Fall 12-2019

University Academic Advising: Impact Analysis

Amanda M. Hagman
Utah State University, amanda.hagman@usu.edu

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

Erik Dickamore
Utah State University, Erik.dickamore@usu.edu

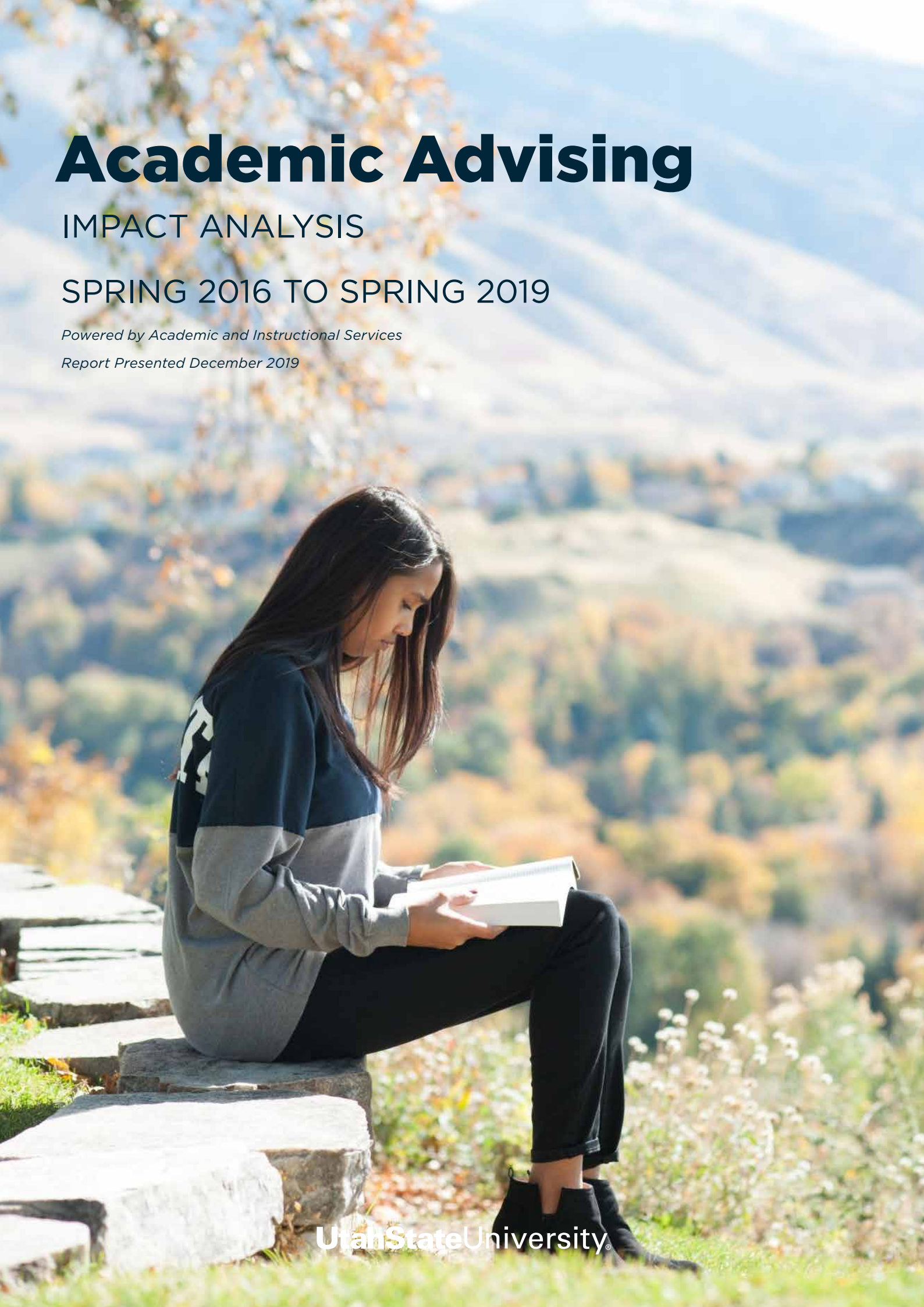
Academic Advising

IMPACT ANALYSIS

SPRING 2016 TO SPRING 2019

Powered by Academic and Instructional Services

Report Presented December 2019



Utah State University

Academic Advising is a High Impact Practice for Influencing Student Persistence

Amanda Hagman

Data Scientist, M.S.

Center for Student Analytics

Mykel Beorchia

Director

University Advising

Erik Dickamore

Undergraduate Researcher

Center for Student Analytics

Students who met with an academic advisor experienced an increase in persistence to the next term compared to similar students who did not meet with an advisor (DID = 0.052, $p < 0.01$).

ABSTRACT:

Academic advising performs a pivotal contribution to student success by providing information about university expectations and avenues towards graduation. The impact of academic advising is routinely assessed to explore its influence on student persistence. This report explores the impact of academic advising between 2016 to 2019 on student persistence to the next term. **METHODS:** Academic advising met with nearly 40% of students at USU each semester. Students who had a record of meeting with an academic advisor were compared to similar students who did not. Students were compared using prediction-based propensity score matching. Students who met with an advisor were matched with students who did not based on their persistence predication and their propensity to participate. The groups were compared using difference-in-difference testing (DID). **FINDINGS:** Students were 99% similar following matching. Students who met with an academic advisor were significantly more likely to persist at USU than similar students who did not (DID = 0.052, $p < .001$). The unstandardized effect size can be estimated through student impact. It is estimated that academic advising assisted in retaining 667 (CI: 618 – 715) students each year who were otherwise not expected to persist.

Table of Contents

II ..... ABSTRACT

IV .... LIST OF TABLES

V ..... LIST OF FIGURES

1 ..... ACADEMIC ADVISING & STUDENT PERSISTENCE

2 ..... STUDENT USE OF ACADEMIC ADVISING

3 ..... IMPACT ANALYSIS RESULTS

- **4** Impact by Persistence Quartiles
- **5** Impact by Term
- **5** Impact by Student Segments

9 ..... IMPACT ANALYSIS RESULTS

- **9** Racially Diverse Students
- **9** Academic Performance
- **9** Level of Use

List of Tables

2 .....TABLE 1. STUDENT USE OF ADVISING ACROSS SEMESTERS

7.....TABLE 2. STUDENT SEGMENTS EXPERIENCING CHANGE FROM USING ACADEMIC ADVISING

List of Figures

3 .....FIGURE 1. DIFFERENCE-IN-DIFFERENCE COMPARING STUDENTS WHO MET WITH AN ACADEMIC ADVISORS AND THOSE WHO DID NOT

4 .....FIGURE 2. PERSISTENCE BY PERSISTENCE QUARTILE

4 .....FIGURE 3. PROPORTION OF STUDENTS FROM EACH QUARTILE MEETING WITH AN ACADEMIC ADVISOR ACROSS TIME

6 .....FIGURE 4. IMPACT BY TERM

6 .....FIGURE 5. IMPACT BY NUMBER OF TERMS COMPLETED

6 .....FIGURE 6. IMPACT BY TIME STATUS

9 .....FIGURE 7. DIFFERENCE-IN-DIFFERENCE COMPARING STUDENTS WHO MET WITH AN ACADEMIC ADVISORS AND THOSE WHO DID NOT FOR RACIAL DIVERSE STUDENTS

9 .....FIGURE 8. DIFFERENCE-IN-DIFFERENCE COMPARING STUDENTS WHO MET WITH AN ACADEMIC ADVISORS AND THOSE WHO DID NOT FOR STUDENTS IN POOR ACADEMIC STANDING

9 .....FIGURE 9. CHANGE IN PERSISTENCE BY LEVEL OF USE

Does academic advising influence student persistence to the next term?

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 represents 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 (Colver, 2019; Bear, Hagman, & Kil, 2020).

WHY USE ANALYTICS?

Higher education professionals labor to support student success in all its various forms. To accomplish this, professionals must leverage their education and experience to meet students' needs. However, professionals now have access to far more data than then can feasibly interpret and utilize to support student success. Fortunately, USU has access to professionals and tools that can process and organize data into insights that have historically been hidden from view (Appendix A). University professions 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).

PERSISTENCE & ACADEMIC ADVISING

Advisors act as a consistence human connection for students in higher education. As professionals, they provide information about university expectations and avenues towards graduation while considering students' personal strengths and academic history (Young-Jones, Burt, Dixon, & Hawthorn, 2011). By providing appreciative advising and guiding students through their academic program, advising aims to impact student persistence.

In an assessment from 2018, academic advising was found to have a large influence on student persistence, helping to retain an estimated 200 students each semester. This report is a continuation of the last, which explores the impact of advising on student persistence. It also considers the impact of recent changes in student outreach by academic advisors. Specifically, academic advisors increased proactive advising for many students in the lower persistence quartiles. They also increased distance advising, i.e. phone and email advising.

Student Use of Academic Advising

SUMMARY STATISTICS

Analysis Terms:	Sp16,Su16,Fa16,Sp17,Su17,Fa17,Sp18, Su18 ,Fa18, Sp18
Total Visits	124,192 Visits
Unique Students	35,536 Students
Unique Confirmed Students	29,716 Students
Percent of Student Body Participating:	61.7%
Face-to-Face Appointments	84,896 Appointments
Email Advising Appointments	2,511 Appointments
Email-Only Advising	1,334 Appointments
Phone Advising	6,643 Appointments
Phone-Only Advising	4,568 Appointments

Descriptive Data Insights

AVERAGE USE

Since Spring 2016, Academic Advising has received 90,179 visits from 37,421 unique students during the regular academic year. During the same time period, there were 56,863 unique USU students, of these students 65.8% had at least 1 visit with their academic advisor.

For those who did meet with their academic advisor, the majority (69.4%) met only once with their academic advisor during a semester. The range of use was between 1 to 16 visits during a semester; only a small proportion met with an advisor on 5 or more occasions during a semester (1.2%).

Table 1 displays semesterly advising visits for all students. As a general trend, there were more **total visits** and **unique student visits** during fall semesters than spring semesters. The proportion of USU students receiving advising appears to be increasing over time, from a low of 35.4% in Spring 2016 to a high of 50.9% in Fall 2018.

TABLE 1: ADVISING TOTAL USE, TOTAL ADVISING VISITS, AND UNIQUE STUDENT VISITS USE BY TERM

	Total USU Population	Total Visits	Unique Students	% USU Students Served
201620	21,896	13,162	7,737	35.4%
201640	23,807	17,108	10,019	42.1%
201720	21,472	15,643	8,771	40.9%
201740	23,388	19,089	10,900	46.7%
201820	20,951	17,463	9,345	44.7%
201840	23,592	21,512	11,983	50.9%
201920	21,764	20,546	10,560	48.6%

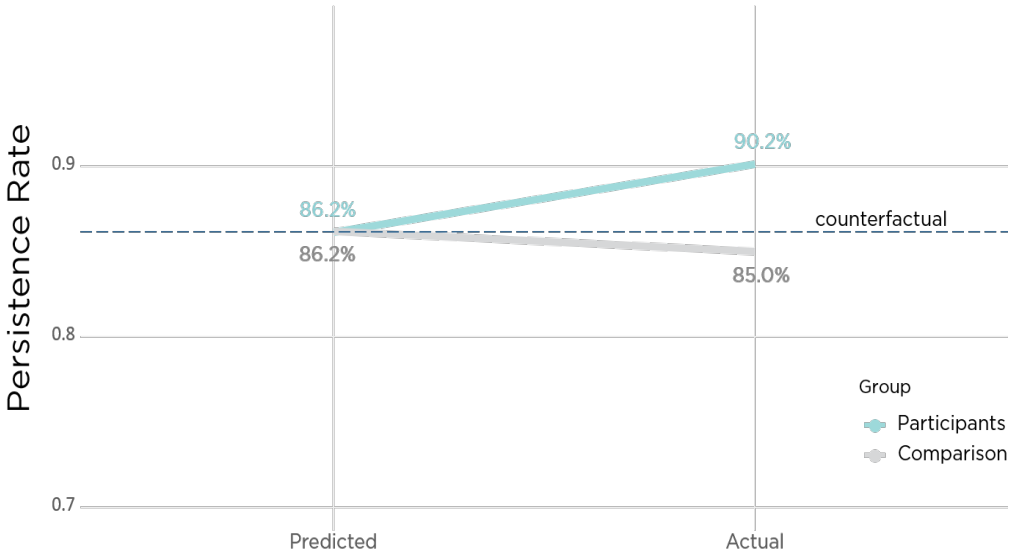


FIGURE 1
Participant and comparison students begin with highly similar persistence predictions. Actual persistence is significantly different between groups.

Academic Advising Impact Results

STUDENT IMPACT

Students with a record of meeting with an academic advisor experienced a significant 5.18% (CI: 4.80% to 5.56%) increase in persistence to the next term. This estimated increase reflected retaining 667 (CI: 618 to 715) students who were otherwise not expected to persist per year. Using an adjusted net tuition multiple from 2017/2018, the estimated retention reflected $3,170,631.19 (CI: $2,937,706.26 to $3,398,802.55) in retained tuition through academic advising.

SUMMARY STATISTICS

Overall Change in Persistence:	5.18% (CI: 4.80% to 5.56%)
Overall Change in Students (per year):	667 (CI: 618 to 715) Students
Analysis Terms:	Sp16,Su16,Fa16,Sp17,Su17,Fa17,Sp18, Su18 ,Fa18, Sp19
Students Available for Analysis:	70,672 Students
Percent of Student Body Participating:	39.6%
Students Matched for Analysis:	51,507 Students
Percent of Students Matched for Analysis	72.9%

Participants

PARTICIPANT DEMOGRAPHICS

Matching procedures for this analysis resulted in the inclusion of 72.9% of available participants. Students were 51.1% male, 89.6% Caucasian, and 6.7% Hispanic/Latino. Included students were 53.6% first-time college students and 99.5% undergraduate.

PARTICIPANTS

Non-degree seeking students were excluded from the analysis. Participating students were registered to academic degrees that were advised by Logan Main Campus academic advisors. Semester-level of participation varied between 1 and 16 visits. Median participation was 2 uses. Comparison students were in similar academic programs to participating students.

RACIAL DIFFERENCES

More Caucasian students visited with an advisor than would be expected from the general USU population. 89.6% of participants were Caucasian, the USU population is 86.0% Caucasian. (Chi Sq. = 561.5, p < 0.001).

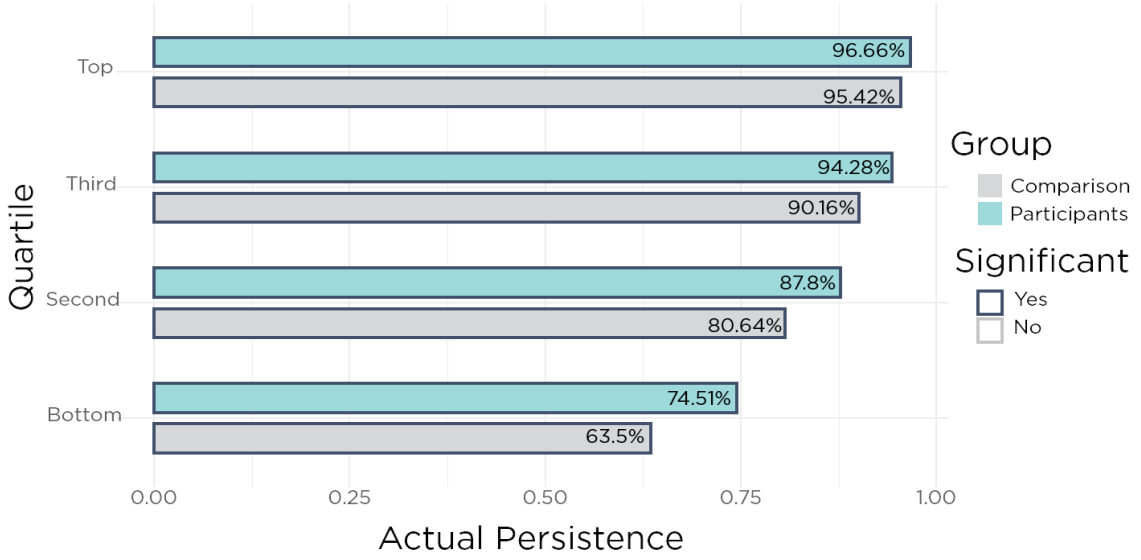


FIGURE 2
Difference in actual persistence between participat-ing and comparison students.

Persistence Prediction Quartiles

IMPACTED BY PERSISTENCE PREDICTION

The predictive analytic model adopted by USU divides students into predicted quartiles. Students in the top persistence quartile are considered the most likely to persist at USU. Students in the bottom persistence quartile are considered the least likely to persist at USU. Figure 3 displays the actual persistence of students by quartile. Meeting with an academic advisor was associated with significant changes in persistence for students in the:

- Top Quartile (75th - 100th Percentiles)
- Third Quartile (50th - 74th Percentiles)
- Second Quartile (25th - 49th Percentiles)
- Bottom Quartile (1st - 24th Percentiles)

Gains in persistence were largest for students in the lower (second and bottom) quartiles, 7.2% and 11.0% increases, respectively. The gains in retained students were as follows:

- Top Quartile - 45 Students/yr
- Third Quartile - 150 Students/yr
- Second Quartile - 252 Students/yr
- Bottom Quartile - 218 Students/yr

The number of students receiving academic advising by quartile also changed across time (Figure 4). Since 2016, there haven't been dra-matic shifts in the number of students advised, **dark blue line.** The proportion of lower quartile students (**light green** and **yellow** columns) is increasing with time.

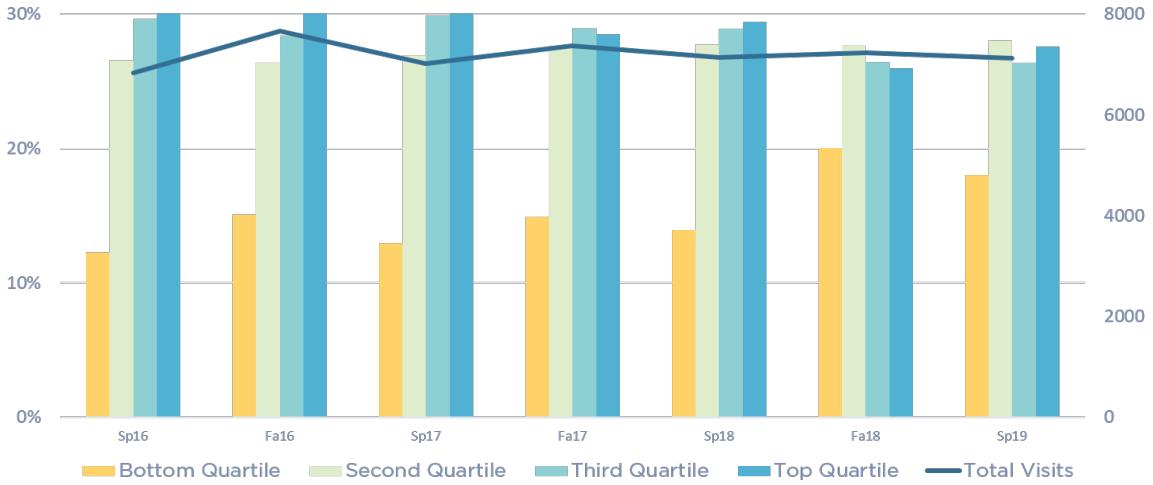
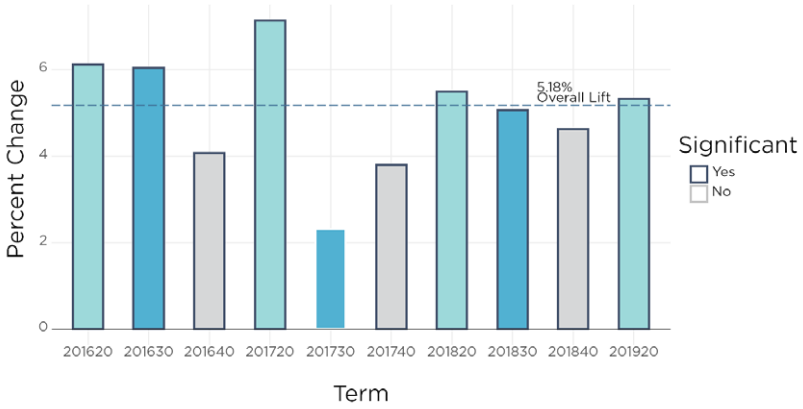


