THE RESEARCH AGENDA

Excess Credit Accumulation: An Examination of Contributing Factors for First-Time Bachelor's Degree Earners

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AACRAO partnered with a large public university in the southwestern United States to examine a multi-year data set and to complete a student survey in order to gain insights into variables that contribute to excess credit accumulation at graduation. Until state legislatures began to decrease funding for public colleges and universities, excess credit was not thought to be an issue worthy of discussion or consideration. One of the tactics to reduce full-time-equivalent-based budget funding was to cap the number of credits an institution was eligible to receive for budget allocation. Some states even decided to penalize students who earned credit above a maximum by charging them a higher tuition rate; some legislatures voted not to fund what they deemed excess credit.

The topics of loss of credits at transfer and excess credit accumulation have been part of the U.S. higher education literature for several years. These topics are of interest to college leaders and researchers because they are factors that may affect both the time to degree and the cost of a degree. Research has found that most students accumulate excess credits toward a bachelor's degree (Adelman 1995; Community College Research Center 2017; Complete College America n.d.; Cullinane 2014; Fink 2018; Romano 2011; Zeidenberg 2012). According to the Complete College America data dashboard, when compared against a standard of 120 semester credit hours required for a degree, students earning a bachelor's degree from the "highest research" institutions earned 136.5 credit hours on average compared to 135 by students at all other bachelor's degree–awarding institutions (Complete College America n.d.). However, current data are mixed on excess credit accumulation and its relationship, or lack thereof, to being a transfer student. A 2009 Washington State University Social and Economic Services Research Center report found little difference in the number of credits attempted/earned by graduation between transfer students who were following a prescribed pathway and direct-entry students enrolled in business and STEM majors (Stern 2009). On average, business majors attempted and earned 139 semester credit hours compared to STEM

majors' 159 semester credit hours. (Note: Quarter semester hours have been converted to semester credit hours.) Transfer students who followed a prescribed transfer track graduated with fewer hours on average than did the general population for both business and STEM majors. However, those who transferred after completing a technical or other two-year degree had more accumulated hours than average (161.3 for business and 188.7 for STEM majors). These findings were supported and expanded to other majors when similar research was completed by the Washington State Board for Community and Technical Colleges (CTC) in 2013 (Kaikkonen 2013). In the 2013 study, the median number of credits earned by graduation for all majors was approximately the same for CTC transfer students and direct-entry students across public institutions in Washington. