiene products (shampoo, conditioner, soap, toothpaste, etc.) and toiletry items for all currently enrolled students.
- Amarillo College Clothing Closet: Access these resources any time you need clothing, shoes, coats, or accessories.
- Ask about our scholarships available to assist with tuition, child-care, transportation, and textbooks for those who qualify. To apply, please visit: www.actx.edu/foundation/. Students must have a 2.0 GPA or higher.
- Our Social Services Program is available to assist students with emergency needs and to connect students with resources on campus and in the community.

Anytime there is a barrier to your success, we invite you to come in and let us see what we can do to try to help, whether it be accessing services here in our department or referring you to an outside agency.

Throughout your journey here at Amarillo College, please know that we are here for you. If you have any questions, please don't hesitate to let us know.

We are located on the Washington Street Campus in the Ware Student Commons - Suite XXX. Stop in and see us or give us a call at xxx-xxxx! We hope to see you soon!

Sincerely,

STAFF NAME

Social Services Coordinator
Advocacy & Resource Center

Amarillo College’s pre-existing approaches to advertising the ARC might have prevented us from finding additional impacts from nudging. Staff already visited classrooms and set up tables on campus to share materials, and faculty and administrators were widely aware of the ARC’s offerings. Alternatively, it is also possible that nudging would support non-nudged students because students often share information. While the information sharing would be good for students, it could make detecting the impacts of nudging more difficult.

We examine impacts on two types of outcomes, which we observe for both nudged and non-nudged students:

- **ARC utilization, including number of visits.** When a student comes to the ARC, they sign in using their student ID. We merge usage data with administrative records to assess outcomes.
- **Academic momentum and attainment.** We assess these outcomes using the college’s administrative records. **Credit completion** is the number of credits finished in credit-bearing courses for a given academic year. **Passed courses** measures completion of all courses (regardless of credit-bearing) for a given academic year. **Completion of developmental education** measures whether students enrolled in developmental education courses completed all their developmental education coursework by the given year, and could move on to credit-bearing coursework.³⁷ **GPA** is annual (average of fall and spring terms), and we examine impacts on annual GPA as well as whether students obtained a 2.0 GPA or above, helping to meet Satisfactory Academic Progress requirements. Finally, we assess whether students **persisted**, **transferred** to a four-year college, or **graduated**.³⁸

For the academic outcomes, we examine impacts for the students that were nudged (an intent-to-treat or ITT analysis) and for the students that used the services (a treatment-on-treated or TOT analysis). The first analysis examines the impact of the nudges on outcomes while the second looks at the impact of receiving services among nudged students.

STUDENT SAMPLE

Students at Amarillo College frequently experience basic needs insecurity. In Fall 2017, the year before our evaluation began, 54% of survey respondents experienced food insecurity, 59% experienced housing insecurity, and 6% lived with homelessness. Food insecurity rates varied by gender, with male-identified students more often experiencing severe challenges like going without food for a day or more at a time. Pell recipients experienced all forms of basic needs insecurity at higher rates. Amarillo took particular interest in ensuring that students from low-income households, a factor often correlated with Pell receipt, received more outreach about the ARC, and understanding whether effects of outreach might differ by gender or students in developmental education coursework.

The following criteria were used to identify students enrolled in early August 2018 who might benefit from nudging:

- Income in the lowest quintile among AC students completing the FAFSA (approximately \$20,000) (N= 1,690)
- Income in the lowest quintile among AC students who did not complete the FAFSA, using the Census block group median for their zip code (N=10)
- Income not in the lowest quintile but placed in developmental education (N=268)

Within this group of 1,968 individuals, researchers used a lottery to select 1,000 students for nudging, while the other 968 could access the ARC but did not receive nudging.³⁹

Table 1 shows the characteristics of the full sample, overall and according to whether they received nudges. The racial, ethnic and gender categories listed in Table 1 reflect what Amarillo College collected. These categories may not reflect the full range of racial, ethnic, or gender identities of students aligned with the sample criteria. About 86% of students are in the bottom quintile of the income distribution and 27% were enrolled in developmental education when the study began. Seventy-two percent are female, 42% are Latinx, 40% are non-Latinx White, and the average age is 26. Students completed 28 credits on average and received a cumulative GPA of 2.17 (just above [Satisfactory Academic Progress standards](#)) prior to when nudging began.

The lottery effectively created two equivalent groups of students, such that nudged students were almost identical in characteristics to non-nudged students before the nudging took place. All differences between the nudged and non-nudged groups have a smaller than 0.25 effect size, well within bounds according to [What Works Clearinghouse standards](#). However, as per these standards, we control for characteristics that have an effect size between 0.05 and 0.25 in all analytic models. This holds true for the subsample of students in developmental education (see Table D-3 in the [web appendices](#) for comparison of demographics for students in developmental education courses). As a result, all subsequent differences between these two groups of students can be properly attributed to the effects of nudging them to use the ARC.

Table 1: Full Sample Characteristics, Overall and by Assignment to Nudging

		All (N=1,968)	Not Nudged (n=968)	Nudged (n=1,000)	Difference (Effect Size)
Percent	Female	72	72	72	0.00
	White	40	39	40	0.02
	Race Black or African American	18	19	18	0.07
	Latinx	42	42	42	0.02
	Enrolled in Developmental Education	27	25	28	0.08
	Bottom Quintile of Family Income	86	87	85	0.13
Average	Age	26	26	26	0.03
	Credits Completed	28	28	27	0.04
	Cumulative GPA	2.17	2.14	2.19	0.04
	EFC (\$)	199	161	236	0.08

SOURCE | Demographic data obtained from Amarillo College administrative records.

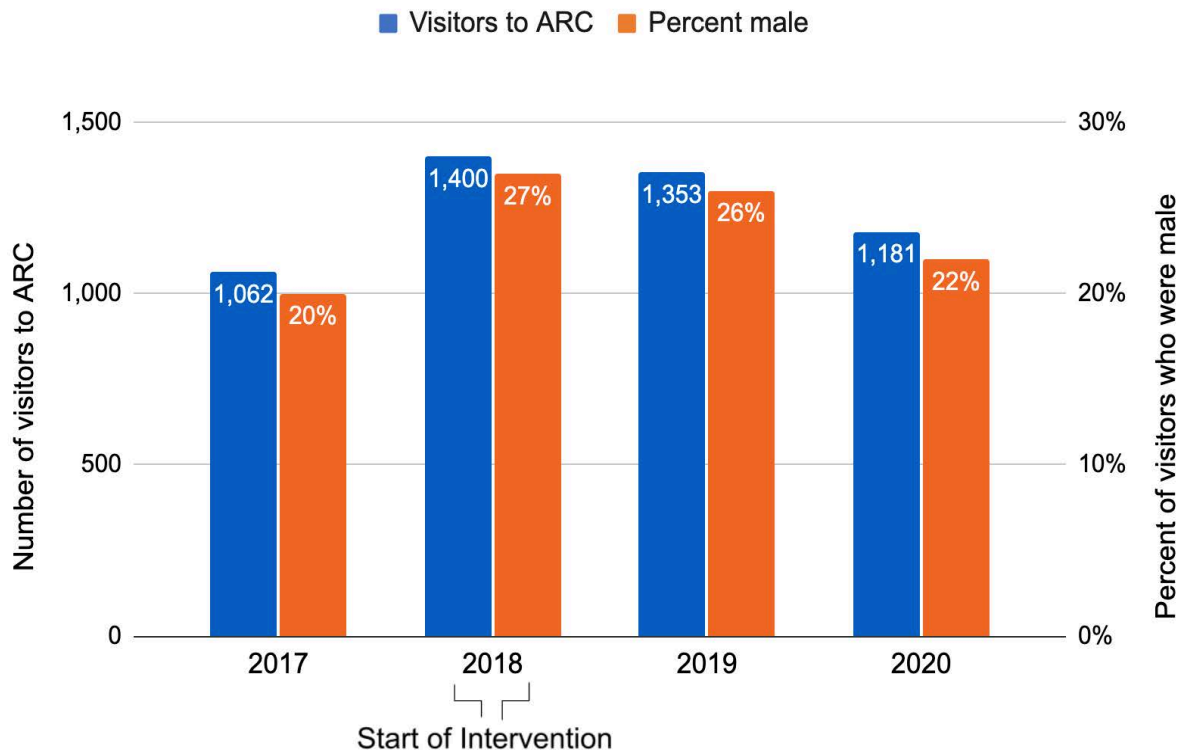
NOTES | Age corresponds to students' age in 2018 as calculated from birth year. "Developmental Education" refers to the percent of students enrolled in developmental education courses in the fall of 2018. EFC corresponds to the students' Expected Family Contribution for the 2018-2019 academic year. Missing demographics and baseline characteristics were mean imputed (see Table D-12 in the [web appendices](#) for percent missing by subgroup). Bottom quintile of family income is derived from FAFSA data. Race and ethnicity categories may not total one hundred due to rounding. Effect size is estimated using Hedge's G or Cox's Index, as appropriate. Effect size is estimated for binary and continuous variables.

IMPACTS OF NUDGING ON ARC UTILIZATION

In fall 2018, AC sent emails to the 1,000 students randomly assigned to receive nudges using both students’ school and personal email addresses. Almost half of the students opened the first email (49%), and 4% clicked on links inside it. After the first month, open rates declined to around 25% per email, with about 2% clicking on links inside each one.

Figure 2 shows the trends in the number of visitors to ARC and the percent of visiting students who were male, as the goal was to increase utilization among male students.⁴⁰ The sample for Figure 2 is all students at Amarillo, not just those in this evaluation. In 2017, the year before nudging began, a total of 1,062 unique students visited the ARC, and just 20% were male. When the nudging began in 2018, ARC utilization rose to a high of 1,400 unique visitors, of whom 27% were male. The number of visitors held steady through the end of the nudging year before declining again in 2020 when nudging stopped.

Figure 2: Visits to ARC Between 2017 and 2020



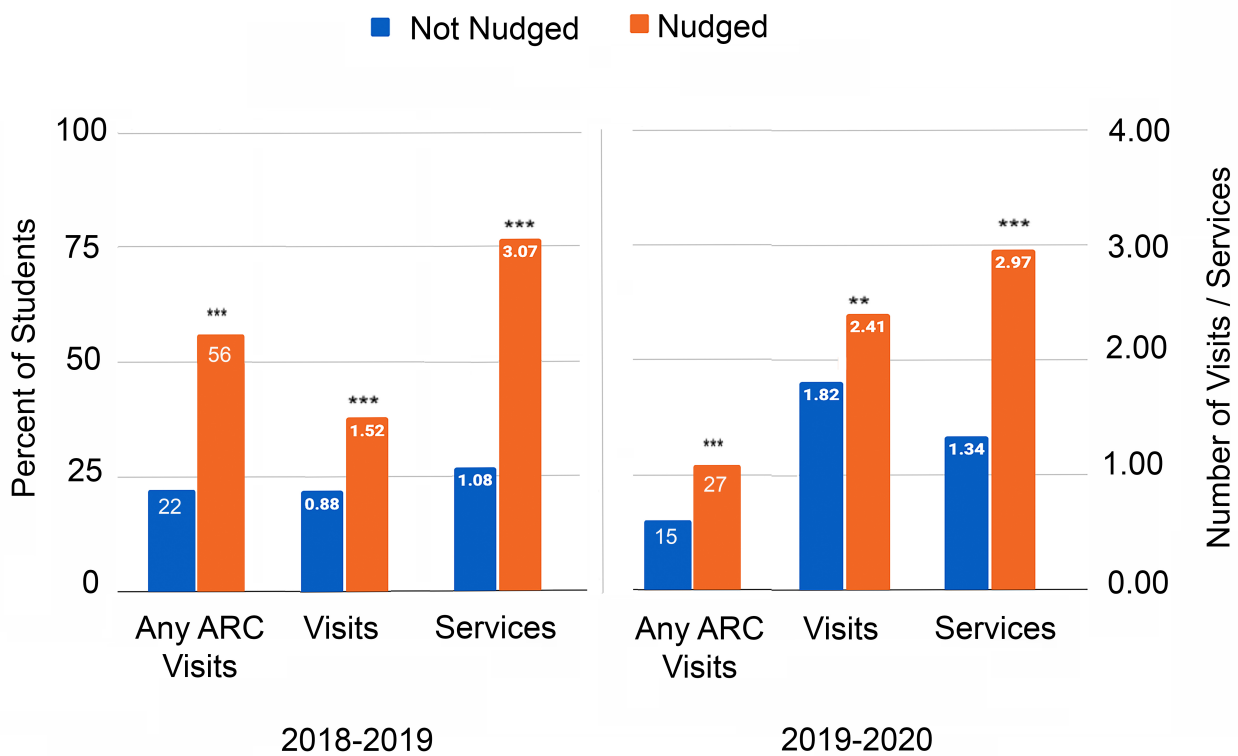
SOURCE | Usage data obtained from ARC program records.

NOTE | Data are for all students attending Amarillo College. 2018 represents the first year of the intervention, and therefore is the first year where students in the study may have received nudges.

Next, we examine the impacts of the intervention at the individual level. To assess whether nudging caused increased use of the ARC, Figure 3 compares visits to the ARC based on whether students were nudged.

Nudging more than doubled use of the ARC during 2018-2019. About 56% of nudged students visited at least once, compared to 22% of students who did not receive nudges. The impact of nudging persisted a year later. During 2019-2020, 15% of non-nudged students used the ARC compared to 27% of nudged students (please see Table D-4 in the [web appendices](#) for additional data points).

FIGURE 3: Impact of Nudging on Visiting the ARC at Least Once



SOURCE | Usage data obtained from ARC program records.

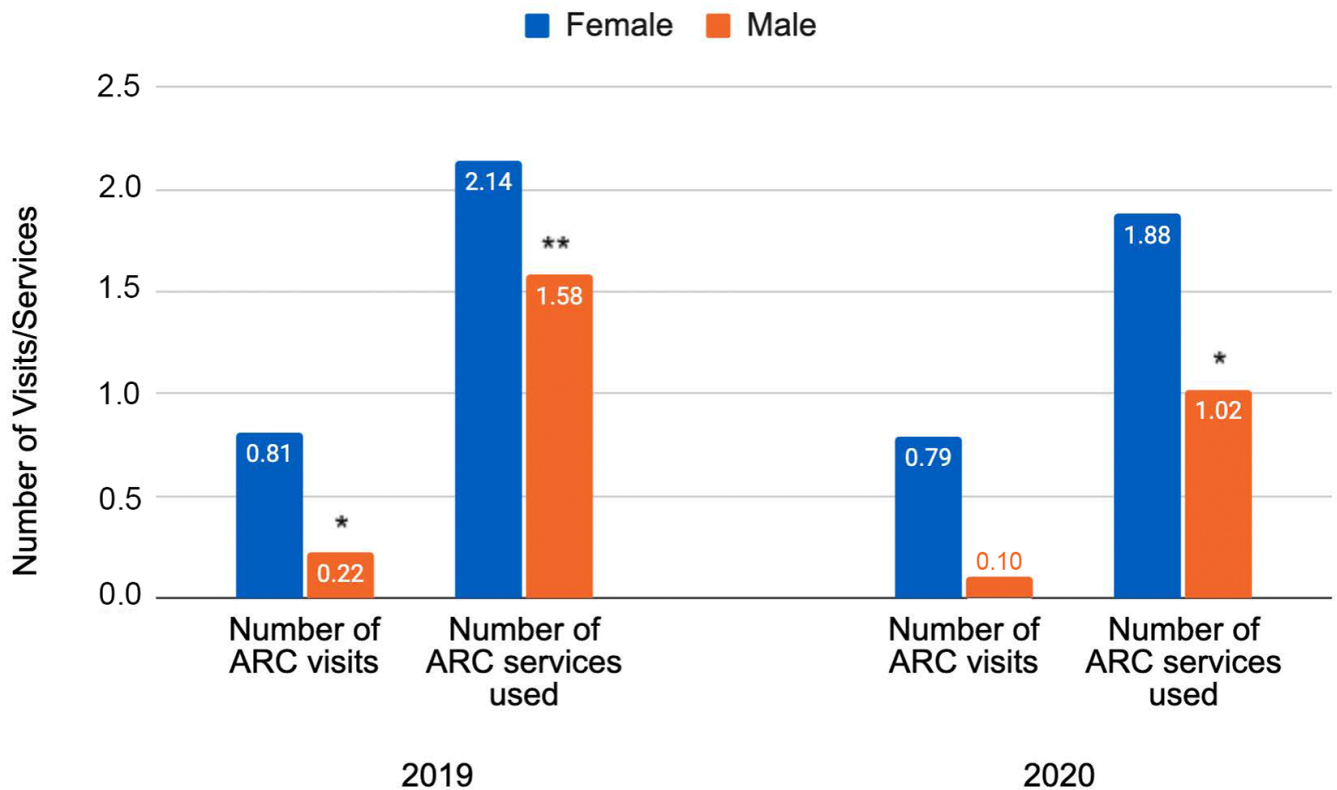
NOTES | * = p<.10, ** = p<.05, *** = p<.01. N=1,968. Data above were collected by ARC staff and obtained from Amarillo College. Any ARC visits is modeled using logistic regression. Visits and services are modeled using linear regression. All models control for EFC, student's race and ethnicity, enrollment in developmental education, and whether the student's family was in the bottom quintile of income on the FAFSA. Missing demographics and baseline characteristics were mean imputed (see Table D-12 in [web appendices](#)). All missing outcomes were imputed as zero. Totals for the 2019-2020 year for students who were no longer enrolled due to graduating, or transferring are equal to the 2018-2019 totals.

In addition to increasing the odds that students would use the ARC, nudging increased the number of visits they made to the ARC and increased the number of services they used. In the first year, nudged students visited one additional time and used two additional services on average, compared to non-nudged students. The differences largely persisted a year later.

GENDER DIFFERENCES IN ARC USAGE

During our earlier case study, we found that male students used the ARC less. We hoped that nudging would help males connect to the ARC. Figure 4 shows that nudging boosted use of the ARC both in the number of visits and number of services used by both male and female students. However, the relative impact of nudging was smaller for male students compared to female students

FIGURE 4: Gender Differences in the Impact of Nudging on Use of the ARC



SOURCE | Program data obtained from Amarillo College ARC program records.

NOTES | * = $p < .10$, ** = $p < .05$, *** = $p < .01$. $N = 1,968$. Significance levels presented above indicate significant differences in impact for male students versus female students. Data above were collected by ARC staff and obtained from Amarillo College. Impacts are modeled using linear regression, and control for EFC, student's race and ethnicity, enrollment in developmental education, and whether the student's family was in the bottom quintile of income on the FAFSA. Missing demographics and baseline characteristics were mean imputed (see Table D-12 in the [web appendices](#) for percent missing by subgroup). All missing outcomes were imputed as zero. Totals for the 2019-2020 year for students who were no longer enrolled due to graduating or transferring out are equal to the 2018-2019 totals. All other missing outcomes were imputed as zero.

IMPACTS OF NUDGING ON ACADEMIC SUCCESS

Because nudging effectively improved utilization of the ARC, the next question is whether it, in turn, positively impacted students' academic progress through increased utilization. Figure 5 uses the intent-to-treat (ITT) approach to examine four outcomes potentially impacted by the nudges: passing developmental education, passing courses, GPA, and continued enrollment or graduation.

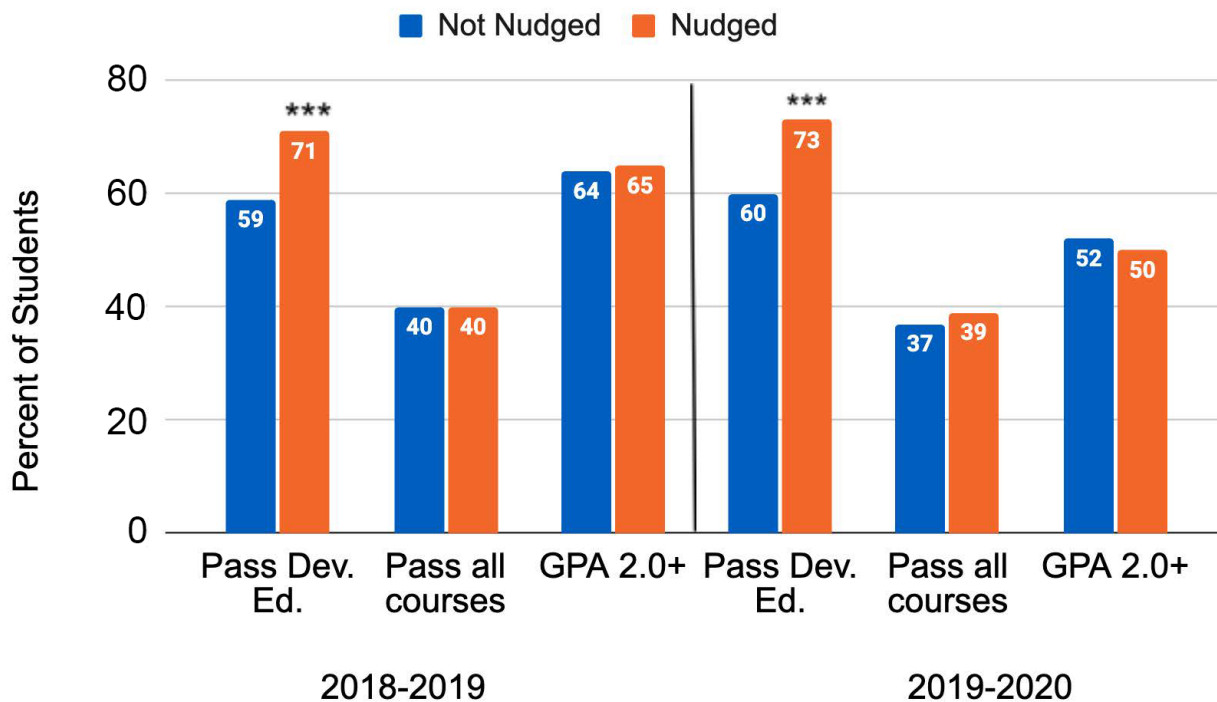
On average, nudging showed a positive impact in helping students pass developmental education. Non-nudged students completed their courses and passed developmental education at a rate of 59%, whereas nudged students passed at a rate of 71% in 2018-2019. Once students passed their developmental education courses they met that benchmark for all future terms. As most students who passed developmental education courses did so in the first year, we observe only a small increase in the impact of nudges on the percentage of students who passed their developmental education courses in the second year.

However, as shown in Figure 5, simply nudging students to use the ARC did not appear to boost their overall rate of passing courses, nor their odds of making at least a 2.0 GPA. Nudging also did not improve overall retention, transfer, or graduation rates.

In addition to examining course completion and the percent of students who received a 2.0 GPA or higher, we also examine annual GPA (a combination of fall and spring terms) and annual credits completed. Nudged students had slightly higher completed credits in both 2019-2019 and 2019-2020. The differences are not large enough to be sure they did not occur by chance. Similarly, receiving nudges did not produce any meaningful differences in annual GPA in either year.



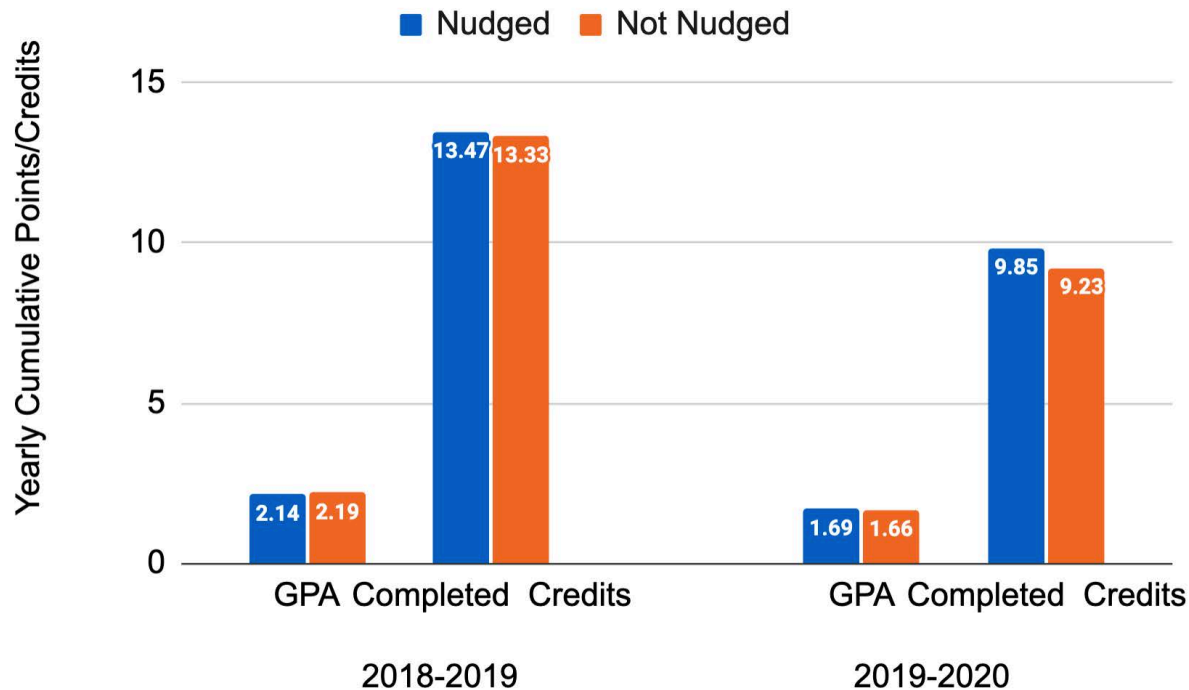
Figure 5: Impacts of Nudging on Academic Progress (ITT)



SOURCE | Academic outcome data obtained from Amarillo College administrative records.

NOTES | * = $p < .10$, ** = $p < .05$, *** = $p < .01$. N=1,968; enrolled in developmental education N= 523. Data above were obtained from Amarillo College administrative records. Continued enrollment or graduation, passed developmental education, and passed all courses are estimated with logistic regression. Passing courses and GPA models control for EFC, student's race and ethnicity, whether the student was enrolled in developmental education, and whether the student's family income falls in the bottom quintile of FAFSA filers. Developmental education models control for age, gender, and pre-treatment GPA. Missing demographics and baseline characteristics were mean imputed (see Table D-12 in the [web appendices](#) for percent missing by subgroup). Students who graduated or transferred to a four-year college are coded as passing their courses. Students who passed all their developmental education courses in 2018-2019 are coded as passing developmental education courses in 2019-2020. All other missing outcomes were imputed as zero.

Figure 6: Impacts of Nudging on GPA and Credit Completion (ITT)

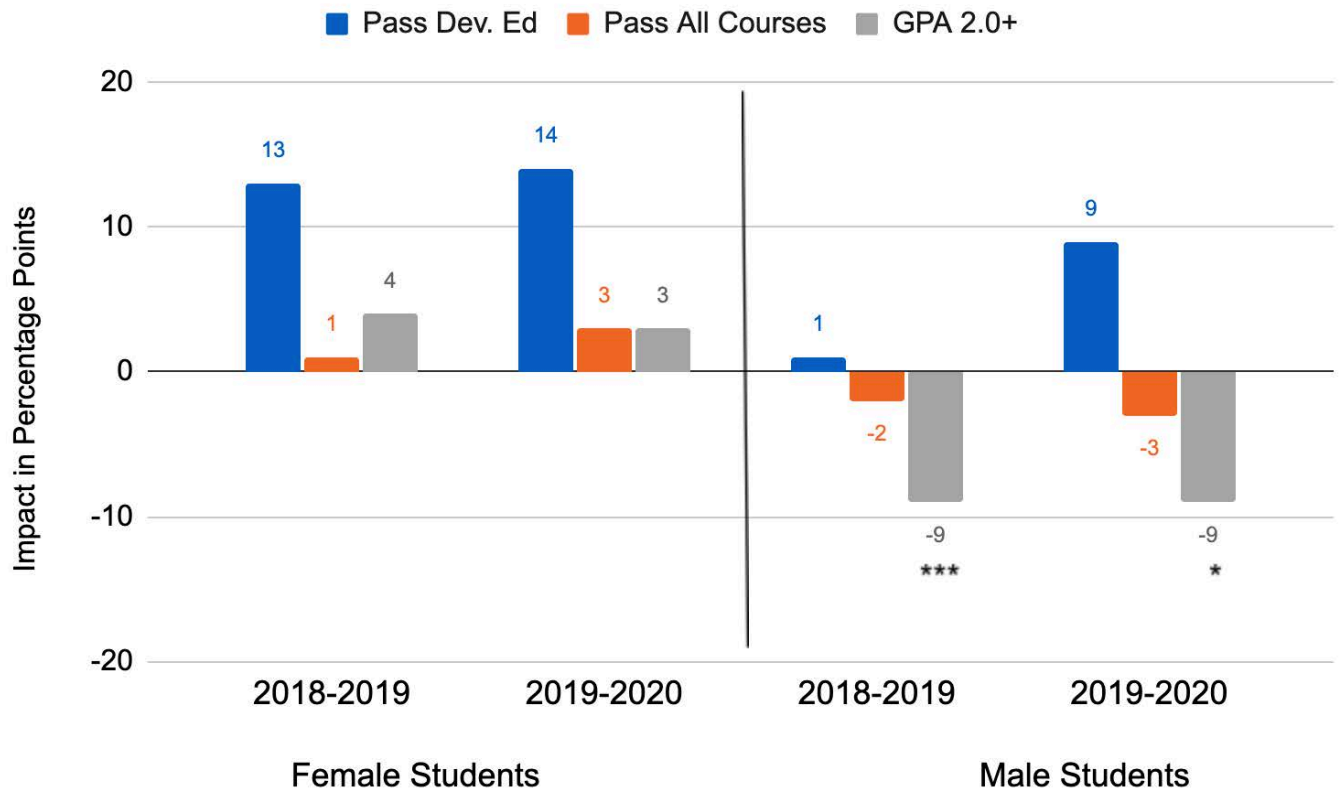


SOURCE | Academic outcome data obtained from Amarillo College administrative records.
 NOTES | * = $p < .10$, ** = $p < .05$, *** = $p < .01$. N=1,968. Annual GPA and annual completed credits are estimated with linear regression. Models control for EFC, student's race and ethnicity, whether the student was enrolled in developmental education, and whether the student's family income falls in the bottom quintile of FAFSA filers. Missing demographics and baseline characteristics were mean imputed (see Table D-12 in the [web appendices](#) for percent missing by subgroup). Students who graduated or transferred to a four-year college have their 2018-2029 completed credits, and 2018-2019 annual GPA used as estimates for 2019-2020. Students who passed all their developmental education courses in 2018-2019 are coded as passing developmental education courses in 2019-2020. Students who graduated or transferred to a four-year college are coded as passing their courses. All other missing outcomes were imputed as zero. See Table D-6 in the web appendices for additional data points.

GENDER DIFFERENCES IN ACADEMIC IMPACTS

Nudging shows a positive impact on pass rates for both male and female students in developmental education courses. Female students show slightly higher gains, as shown in Figure 7, but not enough to say with confidence that receiving nudges impacted male and female students differently. Some evidence shows that nudged male students were less likely to have a 2.0 GPA than their counterparts who did not receive nudges by approximately 9 percentage points. While surprising at first, this may be the result of male students remaining enrolled in developmental education courses instead of withdrawing or not completing. Because more male students, potentially with lower GPAs, stay enrolled in developmental education courses, the percent of male students making at least a 2.0 GPA may decline.

Figure 7: Gender Differences in Impact of Nudging on Academic Progress (ITT)



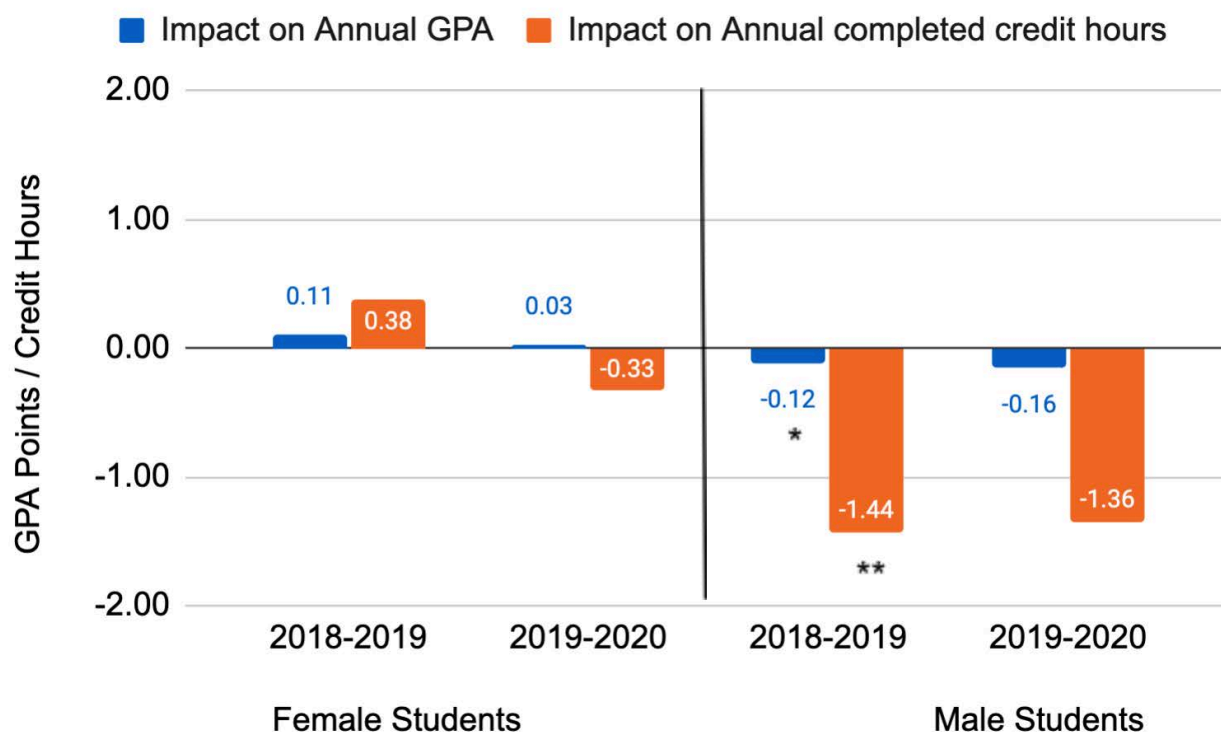
SOURCE | Academic outcome data obtained from Amarillo College administrative records.

NOTES | * = $p < .10$, **= $p < .05$, ***= $p < .01$. N=1,968; enrolled in developmental education N= 523. Significance levels presented above indicate significant differences in impact for male students versus female students.

Passed developmental education, passed all courses, and 2.0 GPA or above are estimated with logistic regression. (4) Passing courses and GPA models control for EFC, student's race and ethnicity, whether the student was enrolled in developmental education, and whether the student's family income falls in the bottom quintile of FAFSA filers. Developmental education models control for age, gender, and pre-treatment GPA. Missing demographics and baseline characteristics were mean imputed (see Table D-12 in the [web appendices](#) for percent missing by subgroup). Students who graduated or transferred to a four-year college have their 2018-2019 GPAs used to estimate 2019-2020 GPA and are coded as passing their courses. Students who passed all their developmental education courses in 2018-2019 are coded as passing developmental education courses in 2019-2020. All other missing outcomes were imputed as zero. See Table D-5 in the web appendices for additional data points.

Evidence also suggests that nudged male students earned approximately one fewer credit hour than their non-nudged counterparts. The disparity may be a product of retaining male students in developmental education courses at higher rates than their non-nudged counterparts. A portion of students who remained in developmental education courses may have chosen to focus their efforts on completing a smaller number of credits.

Figure 8: Gender Differences in Impact of Nudging on GPA and Credit Completion (ITT)



SOURCE | Academic outcome data obtained from Amarillo College administrative records.

NOTES | * = $p < .10$, ** = $p < .05$, *** = $p < .01$. $N = 1,968$. Annual GPA and annual completed credits are estimated with linear regression. Significance levels presented above indicate significant differences in impact for male students versus female students. Models control for EFC, student's race and ethnicity, whether the student was enrolled in developmental education, and whether the student's family income falls in the bottom quintile of FAFSA filers. Missing demographics and baseline characteristics were mean imputed (see Table D-12 in the [web appendices](#) for percent missing by subgroup). Students who graduated or transferred to a four-year college have their 2018-2029 completed credits, and 2018-2019 annual GPA used as estimates for 2019-2020.

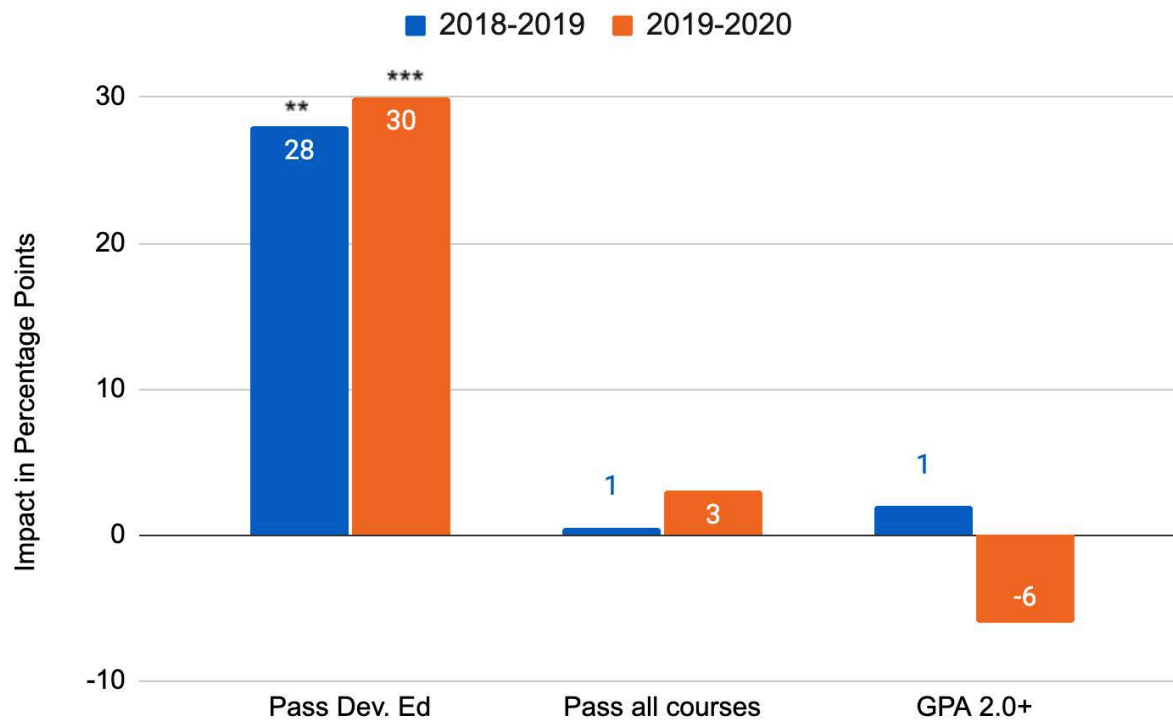
See Table D-5 in the [web appendices](#) for additional data points.

IMPACTS OF ARC USAGE ON ACADEMIC SUCCESS

Next, we consider whether visiting the ARC impacted academic progress. These are the treatment-on-the-treated (TOT) analyses.⁴¹ For the TOT analysis, we first estimate how likely it is that each student will go into the ARC at least once considering an array of student characteristics. We then use that information to examine each of the same outcomes above with the added consideration of how likely students are to visit the ARC. The TOT analysis helps us estimate the impacts of visiting the ARC given that not all students are equally likely to do so.

As illustrated in Figure 9, on average, visiting the ARC had sizable positive implications on students' developmental education passage rates, increasing them by 28 percentage points in the first year, and 30 percentage points in the second year. Visiting the ARC did not appear to significantly impact students' pass rates for their courses, or their likelihood of receiving a 2.0 GPA during either the first or second year.

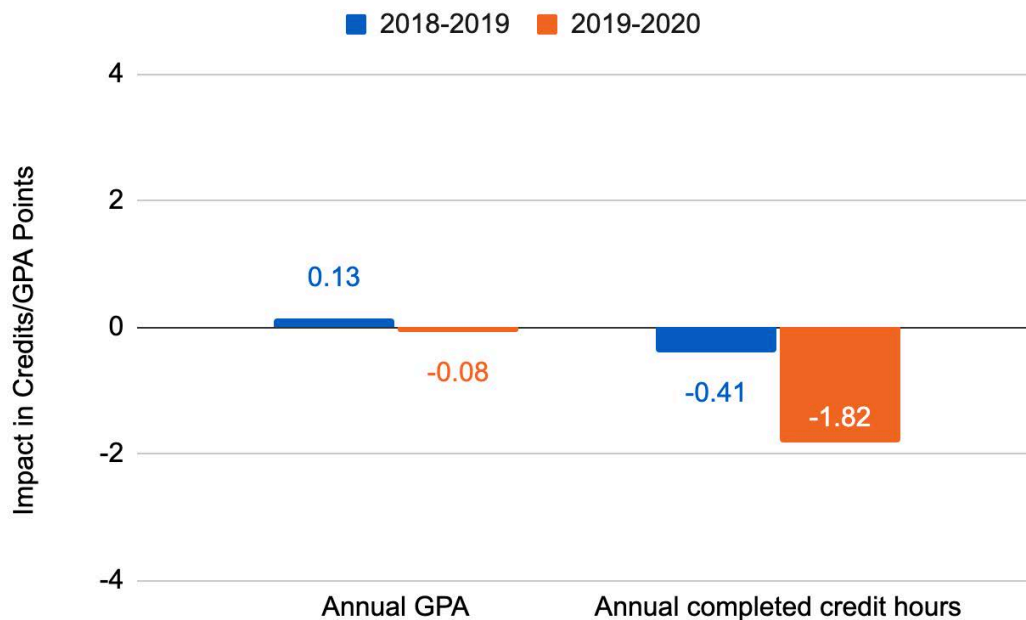
Figure 9: Impact of ARC Usage on Academic Progress (TOT)



SOURCE | Academic outcome data obtained from Amarillo College administrative records.
 NOTES | * = $p < .10$, ** = $p < .05$, *** = $p < .01$. N=1,968; enrolled in developmental education N= 523. Passed developmental education, passed all courses, and 2.0 GPA or above are estimated with two-stage least-squares models. Passing courses and GPA models control for EFC, student's race and ethnicity, whether the student was enrolled in developmental education, and whether the student's family income falls in the bottom quintile of FAFSA filers. Developmental education models control for age, gender, and pre-treatment GPA. Missing demographics and baseline characteristics were mean imputed (see Table D-12 in the [web appendices](#) for percent missing by subgroup). Students who graduated or transferred to a four-year college have their 2018-2019 GPAs used to estimate 2019-2020 GPA and are coded as passing their courses. Students who passed their developmental education courses in 2018-2019 are coded as passing developmental education courses in 2019-2020. All other missing outcomes were imputed as zero. See Table D-6 in the [web appendices](#) for additional data points.

Figure 10 shows that visiting the ARC did not appear to have a significant impact on annual GPA or number of credits completed in either the first or second year. Students who visited the ARC completed around two fewer in 2019-2020. However, the size of the difference is small enough to say it may be attributable to chance.⁴²

Figure 10: Impact of ARC Usage on GPA and Credit Completion (TOT)



SOURCE | Academic outcome data obtained from Amarillo College administrative records.

NOTES | * = $p < .10$, ** = $p < .05$, *** = $p < .01$. N=1,968. Annual GPA and annual completed credits are estimated with two-stage least-squares models. Models control for EFC, student's race and ethnicity, whether the student was enrolled in developmental education, and whether the student's family income falls in the bottom quintile of FAFSA filers. Missing demographics and baseline characteristics were mean imputed (see Table D-12 in the [web appendices](#) for percent missing by subgroup). Students who graduated or transferred to a four-year college have their 2018-2029 completed credits, and 2018-2019 annual GPA used as estimates for 2019-2020. All other missing outcomes were imputed as zero. See Table D-6 in the [web appendices](#) for additional data points.



CONCLUSION AND RECOMMENDATIONS

For decades, college leaders and policymakers have sought new ways to boost completion rates at community colleges. Supporting academically under-prepared students and students with long gaps in enrollment between high school and college will create significant change. Colleges often place under-prepared students in developmental education where they may never enter into credit-bearing courses. Major reforms in Texas, the home of Amarillo College, eliminated standard developmental education and replaced it with a corequisite model.⁴³ A 2018 report from the Texas Higher Education Coordinating Board outlined a "statewide plan for supporting underprepared students." Over the course of that 47-page discussion of that support, the authors made not one mention of addressing poverty, food insecurity, or students' basic needs.

The under-utilization of basic needs supports remains a challenge. Results of the #RealCollege survey consistently find that only a small fraction of students with needs connect to support. Access to support is highly inequitable:

Black male students are the least likely to access campus supports conditional on need. At two-year colleges, 68% of Black males experience basic needs insecurity, but only 31% of those with need utilize campus supports, meaning the gap between need and use of supports is 37 percentage points. By comparison, the gap for Latinx male students at two-year colleges is 31 percentage points, and for White males at two-year colleges, it is 26 percentage points.

The results of this evaluation suggest that those authors missed an important opportunity. Simply sending students monthly reminders about the availability of services at the ARC increased developmental education pass rates by 20%. Connecting students to supports for their basic needs is much less involved and more cost-effective than rethinking instructional strategies. Both efforts may be needed. Basic needs support in addition to co-requisite remediation looks especially powerful and should be examined.

This evaluation finds that monthly emails providing information about the ARC, describing available support to students (overcoming perceived ineligibility), and emphasizing that many supports exist (countering concerns about resource scarcity) effectively connected far more students with basic needs supports. Moreover, the connections yielded dividends in terms of academic progress. We therefore offer the following recommendations:

- Colleges and policymakers should invest in supports for students' basic needs. For example, all of California's public universities have state-supported basic needs centers. Colleges and universities may use federal dollars from the Higher Education Emergency Relief Fund (HEERF) for planning and initial implementation of basic needs centers. The California legislature recently provided \$30M to the state's community colleges to create centers on those campuses.
- Colleges and policymakers should invest in thoughtful marketing and outreach to connect students to basic needs supports. We recommend using personalized nudging.
- The many entities working to improve outcomes for underprepared students should integrate basic needs supports into their work and evaluate the outcomes.

- Researchers should continue to examine how to connect students most effectively to basic needs supports with a focus on potential differences in impacts by gender.
- Everyone—colleges, policymakers, researchers, etc.—should carefully consider equity in their design and funding of basic needs supports. Community college students have greater need, but their colleges receive much less funding on a per-student basis. Male students and structurally marginalized students may require additional efforts to help address their basic needs. Programs must disaggregate data to reveal where gaps exist.

The late Mike Rose was among the first influential scholars to explicitly recognize the humanity of community college students. Everyone is capable of learning, but to use those capabilities, students must be treated as humans first.⁴⁴ Providing basic needs supports and helping students access them builds connections between students and their institutions. This report is likely just the start of scientific advancements in understanding the academic payoff of treating the whole person.



ACKNOWLEDGEMENTS

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FUNDER DISCLOSURE

The opinions expressed are those of the authors and do not represent views of the Trellis Foundation.

ABOUT THE HOPE CENTER

The [Hope Center for College, Community, and Justice](#) at Temple University is redefining what it means to be a student-ready college, with a national movement centering #RealCollege students' basic needs. Food, affordable housing, transportation, childcare, and mental health are central conditions for learning. Without those needs being met, too many students leave college in debt and/or without a degree.

For information about The Hope Center's technical assistance services, visit hope4college.com/realcollege-technical-assistance/. For media inquiries, contact Director of Communications Deirdre Childress Hopkins, at deirdre.hopkins@temple.edu.

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Dedication: This report is dedicated to Mike Rose, professor at UCLA, whom we lost in August. Mike's insightful research with community college students inspired our focus on students as humans first, and in turn our hypothesis that addressing their basic needs might bear academic fruit. He always said higher education knew what needed to be done when it came to helping students in developmental education succeed—but was unwilling. This paper suggests that he was right.

