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Aggie First Scholars: A Quality Workforce Initiative for Promoting First-Generation Student Success

Amanda M. Hagman
amanda.hagman@usu.edu


John Louviere
Utah State University, john.louviere@usu.edu

Heidi Kesler
Utah State University, heidi.kesler@usu.edu

Mykel Beorchia
Utah State University, Mykel.beorchia@usu.edu

Lisa Simmons
Utah State University, Lisa.simmons@usu.edu

Mitchell Colver
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Utah State University, mitchell.colver@usu.edu

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Aggie First Scholars

A QUALITY WORKFORCE INITIATIVE FOR
PROMOTING FIRST GENERATION STUDENT SUCCESS

Powered by Academic and Instructional Services
Fall 2018 & Spring 2019 Report

Report Presented December 2019



Program to improve first-generation student retentions delivers significant gains.

Amanda Hagman

Data Scientist, M.S.

Center for Student Analytics

John Louviere

Executive Director & Assistant Vice President, Ph.D.

Academic & Instructional Services

Heidi Kesler

Director

Student Achievement Collaborative: Student Retention & Completion

Mykle Beorchia

Director

Student Achievement Collaborative: University Advising

Lisa Simmons

Director

Student Achievement Collaborative: Student Orientation & Transition

Mitchell Colver

Manager, Ph.D.

Center for Student Analytics

First-generation students who participated in the Aggie First Scholar program experienced significant gains in persistence compared to similar students who did not (DID = 9.2%, $p < .01$).

INTRODUCTION: First-generation students lag behind continuing-generation peers in terms of graduation rates and average time to graduation. This phenomenon has been extensively studied in higher education with the intent of closing the gap seen between generational statuses. Utah State University provides services to support first-generation students. In the 2018/2019 academic year, USU initiated a full-kit initiative to help first-generation students participate in several proven first-year student milestones. This report explores the impact of full-kit use of services and the individual impact of each service on first-generation student persistence.

METHODS: Students who self-identified as first-generation on their USU application were invited to participate in the Aggie First Scholars (AFS) program. AFS was developed to support first-generation students during their first academic year through peer mentoring. The program developed a full-kit of services believed to support first-year success. These programs included

- Complete a FAFSA
- Meet with an advisor
- Initiate a degree plan
- Participate in Connections
- Complete orientation modules

Additionally, students could have one-on-one or group meetings with a mentor. Students level of participation in the various programs was assessed for its impact on student persistence.

AFS students were compared to similar students through prediction-based propensity score matching. This technique matched participating students with non-participants based on their persistence prediction and their propensity to participate. The differences between predicted and actual persistence rates were compared using difference-in-difference testing.

FINDINGS: Students who participated in at least 4 of the AFS full-kit services were more likely to persist to the next term. Peer mentoring emerged as a significant single milestone for first-generation students.

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Do first-generation students who participate in AFS programs experience a change in persistence?

WHY PERSISTENCE?

Student success can be defined in various ways. One valuable way to view student success is through progress towards graduation. Progress towards graduation reflects students acquiring the necessary knowledge and accumulating credentials that prepare them for graduation. Progress towards graduation can be measured through student persistence. Here, persistence is defined as term-to-term enrolment at Utah State University. As a measurement, persistence facilitates a quick feedback loop to identify what's working well and what can be better (Baer, Hagman, & Kil, 2020; Colver, 2019).

WHY USE ANALYTICS?

Higher education professionals labor to support student success in all its various forms, not just through persistence. However, professionals now have access to far more data than they can feasibly interpret and utilize to support student success without the help of analytics. Fortunately, USU has access to professional tools that can process and organize data into insights that have historically been hidden from view (Appendix A). University professionals can leverage insights to directly influence student success (Baer, Kil, & Hagman, 2019). Indeed, analytics aligns with USU's mission to be a "premier student-centered land-grant institution" by allowing professionals to know what is going well and what could be better (see Appendix G for the evaluation cycle).

FIRST GENERATION STUDENTS & PERSISTENCE

Nationally, graduation rates are lower and average time to graduation is longer for first generation students compared to their continuing-generation peers. The higher drop-out and duration of college career have been, in part, attributed to students' academic and social integration (US Department of Education, 1998; Tinto, 1975) and a lack of institutional knowledge (Hottinger & Rose, 2006).

In order to support first-generation student success, USU created targeted programming to bolster student first-year success for first-generation students. University professionals identified first-year milestones associated with student success. The milestones, taken together (in the "full-kit"), were believed to have a beneficial impact on students' persistence at USU. Student mentoring in individual and group settings supported social integration and the guidance through the first-year milestones provided scaffolded institutional integration. Meeting with academic advisors facilitated the connection to academics.

This report explores the impact of AFS programming on first-generation student persistence between their first and third semesters. It was anticipated that completion of individual first-year milestones would improve student persistence, but that the largest impact would be felt by students who participated in all, or most, of the milestones; i.e. students who utilized the full-kit of programs.

Alleviating Bottlenecks to Success for First-Generation Students: Theory of Constraints in Practice

THEORY OF CONSTRAINTS

The theory of constraints was born out of the manufacturing industry (Goldratt, 1984). It combated siloed processes to view the production process as a whole. The theory suggests that there are portions of any process that serve as bottlenecks to productivity. By identifying the bottlenecks, concerted effort can relieve the constraint and improve the process. An improved process facilitates success.

Since 1984, when the theory of constraints was first introduced, it has grown in popularity as a tool for improving process across numerous fields, including higher education.

By design, higher education is intended to be rigorous. Liberal arts education is intended to promote holistic personal development, co-curricular immersion, social integration, and specialized discipline specific training (Colver, 2018). Obtaining a degree is not a simple task. However, in addition to the intended rigor of higher education there are often unintended rigors that constrain degree completion.

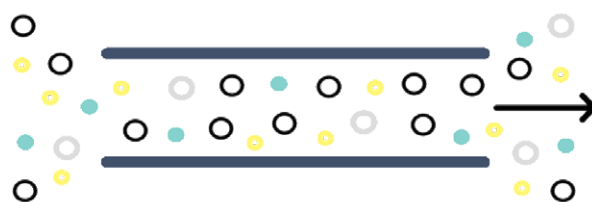
Complicated processes associated with financial aid, major declaration, graduation applications, and all the steps in-between can hinder students progress towards completion. These process constraints are not part of the necessary rigor of university.

Interestingly, the strain of these complicated processes is often not equally dispersed across all student segments. Specifically, continuing-generation students often have an upper-hand since they have familial support in finding resources and understanding processes (Peabody, 2013). Taking a close look at constraints can promote equity within higher education.

Following the identification of constraints, targeted efforts are made to exploit the constraint. In this report the targeted efforts focused on building first-generation students' social,

academic, and institution integration to alleviate process constraints that can result in drop-out.

Specifically for first-generation students, first-year milestone activities were selected that promote holistic student success. To support social integration, peer mentors regularly reached-out to students to provide opportunities to networking and socialize. Peer mentors also encouraged and guided students through processes associated with academic and institutional integration. Students were encouraged to meet with an academic advisor, begin a degree plan, complete a FAFSA, attend first-year seminar, and engage in orientation modules. Each of these milestones are believed to be impactful on student persistence, however, the combined effect was expected to be more powerful as a full-kit, multifaceted approach to relieving the constraints to persistence. This report explores the impact of the full-kit of services and the individual impacts of single milestone participation.



BOTTLENECK: Illustration of a process bottleneck. Interestingly, this bottleneck makes it appear that, while flow is slowed, all eventually progress through the bottleneck, this is untrue in higher education. Where bottlenecks slow students, student persistence is challenged resulting in drop-out. Alleviating bottlenecks supports retention efforts.

Participation Among First-Time, Full-Time Freshmen in First-Year Milestones

FIRST-YEAR MILESTONES

Several university resources were identified as important first-year milestones. The below milestones set students on a path towards retention.

- Consulting with an Advisor
- Participating in Connections (first-year seminar)
- Completing all Online Orientation Modules
- Initiating a Degree-Plan
- Submitting a FAFSA

These milestones were considered to be effective retention efforts for all first-year students.

FIRST-GENERATION STUDENTS

Given that first-generation students lag behind continuing generation peers in their time to graduation and graduation rates, but not ability, it was necessary to provide greater attention and support to their needs. A strength of the AFS methods was to promote retention by leveraging the existing milestones to put first-generation students on a path towards degree completion.

In addition to mentioned milestones, AFS had a unique support available only to AFS participants, peer mentoring. The peer mentors scaffolded many of the milestone, giving direction and reminders of dates and deadlines. In addition to

being a resource for the first-year milestones, peer mentors also provided opportunities for socialization and networking.

FULL-KIT MILESTONE COMPLETION

In Fall 2018, AFS focused on delivering the full-kit of first-milestones to participants. Mean participation was 3 initiatives, with a median at 4 milestones. 12% of AFS participants completed the full-kit, 23.4% completed 5 milestones, and 24.7% completed 4.

The most widely participated in first-year milestone was the completing of a FAFSA. The least utilized resources was peer mentoring networking, see Table 1.

FIRST-YEAR MILESTONE COMPLETION

There were some differences in milestone completion rate by generational status and academic year. The proportion of students consulting with an advisor was similar between generation status across terms. While there were fluctuations over time, the changes were not associated to AFS status.

TABLE 1:

Targeted Programs Participation Data

	Aggie First Scholars				Continuing-Generation			
	Fa17 N = 487	Sp18 N = 487	Fa18 N = 619	Sp19 N = 619	Fa17 N = 2,708	Sp18 N =	Fa18 N =	Sp19 N =
Academic Advising	58.5%	53.5%	67.6%	41.8%	59.2%	53.2%	67.4%	43.3%
Degree Planning	No Data	No Data	68.1%	78.1%	No Data	No Data	59.0%	73.3%
Took First-Year Seminar	63.2%	NA	81.3%	NA	64.2%	NA	77.0%	NA
Completed Orientation Modules	43.1%	NA	48.4%	NA	42.1%	NA	50.0%	NA
Submitted FAFSA	NA	NA	NA	81.9%	NA	61%	NA	65%
Met with a Mentor	NA	NA	19.7%	22.0%	NA	NA	NA	NA

The proportion of students initiating a degree plan was higher among the AFS population. Of the students who initiated a degree plan, roughly a quarter self-initiated and 20% self-modified their plan. The rates of self-creation and modification was similar for continuing generation students.

Student participation in Connections, USU's first-year seminar program, was also higher among AFS participants during Fall 2018. In Fall 2017, AFS participation in Connections was similar to their continuing-generation peers.

FAFSA data is protected and was unavailable with the exception of the percent of students who completed the process for AFS students in the 2018/2019 academic year. First-generation students tend to have greater need for financial support and this is reflected in the high proportion of AFS

students completing a FAFSA, 81.9%. The USU average FAFSA completion is far lower, closer to 60%.

USU provides a phased-online orientation for new students. This method of orientation has shown effective impacts on student institutional knowledge and persistence (Simmons & Dickamore, 2019). There are 5 modules; modules 1 through 4 are required. Module 5 still contains valuable, time-specific institutional knowledge, but there are no holds or other consequences attached to module completion.

AFS participant use of mentoring events was lower than expected, around 20% each semester. However, when considered across the academic year, 33.9% of AFS students during the Fall of 2018 met at least once with a peer mentor.

Does generation status influence student persistence?

PERSISTENCE GAP AT USU: FIRST- & CONTINUING-GENERATION STUDENTS

To identify the impact of generation status on student persistence, first-generation students were compared to continuing generation peers. A robust comparison of groups required that student inputs must be balanced between groups (see Appendix A). To accomplish this, the analysis used a technique called prediction-based propensity score matching. In this method first-generation students were matched with similar continuing generation students (See Appendix B for analytic details). Matching helps account for differences in student inputs between the two groups and

better isolates the effect of being generation status on student persistence. Briefly, students are matched on their likelihood to persistence and their propensity to be AFS to ensure a good comparison between groups.

Generation status was compared during the 2017/2018 and 2018/2019 academic years. In 2018/2019, first-generation students were encouraged to participate robustly in the full-kit of milestones. AFS services were also available during the 2017/2018 academic year, but the full-kit approach had not yet been adapted.

DEFINITION

Persistence is defined as term-to-term enrollment. Persistence rate for a given term is a measure of next term enrollment. Such that, a Fall 2018 persistence rate reflects students enrolled in Fall 2018 who attended again in Spring 2019.

Students from Fall 2017 and Spring 2018 academic year were used to estimate the persistence gap since services were business-as-usual. This sample provides a baseline for the gap between AFS and similar continuing generation students. In Fall 2017 the mean persistence difference between AFS and similar continuing generation students was -3.14% (CI: -7.34% to 1.16%). In Spring 2018 the difference in persistence was -3.50% (CI: -8.91 to 1.89%). Neither term reached statistical significance. Between these two semesters, it is estimated that USU could have lost 24 first generation students who were otherwise expected to persist.

First-generation students from Fall 2018 and Spring 2019 academic year benefited from targeted, full-kit programming designed to close the gap between AFS and continuing generation students. In Fall 2018 the mean persistence difference between AFS and similar continuing-generation students was -2.75% (CI: -6.15% to 0.65%). In Spring the difference was -0.14 (CI: -4.94 to 4.66%). Between these two semesters, it is estimated that USU lost 15 AFS students who were otherwise expected to

persist. Again, neither term reached statistical significance, the small gains may reflect a closing in the persistence gap between first generation and continuing-generation peers at USU, see Figure 2.

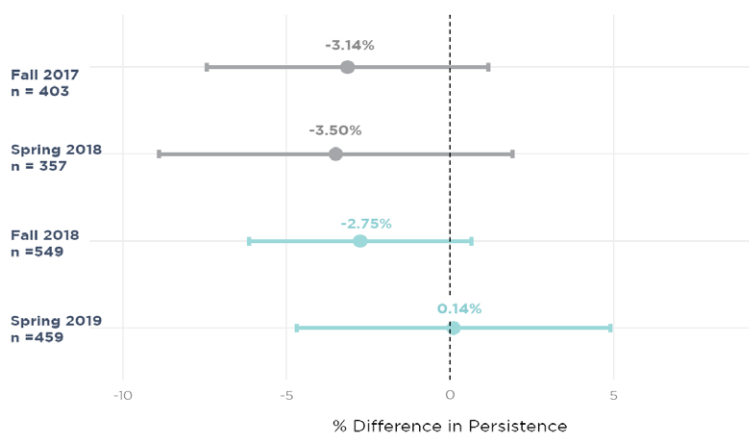


FIGURE 2 Closing the Gap

Mean change in persistence [dots] by term with confidence intervals [lines]. **Teal color** refers to full-kit service year.

Impact by Level of Participation

Not all AFS students took advantage of the full-kit of services. As seen above, only 12% participated in all 6 milestones, 23% completed 5, and 24% completed 4 milestones. Figure 3 illustrates the change in persistence by students level of participation compared to similar AFS students who engaged in fewer services. The small number of participants who completed the full-kit made the estimate less accurate (the analysis needs a minimum of 250 participants for accurate estimation, but prefers analyses with over 1,000). While the number of participants remained small in the 4 plus analysis, a significant difference was detected. The change in persistence is associate with retaining an estimated 23 (CI: 6 to 41) first-generation students who were otherwise not expected to persistence. This increase reflects an estimated \$109,336.25 (CI: \$28,522.50 to \$194,903.75) in retained tuition, assuming a net tuition of \$4,753.75 (see Appendix C).

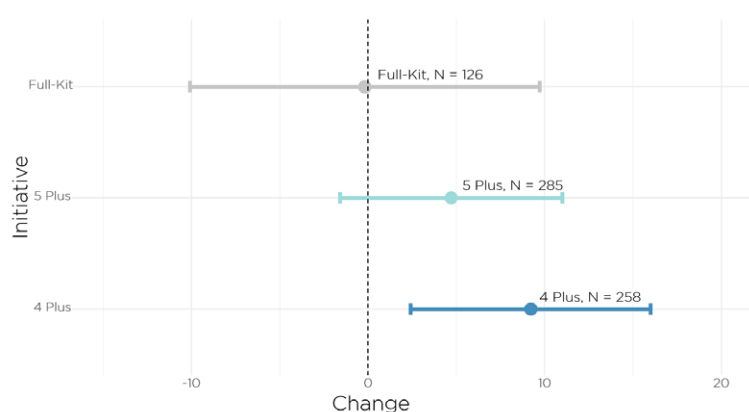


FIGURE 3 4+ participation shows significant gains

Mean change in persistence [dots] by level of participation in full-kit services for the 2018/2019 academic year with confidence intervals [lines].

CHANGE IN PERSISTENCE COMPARED TO SIMILAR CONTINUING-GENERATION PEERS

A limiting factor in the above analyses was a restricted comparison group. While there were 370 students who participated in 4 or more milestones, there were only 294 eligible comparison students in the AFS populations (with a total AFS population of 619).

The following analysis looked at the level of participation compared to similar continuing generation peers. In Figure 4 the change in persistence is displayed. While none of the analyses reached statistical significance, the practical gains suggest that participation at the 5 Plus or 4 Plus level are associated with gains in persistence. Additional years of data will increase the sample size, and will permit a more accurate estimate and understanding of the impact of full-kit services on student persistence.

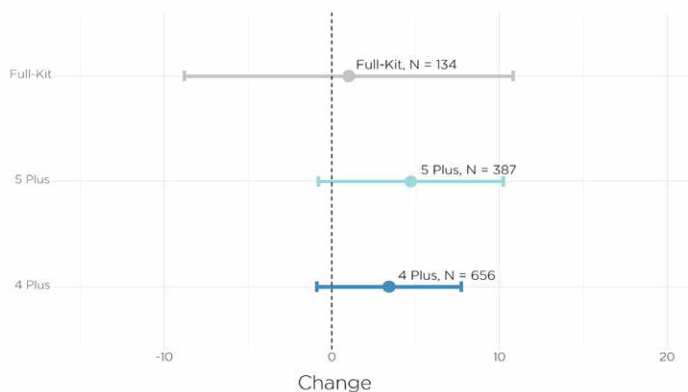


FIGURE 4 Change in Persistence Compared to Continuing-Generation Peers

Mean change in persistence [dots] by level of participation in full-kit services for the 2018/2019 academic year with confidence intervals [lines] compared to similar continuing-generation students.

CHANGE IN PERSISTENCE BY TERM

Illume impact isolates the association between initiatives by term. Neither term raised to statistical significance, however, the estimated gain in persistence is much larger in spring (see Figure 5). This number reflects the persistence rate between spring and fall, or, in other words, students who are retained from spring to the fall semester. The increase in persistence between spring and fall may suggest that AFS activities are associated with retention over the summer-melt.

CHANGE IN PERSISTENCE BY STUDENT SEGMENTS

Illume Impact delved into impact by various student segments to identify how the program influenced students with specific characteristics. Please note that the student segments are not mutually exclusive. Two student segments emerged as showing significant differences between comparison students:

- STEM Majors
- Students with Mixed Modality Courses

Both groups had smaller sample sizes that desired, but suggests that students in STEM majors are more likely to be retained if they complete at least 4 of the first-year milestones compared to similar continuing-generation peers. Similarly, students who have some online or broadcast courses appear from completing at least 4 of the AFS full-kit milestones.

Appendix D lists all student segments with non-significant findings.

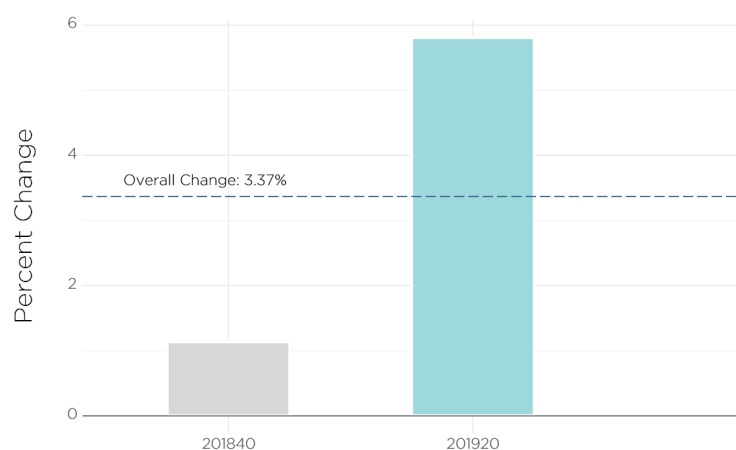


FIGURE 5 Change in Persistence Compared to Continuing-Generation Peers by Term

Mean change in persistence compared to similar continuing-generation students.

Impact by Individual AFS Supports

THE PLAN TO CLOSE THE GAP

The above analysis looked at the impact of full-kit services on student persistence, the following pages outline the impact by single student support to explore the salience of single services on student persistence.

- Academic advising
- Developing a degree plan
- First-year seminar (Connections)
- FAFSA support
- New student orientation
- Peer mentoring

ACADEMIC ADVISING

448 unique AFS students, or 72.4%, met with advisors during their first year at USU. The gain in persistence from meeting with an advisor was not statistically significant, but is practically significant. Students who met with an advisor experienced a 3.55% higher persistence rate. Figure 6A illustrates that the difference is more associated with a drop in persistence for students who did not meet with an advisor than a gain in persistence for AFS students who did meet with an advisor. This suggests that meeting with an advisor is an important element of closing the persistence gap. While meeting with an advisor does not drastically increase persistence, it prevents a drop in persistence.

DEGREE PLANNING

423 unique AFS students, or 68.3%, completed a degree plan during their first year at USU. The gain in persistence from making a degree plan was non-significant, but it was practically significant. Students who created a degree plan experienced a 3.86% higher persistence rate. Figure 6B illustrates that the difference is completely associated with a drop in persistence for students who did not create a plan. This suggests that meeting with an advisor is an important element of closing the persistence gap for first generation students. While there is no gain for AFS who have a degree plan, AFS students who do not have a markedly reduced persistence.

TABLE 2:

Targeted Programs Participation Data

	Fall 2018		Spring 2019	
	Used Resource	Did Not Use Resource	Used Resource	Did Not Use Resource
Academic Advising	379	222	279	237
Degree Planning	398	221	372	144
Took First-Year Seminar	425	194	na	na
Filed a FAFSA	na	na	507	112
Completed New Student Orientation	383	236	na	na
Met with a Mentor	122	484	136	428

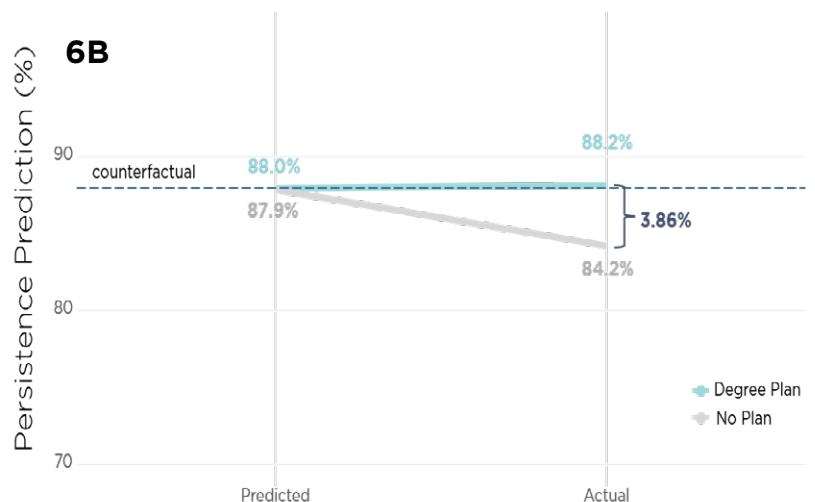
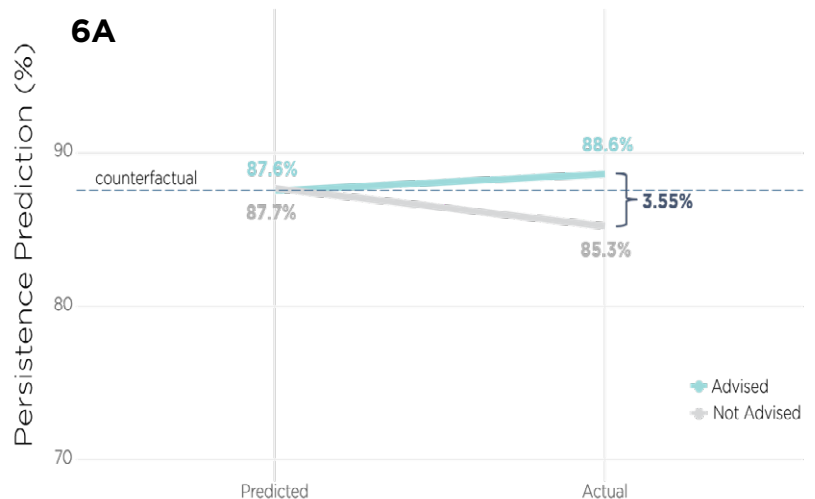
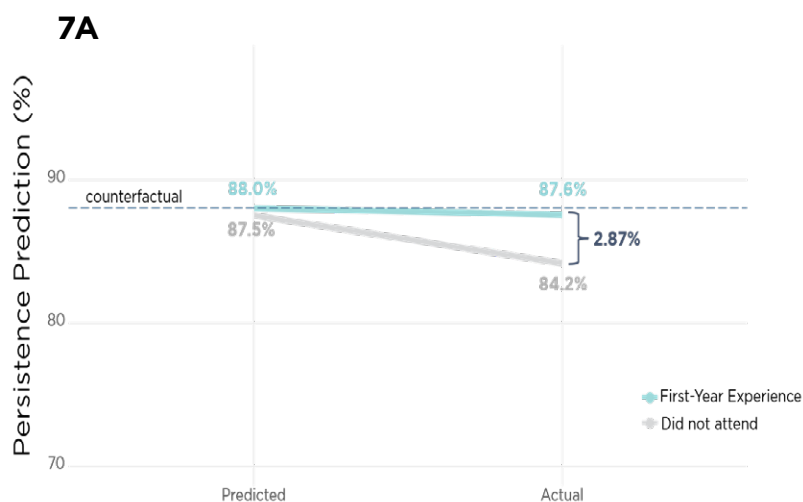


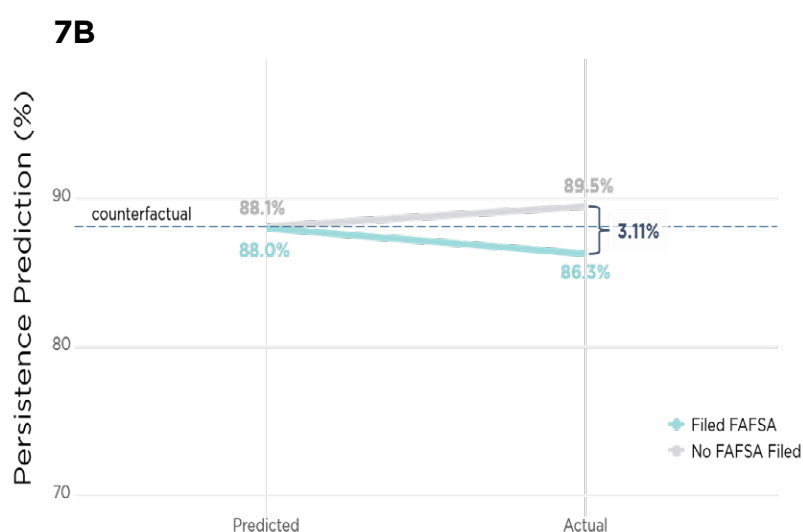
FIGURE 6A & 6B ADVISING & DEGREE PLANNING PREVENT DROP-OUT

Predicted and actual persistence for AFS students who used advising (6A) or degree planning (6B) compared to similar AFS students who did not use the resources.



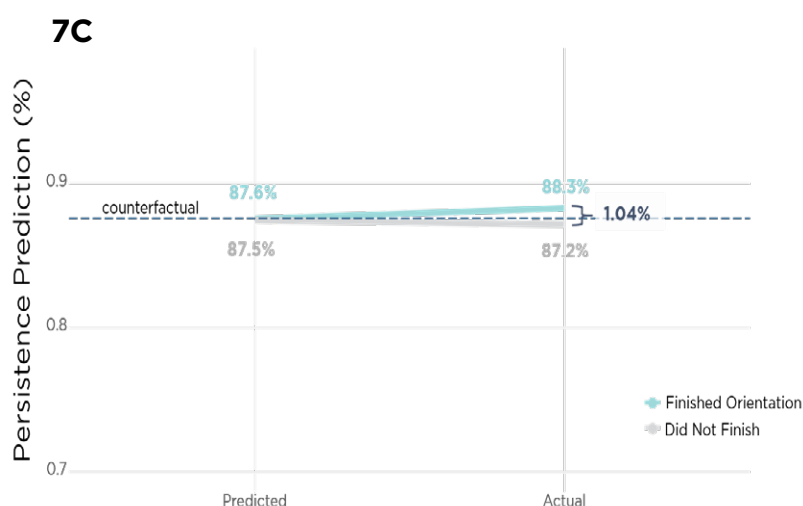
FIRST-YEAR SEMINAR

439 unique AFS students, or 68.7%, registered for USU's first-year experience (Connections). Of those students who took Connections, 425 passed the course with a C- or higher. The gain in persistence was not statistically significant for students taking Connections or for students passing Connections. The gains are practically significant and follow the same trends seen in academic advising and degree planning. AFS students who took Connections remained at their predicted persistence, AFS students who did not participate in the seminar dropped from their predicted persistence of 88.0% to their actual persistence of 84.2%. See Figure 7A.



FAFSA

507 unique AFS students, or 81.9%, completed a FAFSA during their first year at USU. The change in persistence from completing a FAFSA was not statistically significant. Interestingly, students who did not complete a FAFSA had slightly higher (though not statistically significant) persistence than AFS students who did not complete a FAFSA application. See Figure 7B for an illustration of the change in persistence.



NEW STUDENT ORIENTATION

USU adopted a phased, online orientation model. The phased orientation allows USU to present small amounts of information to incoming students at the right time. The series includes 5 modules. Modules 1 - 3 are required; modules 4 & 5 are optional. Each includes important information designed to help students succeed at USU. This analysis compared AFS students who completed all 5 modules to AFS students who did not. The difference between students was not statistically significant, nor was it practically significant. See Figure 7C.

FIGURE 7A, 7B, & 7C FIRST-YEAR SEMINAR PREVENTS DROP. FILING A FAFSA & COMPLETING ORIENTATION DID NOT CONTRIBUTE TO PERSISTENCE.

Predicted and actual persistence for AFS students who passed the first-year seminar (7A), filed a FAFSA (7B), & completed orientation (7C) compared to similar AFS students who do not use the resources.

Peer Mentorship

188 unique AFS students, 30.4%, met with a peer mentor during their first year at USU. Most of these students met both during the Fall and Spring semester. Students could meet for ice cream or lunch. The gain in persistence was not statistically significant for meeting with a peer mentor, but there is practical significance (4.14%, CI: -1.60% to 9.88%). However, when only lunch meetings were considered, the analysis was statistically significant. The time spent during a lunch peer mentor meeting was greater than meeting for ice cream, this extra time to visit may contribute a significant gain in persistence (6.48%, CI: 0.57% to 12.39%).

Several student subgroups experienced significant gains from having lunch with a mentor (Figure 4).

- Caucasian & non-Hispanic/Latinx
- Female Students
- Non-STEM Majors

Given the small sample size of the analysis, it is more difficult to find statistically significant impacts for many student subgroups. The demographic representativeness of peer mentoring was worth exploring.

RACE

USU has a high population of White or Caucasian students, about 85%. Students who participated in AFS programming had a similarly high proportion of Caucasian students, 85.1%. The breakdown by race in Table 3 illustrates that about a quarter of Caucasian, Multiracial, and African-American AFS students met at least once with a peer mentor. Asian-American, Pacific Islanders, and American-Natives met at slightly higher rates (40%-50%), but the sample size was small, which makes the data less reliable.

ETHNICITY

Table 3 also illustrates the rates of participation for Hispanic/Latinx AFS students. The rate of participation for Hispanic/Latinx AFS students is slightly higher than non-Hispanic/Latinx AFS students. The overall proportion of Hispanic/Latinx students in the AFS population is greater than what would be expected from the USU general student body. 5.5% of the USU student body identifies as Hispanic/Latinx, 12.4% of the AFS students are Hispanic/Latinx.

GENDER

AFS is composed mostly of female students, 61.6% of all AFS students are women. Women also make up the majority of AFS students who meet with a peer mentor. 78.3% of people meeting with mentors are women, only 21.7% are men.

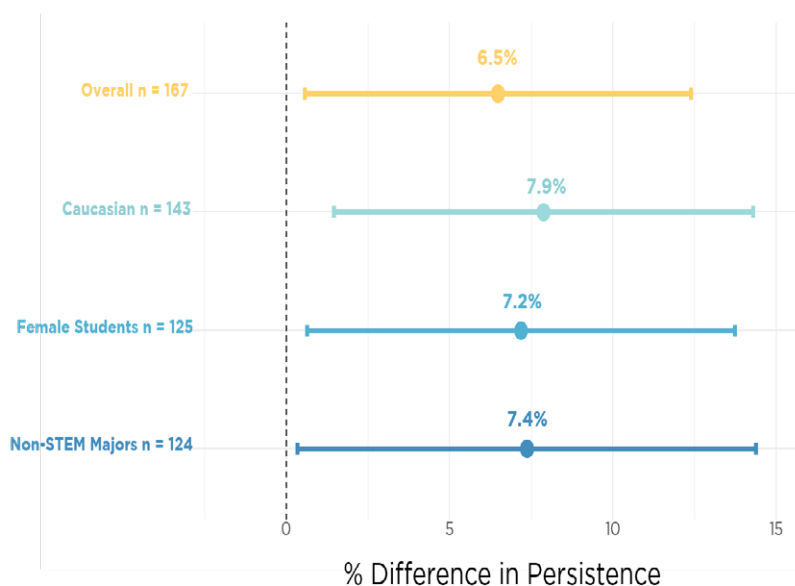


FIGURE 8. CAUCASIAN, FEMALES, & NON-STEM MAJORS INCREASE IN PERSISTENCE FROM MEETING WITH MENTOR

Mean change in persistence [dots] by term with confidence

TABLE 3:

Race & ethnicity of students who met with a peer mentor

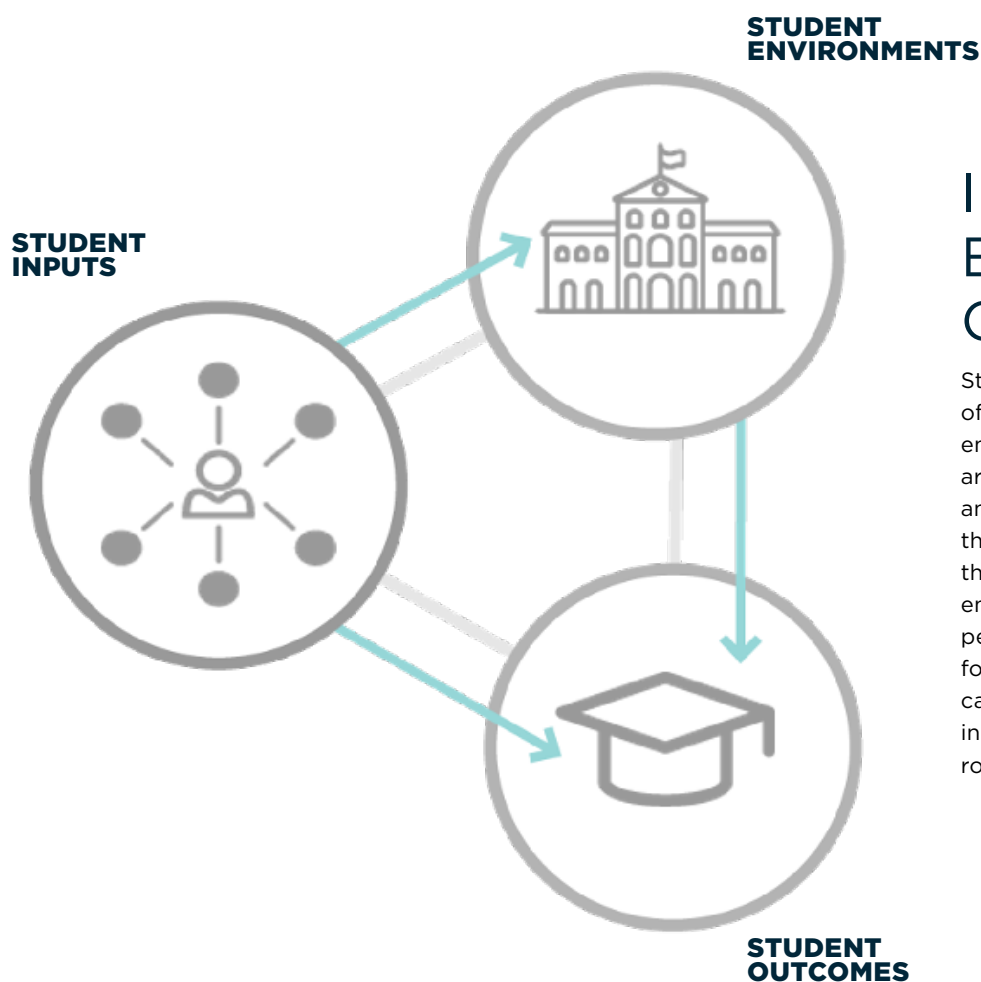
	Met with Mentor	Did Not Meet with Mentor	Proportion
RACE			
Caucasian	130	397	24.7%
Multiracial	4	13	23.5%
Asian American	6	8	42.9%
African-American	2	7	22.2%
Pacific Islander	2	3	40.0%
American-Native	1	1	50.0%
ETHNICITY			
Hispanic/Latinx	23	54	29.9%
Non-Hispanic/Latinx	125	378	24.9%
GENDER			
Female	119	262	31.2%
Male	33	189	14.9%

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Appendix A

THEORETICAL FOUNDATION FOR IMPACT ANALYSES: INPUT, ENVIRONMENT, OUTPUT MODEL (ASTIN , 1993)



Input - Environment - Outcomes

Student success is composed of both personal inputs and environments to which individuals are exposed (Astin, 1993). Impact analysis controls for student input though participant matching on (1) their likelihood to be involved in an environment and (2) their predicted persistence score. By controlling for student inputs, impact analyses can more accurately measure the influence of specific student environments on student persistence.

STUDENT INPUTS

Students bring different combinations of strengths to their university experience. Their inputs influence student life and success, but do not determine it.

STUDENT ENVIRONMENTS

The University provides a diverse array of curricular, co-curricular, and extra-curricular activities to enhance the student experience. Students selectively participate to varying degrees in activities. Student environments influence student life and success, but do not determine it.

STUDENT OUTCOMES

While student success can be defined in multiple ways, a good indicator of student success is persistence to the next term. It means that students are continuing on a path towards graduation. Persistence is influenced by student inputs and University environments.

IMPACT ANALYSIS

An impact analysis can effectively measure the influence of University initiatives on student persistence by accounting for student inputs through matching participants with similar students who chose not to participate.

Appendix B

ANALYTIC DETAILS: ESTIMATING PROGRAMMATIC IMPACT THROUGH PREDICTION-BASED PROPENSITY SCORE MATCHING (PPSM)

Impact analyses are quasi-experiments that compare students who participate in University initiatives to similar students who do not. Students who participate are called participants, students who do not have a record of participation are called comparison students. The analysis results in an estimation of the effect of the treatment on the treated (ETT). In other words, it estimates the effect of participating in University initiatives on student persistence for students who participated. This estimation is appropriate for observational studies with voluntary participation (Geneletti & Dawid, 2009).

Accounting for bias. While ETT is appropriate for observational studies with voluntary participation, voluntary participation adds bias. Specifically, voluntary participation results in self-selection bias, which refers to the fact that participants and comparison students may be innately different. For example, students who self-select into math tutoring (or intramurals or the Harry Potter Club) may be quantitatively and qualitatively different than students who do not use math tutoring (or intramurals or the Harry Potter Club). To account for these differences, reduce the effect of self-selection bias, and increase validity, a matching technique called Prediction-Based Propensity Score Matching (PPSM) is used.

In PPSM, matching is achieved by pairing participating students with non-participating students who are similar in both their (a) predicted persistence and (b) their propensity to participate in an iterative, boot-strapped analysis (Milliron, Kil, Malcolm, & Gee, 2017).

(A) Predicted Persistence. Utah State University utilizes student data to create a persistence prediction for each student. The main benefit to students from the predictive system is an as early alert system; it identifies students in need of additional resources to support their success at USU. A secondary use of the predicted persistence scores are to evaluate the impact on student-facing programs on student success. This is an invaluable practice that fosters accountability, efficiency, and innovation for the benefit of students.

The predicted persistence scores are derived through a regularized ridge regression. This technique allows for the incorporation of numerous student data points, including:

- academic performance
- degree progress metrics
- socioeconomic status
- student engagement

The ridge regression rank orders the numerous covariates by their predictive power. This equation is then used to predict student persistence scores for students at USU. This score is utilized as one point for matching in PPSM.

(B) Propensity to Participate. The second point used for matching in PPSM is a propensity score. Propensity scores reflect a student's likelihood to participate in an initiative (Rosenbaum & Rubin, 1983). It is derived through logistic ridge regression that utilizes participation status as the outcome variable. Using the equation, each student is given a propensity score which reflects their likelihood to participate regardless of their actual participation status.

Matching is achieved through bootstrapped iterations that randomly select a subset of participant and comparison students. Within each bootstrapped iteration, comparison students are paired using 1-to-1, nearest neighbor matching. Matches are created when student predicted persistence and propensity scores match within a 0.05 caliper width. Within the random bootstrapping iterations, all participants are included at least once. Students who do not find an adequate match are excluded from the analysis (for additional details see Louviere, 2020).

Difference-in-Difference. To measure the impact of University services on student persistence, a difference-in-difference analysis is used. A difference-in-difference analysis compares the calculated predicted means from the bootstrapped iteration distributions to the actual persistence rates of participating and comparison students. In other words, the analysis looks at the difference between predicted persistence and actual persistence between the two groups of well-matched students. Statistical significance is measured at the 0.05 alpha level and utilizes confidence intervals. The results reflect the ETT.

Appendix C

ADJUSTED RETAINED TUITION MULTIPLIER

Retained tuition is calculated by multiplying retained students by the USU average adjusted tuition. Average adjusted tuition was calculated in 2018/2019 dollars with support from the Budget and Planning Office. The amounts in the below table reflect net tuition which removes all tuition waivers from the overall gross tuition amounts. Utilizing net tuition provides a more accurate and conservative multiplier for understanding the impact of University initiatives on retained tuition. The table below parses the average adjusted tuition by campus and academic level. The highlighted cell represents the multiplier used in this analysis.

RETAINED TUITION MULTIPLIER CALCULATION

Student Groups	Net Tuition	Number of Students	Average Annual Tuition & Fees
All USU Students	\$148,864,384	33,070	\$4,501.49
Undergraduates	\$131,932,035	29,033	\$4,544.21
Graduates	\$16,932,349	4,037	\$4,194.29
Logan Campus Students	\$119,051,003	25,106	\$4,741.93
Undergraduates	\$107,711,149	22,659	\$4,753.57
Graduates	\$11,339,854	2,447	\$4,634.19
State-Wide Campus Students	\$25,941,419	7,964	\$3,257.34
Undergraduates	\$20,303,215	3,864	\$5,254.46
Graduates	\$5,638,204	1,590	\$3,546.04
USU-E Price & Blanding Students	\$3,871,962	2,560	\$1,512.49

Appendix D

STUDENT SEGMENTS THAT DID NOT EXPERIENCE A SIGNIFICANT CHANGE IN PERSISTENCE FROM PARTICIPATING IN 4+ MILESTONES

N	Student Segment**	Model Fit***	Actual Persistence		Difference-in Difference	CI	p-value
			Participants	Comparison Students			
656	Overall	Poor	80.85%	77.44%	3.37%	4.30%	0.12
656	Undergraduate Students	Poor	80.85%	77.44%	3.37%	4.30%	0.12
655	First Time in College	Poor	80.83%	77.47%	3.32%	4.30%	0.13
621	Full-time Courses	Poor	81.92%	78.14%	3.75%	4.36%	0.09
582	White or Caucasian	Poor	80.11%	77.09%	3.00%	4.60%	0.20
573	Not Hispanic or Latino	Poor	79.89%	77.24%	2.62%	4.64%	0.27
512	All On-Ground Status	Poor	81.60%	80.43%	1.17%	4.69%	0.63
489	Non-STEM Major	Poor	79.35%	77.86%	1.45%	5.02%	0.57
477	Female Students	Poor	80.89%	77.79%	3.04%	5.03%	0.24
358	1-3 Terms Completed	Poor	72.22%	69.36%	2.89%	6.55%	0.39
272	Third Persistence Prediction Quartile (50th - 74th Percentiles)	Poor	84.81%	82.59%	2.09%	6.18%	0.51
262	0 Terms Completed	Good	91.30%	89.85%	1.37%	4.93%	0.59
249	Second Persistence Prediction Quartile (25th - 49th Percentiles)	Poor	76.86%	73.48%	3.48%	7.54%	0.37
178*	Male Students	Poor	80.71%	76.52%	4.23%	8.29%	0.32
91*	Top Persistence Prediction Quartile (75th - 100th Percentiles)	Poor	91.36%	82.97%	8.19%	9.62%	0.09
82*	Hispanic or Latino	Poor	87.76%	79.20%	8.53%	11.17%	0.13
43*	Bottom Persistence Prediction Quartile (1st - 24th Percentiles)	Poor	55.59%	54.74%	0.97%	21.10%	0.93
34*	Part-time Courses	Poor	61.58%	64.91%	-3.35%	23.03%	0.77
27*	Unknown Racial Heritage	Poor	83.08%	82.25%	0.72%	20.09%	0.94
17*	Two or More Racial Heritages	Poor	91.97%	69.66%	22.58%	25.70%	0.08
16*	Asian or Asian American	Poor	89.19%	88.21%	0.75%	21.98%	0.95
6*	Black or African American	Poor	100.00%	85.38%	14.58%	34.13%	0.33
5*	Pacific Islander	Poor	73.58%	74.85%	-2.01%	62.49%	0.94
2*	All Online Status	Poor	52.71%	79.79%	-25.01%	173.48%	0.60

* Cells with fewer than 250 matched student pairs are too small for reliable analysis

** Student group definitions available in Appendix F

*** Model fit refers to the predictive stability of the model between prediction and actual persistence. The model is good, when the predictive stability is within 1%, it is adequate when within 3%, and poor when it is beyond 3%.

Appendix E

MATCHING DETAILS FOR 4+ MILESTONES IN AFS PROGRAM

Matching for the analysis resulted in 93% of available participants, or 656 students, being successfully matched for the analysis. Participating students who did not have an adequate match in the comparison group during the PPSM process were excluded from the analysis.

PERSISTENCE MATCHING: Prior to matching, samples were 92% similar based on students' predicted persistence (Figure A). Following matching the samples were 93% similar.

