

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

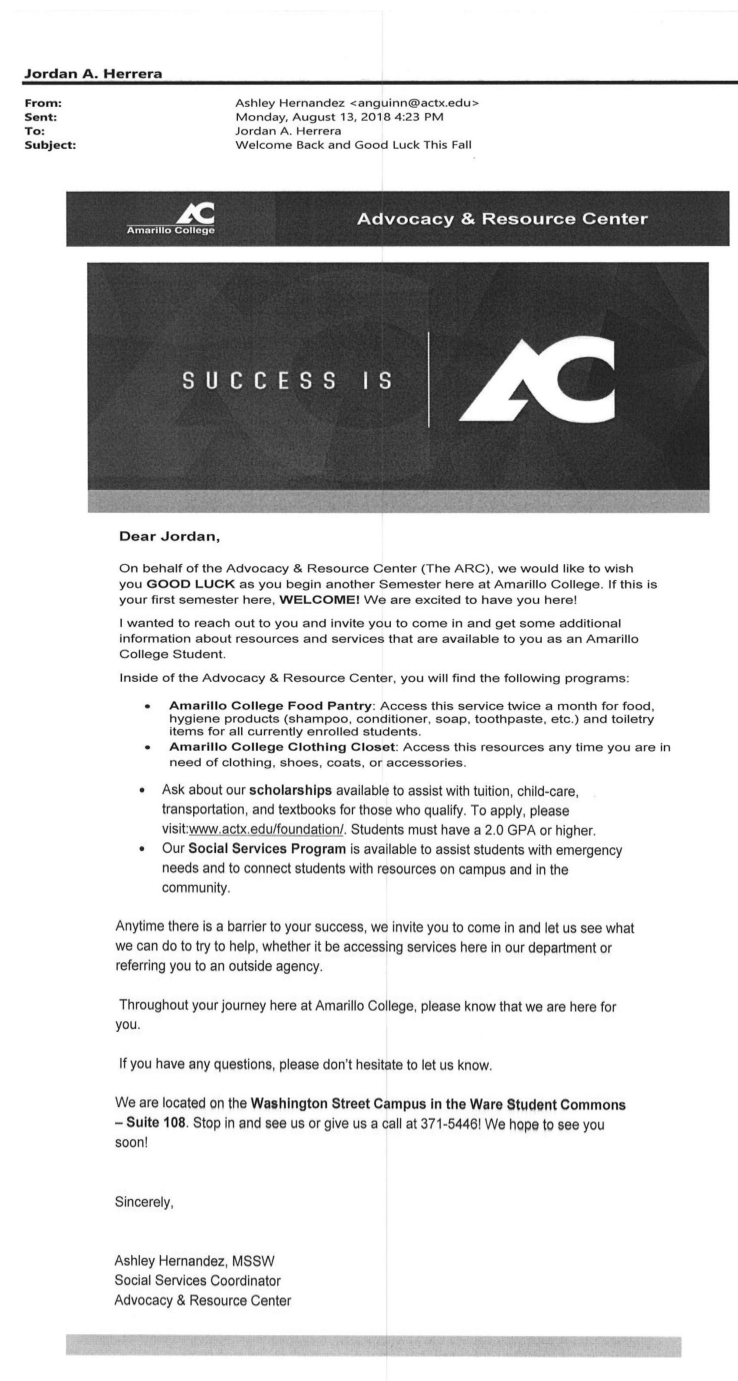
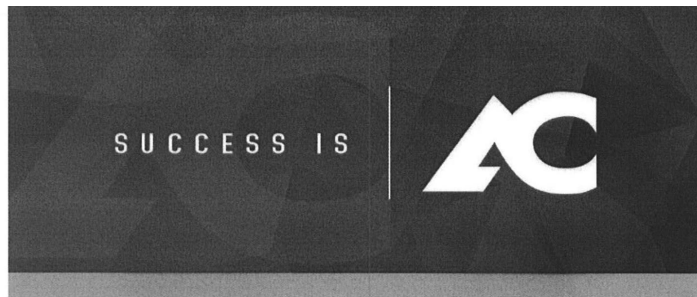


FIGURE B-2 | SAMPLE NUDGE EMAIL #2



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 resource 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.

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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.

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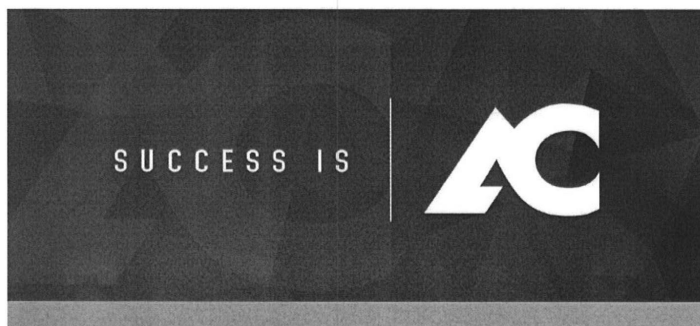
Sincerely,

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 x 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	(n= 693)	(n= 715)	Hedges/ Cox ES	All	(n= 275)	(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
White (%)	37.67	35.25	39.78	0.12
Race 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								
	Not Nudge d	Nudge d	Impact	P-value	SE	Impact	P-value	SE
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)

Unadjusted Model						Adjusted for Admin Variables				
2018-2019	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	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)

	Unadjusted Model			Adjusted for Admin Variables		
2018-2019	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)

	Unadjusted Model			Adjusted for Admin Variables		
2018-2019	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)

	Unadjusted Model			Adjusted for Admin Variables		
2018-2019	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
White (%)	40.00	39.63	0.00
Race 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:

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

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:

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

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 > 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 > 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.