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- ³⁰ The evidence on the efficacy of corequisite remediation varies widely; a recent rigorous evaluation in Tennessee Community Colleges concluded that it was ineffective. (See Kane, T. J., Boatman, A., Kozakowski, W., Bennett, C., Hitch, R., & Weisenfeld, D. (2021). [*Is college remediation a barrier or a boost? Evidence from the Tennessee SAILS Program*](#). *Journal of Policy Analysis and Management*, 40(3), 883-913.)
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³² The Single Stop model is [now being evaluated](#) with a randomized experimental design in North Carolina and Colorado.

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³⁸ Credit completion, grades, etc. are computed for the first academic year in which nudging took place (2018-2019) and the subsequent year. If a student was not enrolled in the second year, their outcomes were imputed from the prior year.

³⁹ Randomization was blocked by gender. Female-identified students were 71% of the overall sample.

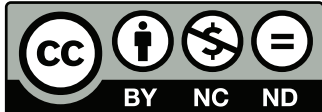
⁴⁰ Data received via email correspondence between ARC staff and Hope Center researchers in May of 2021.

⁴¹ Gender differences were not able to be estimated for the TOT analysis as there were not enough male students in the subgroups to accurately estimate likelihood of visiting the ARC given necessary model controls.

⁴² Gender differences for these outcomes were examined but are not reported due to small sample sizes.

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⁴⁴ Rose, Mike. *Lives on the Boundary: a Moving Account of the Struggles and Achievements of America's Educationally Underprepared*. New York, N.Y., U.S.A.: Penguin Books, 2005.



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Supporting the Whole Community College Student: The Impact of Nudging for Basic Needs Security

WEB APPENDICES

OCTOBER 5, 2021

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APPENDIX A. RANDOMIZATION

Amarillo College, like many colleges in the United States, has a greater proportion of female students than male students. In this study, we wanted to ensure the gender balance of who received nudges represented the whole sample. To do this, we split the sample into two groups, called blocks: those identified as male and those identified as female. We then used a randomly generated number to assign students to either receive nudges or not to receive nudges. We did this within each gender block, so we got a representative share of males and females in the nudge group. Once randomization was complete, the nudge group and the non-nudge group were compared to see whether they were relatively equal across gender, socio-economic status, race, ethnicity, Expected Family Contribution, and age. Differences between groups were measured in effect size. We adhered to the What Works Clearinghouse Standards manual (version 4.1) for what was within acceptable range for effect size. Anything between 0.05 and 0.25 was adjusted in our estimates.

APPENDIX B. SAMPLE NUDGE EMAILS

FIGURE B-1 | SAMPLE NUDGE EMAIL #1

Jordan A. Herrera

From: Ashley Hernandez <anguinn@actx.edu>
Sent: Monday, August 13, 2018 4:23 PM
To: Jordan A. Herrera
Subject: Welcome Back and Good Luck This Fall



Dear Jordan,

On behalf of the Advocacy & Resource Center (The ARC), we would like to wish you **GOOD LUCK** as you begin another Semester here at Amarillo College. If this is your first semester here, **WELCOME!** We are excited to have you here!

I wanted to reach out to you and invite you to come in and get some additional information about resources and services that are available to you as an Amarillo College Student.

Inside of the Advocacy & Resource Center, you will find the following programs:

- **Amarillo College Food Pantry:** Access this service twice a month for food, hygiene products (shampoo, conditioner, soap, toothpaste, etc.) and toiletry items for all currently enrolled students.
- **Amarillo College Clothing Closet:** Access this resources any time you are in need of clothing, shoes, coats, or accessories.
- Ask about our **scholarships** available to assist with tuition, child-care, transportation, and textbooks for those who qualify. To apply, please visit: www.actx.edu/foundation/. Students must have a 2.0 GPA or higher.
- Our **Social Services Program** is available to assist students with emergency needs and to connect students with resources on campus and in the community.

Anytime there is a barrier to your success, we invite you to come in and let us see what we can do to try to help, whether it be accessing services here in our department or referring you to an outside agency.

Throughout your journey here at Amarillo College, please know that we are here for you.

If you have any questions, please don't hesitate to let us know.

We are located on the **Washington Street Campus in the Ware Student Commons – Suite 108**. Stop in and see us or give us a call at 371-5446! We hope to see you soon!

Sincerely,

Ashley Hernandez, MSSW
Social Services Coordinator
Advocacy & Resource Center

FIGURE B-2 | SAMPLE NUDGE EMAIL #2



Dear Ashley,

On behalf of the Advocacy & Resource Center (The ARC), we would like to invite you to join us on TODAY, September 18th for our 7th Annual Amarillo College Resource Fair from 9:00am-12:00pm in the Oeschger Mall Area! Come and join us as we host a one-stop shop for students to get information on resources both on campus and in the community. Enter to win a scholarship as you visit with community and campus resources at this come-and-go event.

As a reminder, The Advocacy & Resource Center is available to every currently enrolled Amarillo College Student. Come in and get some additional information about resources and services that are available to you as an Amarillo College Student.

Inside of the Advocacy & Resource Center, you will find the following programs:

- Amarillo College Food Pantry: Access this service twice a month for food, hygiene products (shampoo, conditioner, soap, toothpaste, etc.) and toiletry items for all currently enrolled students.
- Amarillo College Clothing Closet: Access this resources any time you are in need of clothing, shoes, coats, or accessories.
- Ask about our scholarships available to assist with tuition, childcare, transportation, and textbooks for those who qualify. To apply, please visit: www.actx.edu/foundation/. Students must have a 2.0 GPA or higher.
- Our Social Services Program is available to assist students with emergency needs and to connect students with resources on campus and in the community.

Anytime there is a barrier to your success, we invite you to come in and let us see what we can do to try to help, whether it be accessing services here in our department or referring you to an outside agency.

Throughout your journey here at Amarillo College, please know that we are here for you.

If you have any questions, please don't hesitate to let us know.

We are located on the Washington Street Campus in the Ware Student Commons – Suite 108. Stop in and see us or give us a call at 371-5446! We hope to see you soon!

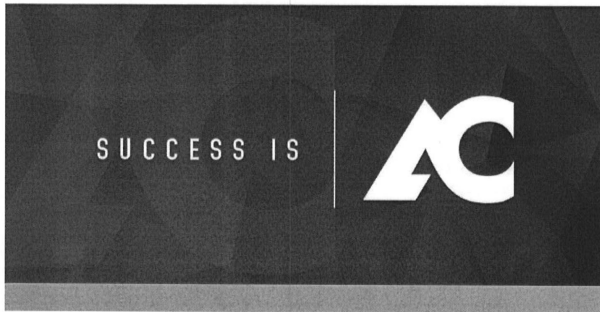
Sincerely,

Ashley Hernandez, MSSW
Social Services Coordinator
Advocacy & Resource Center

FIGURE B-3 | SAMPLE NUDGE EMAIL #3

Jordan A. Herrera

From: Ashley Hernandez <anguinn@actx.edu>
Sent: Tuesday, October 9, 2018 9:07 AM
To: Jordan A. Herrera
Subject: Good Luck on Finals



Dear Jordan,

On behalf of the Advocacy & Resource Center (The ARC), we would like to wish you all GOOD LUCK on your upcoming finals. The ARC will be closed to student traffic next week, October 15th – 19th to prepare our resources for the next 8-week session. Come in and see us starting on October 22nd, as we resume services.

As a reminder, The Advocacy & Resource Center is available to every currently enrolled Amarillo College Student. Come in and get some additional information about resources and services that are available to you as an Amarillo College Student.

Inside of the Advocacy & Resource Center, you will find the following programs:

Amarillo College Food Pantry: Access this service twice a month for food, hygiene products (shampoo, conditioner, soap, toothpaste, etc.) and toiletry items for all currently enrolled students.

Amarillo College Clothing Closet: Access this resources any time you are in need of clothing, shoes, coats, or accessories.

Ask about our scholarships available to assist with tuition, childcare, transportation, and textbooks for those who qualify. To apply, please visit: www.actx.edu/foundation/. Students must have a 2.0 GPA or higher.

Our Social Services Program is available to assist students with emergency needs and to connect students with resources on campus and in the community.

Anytime there is a barrier to your success, we invite you to come in and let us see what we can do to try to help, whether it be accessing services here in our department or referring you to an outside agency.

Throughout your journey here at Amarillo College, please know that we are here for you. If you have any questions, please don't hesitate to let us know.

We are located on the Washington Street Campus in the Ware Student Commons – Suite 108. Stop in and see us or give us a call at 371-5446! We hope to see you soon!

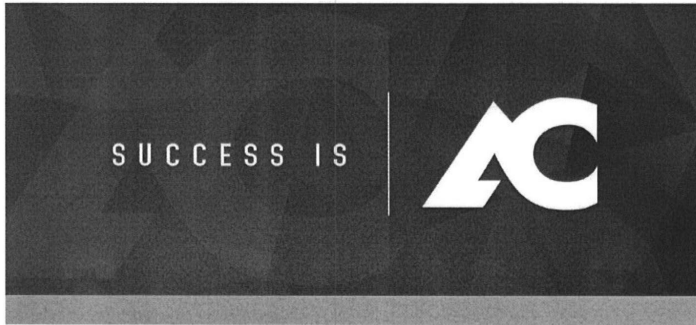
Sincerely,

Ashley Hernandez, MSSW
Social Services Coordinator
Advocacy & Resource Center

FIGURE B-4 | SAMPLE NUDGE EMAIL #4

Jordan A. Herrera

From: Ashley Hernandez <anguinn@actx.edu>
Sent: Thursday, November 8, 2018 4:44 PM
To: Jordan A. Herrera
Subject: Free Thanksgiving Bags Available



Dear Jordan,

On behalf of the Advocacy & Resource Center (The ARC), we would like to share information with you about our upcoming Thanksgiving Bag. We will be distributing FREE Thanksgiving Bags complete with items needed to create a Thanksgiving meal on November 15th at 12:00pm at the following campuses:

- Washington Street Campus -- College Union Building -- Oak Room
- East Campus -- Student Service Center
- West Campus -- Lecture Hall
- Moore County Campus in Dumas -- Conference Room B
- Hereford Campus -- Room 139

As a reminder, The Advocacy & Resource Center is available to every AC Student. Come in and get some additional information about resources and services that are available to you as an Amarillo College Student.

Inside of the Advocacy & Resource Center, you will find the following programs:

- **Amarillo College Food Pantry:** Access this service twice a month for food, hygiene products (shampoo, conditioner, soap, toothpaste, etc.) and toiletry items for all currently enrolled students.
- **Amarillo College Clothing Closet:** Access this resources any time you are in need of clothing, shoes, coats, or accessories.
- Ask about our **scholarships** available to assist with tuition, childcare, transportation, and textbooks for those who qualify. To apply, please visit: www.actx.edu/foundation/. Students must have a 2.0 GPA or higher.
- Our **Social Services Program** is available to assist students with emergency needs and to connect students with resources on campus and in the community.

Anytime there is a barrier to your success, we invite you to come in and let us see what we can do to try to help, whether it be accessing services here in our department or referring you to an outside agency.

Throughout your journey here at Amarillo College, please know that we are here for you.

If you have any questions, please don't hesitate to let us know.

We are located on the Washington Street Campus in the Ware Student Commons – Suite 108. Stop in and see us or give us a call at 371-5446! We hope to see you soon!

Sincerely,

Ashley Hernandez, MSSW
Social Services Coordinator
Advocacy & Resource Center

APPENDIX C. DEFINITIONS OF OUTCOMES USED IN THIS REPORT

Annual GPA: Annual grade point average (GPA) is the combined GPA of fall and spring terms for the given academic year. Students who have graduated or transferred to a four-year college after the start of the study have their 2019-2020 annual GPAs equal to their 2018-2019 annual GPAs. Students who were randomized and did not enroll in classes for either year have their annual GPAs imputed as zero for that year.

Completed credits: Completed credits is the combined credits of fall and spring terms for the 2018-2019 academic year. Students who have graduated or transferred to a four-year college after the start of the study have their 2019-2020 cumulative credits equal to their 2018-2019 cumulative credits. Students who were randomized and did not enroll in classes for either year have their cumulative credits imputed as zero for that year.

