Administrative Issues Journal: Connecting Education, Practice, and Research, Fall 2022, Vol. 12, No. 2: 1-12. DOI: 10.5929/2022.12.2.1

An Evolved Method of Reporting Retention by Major

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Abstract

Higher education institutions face increased pressure from government and external funding sources to retain and graduate their students each year. Nationally, the federal government's IPEDS report defines the standard measure of an institution's retention and graduation success. When universities attempt to adapt this institutional standard to individual majors, they must proceed with caution. In this paper, researchers present the problems institutions can expect in directly adapting the IPEDS standard to measure a single academic major's retention. They also propose an evolved means of reporting a major's "student retention to graduation." In doing so, they create a better depiction of the journey students take through a degree program. The modifications introduced in this evolved report make it more useful and more meaningful to university administrators and program faculty as it provides a clearer, truer retention picture. The evolved report thereby provides better support to decision makers seeking to identify retention problems, propose alternative solutions, and gauge undertaken initiatives.

Keywords: retention of college students, graduation rate, retention by major, NCAA Graduation Success Rate, NCAA Academic Success Rate

Categorizations: Theoretical framework, Education Administration

It is difficult to find a more important metric to college administrators and other university stakeholders in higher education than a university's retention rate. Measuring retention involves quantifying the degree to which students enrolled in one term return in subsequent terms. Since graduation rates are not identified until years after students begin their coursework, using them alone introduces a substantial delay in knowing how a particular group of students is faring at the institution. For this reason, an institution's stakeholders use retention rates calculated on a year-to-year basis to determine whether students are progressing to degree completion. Retention rates provide a gauge of student success and a means of evaluating the effectiveness of bridge programs, advising methods, recruiting strategies, and similar university initiatives in which the intermediate progress toward graduation is essential. Together, retention and graduation metrics have changed how universities demonstrate accountability to students, parents, government officials, taxpayers, and others who have a vested interest in the success of college students.

Universities seek to improve retention and graduation rates in a number of ways. Some efforts focus on reducing student wandering through majors by developing systems that progressively help students to narrow their academic interests as they proceed toward graduation (Kafka, 2019; O'Banion, 2017; Schudde et al., 2020). Other efforts aim at improved, more intrusive advising and mentoring (Patel, 2014; Alzen et al., 2021; Lynch & Lungrin, 2018). However, individual initiatives must not lose sight of an overall retention strategy. An effective strategy with an eye toward retention encourages a holistic approach, such as the "4 P's framework of student retention," which encourages university administrators to examine student Profile, academic Progress, institutional Process, and fulfillment of Promise (Kalsbeek, 2013; Kalsbeek & Zucker, 2013; Kuh, 2013; Schroeder, 2013; Spittle, 2013).

Distilling retention and graduation information into a concise, understandable report without unintentionally hiding or misrepresenting key facets of the true picture of student progression toward graduation can be a challenge. The numbers may not clearly differentiate graduates from dropouts or track the flow of students between majors, making it difficult to pinpoint the cause of retention problems and determine the level at which they should be addressed. In this paper, we propose an evolved means of reporting student retention and graduation that better depicts the journey of students through their degree programs. The modifications introduced in this evolved report make it more useful and more meaningful to university administrators and program faculty as it provides a clearer, truer retention picture. The evolved report thereby provides better support to decision makers seeking to identify retention problems, propose alternative solutions, and gauge undertaken initiatives.

The Growing Importance of Retention and Graduation Rates

Over the last decades, institutions have focused more on student retention and graduation rates than ever before. As the importance of accurately measuring retention and graduation rates has grown, definitions and calculations of those rates have evolved. Until the 1970s, graduation rates used a 4-year benchmark; today, the benchmark has expanded to six years to account for students who need extra time to complete their degrees (Kuh, Kinzie, Schuh, & Whitt, 2010). The National Center for Education Statistics (2019), a subsidiary of the Institute of Education Sciences, allows for flexibility in the timeframe by defining "graduation rate" as "the percentage of first-time undergraduate students who complete their program at the same institution within a specified period of time." Furthermore, it uses the term "retention" (or persistence) to refer to the percentage of first-time undergraduates who subsequently return to the same institution.