FIGURE 3
Proportion of students meeting with an advisor by persistence quartile.

Impact on Term

The impact of academic advising varied by term. Most terms reached statistical significance, with the exception of Summer 2017. Across the past 4 terms, the change in persistence has been relatively consistent.

FIGURE 4
Change in persistence by term.



Student Segment Findings

IMPACTED STUDENT GROUPS

Illume Impact provides an analysis that looks at various student segments to identify how the program influenced different populations of students. Please note that the student groups are not mutually exclusive. Table 2 shows all student groups who experienced a significant change from meeting with an advisor. Appendix D lists all student segments with non-significant findings.

In general, students that met with an advisor experienced an increase in persistence. Within the segment analyses, there were several segments that experienced significant changes.

Race & Ethnicity (Figure 6): USU has a high population of White or Caucasian and non-Hispanic or Latino students. For this reason, Impact analyses can often detect change in persistence for these groups; however, students of other races or ethnicities rarely reach the critical mass necessary to detect a significant change. With this in mind, the analysis found that all racial and ethnic identities experienced significant increases in persistence from meeting with an advisor. Considered identities included:

- Caucasian and non-Hispanic/Latino students
- Hispanic/Latinx students
- Asian-American students
- Native-American students
- African-American students
- Pacific Islander students
- Multi-racial and unclassified students

Degree Level: University advising is targeted toward undergraduates. The finding that undergraduates account for 99.5% of the visits is aligned with the intent of university advising. Undergraduate students, but not graduate students (as would be expected), experienced a significant increase in persistence from meeting with an advisor.

Degree Type. The analysis divided students by majors into STEM and Non-STEM students. Both STEM and Non-STEM majors experienced a significant increase in persistence. In general, STEM students have an overall persistence rate higher than the overall USU average persistence, 90% compared to 87% for Logan Main Campus students. STEM students who met with an advisor had an actual persistence of 92.6% compared to STEM students who did not meet with an advisor who had a 87.2% actual persistence.

Course Modality. There were three types of course modality considered in the analysis; all on-ground, mixed modality, and all online. Meeting with an advisor had a significant influence for students from all course modalities. The majority of students were all on-ground status, 57.4%. All on-ground students experienced a 5.6% increase in persistence from meeting with an advisor. Mixed modality students composed 36.5% of the students analyzed, these students experienced a 4.2% increase in persistence. All online students composed 6.1% of the sample and experienced a gain of 6.9%.

Student Gender. Both students who identify as male and female who met with an advisor experienced an increase in persistence. The increase for students identifying as male was 5.7%, male students who met with an advisors had an actual persistence of 90.3%, comparison students had an actual persistence of 84.3%. The increase for females students was 4.7%, female students who met with an advisor had an actual persistence of 90.0%, comparison students had an actual persistence of 85.7%.

Student Type. Students who were first-time in college or readmitted students experienced a significant increase in persistence from meeting with an advisor compared to similar students who did not. The larger change was seen among first-time in college students. Transfer students did not experience a significant change.

Terms Completed (Figure 5). The analysis considered three term breakpoints: new students (0 terms completed), early career students (1 to 3 terms completed), and later career students (4 or more terms). Students at any point in their academic career experienced significant gains in their persistence. The gains were highest for new freshmen (7.7%) and early career students (6.9%). New freshmen and early career students had similar actual persistence, 87%. For later career students, the gain was 3.5%.

Student Time Status (Figure 6): Students who attended USU full-time and part-time both experienced significant gains in persistence. The gains were larger for part-time students, 7.3%. Interestingly, 34% of Logan Main Campus students are part-time students and 23% of students in the analysis were part-time. Full-time students experienced a gain of 4.5%.

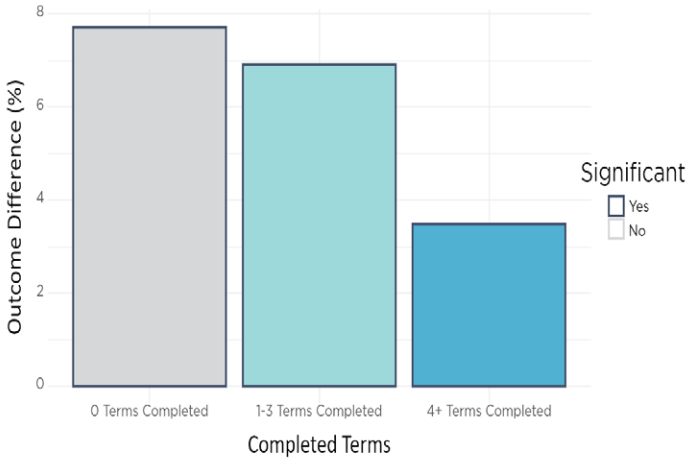


FIGURE 5

Difference in actual persistence between participating and comparison students by number of terms completed.

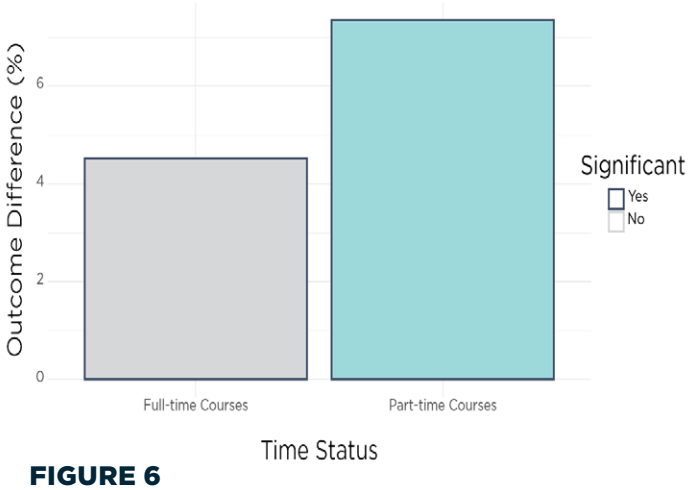


FIGURE 6

Difference in actual persistence between participating and comparison students by number of terms completed.