PROPENSITY MATCHING: Participating and comparison students were 65% similar based

on propensity score prior to matching (Figure B). Following matching, the similarity in propensity was 92%.

Both the persistence matching graph (Figure A) and the propensity matching graph illustrate substantial overlap between the red and blue lines. Detectable self-selection bias was not found between populations of participants and non-participants. A representative sample was created and used in the analysis.

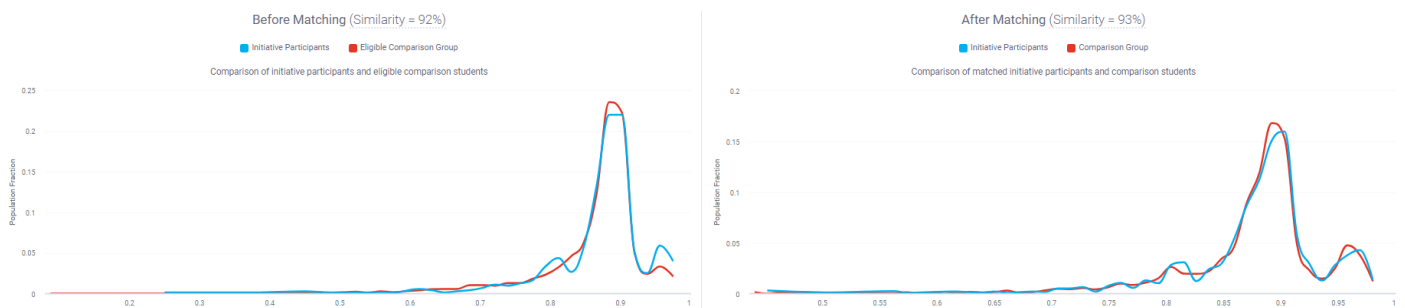


FIGURE A PREDICTED PERSISTENCE: PARTICIPATING & COMPARISON STUDENTS
Participating and comparison students receive scores based on their predicted persistence to the next semester. This score is based on historical data from Utah State University students.

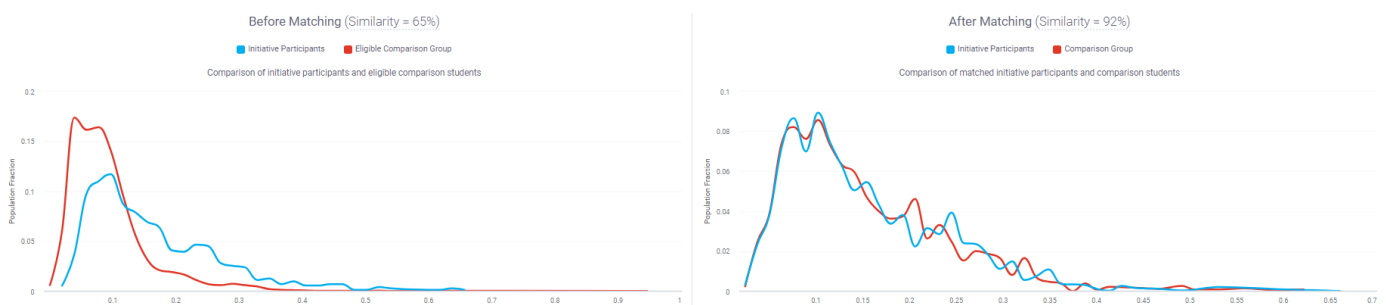


FIGURE B PROPENSITY TO PARTICIPATE BTW PARTICIPATING & COMPARISON STUDENTS
Participating and comparison students receive scores based on their likelihood to participate in the initiative.

Appendix F

STUDENT SEGMENT DEFINITIONS

Student Subgroup	Definition
0 Terms Completed	Students with 0 terms in their collegiate career completed; incoming freshmen
1 - 3 Terms Completed	Students who have completed 1 to 3 terms in their collegiate career
4+ Terms Completed	Students with 4 or more terms in their collegiate career completed
All On-Campus	Students attending all courses face-to-face
Online or Broadcast	Students attending all courses online or via broadcast
Mixed or Blended Course Modality	Students attending both face-to-face and online or broadcast courses
Full-time Students	Undergraduate students enrolled in 12 or more credits; Graduate students enrolled in 9 or more credits
Part-time Students	Undergraduate students enrolled in less than 12 credits; Graduate students enrolled in less than 9 credits
First Time in College	Students who enter USU as new freshmen, who have maintained continuous enrollment or records of absences (i.e. LOA)
Transfer Students	Students who attended another university prior to attending USU
Readmitted Students	Students who attended USU, left for a time (without filing a LOA), and returned after re-applying to USU
Unknown Undergraduate Type	Students with an unknown admitted type
High School Dual Enrollment	High school students simultaneously taking high school and college courses
STEM	Students with a primary major in science, technology, engineering, or mathematics
Non-STEM	Students with a primary major that is not in science, technology, engineering, or mathematics
Top Persistence Prediction Quartile	The total USU student population is divided so that 25% of students fall in each quartile. The top quartile contains students with the highest predicted persistence (75th – 100th percentile)
Third Persistence Prediction Quartile	The total USU student population is divided so that 25% of students fall in each quartile. The third quartile contains students with higher predicted persistence (50th – 74th percentiles)
Second Persistence Quartile	The total USU student population is divided so that 25% of students fall in each quartile. The second quartile contains students with lower predicted persistence (25th – 49th percentiles)
Bottom Persistence Quartile	The total USU student population is divided so that 25% of students fall in each quartile. The bottom quartile contains students with the lowest predicted persistence (1st – 24th percentile students)
Female	Students identifying as female
Male	Students identifying as male

STUDENT SEGMENT DEFINITIONS [CONTINUED]

Student Subgroup	Definition
Non-Hispanic or Latino	Students who do not identify as Hispanic or Latino
Hispanic or Latino	Students who identify as Hispanic or Latino
Race: Two or More	Students who identify with two or more races
Race: Unknown	Students who did not provide race information
Race: Asian	Students who identify as Asian
Race: Black or African American	Students who identify as African American
Race: Pacific Islander	Students who identify as a Pacific Islander
Race: American Indian/ Alaskan Native	Students who identify as American Indian or Alaska Native
Race: White or Caucasian	Students who identify as White or Caucasian

Appendix G

UTAH STATE UNIVERSITY'S EVALUATION CYCLE



EVALUATE & RE-EVALUATE

Get the data to AIS and we can run an evaluation on persistence. For goals that don't include persistence AIS can assist you in finding resources to measure your improvement.

REFLECT & DISCUSS

Consider the report and the evaluators insights to produce discussion within your department.

MAKE DECISIONS

Formulate possible actions to improve your program. Select actions that align with your program goals.

PLAN

Make concrete plans to apply your decisions. Determine the who, where, and when of your actions.

IMPLEMENT

Put your plans into actions. Remember to periodically check the progress of your plans as they are being implemented.