University decision makers use retention and graduation measures as key indicators of institutional effectiveness and student success, making these measures increasingly more important. These measures have become standards of university success and play a significant role in accreditation, ranking, and policy decisions (Berger et al., 2012). Retention and graduation levels have increasingly influenced government funding itself (Gumport, 2000). Many states have introduced performance-based funding and tuition decisions, requiring public higher education institutions to produce data indicating satisfaction of these standards (Melkers & Willoughby, 1998; McKeown-Moak, 2001). The 1990 Student Right-to-Know Act requires all colleges and universities who accept Federal Student Aid to report their graduation and retention information for degree-seeking, full-time students (United States Congress, n.d.). The federal government's Integrated Postsecondary Education Data System, IPEDS, collects and stores this information (U.S. Department of Education, n.d.).

NCAA Reporting Requirements

While many consider the IPEDS metrics to be the standard for retention and graduation reporting, other measures certainly exist. Those required by the National Collegiate Athletic Association (NCAA) claim to offer a more complete picture for student-athletes. Since 1985, the NCAA has required its

members to report graduation rates (U.S. Department of Education, 2016). In 2002, the NCAA developed the Graduation Success Rate (GSR) to create a more "meaningful and inclusive summary of the graduation performance within a cohort of student-athletes" (Brown, 2014). The NCAA views the GSR, which "tracks the number of first-year, full-time students who entered college with financial aid and graduated from that school within six years, including anyone who transferred into that school," as a more robust measure since it includes nearly 40% more student-athletes than the standard IPEDS Federal Graduation Rate. Due to the NCAA's success in tracking students through to graduation using the GSR, in 2005 it created another similar metric named the Academic Success Rate (ASR). The ASR's calculation is nearly identical to the GSR. Both examine the academic success of student-athletes, but the ASR provides for an even more complete view by including all student-athletes, not only those who receive sports scholarships (NCAA, n.d.-c).

The GSR and ASR measures capture a more complete picture of student achievement and success by improving the means of accounting for transfer students. While the IPEDS Federal Graduation Rate counts students who transfer to other institutions in the same manner as other non-returning individuals, the GSR and ASR avoid penalizing member institutions for student-athletes in good standing who transfer to other schools (NCAA, n.d.-a). Even if transfer students eventually graduate elsewhere, the original school must count them as non-graduates when calculating their IPEDS Federal Graduation Rate. The NCAA's rates do not assess this penalty (NCAA, n.d.-b).

Reporting on Retention by Major

While universities must comply with governmental and NCAA reporting requirements, it is also tempting to apply institutional measurement methods to individual degree programs in order to improve retention. However, such initiatives must proceed with caution. Assessing individual majors using traditional IPEDS retention metrics designed for the university as a whole can result in misleading interpretations. This paper explores the pitfalls of a direct application of institutional IPEDS metrics at the major level and suggests an evolved method of reporting retention within a major by utilizing ideas from the NCAA's Graduation Success Rate (GSR) and Academic Success Rate (ASR) metrics.

Calculating retention using the IPEDS standards requires universities to identify their incoming freshman class or "cohort" each academic year. A cohort is "a clearly defined group … of students at one point in time, place, and with specific demographic and enrollment characteristics" (Mortenson, 2012, p.37). IPEDS specifies that a university's yearly cohort is the group of first-time bachelor's degree-seeking students (or those seeking other equivalent 4-year degrees) who enter the university in the fall term of that academic year. Traditional retention rates measure the portion of each cohort that returns to re-enroll the subsequent fall term. Applying this metric at the degree program (or major) level requires separating cohorts by major, creating "major cohorts." Directly adapting institutional IPEDS retention metrics to major cohorts yields retention-within-major and retention-within-university calculations as follows:

$$retention\ within\ major\ = \frac{number\ of\ major\ cohort\ students\ still\ enrolled\ in\ the\ major}{number\ of\ students\ assigned\ to\ initial\ major\ cohort}.$$

$$retention\ within\ university = \frac{number\ of\ major\ cohort\ students\ still\ enrolled\ in\ the\ university}{number\ of\ students\ assigned\ to\ initial\ major\ cohort}.$$

For these metrics, 100% retention is achieved if the number of major cohort students still enrolled in the major (or university) is equal to the number of students in the initial major cohort. While the denominators of these metrics are fixed and do not change, the numerators decrease over time as they measure those who have persisted and remain enrolled in the cohort. Some fluctuation will be due to students temporarily stopping out, but all cohort members will eventually leave the group: all will

eventually graduate, transfer to another institution, drop out permanently, or die. (Mortenson, 2012; Hagedorn, 2012).

A Directly Adapted Retention Report for Majors

Figure 1 shows a report used at the authors' university to measure retention within major. This report directly adapts the institutional IPEDS metrics to gauge retention within particular degree programs by calculating both retention within major and retention within university as described in the previous section. Each major on campus receives a separate report. The 2020 report shown tracks the retention history of first-time freshmen who entered the major each fall from 2015 to 2019.

The *Major Cohort* column shows the number of students who declared the major upon entry to the university. (Note that only the initially declared major is considered—even if students subsequently change majors within the institution.) Under the headings *Retained to Year 2*, *Retained to Year 3*, …, the report indicates the percentage of students from each major cohort that re-enrolled each subsequent year. Both *in Major* and *in Univ* percentages are reported. The latter indicates that other majors within the university still actively enroll some students who are no longer retained within the major. In addition, the *Graduation Rate* helps to expand the picture of retention by providing the percentage of students who have graduated from the major and from the university. While this direct adaptation of institutional measures enables examination of retention to graduation at the level of individual majors, relying on such a report creates a number of problems, which the authors identify and discuss in the next sections.

Figure 1: Directly Adapted Retention Report for a Given Major

2020 Fall Retention Report for <Major>

Major Cohort	Retained to Year 2		Retained to Year 3		Retained to Year 4		Retained to Year 5		Retained to Year 6		Graduation Rate	
	in Major	in Univ	in Major	in Univ	in Major	in Univ	in Major	in Univ	in Major	in Univ	in Major	in Univ
Fall 2015												
45	71%	84%	51%	76%	38%	64%	29%	42%	18%	35%	36%	49%
Fall 2016												
36	64%	75%	47%	67%	42%	61%	31%	53%			25%	39%
Fall 2017												
43	56%	70%	49%	63%	39%	58%					5%	5%
Fall 2018												
41	68%	85%	49%	80%								
Fall 2019												
34	74%	85%										

Problem: Care Needed to Interpret Graduates Properly

The first problem we identify in the directly adapted retention report is that care must be taken in interpreting the effect of graduating students. In the retention report, graduating students affect the retention-within-major and retention-within-university formulas in the same manner as non-returning students: the numerators decrease as graduates are no longer actively enrolled. This may lead to a misinterpretation of the retention data.

Figure 2: Fall 2017 Cohort (Excerpt from Figure 1)

Major	Retained to Year 2		Retained to Year 3		Retained to Year 4		Retained to Year 5		Retained to Year 6		Graduation Rate	
Cohort	in Major	in Univ	in Major	in Univ	in Major	in Univ	in Major	in Univ	in Major	in Univ	in Major	in Univ
Fall 2017												
43	56%	70%	49%	63%	39%	58%					5%	5%

Figure 2, an excerpt from the full report in Figure 1, focuses on the Fall 2017 cohort in order to demonstrate this potential confusion. At first glance, it appears the major lost 10% of its cohort from year 3 (49%) to year 4 (39%). Only with careful attention will the report reader note the 5% graduation rate posted for this cohort and realize that two students out of the 43 that began the degree program in Fall 2017 completed it within three years. So, a correct interpretation will reduce the 10% loss to account for graduates who are not counted in the *Retained to Year 4* percentages.

Figure 3: Fall 2015 Cohort (Excerpt from Figure 1)

Major	Retained to Year 2		Retained to Year 3		Retained to Year 4		Retained to Year 5		Retained to Year 6		Graduation Rate	
Cohort	in Major	in Univ	in Major	in Univ	in Major	in Univ	in Major	in Univ	in Major	in Univ	in Major	in Univ
Fall 2015												
45	71%	84%	51%	76%	38%	64%	29%	42%	18%	35%	36%	49%

A more complex example of this problem is shown in Figure 3. Here the major's percentage of retained students drastically drops each year (from 71% to 51%, 38%, 29%, and 18%), indicating that something must be done to remedy this retention failure. Noting the 36% *in Major* graduation rate can help to ease some concerns, but report readers are not given details about when the 36% graduated. While the full 36% impacts year 6 retention rates, what portion of these completers reduced the retention rates for prior years? There is no way to determine this with the information presented. All those graduating before year 4 will be shown as not retained for year 4 and following years. Graduates before year 5's beginning will similarly be shown as not retained for years 5 and 6.

Administrators relying on this report can easily form a false impression. Besides the possibility of misinterpretation, the report makes it difficult to correctly distribute the cohort's graduates to their years of graduation. Using this report makes it difficult to grasp a true picture of student progression.

Problem: Students Changing Majors

A second problem arises in the directly adapted retention report due to students changing majors. The retention report accounts for students who change their initially selected major by reporting both *Retained in Major* and *Retained in Univ*. However, using two measures to account for these students can be confusing and misleading. A close examination reveals that the cause of the confusion is the method used to assign students to major cohorts.

When continuing students change their initially selected major, the retention report for the initial major reduces the *Retained in Major* percentage. Still, it includes these students within its *Retained in Univ* figure. From this point forward, the initially selected major continues to report retention metrics for students who are now in other majors—likely in other departments or colleges within the university. Since cohorts are fixed and students are only reported within their initial major cohort, the retention reports for the students' new majors neither record these new students nor track their retention.

Figure 3 shows that of the 45 students who initially selected this major in Fall 2015, 38 (84%) returned to the university, and 32 (71%) returned to the same major. So, six of the returning students changed to other majors on campus. However, four of these students left the university the following year

(year 3). The loss of four students is reflected in the *Retained in Major* and *Retained in Univ* calculations for year 3, year 4, year 5, and year 6 even though these students were enrolled in other majors before the beginning of year 2.

Problem: Missing Personal Details

A third problem with the directly adapted retention report is that it includes only the high-level summaries shown in Figures 1, 2, and 3. However, if the report's purpose is retention, providing the calculation details would be extremely beneficial. Departmental administration and faculty more acutely feel the weight of responsibility for retention when the numbers are made personal. Report detail should drill down to the level of students assigned to the major if administrators are to hold departments and faculty accountable for retaining individuals rather than just meeting acceptable summary statistics.

An Evolved Retention Report for Majors

Now that we have identified the problems with a direct adaptation of institutional IPEDS metrics to individual majors, this section proposes solutions. It introduces an improved metric, expands the reported information, and reformats the report to make it more accessible and intuitive. These changes work together to modify the directly adapted retention report into an evolved retention report.

Allowing Cohorts to Change

Allowing cohorts to change is the first update proposed. In the directly adapted retention report discussed above, incoming major cohorts remain fixed based on the majors that students selected upon initial entry into the university. In the evolved report, cohorts change as students change their majors. By doing this, responsibility for retaining the student shifts from the initial major to the new major. The authors borrow some ideas from the NCAA retention model to accomplish this.

The NCAA's retention measures account for students who transfer to another institution without penalty to the initial institution. Similarly, the authors account for major changes without penalty to the initial major by modifying the denominator of the retention-within-major metric from the number of students assigned to the **initial** major cohort to the number assigned to the **current** one. With this change, as students switch to other majors on campus, the numerator and the denominator both decrease in the retention-within-major calculation. The numerator and denominator of the new major correspondingly increase as it is now assigned accountability for this student. Consequently, each time a student changes major, the responsibility for retaining the student changes to the new major. The updated calculation counts students not retained within the university in the denominator of their most recent major.

Avoiding Penalties for Graduates

The second update proposed avoids penalties for graduates. As described, the directly adapted retention metrics account for graduates similarly to dropouts, potentially causing a degree program to be penalized when students graduate. Since the denominator of the retained-within-major metric counts graduates as members of their assigned major cohort, adding them to the numerator will remedy this problem. This change ensures that graduates will be counted as *retained* when completing their degrees rather than being reported as *not retained* by the major. This change reflects the aim of retaining students through their college career to graduation. The formula for the evolved retention metric is below.

$$\boldsymbol{Directly\ Adapted\ Retention\ Within\ Major}$$

$$\frac{number\ of\ major\ cohort\ students\ still\ enrolled\ in\ the\ major}{number\ of\ students\ assigned\ to\ initial\ major\ cohort}.$$

↓

$$\textbf{\textit{Evolved Retention Within Major}} = \frac{number\ of\ major\ cohort\ students\ still\ enrolled\ in\ the\ major + number\ of\ major\ cohort\ graduates}{number\ of\ students\ assigned\ to\ current\ major\ cohort}$$

Figure 4: Evolved Retention Report Summary: Retained to Graduation Report for Single Major

Directly Adapted Retention Report for a Major

2020 Fall Retention Report for <Major>

Major Cohort	Retained to Year 2		Retained to Year 3		Retained to Year 4		Retained to Year 5		Retained to Year 6		Graduation Rate	
	in Major	in Univ	in Major	in Univ	in Major	in Univ	in Major	in Univ	in Major	in Univ	in Major	in Univ
Fall 2015												
45	71%	84%	51%	76%	38%	64%	29%	42%	18%	35%	36%	49%
Fall 2016												
36	64%	75%	47%	67%	42%	61%	31%	53%			25%	39%
Fall 2017												
43	56%	70%	49%	63%	39%	58%					5%	5%
Fall 2018												
41	68%	85%	49%	80%								
Fall 2019												
34	74%	85%										

Evolved Retention Report for a Major

2020 Fall Retained to Graduation Report for <Major>

	% of Students Who Are Retained/Have Graduated					
Cohort Year	1-Year Later	2-Years Later	3-Years Later	4-Years Later	5-Years Later	Summary
2015	82%	74%	69%	68%	63%	63%
2016	79%	68%	72%	61%		61%
2017	73%	70%	61%			61%
2018	87%	78%				78%
2019	86%					86%

Simplifying the Summary Report

The third report update proposed is simplifying the summary report. The changes discussed above enable a simpler and more intuitive layout. Figure 4 depicts the directly adapted report (copied from Figure 1) and the evolved report to show the effect of the proposed changes. The new method improves the accounting of both graduates and changes of major, thereby eliminating the need for separate graduation rates and *in Major/in Univ* breakdowns. Also, report readers now intuitively grasp and accept the evolved cohort group assignments. As expected by responsible parties, a major's cohort group does

not include those who have left the major and are now pursuing other programs of study within the university. The most recent major assumes accountability for students not retained.

To assist the reader in understanding the differences between the two reports, the authors detail the change in the metrics reported for the Fall 2019 cohort. Note that the Fall 2019 *in Major* retention rate increases from 74% in the directly adapted report to 86% in the evolved report. This increase occurs because the directly adapted calculation only considers that 25 of 34 students returned to the major. However, the evolved metric considers more information to represent a fuller, truer picture: it also includes six students who switched into the major and four students who switched out of it. Below are the details of the calculation.

$$\frac{number\ of\ major\ cohort\ students\ still\ enrolled\ in\ the\ major + number\ of\ major\ cohort\ graduates}{number\ of\ students\ assigned\ to\ current\ major\ cohort}$$

$$\frac{(25\ reenrolled\ majors + 6\ who\ switched\ into\ major) + 0\ graduates}{(34\ initially\ in\ major - 4\ who\ switched\ out\ of\ major + 6\ who\ switched\ into\ major)} = \frac{31}{36} = 86\%$$

Providing Calculation Details

The fourth proposed update provides calculation details. In addition to the summary from Figure 4, the evolved report includes calculation details that further explain the summary measures for each cohort. Figure 5 shows details relating to the Fall 2015 cohort. The additional details clearly show the yearly movement of students into and out of the major, which in itself might aid in identifying problems. However, the report also depicts student progression within the cohort by detailing the distribution by classification: the counts of freshmen, sophomores, juniors, and seniors still enrolled each subsequent year. In addition, it includes annual counts of graduates and students who have left the university. These details present a much clearer picture of student retention within the major.

Figure 5: Evolved Retention Report Details: Calculation Details for Fall 2015 Cohort (as of 2020)

	1 Year Later: Fall 2016		2 Years Later: Fall 2017		3 Years Later: Fall 2018		4 Years Later: Fall 2019		5 Years Later: Fall 2020	
Changes in Fall 2015 Cohort Students Assigned to this Major										
Assigned to Major at Beginning of Year	45	Fall 2015	51	Fall 2016	53	Fall 2017	51	Fall 2018	50	Fall 2019
Switched Into Major during Year	+12		+7		+2		+0		+0	
Switched Out of Major during Year	-6		-5		-4		-1		-1	
Total Cohort Students Assigned to Major	51	Fall 2016	53	Fall 2017	51	Fall 2018	50	Fall 2019	49	Fall 2020

Progression Towards a Degree for 2015 Cohort Students Assigned to Major										
Enrolled in Major in Subsequent Term: Freshmen	10	19.6%	1	1.9%	0	0.0%	0	0.0%	0	0.0%
Enrolled in Major in Subsequent Term: Sophomores	32	62.7%	10	18.9%	3	5.9%	0	0.0%	1	2.0%
Enrolled in Major in Subsequent Term: Juniors	0	0.0%	26	49.1%	8	15.7%	5	10.0%	0	0.0%
Enrolled in Major in Subsequent Term: Seniors	0	0.0%	2	3.8%	21	41.2%	20	40.0%	14	28.6%
Graduated (By Beginning of Subsequent Term)	0	0.0%	0	0.0%	3	5.9%	9	18.0%	16	32.7%
Not retained at University	9	17.6%	14	26.4%	16	31.4%	16	32.0%	18	36.7%
Total Cohort Students Assigned to Major	51	100%	53	100%	51	100%	50	100%	49	100%

Retention Metrics (Based upon 2015 Cohort Students Assigned to this Major)										
Students Still Enrolled/Graduated	42	82.4%	39	73.6%	35	68.6%	34	68.0%	31	63.3%
Students Not Retained at University	9	17.6%	14	26.4%	16	31.4%	16	32.0%	18	36.7%
Total Cohort Students Assigned to Major	51	100%	53	100%	51	100%	50	100%	49	100%

Providing Student Details

The fifth proposed update is to provide student details. The evolved retention report also includes a section (not shown) that details each student's progression, performance, and contact information. By contacting struggling students, administrators can proactively identify and address potential retention problems in curriculum or student support areas. Perhaps most importantly, reporting data on individual students personalizes the report, underscoring the human side of retention. While striving to satisfy stakeholders' demands by reaching defined numerical goals is necessary, educators must not lose sight of the need to connect with individual students, encourage them, and help them succeed.

Conclusion

In summary, the directly adapted retention report includes yearly *Retained in Major*, *Retained in Univ*, and *Graduation* statistics that can be challenging to parse and may even be misleading. Complications in interpreting this information often arise when students graduate or change majors. Furthermore, the directly adapted retention report lacks essential details to effectively identify and address possible problems. This paper proposes overcoming these problems with an evolved retention metric and report developed via the following solutions:

- Allowing Cohorts to Change: Major cohorts are no longer fixed, allowing students to be reassigned based on their current major. This enables the collapsing of annual in-major and in-university retention measures into one yearly measure.
- Avoiding Penalties for Graduates: The graduation rate is integrated into the retention measure. Therefore, the evolved report avoids the complexity of separately listing graduation rates and avoids the confusion associated with reporting non-enrolled graduates in the same manner as other non-retained students.
- Simplifying the Summary Report: The evolved retention report's summary is more straightforward and intuitive due to the changes listed above.
- Providing Calculation Details: The evolved report includes details of the reported summaries to enable deeper analysis.
- Providing Student Details: The evolved report includes information about individual students to aid departments in maintaining personal contact.

These improvements result in an evolved retention report which is more valuable and meaningful for departments and administrators. Those seeking to identify retention problems receive better support with a clearer, truer retention picture. Those proposing solutions to retention problems find a richer source of data to support their ideas. Those gauging undertaken initiatives can more clearly see the impact of their policies and decisions.

APPENDIX: Additional Notes

A number of major-specific complexities arise when reporting retention, such as how institutions code students who have multiple majors or meta-majors and how to handle 4+1 programs where students begin coursework for master's programs toward the end of their undergraduate career. In the model presented, the authors only utilize the primary majors of students pursuing multiple majors so that students are not counted multiple times. Meta-majors are treated just like traditional majors, and no special accommodation is given to 4+1 programs. Instead, it is assumed that administrators take into consideration the expected timeframe to complete these special programs. If desired, the report introduced in this paper may be extended beyond the "5 Years Later" timeframe while maintaining all of the advantages discussed. Further future research in alternative accounting treatments for these

situations could yield benefits. Additionally, further application of the NCAA metrics' ability to better track transfer students could result in a fuller and clearer picture of retention by major. While this paper utilizes such tracking to better account for switching majors, added benefit could result from incorporating transfers into a major from other universities and out of a major to other universities.

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