Student Segment Table

TABLE 2:

Student Segments Experiencing a Significant Change From Participating

N	Student Group**	Model Fit***	Actual Persistence		Difference-in-Difference	CI	p-value	Lift in People
			Participating Students	Comparison Students				
51,507	Overall	Good	90.16%	85.02%	5.18%	0.38%	0.0001	667
51,229	Undergraduate Students	Good	90.22%	85.01%	5.26%	0.38%	0.0001	674
48,081	Not Hispanic or Latino	Good	90.34%	85.22%	5.16%	0.39%	0.0001	620
46,162	White or Caucasian	Good	90.34%	85.46%	5.02%	0.40%	0.0001	579
39,651	Full-time Courses	Good	92.55%	88.06%	4.52%	0.40%	0.0001	448
37,646	Non-STEM Major	Good	89.35%	84.39%	5.48%	0.45%	0.0001	516
29,543	All On-Ground Status	Good	90.03%	84.45%	5.61%	0.51%	0.0001	414
27,618	First Time in College	Good	90.48%	84.72%	5.46%	0.51%	0.0001	377
26,521	4+ Terms Completed	Good	92.52%	89.30%	3.49%	0.47%	0.0001	232
26,295	Male Students	Good	90.34%	84.30%	5.66%	0.55%	0.0001	372
25,210	Female Students	Good	89.97%	85.68%	4.72%	0.53%	0.0001	298
19,249	1-3 Terms Completed	Poor	87.76%	80.49%	6.92%	0.70%	0.0001	333
18,806	Mixed or Blended Status	Good	91.57%	87.41%	4.22%	0.60%	0.0001	199
14,896	Top Persistence Prediction Quartile (75th - 100th Percentiles)	Good	96.66%	95.42%	1.22%	0.44%	0.0001	46
14,635	Third Persistence Prediction Quartile (50th - 74th Percentiles)	Good	94.28%	90.16%	4.12%	0.61%	0.0001	151
14,060	Second Persistence Prediction Quartile (25th - 49th Percentiles)	Poor	87.80%	80.64%	7.17%	0.84%	0.0001	252
13,783	STEM Major	Good	92.64%	87.18%	4.30%	0.70%	0.0001	148
11,815	Transfer Students	Good	90.28%	86.01%	4.76%	0.81%	0.0001	141
11,800	Part-time Courses	Adequate	82.16%	75.32%	7.34%	1.00%	0.0001	217
11,688	Readmitted Students	Good	89.61%	84.78%	5.25%	0.83%	0.0001	154

*Subgroups with fewer than 250 students are considered too small for reliable analysis

** Student group definitions available in Appendix F

*** Model fit is measured considering the fidelity of the comparison group to the predicted persistence. Good fit is ascertained when comparison students' actual persistence was similar to their predicted persistence (< 1% difference). Adequate fit has a difference between 1% and 2.9% between actual and predicted persistence. Poor fit has greater than 3% difference between actual and predicted persistence.

Student Segment Table [continued]

TABLE 2:

Student Segments Experiencing a Significant Change From Participating

N	Student Group**	Model Fit***	Actual Persistence		Difference-in-Difference	CI	p-value	Lift in People
			Participating Students	Comparison Students				
5,737	0 Terms Completed	Adequate	87.28%	79.45%	7.71%	1.28%	0.0001	111
3,426	Hispanic or Latino	Good	87.62%	81.92%	5.54%	1.67%	0.0001	48
3,158	All Online Status	Good	82.94%	76.09%	6.91%	1.92%	0.0001	55
1,444	Two or More Racial Heritages	Good	89.12%	86.17%	3.12%	2.26%	0.0069	11
1,433	Unknown Racial Heritage	Good	89.78%	81.88%	6.93%	2.53%	0.0001	25
904	Asian or Asian American	Adequate	92.98%	88.18%	4.26%	2.88%	0.0038	10
798	American Indian/ Alaskan Native	Poor	81.44%	73.17%	8.17%	3.43%	0.0001	16
524	Black or African American	Poor	86.46%	78.28%	7.69%	4.66%	0.0013	10
278	Graduate Students	Adequate	78.45%	87.79%	-9.07%	5.78%	0.0021	-6
239*	Pacific Islander	Poor	90.50%	71.62%	15.27%	6.98%	0.0001	9

*Subgroups with fewer than 250 students are considered too small for reliable analysis

** Student group definitions available in Appendix F

*** Model fit is measured considering the fidelity of the comparison group to the predicted persistence. Good fit is ascertained when comparison students' actual persistence was similar to their predicted persistence (< 1% difference). Adequate fit has a difference between 1% and 2.9% between actual and predicted persistence. Poor fit has greater than 3% difference between actual and predicted persistence.

Additional Analyses

RACIALLY DIVERSE STUDENTS

USU has a high population of White or Caucasian and non-Hispanic or Latinx students. For this reason, Impact analyses can often detect change in persistence for these groups; students of other races or ethnicities rarely reach the critical mass necessary to detect a significant change. To makes sure the results were representative of the diverse populations at USU, Caucasian students were excluded from this analysis to explore the impact of advising for these students.

For racially diverse students the change in persistence was statistically significant and similar to what was seen in the overall analysis, 5.35%. The following subgroups were impacted significantly:

- Undergraduates
- Time Status
- Major Type
- Course Modality
- Student Type
- Terms Completed
- Gender

Additionally, students with African, Asian, Pacific Island, and Native heritages all experienced significant gains in persistence. Interestingly, while about 40% of USU students met with an academic advisor, only 25% of students from diverse heritages met with an advisor.