Continued enrollment or graduation: Continued enrollment or graduation is defined as being enrolled for the given year, having transferred to a four-year college by the given year, or graduating by a given year.

Developmental education: Completing developmental education courses only applies to students who were enrolled in developmental education courses at either the time of randomization or in the 2018-2019 year. Completing developmental education courses is a cumulative measure of students passing the developmental education courses they were enrolled in for the 2018-2019 year. Students who were enrolled in developmental education courses in 2018-2019 and passed all those courses are coded as passing their developmental education courses in 2019-2020.

Pass courses: Passing all courses refers to passing all courses students were enrolled in for the given year. Students who graduated or transferred to a four-year college after the start of the study were coded as passing all their courses in 2019-2020. Students who were randomized and did not enroll in classes for either year were coded as not passing their courses for that year.

ARC resources: Number of ARC resources is a count of the resources students used at ARC and is cumulative for the 2018-2019 and 2019-2020 years. Students can use multiple resources at each visit and can also use resources without needing to visit the ARC in person.

Any ARC visit: Any ARC visit is a measure of whether students visited the ARC at least once and is cumulative for the 2018-2019 and 2019-2020 years.

Number of ARC visits: Number of ARC visits is the cumulative number of visits to the ARC for the given year. For the 2019-2020 year this includes the total number of visits for both 2018-2019 and 2019-2020.

APPENDIX D. DETAILED TABLES FROM ANALYSES REFERENCED IN REPORT

TABLE D-1 | STUDENT BASELINE CHARACTERISTICS BY PROGRAM ASSIGNMENT AFTER IMPUTATION (TABLE 1)

		All	Not Nudged (n=968)	Nudged (n=1,000)	Hedges/Cox's ES
Full Sample					
	Female	71.54	71.59	71.50	0.00
%	Race				
	White	39.63	39.15	40.10	0.02
	Black or African American	18.39	19.21	17.60	0.07
	Latinx	41.97	41.63	42.30	0.02
	Enrolled in Developmental Education	26.58	25.21	27.90	0.08
	Bottom Quintile of Family Income	85.87	87.19	84.60	0.13
	Average Age	26.21	26.07	26.36	0.03
	Average Credits Completed	27.91	28.48	27.37	0.04
	Average Cumulative GPA	2.17	2.14	2.19	0.04
	Average EFC (\$)	199.43	161.24	236.40	0.08

SOURCE | Demographic data obtained from Amarillo College administrative records.

NOTES | Age corresponds to students' age in 2018 as calculated from birth year. "Developmental Education" refers to the percent of students enrolled in developmental education courses in the fall of 2018. EFC corresponds to the students' Expected Family Contribution for the 2018-2019 academic year. Missing demographics and baseline characteristics were mean imputed (see Table D-12 in the web appendices for percent missing by subgroup). Bottom quintile of family income is derived from FAFSA data. Race and ethnicity categories may not total one hundred due to rounding. Effect size is estimated using Hedge's G or Cox's Index, as appropriate. Effect size is estimated for binary and continuous variables.

TABLE D-2 | STUDENT BASELINE CHARACTERISTICS BY PROGRAM ASSIGNMENT AND GENDER (AFTER IMPUTATION)

		Not Nudged				Not Nudged			
		All	Nudged (n= 693)	Hedges/ (n= 715) Cox ES	All	Nudged (n= 275)	Nudged (n= 285)	Hedges/ Cox ES	
		Female Students				Male Students			
%	White	40.27	40.12	40.42	0.01	38.04	36.73	39.30	0.07
	Race Black or African American	17.61	17.89	17.34	-0.02	20.36	22.55	18.25	0.16
	Latinx	42.12	41.99	42.24	0.01	41.61	40.73	42.46	0.04
	Enrolled in Developmental Education	25.92	23.38	28.39	0.16	28.21	29.82	26.67	0.09
	Bottom Quintile of Family Income	88.49	90.04	86.99	-0.18	79.29	80.00	78.60	0.05
	Average Age	26.53	26.33	26.71	0.04	25.43	25.39	25.46	0.01
	Average Credits Completed	29.17	30.17	28.20	-0.08	24.77	24.21	25.30	0.05
	Average Cumulative GPA	2.21	2.20	2.22	0.02	2.06	1.99	2.12	0.10
	Average EFC (\$)	167.34	144.75	189.22	0.05	280.13	202.78	354.76	0.16

SOURCE | Demographic data obtained from Amarillo College administrative records.

NOTES | Age corresponds to students' age in 2018 as calculated from birth year. "Developmental Education" refers to the percent of students enrolled in developmental education courses in the fall of 2018. EFC corresponds to the students' Expected Family Contribution for the 2018-2019 academic year. Missing demographics and baseline characteristics were mean imputed (see Table D-12 in the web appendices for percent missing by subgroup). Bottom quintile of family income is derived from FAFSA data. Race and ethnicity categories may not total one hundred due to rounding. Effect size is estimated using Hedge's G or Cox's Index, as appropriate. Effect size is estimated for binary and continuous variables.

TABLE D-3 | STUDENT BASELINE CHARACTERISTICS BY PROGRAM ASSIGNMENT AMONG STUDENTS TAKING DEVELOPMENTAL EDUCATION COURSES (AFTER IMPUTATION)

	All	Not Nudged (n=219)	Nudged (n=246)	Hedges/Cox ES
Developmental Education Subsample				
Female (%)	69.79	66.39	72.76	0.18
Race				
White (%)	37.67	35.25	39.78	0.12
Black or African American (%)	19.89	20.08	19.71	0.01
Latinx (%)	42.45	44.67	40.50	0.10
Bottom Quintile of Family Income (%)	52.01	52.87	51.25	0.04
Average Age	25.18	24.46	25.81	0.15
Average Credits Completed	13.28	12.85	13.66	0.05
Average Cumulative GPA	1.41	1.29	1.52	0.18
Average EFC (\$)	167.54	157.63	176.20	0.04

SOURCE | Demographic data obtained from Amarillo College administrative records.

NOTES | Age corresponds to students' age in 2018 as calculated from birth year. N=523. "Developmental Education" refers to the percent of students enrolled in developmental education courses in the fall of 2018. EFC corresponds to the students' Expected Family Contribution for the 2018-2019 academic year. Missing demographics and baseline characteristics were mean imputed (see Table D-12 in the web appendices for percent missing by subgroup). Bottom quintile of family income is derived from FAFSA data. Race and ethnicity categories may not total one hundred due to rounding. Effect size is estimated using Hedge's G or Cox's Index, as appropriate. Effect size is estimated for binary and continuous variables

TABLE D-4 | INTENT-TO-TREAT (ITT) AND TREATMENT-ON-THE-TREATED (TOT) IMPACTS ON THE USE OF ARC OVER TIME (FIGURE 3)

	ITTs					TOT		
	Not Nudged	Nudged	Impact	P-value	SE	Impact	P-value	SE
2018-2019								
Any ARC visits (%)	0.22	0.56	0.32	0.00	0.10	/	/	/
Number of ARC visits	0.88	1.52	0.64	0.00	0.14	1.84	0.00	0.39
Number of ARS services used	1.08	3.07	1.98	0.00	0.15	5.81	0.00	0.41
2019-2020								
Any ARC visits (%)	0.15	0.27	0.12	0.00	0.11	/	/	/
Number of ARC visits	1.82	2.41	0.60	0.01	0.24	1.62	0.02	0.70
Number of ARS services used	1.34	2.97	1.64	0.00	0.23	4.77	0.00	0.68

SOURCE | Usage data obtained from ARC program records.

NOTES | N=1,968. Data above were obtained from ARC program records and Amarillo College administrative records. Any ARC visits were estimated with logistic regression. Number of ARC visits, and number of services used were estimated using linear regression. All models control for EFC, student's race, whether the student was enrolled in developmental education, and whether the student's family income fell in the bottom quintile of FAFSA filers. Missing demographics and baseline characteristics were mean imputed (see Table D-12 in the web appendices for percent missing by subgroup). All missing outcomes were imputed as zero. Totals for the 2019-2020 year for students who were no longer enrolled due to graduating, or transferring out are equal to the 2018-2019 totals

TABLE D-5 | GENDER DIFFERENCES IN THE INTENT-TO-TREAT (ITT) IMPACTS OF NUDGING ON THE USE OF THE ARC AND ACADEMIC PROGRESS (FIGURES 4, 7, & 8)

	Impact for Female Students			Impact for Male Students		
2018-2019						
ARC Usage						
	B	P-value	SE	B	P-value	SE
Number of ARC visits	0.81	0.00	0.17	-0.59	0.03	0.28
Number of ARC services used	2.14	0.00	0.18	-0.56	0.05	0.29
	OR	P-value	SE	OR	P-value	SE
Any ARC Visits (%)	4.82	0.00	0.57	0.92	0.71	0.22
	B	P-value	SE	B	P-value	SE
Annual GPA	0.11	0.12	0.07	-0.23	0.09	0.14
Annual completed credit hours	0.38	0.40	0.45	-1.82	0.04	0.89
	OR	P-value	SE	OR	P-value	SE
GPA 2.0 or higher	1.21	0.11	0.14	0.58	0.01	0.12
Graduation (%)	1.12	0.43	0.15	0.75	0.31	0.21
Transfer (%)	1.74	0.14	0.63	0.22	0.06	0.18
Retention (%)	1.16	0.38	0.20	0.64	0.14	0.19
Passed developmental ed	1.87	0.01	0.46	0.78	0.57	0.34
Pass all courses	1.05	0.67	0.12	0.87	0.51	0.19

Table continued on next page

	Impact for Female Students			Impact for Male Students		
2019-2020						
ARC Usage						
	B	P-value	SE	B	P-value	SE
Number of ARC visits	0.79	0.01	0.29	-0.69	0.17	0.50
Number of ARC resources used	1.88	0.00	0.29	-0.85	0.08	0.48
	OR	P-value	SE	OR	P-value	SE
Any ARC Visits (%)	2.11	0.00	0.28	1.02	0.94	0.28
	B	P-value	SE	B	P-value	SE
Annual GPA	0.03	0.74	0.08	-0.19	0.23	0.15
Annual completed credit hours	-0.33	0.52	0.51	-1.02	0.30	1.00
	OR	P-value	SE	OR	P-value	SE
GPA 2.0 or higher	1.02	0.89	0.11	0.69	0.07	0.14
Graduation (%)	1.09	0.50	0.13	0.93	0.75	0.22
Transfer (%)	1.21	0.19	0.26	0.55	0.15	0.23
Retention (%)	0.90	0.40	0.10	1.00	0.98	0.21
Passed developmental ed	2.02	0.01	0.50	0.68	0.38	0.30
Pass all courses	1.15	0.21	0.13	0.74	0.18	0.16

SOURCE | Data above were obtained from ARC program records and Amarillo College administrative records.

NOTES | N=1,968. Intent-to-treat estimates for male students are in relation to treatment impacts for female students.

Graduate or transfer refers to students who either graduated or transferred to a four-year institution. Interaction estimates above control for EFC, student's race, whether the student was enrolled in developmental education, and whether the student's family income fell in the bottom quintile of FAFSA filers. Developmental education models control for age, gender, race and ethnicity, and pre-treatment GPA. Missing demographics and baseline characteristics were mean imputed (see Table D-12 in the web appendices for percent missing by subgroup). All missing outcomes were imputed as zero. Students who graduated or transferred to a four-year college were coded as passing their courses. Graduation or transfer, passed developmental education, pass courses, and retention were estimated with logistic regressions. Completed credit hours, number of ARC visits, and number of services used were estimated using linear regression. Coefficient estimates for logistic regressions are presented in log odds.