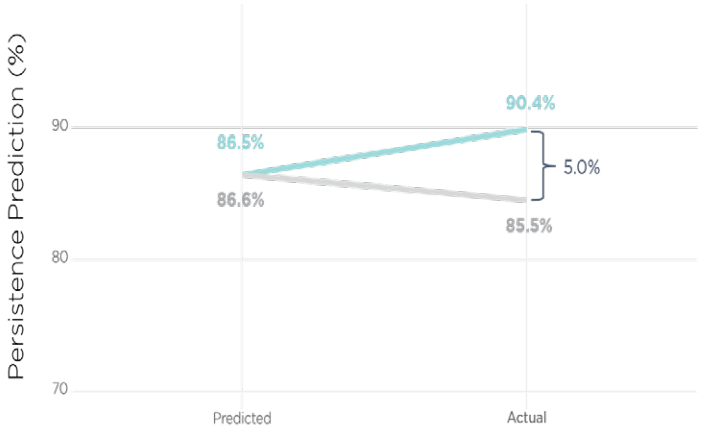


FIGURE 7 RACIALLY DIVERSE STUDENTS

Participant and comparison students begin with highly similar persistence predictions. Actual persistence is significantly different between groups.

ACADEMIC STANDING

Students who moved into poor academic standing dropped in their persistence to the next term. Yet, students who were in poor academic standing who met with an academic advisor had significantly high persistence compared to similar students in poor academic standing who did not meet with an advisor. While both groups started with predicted persistence in the 70s, both groups actual persistence dropped. Students in poor academic standing who did not meet with an advisor had an actual persistence of 44.8%. Students in poor academic standing who met with an advisor had an actual persistence of 54.5%. This difference in actual persistence is associated with retaining 41 students a year who were otherwise not expected to persist.

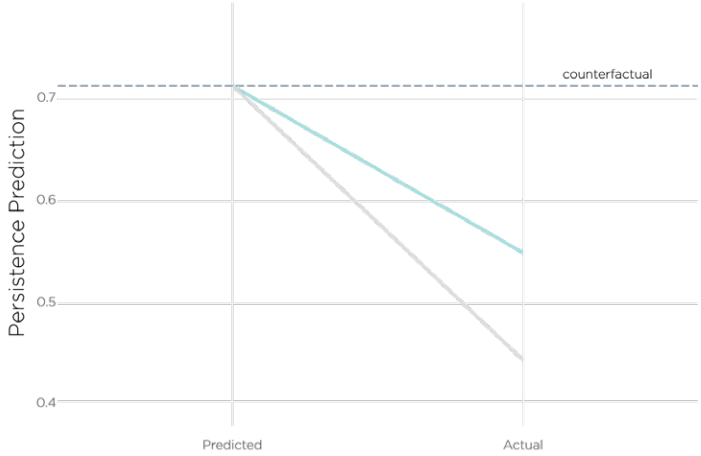


FIGURE 8 ACADEMIC PERFORMANCE

Participant and comparison students begin with highly similar persistence predictions. Actual persistence is significantly different between groups.

DOSAGE EFFECT: MEETING MULTIPLE TIMES WITH AN ADVISOR

Advising is available throughout the semester. Many students will meet with their advisor on multiple occasions. In fact, 30.6% of students who met with an advisor during a semester had more than one appointment. To better understand the impact of advising dosage on student persistence three additional analyses were conducted to explore the impact of meeting **ONLY ONCE**, **2 OR 3 TIMES**, or **5+ TIMES** during a semester. Similar impacts were seen for **ANY**, **ONCE**, and **2 OR 3 TIMES**. Meeting with an academic advisor **5+ TIMES** has a larger impact, it also has a larger confidence interval, suggesting more variability in persistence outcome.

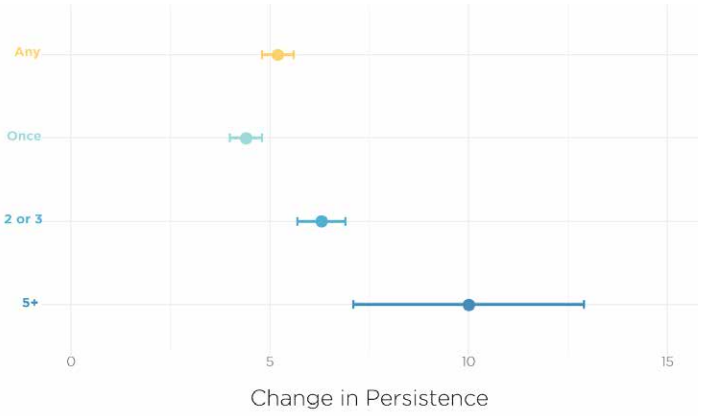


FIGURE 9 ADVISING DOSAGE

Change in persistence (dot) and confidence interval (line) by number of advising appointments.

References

Astin, A. (1993). What Matters in College? Jossey-Bass. San Francisco, CA.

Baer, L. L., Kil, D., & Hagman, A. M. (2019). Sherlock Holmes redux: Putting the pieces together. In L. L. Baer & C. Carmean (Eds.), An analytics handbook: Moving from evidence to impact (pp. 39-50). Ann Arbor, MI: Society for College and University Planning.

Baer, L., Hagman, A. M., Kil, D. (2020). Preventing the winter of disillusionment. Educause Review. 1: 46-54.

Geneletti, S. & Dawid, A. P. (2009). Defining and identifying the effect of treatment on the treated.

Louviere, J. (2020). Persistence impacts on student subgroups that participate in the high impact practice of service learning. All Graduate These and Dissertations. 7746. https://digitalcommons.usu.edu/etd/7746

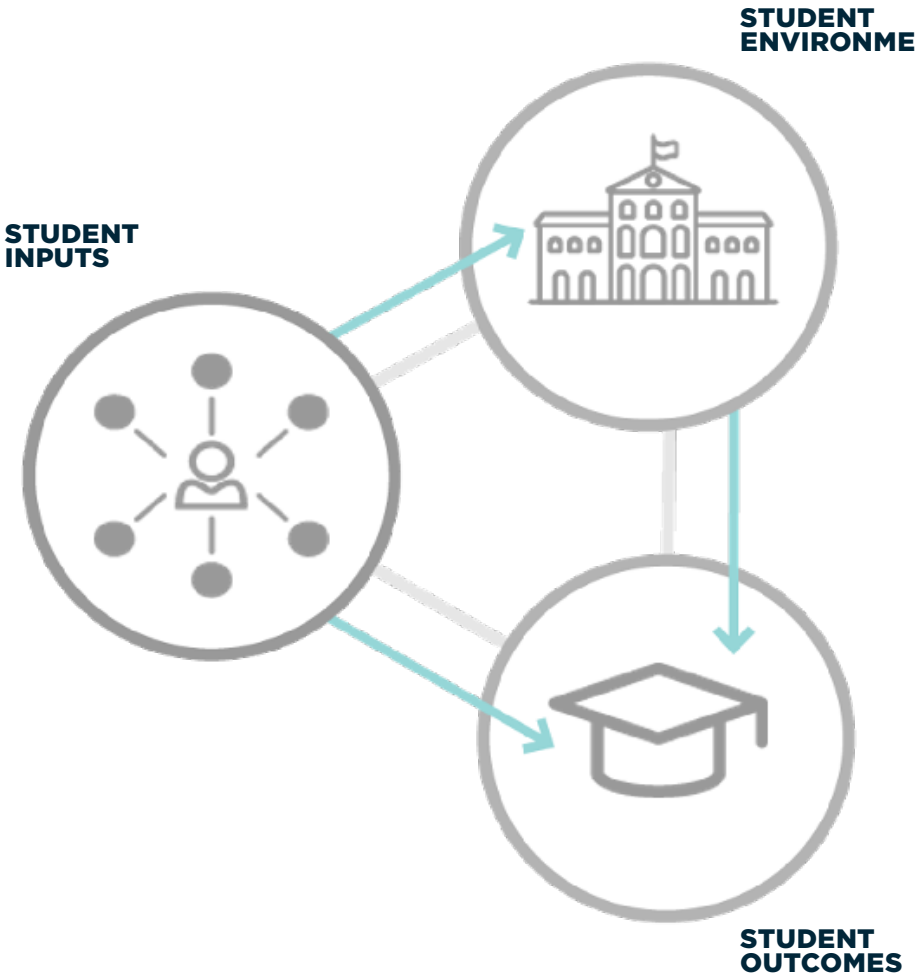
Milliron, M., Kil, D., Malcolm, L., Gee, G. (2017). From innovation to impact: How higher education can evaluate innovation's impact and more precisely scale student support. Planning for Higher Education Journal, 45(4), 1-12.

Rosenbaum, P.R. & Rubin (1983). The central role of the propensity socre in observational studies for causal effects. Biometrika, 70(1), 41-55.

Young-Jones, A., Burt, T., Dixon, S. and Hawthorne, M. (2013), "Academic advising: does it really impact student success?", Quality Assurance in Education, Vol. 21 No. 1, pp. 7-19.

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, 1969). 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 intramural or the Harry Potter Club) may be quantitatively and qualitatively different than students who do not use math tutoring (or intramural 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 students 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 selects 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 calliper 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 reflects 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 SUBGROUPS THAT DO NOT EXPERIENCE A SIGNIFICANT CHANGE IN PERSISTENCE

N	Student Group**	Model Fit***	Actual Persistence		Difference of Difference	Confidence Interval	p-value
			Participant	Comparison			
88*	Unknown Undergraduate Type	Poor	84.53%	83.53%	-1.63%	9.14%	0.7253
17*	High School Dual Enrollment	Poor	81.08%	94.76%	-16.19%	21.50%	0.1323

*Subgroups with fewer than 250 students are considered too small for reliable analysis

** Student group definitions available in Appendix F

*** Model fit is measured considering the fidelity of the comparison group to the predicted persistence. Good fit is ascertained when comparison students' actual persistence was similar to their predicted persistence (< 1% difference). Adequate fit has a difference between 1% and 2.9% between actual and predicted persistence. Poor fit has greater than 3% difference between actual and predicted persistence.

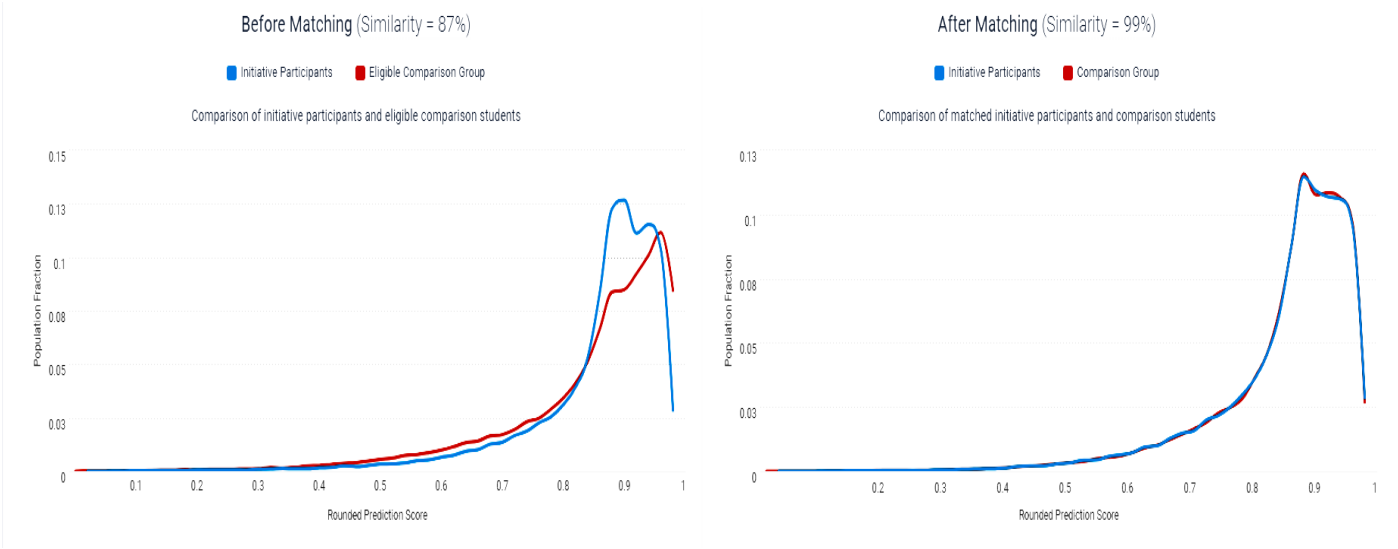
Appendix E

MATCHING DETAILS

Matching for the analysis resulted in 72.9% of available participants, or 51,507 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. While higher matching is preferred, a 72.9% match is adequate with a large sample size, like those seen in this analysis.