TABLE D-6 | INTENT-TO-TREAT (ITT) AND TREATMENT-ON-THE-TREATED (TOT) IMPACTS OF NUDGING ON ACADEMIC PROGRESS OVER TIME (FIGURES 5, 6, 9, & 10)

	ITTs					TOTs		
	Not Nudge d	Nudge d	Impact	P-value	SE	Impact	P-value	SE
2018-2019								
Annual GPA	2.14	2.19	0.05	0.45	0.06	0.13	0.51	0.18
GPA 2.0 or higher (%)	0.64	0.65	0.00	0.81	0.10	0.02	0.79	0.06
Annual completed credit hours	13.47	13.33	-0.14	0.72	0.39	-0.41	0.72	1.14
Graduation (%)	0.18	0.19	0.00	0.77	0.12	0.01	0.82	0.05
Transfer (%)	0.02	0.03	0.00	0.53	0.29	0.01	0.54	0.02
Retention (%)	0.87	0.88	0.00	0.99	0.14	0.00	0.99	0.04
Passed developmental education	0.59	0.71	0.12	0.01	0.20	0.28	0.01	0.11
Passed all courses	0.40	0.40	0.00	0.92	0.09	0.01	0.91	0.06
2019-2020								
Annual GPA	1.69	1.66	-0.02	0.74	0.07	-0.08	0.70	0.21
GPA 2.0 or higher (%)	0.52	0.50	-0.02	0.37	0.09	-0.06	0.35	0.07
Annual completed credit hours	9.85	9.23	-0.62	0.16	0.44	-1.82	0.16	1.30
Graduation (%)	0.28	0.29	0.01	0.57	0.10	0.03	0.59	0.06
Transfer (%)	0.07	0.08	0.00	0.68	0.17	0.02	0.51	0.03
Retention (%)	0.65	0.63	-0.02	0.30	0.09	-0.06	0.33	0.06
Passed developmental education	0.60	0.73	0.12	0.00	0.20	0.30	0.01	0.11
Passed all courses	0.37	0.39	0.01	0.49	0.09	0.03	0.50	0.06

SOURCE | Data above were obtained from Amarillo College administrative records.

NOTES | N=1,968; enrolled in developmental education: N= 523. Continued enrollment or graduation, passed developmental education, and passed all courses were estimated with logistic regression. Annual GPA and completed credit hours were estimated using linear regression. All models (except for developmental education) control for EFC, student’s race, whether the student was enrolled in developmental education, and whether the student’s family income falls in the bottom quintile of FAFSA filers. Developmental education models control for age, gender, race and ethnicity, and pre-treatment GPA. Missing demographics and baseline characteristics were mean imputed (see Table D-12 in the web appendices for percent missing by subgroup). All missing outcomes were imputed as zero. All outcomes for 2019-2020 were cumulative over the two years except for annual GPA. Students who graduated or transferred to a four-year college were coded as passing their courses.

TABLE D-7 | INTENT-TO-TREAT (ITT) IMPACTS ON THE USE OF ARC AND ACADEMIC PROGRESS OVER TIME (UNADJUSTED AND ADJUSTED)

2018-2019	Unadjusted Model					Adjusted for Admin Variables				
	Not Nudged	Nudged	Impact	P-value	SE	Not Nudged	Nudged	Impact	P-value	SE
Annual GPA	2.14	2.18	0.04	0.51	0.06	2.14	2.19	0.05	0.45	0.06
GPA 2.0 or higher (%)	0.64	0.65	0.00	0.88	0.09	0.64	0.65	0.00	0.81	0.10
Completed credits	13.48	13.31	-0.16	0.68	0.39	13.47	13.33	-0.14	0.72	0.39
Any ARC Visits (%)	0.22	0.55	0.31	0.00	0.10	0.22	0.56	0.32	0.00	0.10
Total ARC visits	0.89	1.51	0.62	0.00	0.14	0.88	1.52	0.64	0.00	0.14
Total ARC resources	1.10	3.05	1.95	0.00	0.15	1.08	3.07	1.98	0.00	0.15
Graduation (%)	0.18	0.18	0.00	0.96	0.12	0.18	0.19	0.00	0.77	0.12
Transfer (%)	0.02	0.03	0.00	0.54	0.29	0.02	0.03	0.00	0.53	0.29
Retention (%)	0.88	0.88	0.00	1.00	0.14	0.87	0.88	0.00	0.99	0.14
Developmental ed (%)	0.59	0.71	0.12	0.01	0.20	0.59	0.71	0.12	0.01	0.20
Pass all courses (%)	0.40	0.40	0.00	0.99	0.09	0.40	0.40	0.00	0.92	0.09

2019-2020	Unadjusted Model					Adjusted for Admin Variables				
	Not Nudged	Nudged	Impact	P-value	SE	Not Nudged	Nudged	Impact	P-value	SE
Annual GPA	1.69	1.66	-0.03	0.65	0.07	1.69	1.66	-0.02	0.74	0.07
GPA 2.0 or higher (%)	0.52	0.50	-0.02	0.32	0.09	0.52	0.50	-0.02	0.37	0.09
Completed credits	9.87	9.22	-0.65	0.14	0.44	9.85	9.23	-0.62	0.16	0.44
Any ARC Visits (%)	0.15	0.27	0.12	0.00	0.11	0.15	0.27	0.12	0.00	0.11
Total ARC visits	1.85	2.39	0.54	0.03	0.25	1.82	2.41	0.60	0.01	0.24
Total ARC resources	1.36	2.95	1.60	0.00	0.24	1.34	2.97	1.64	0.00	0.23
Graduation (%)	0.28	0.29	0.00	0.85	0.10	0.28	0.29	0.01	0.57	0.10
Transfer (%)	0.07	0.08	0.00	0.76	0.17	0.07	0.08	0.00	0.68	0.17
Retention (%)	0.65	0.62	-0.02	0.27	0.09	0.65	0.63	-0.02	0.30	0.09
Developmental ed (%)	0.60	0.73	0.13	0.00	0.20	0.60	0.73	0.12	0.00	0.20
Pass all courses (%)	0.38	0.38	0.01	0.68	0.09	0.37	0.39	0.01	0.49	0.09

SOURCE | Data above were obtained from ARC program records and Amarillo College administrative records.

NOTES | N=1,968; enrolled in developmental education: N= 523. Continued enrollment or graduation, passed developmental education, and passed all courses were estimated with logistic regression. All others were estimated using linear regression. All models, (except for developmental education) control for EFC, student's race, whether the student was enrolled in developmental education, and whether the student's family income fell in the bottom quintile of FAFSA filers. Developmental education models controlled for age, gender, race and ethnicity, and pre-treatment GPA. Missing demographics and baseline characteristics were mean imputed (see Table D-12 in the web appendices for percent missing by subgroup). All missing outcomes were imputed as zero. All outcomes for 2019-2020 were cumulative

over the two years except for annual GPA. Students who graduated or transferred to a four-year college were coded as passing their courses.

TABLE D-8 | TREATMENT-ON-THE TREATED (TOT) IMPACTS OF VISTING ARC ON ACADEMIC PROGRESS OVER TIME (UNADJUSTED AND ADJUSTED)

2018-2019	Unadjusted Model			Adjusted for Admin Variables		
	Impact	P-value	SE	Impact	P-value	SE
Annual GPA	0.12	0.51	0.18	0.13	0.45	0.18
GPA 2.0 or higher (%)	0.01	0.88	0.06	0.02	0.79	0.06
Annual completed credit hours	-0.49	0.68	1.18	-0.41	0.72	1.14
Total ARC visits	1.84	0.00	0.39	1.89	0.00	0.38
Total ARC services	5.81	0.00	0.41	5.83	0.00	0.40
Graduation (%)	0.00	0.96	0.05	0.01	0.82	0.05
Transfer (%)	0.01	0.54	0.02	0.01	0.54	0.02
Retention (%)	0.00	1.00	0.04	0.00	0.99	0.04
Pass developmental education courses	0.28	0.01	0.11	0.28	0.01	0.11
Passed all courses	0.00	0.99	0.07	0.01	0.91	0.06
2019-2020	Impact	P-value	SE	Impact	P-value	SE
Annual GPA	-0.10	0.65	0.21	-0.08	0.70	0.21
GPA 2.0 or higher (%)	-0.07	0.32	0.07	-0.06	0.35	0.07
Annual completed credit hours	-1.95	0.14	1.33	-1.82	0.16	1.30
Total ARC visits	1.62	0.02	0.70	1.76	0.01	0.68
Total ARC services	4.77	0.00	0.68	4.81	0.00	0.67
Graduation (%)	0.01	0.85	0.06	0.03	0.59	0.06
Transfer (%)	0.01	0.75	0.04	0.02	0.51	0.03
Retention (%)	-0.07	0.28	0.07	-0.06	0.33	0.06
Pass developmental education courses	0.30	0.00	0.11	0.30	0.01	0.11
Passed all courses	0.03	0.68	0.07	0.04	0.50	0.06

SOURCE | Data above were obtained from ARC program records and Amarillo College administrative records.

NOTES | N=1,968; enrolled in developmental education: N= 523. Continued enrollment or graduation, passed developmental education, and passed all courses were estimated with logistic regression. Completed credit hours, number of ARC visits, and number of services used were estimated using linear regression. All models (except for developmental education), control for EFC, student's race, whether the student was enrolled in developmental education, and whether the student's family income falls in the bottom quintile of FAFSA filers. Developmental education models control for age, gender, race and ethnicity, and pre-treatment GPA. Missing demographics and baseline characteristics were mean imputed (see Table D-12 in the web appendices for percent missing by subgroup). All missing outcomes were imputed as zero. Students who graduated or transferred to a four-year college were coded as passing their courses. Treatment-on-the-treated (TOT) estimates are modeled using two-stage least squares, where the first stage models students' probability of visiting the ARC at least once, and the second stage models outcomes as a function of students' likelihood of visiting ARC at least once controlling for student differences mentioned above.

TABLE D-9 | INTENT-TO-TREAT (ITT), DIFFERENTIATED IMPACTS OF NUDGES BY RACE AND OVER TIME

	Impact			Difference in Impact					
	White Students			Latinx Students			Black or African American Students		
2018-2019									
ARC Usage									
	B	P-value	SE	B	P-value	SE	B	P-value	SE
Number of ARC visits	0.66	0.00	0.20	0.08	0.79	0.3	-0.30	0.48	0.42
Number of ARC services used	2.11	0.00	0.21	-0.02	0.95	0.31	-0.65	0.16	0.47
	OR	P-value	SE	OR	P-value	SE	OR	P-value	SE
Any ARC Visits	4.95	0.00	0.79	0.92	0.72	0.21	0.86	0.59	0.24
Academics									
	B	P-value	SE	B	P-value	SE	B	P-value	SE
Annual GPA	0.08	0.39	0.10	-0.05	0.74	0.13	-0.10	0.56	0.17
Annual completed credit hours	0.00	0.99	0.60	-0.13	0.88	0.85	-0.48	0.67	1.11
	OR	P-value	SE	OR	P-value	SE	OR	P-value	SE
GPA 2.0 or higher	1.08	0.63	0.17	1.01	0.96	0.27	0.88	0.54	0.19
Graduation (%)	1.20	0.32	0.22	0.94	0.83	0.25	0.48	0.04	0.17
Transfer (%)	1.64	0.27	0.75	0.83	0.79	0.56	/	/	/
Retention (%)	1.22	0.42	0.30	0.71	0.30	0.23	0.82	0.59	0.30
Passed developmental ed	2.28	0.01	0.74	0.58	0.23	0.26	0.76	0.62	0.42
Pass all courses	1.12	0.44	0.16	0.63	0.09	0.17	0.94	0.78	0.19

Table continued on next page

	Impact			Difference in Impact					
	White Students			Latinx Students			Black or African American Students		
2019-2020									
ARC Usage									
	B	P-value	SE	B	P-value	SE	B	P-value	SE
Number of ARC visits	0.92	0.01	0.34	-0.06	0.91	0.50	-1.61	0.04	0.78
Number of ARC services used	2.03	0.00	0.32	-0.02	0.96	0.48	-2.09	0.01	0.77
	OR	P-value	SE	OR	P-value	SE	OR	P-value	SE
Any ARC Visits	2.59	0.00	0.52	1.60	0.02	0.33	0.75	0.37	0.24
Academics									
	B	P-value	SE	B	P-value	SE	B	P-value	SE
Annual GPA	0.03	0.77	0.12	-0.03	0.85	0.16	-0.24	0.21	0.19
Annual completed credit hours	-0.55	0.43	0.70	0.71	0.47	0.97	-2.00	0.10	1.22
	OR	P-value	SE	OR	P-value	SE	OR	P-value	SE
GPA 2.0 or higher	0.96	0.75	0.14	0.77	0.30	0.20	1.03	0.89	0.21
Graduation (%)	1.15	0.41	0.19	0.96	0.85	0.22	0.72	0.27	0.21
Transfer (%)	1.13	0.65	0.29	1.43	0.36	0.55	0.37	0.07	0.21
Retention (%)	0.91	0.54	0.14	1.12	0.59	0.23	0.77	0.33	0.20
Passed developmental ed	2.53	0.00	0.83	0.50	0.13	0.23	0.74	0.41	0.59
Pass all courses	1.19	0.23	0.18	0.94	0.75	0.20	0.62	0.08	0.17

SOURCE | Data above were obtained from ARC program records and Amarillo College administrative records.