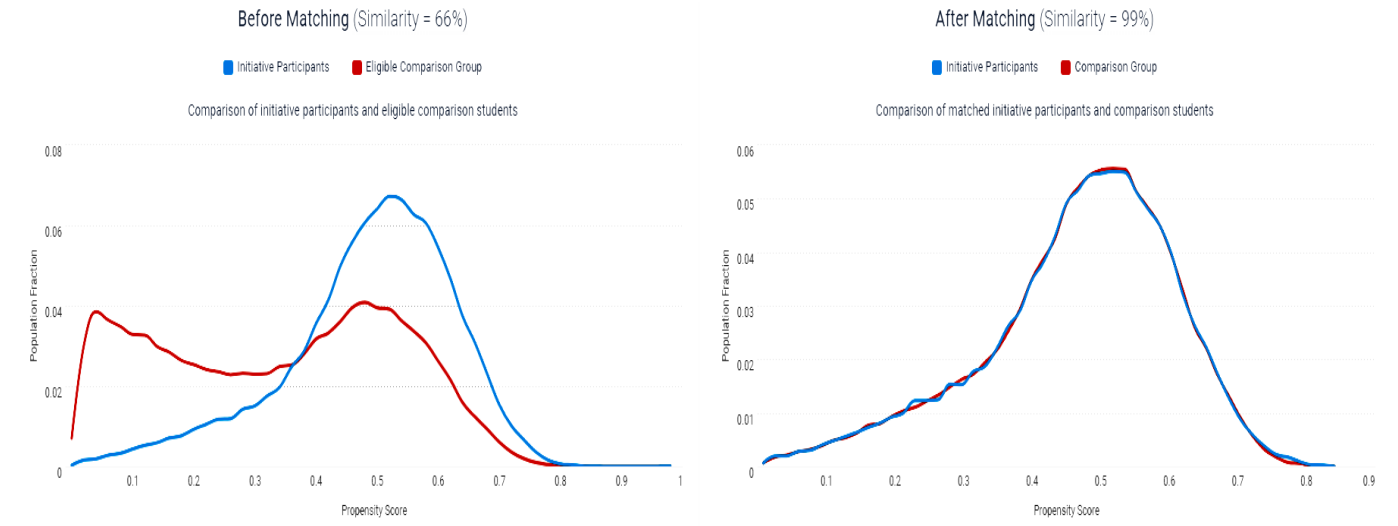
Predicted Persistence Matching: Prior to matching samples were 84% similar based on students' predicted persistence (Figure A). Following matching the samples were 98% similar.

Propensity Matching: Participating and comparison students were 66% similar based on propensity score prior to matching (Figure B). Following matching, the similarity in propensity was 99%. Interestingly, the red and blue lines on Figure B do not have the same shape. This suggests participation bias, meaning that students who met with an advisor looked different (based on underlying data) than students who did not meet with an advisor. Specifically, there is a mound of comparison students with similar propensity scores towards the left-hand side of the graph.



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 historic data from Utah State University Students



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

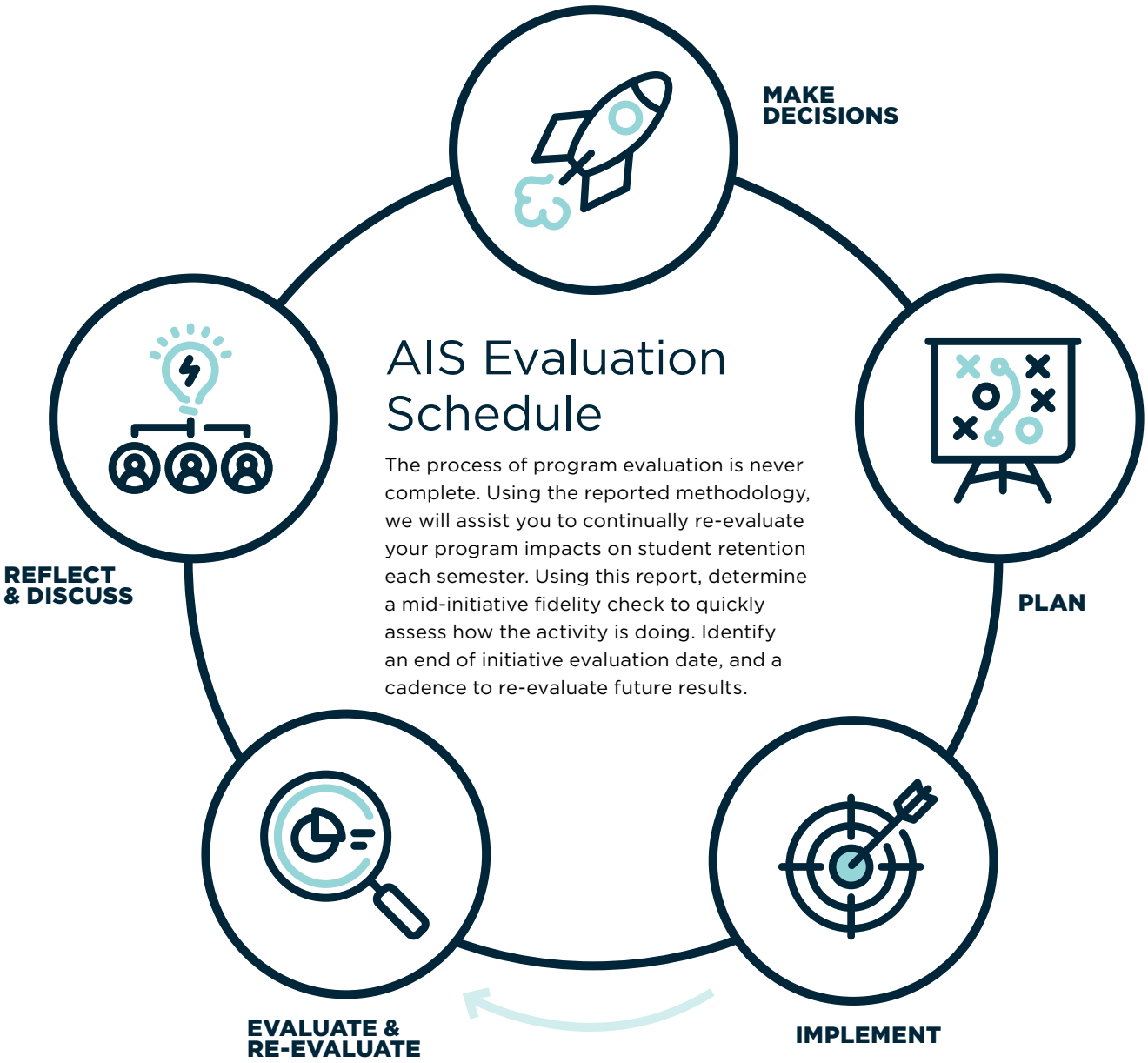
Student Subgroup	Definition
0 Terms Completed	Students with 0 terms in their collegiate career completed; incoming freshmen
1 - 3 Terms Completed	Students who have completed 1 to 3 terms in their collegiate career
4+ Terms Completed	Students with 4 or more terms in their collegiate career completed
All 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



AIS Evaluation Schedule

The process of program evaluation is never complete. Using the reported methodology, we will assist you to continually re-evaluate your program impacts on student retention each semester. Using this report, determine a mid-initiative fidelity check to quickly assess how the activity is doing. Identify an end of initiative evaluation date, and a cadence to re-evaluate future results.

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.