NOTES | Intent-to-treat estimates for Latinx and Black or African American students are in relation to treatment impacts for White students. N=1,968. Graduate or transfer refers to students who either graduated or transferred to a four-year institution. Interaction estimates above control for EFC, student's race, whether the student was enrolled in developmental education, and whether the student's family income fell in the bottom quintile of FAFSA filers. Developmental education models control for age, gender, race and ethnicity, and pre-treatment GPA. Missing demographics and baseline characteristics were mean imputed (see Table D-12 in the web appendices for percent missing by subgroup). All missing outcomes were imputed as zero. All outcomes for 2019-2020 were cumulative over the two years except for annual GPA. Students who graduated or transferred to a four-year college were coded as passing their courses. Graduation or transfer, passed developmental education, pass courses, and retention were estimated with logistic regressions. Completed credit hours, number of ARC visits, and number of services used were estimated using linear regression. Coefficient estimates for logistic regressions are presented in log odds.

TABLE D-10 | TREATMENT-ON-THE TREATED (TOT), IMPACT OF VISITING THE ARC ON ACADEMIC OUTCOMES AMONG FEMALE STUDENTS OVER TIME (UNADJUSTED AND ADJUSTED)

2018-2019	Unadjusted Model			Adjusted for Admin Variables		
	Impact	P-value	SE	Impact	P-value	SE
Annual GPA	0.28	0.16	0.20	0.28	0.15	0.19
GPA 2.0 or higher (%)	0.10	0.15	0.07	0.11	0.11	0.07
Annual completed credit hours	0.99	0.44	1.27	0.90	0.46	1.23
Total ARC visits	2.25	0.00	0.45	2.27	0.00	0.44
Total ARC services	5.98	0.00	0.48	5.96	0.00	0.47
Graduation (%)	0.02	0.80	0.06	0.05	0.30	0.05
Transfer (%)	0.03	0.18	0.02	0.03	0.12	0.02
Retention (%)	0.04	0.37	0.05	0.04	0.36	0.05
Pass developmental education courses	0.28	0.02	0.12	0.28	0.02	0.12
Passed all courses	0.01	0.89	0.07	0.03	0.66	0.07
2019-2020	Impact	P-value	SE	Impact	P-value	SE
Annual GPA	0.02	0.92	0.24	0.04	0.86	0.23
GPA 2.0 or higher (%)	0.00	0.97	0.08	0.01	0.91	0.07
Annual completed credit hours	-1.09	0.45	1.45	-1.11	0.43	1.41
Total ARC visits	2.17	0.01	0.79	2.19	0.00	0.77
Total ARC services	5.29	0.00	0.80	5.16	0.00	0.78
Graduation (%)	0.01	0.94	0.07	0.05	0.41	0.06
Transfer (%)	0.03	0.42	0.04	0.05	0.17	0.04
Retention (%)	-0.07	0.33	0.07	-0.06	0.40	0.07
Pass developmental education courses	0.31	0.01	0.12	0.33	0.01	0.12
Passed all courses	0.06	0.38	0.07	0.09	0.18	0.07

SOURCE | Data above were obtained from ARC program records and Amarillo College administrative records.

NOTES | N=1,408; enrolled in developmental education: N= 365. Continued enrollment or graduation, passed developmental education, and passed all courses were estimated with logistic regression. Developmental education models control for age, gender, race and ethnicity, and pre-treatment GPA. All other models were estimated using linear regression and control for EFC, student's race, whether the student was enrolled in developmental education, and whether the student's family income fell in the bottom quintile of FAFSA filers. Missing demographics and baseline characteristics were mean imputed (see Table D-12 in the web appendices for percent missing by subgroup). All missing outcomes were imputed as zero. All outcomes for 2019-2020 were cumulative over the two years except for annual GPA. Students who graduated or transferred to a four-year college were coded as passing their courses. Treatment-on-the-treated (TOT) estimates were modeled using two-stage least squares, where the first stage modeled students' probability of visiting the ARC at least once, and the second stage modeled outcomes as a function of students' likelihood of visiting ARC at least once controlling for student differences mentioned above.

TABLE D-11 | TREATMENT-ON-THE TREATED (TOT), IMPACT OF VISITING THE ARC ON ACADEMIC OUTCOMES AMONG MALE STUDENTS (UNADJUSTED AND ADJUSTED)

2018-2019	Unadjusted Model			Adjusted for Admin Variables		
	Impact	P-value	SE	Impact	P-value	SE
Annual GPA	-0.36	0.40	0.43	-0.52	0.21	0.41
GPA 2.0 or higher (%)	-0.27	0.08	0.15	-0.32	0.03	0.15
Annual completed credit hours	-5.10	0.08	2.89	-5.31	0.06	2.82
Total ARC visits	0.55	0.46	0.74	0.64	0.37	0.72
Total ARC services	5.29	0.00	0.76	5.31	0.00	0.74
Graduation (%)	-0.06	0.60	0.11	-0.08	0.41	0.10
Transfer (%)	-0.05	0.19	0.04	-0.06	0.13	0.04
Retention (%)	-0.13	0.25	0.11	-0.13	0.23	0.11
Pass developmental education courses	0.26	0.25	0.23	0.22	0.29	0.21
Passed all courses	-0.03	0.84	0.14	-0.08	0.57	0.13
2019-2020	Impact	P-value	SE	Impact	P-value	SE
Annual GPA	-0.47	0.31	0.46	-0.59	0.18	0.44
GPA 2.0 or higher (%)	-0.27	0.08	0.15	-0.31	0.03	0.15
Annual completed credit hours	-4.61	0.13	3.08	-4.73	0.12	3.03
Total ARC visits	-0.10	0.95	1.48	0.09	0.95	1.44
Total ARC services	3.16	0.02	1.33	3.23	0.01	1.30
Graduation (%)	0.03	0.80	0.13	-0.01	0.90	0.11
Transfer (%)	-0.06	0.41	0.07	-0.08	0.22	0.07
Retention (%)	-0.07	0.63	0.15	-0.10	0.49	0.14
Pass developmental education courses	0.23	0.31	0.23	0.22	0.31	0.21
Passed all courses	-0.09	0.52	0.14	-0.13	0.31	0.13

SOURCE | Data above were obtained from ARC program records and Amarillo College administrative records.

NOTES | N=560; enrolled in developmental education: N=158. Continued enrollment or graduation, passed developmental education, and passed all courses were estimated with logistic regression. Completed credit hours, number of ARC visits, and number of services used were estimated using linear regression. All models (except for developmental education), control for EFC, student's race, whether the student was enrolled in developmental education, and whether the student's family income fell in the bottom quintile of FAFSA filers. Developmental education models control for age, gender, race and ethnicity, and pre-treatment GPA. Missing demographics and baseline characteristics were mean imputed (see Table D-12 in the web appendices for percent missing by subgroup). All missing outcomes were imputed as zero. All outcomes for 2019-2020 were cumulative over the two years except for annual GPA. Students who graduated or transferred to a four-year college were coded as passing their courses. Treatment-on-the-treated (TOT) estimates were modeled using two-stage least squares, where the first stage models students' probability of visiting the ARC at least once, and the second stage models outcomes as a function of students' likelihood of visiting ARC at least once controlling for student differences mentioned above.

TABLE D-12 | GROUP MEANS BEFORE AND AFTER MEAN IMPUTATION OF STUDENT BASELINE CHARACTERISTICS

	Mean Prior to Imputation	Mean After Imputation	Percent Imputed
Full Sample			
Female (%)	72.00	71.54	0.00
Race			
White (%)	40.00	39.63	0.00
Black or African American (%)	18.00	18.39	0.00
Latinx (%)	42.00	41.97	0.00
Enrolled in Developmental Education (%)	27.00	26.58	0.00
Bottom Quintile of Family Income (%)	86.00	85.87	10.00
Average Age	26.21	26.21	0.00
Average Credits Completed	27.91	27.91	10.00
Average Cumulative GPA	2.17	2.17	10.00
Average EFC (\$)	171.26	199.43	22.00

SOURCE | Data above were obtained from ARC program records and Amarillo College administrative records.

NOTES | N=1,968. Demographic data obtained from Amarillo College administrative records. Age corresponds to the student's age in 2018 as calculated from birth year. "Developmental Education" refers to the percent of students enrolled in any developmental education courses in the fall of 2018. EFC corresponds to the students' Expected Family Contribution for the 2018-2019 academic year. Bottom quintile of family income is derived from FAFSA data. Race and ethnicity categories may not total one hundred due to rounding.

APPENDIX E. EQUATIONS FROM THE INTENT-TO-TREAT MODELS

Unadjusted model

$$y_i = \beta_0 + \beta_1 (Treatment_i) + \varepsilon_i$$

In the model above, y_i represents the outcome for student i ; $Treatment_i$ is a dichotomous indicator for whether a student was assigned to treatment, and ε_i is a term for student-specific random error. β_1 represents the treatment impact, the average improvement in outcome y_i for the treatment group relative to the control group.

Adjusted model:

$$y_i = \beta_0 + \beta_1 (Treatment_i) + \Sigma \beta_n \chi_n + \varepsilon_i$$

In the adjusted model presented above, χ_n is a vector of student-level, pre-treatment covariates found to not be in balance at baseline according to What Works Clearinghouse standards ($0.25 > ES > 0.05$; see Appendix D-1). β represents the coefficient for each variable in vector χ_n . β_1 represents the treatment impact, the average improvement in outcome for the treatment group relative to the control group.

Interaction Model:

$$y_i = \beta_0 + \beta_1 (Treatment_i) + \Sigma \beta_n \chi_n + \Sigma \beta_n (\chi_n * Treatment_i) + \varepsilon_i$$

In the model presented above $\chi_n * Treatment_i$, is an interaction term between treatment and race, ethnicity, and gender. β represents the coefficients for each term and interaction term.

APPENDIX F. EQUATIONS FROM TREATMENT-ON-THE-TREATED MODELS

Treatment-on-the-treated (TOT) estimates are modeled using two-stage least squares, where the first-stage model estimates students' probability of visiting the ARC at least once, and the second stage model estimates outcomes as a function of students' likelihood of visiting ARC at least once controlling for student differences.

$$\text{Stage 1: Prob_Visit}_i = \beta_0 + \beta_1(NG_i) + \sum \beta_n \chi_n + \varepsilon_i$$

In stage 1, Prob_Visit_i represents the predicted probability that student “i” would visit the ARC at least once during the 2018-2019 academic year. β_0 represents the mean likelihood of visiting the ARC at least once during the 2018-2019 academic year for students in the NG group. β_1 represents the difference in mean likelihood of visiting ARC at least once for students in the nudge group. NG_i is a dummy indicator for students assigned to the nudge group. $\chi_n +$ is a vector of student-level, pre-treatment covariates found to not be in balance at baseline according to What Works Clearinghouse standards ($0.25 > \text{Effect size} > 0.05$; see Appendix D-1). β represents the coefficient for each variable in vector χ_n .

$$\text{Stage 2: } \gamma_i = \beta_0 + \beta_1 (\text{Prob_Visit}_i) + \sum \beta_n \chi_n + \varepsilon_i$$

In stage 2, γ_i represents the outcome for student “i”; Prob_Visit_i is each student’s predicted probability of visiting ARC as predicted in stage 1. χ_n is a vector of student-level, pre-treatment covariates found to not be in balance at baseline according to What Works Clearinghouse standards ($0.25 > \text{Effect size} > 0.05$; see Appendix D-1). β_n represents the coefficient for each variable in vector $\chi_n +$, and ε_i is a term for student-specific random error. β_1 represents the treatment impact, the average improvement in outcome γ_i for each unit increase in Prob_Visit.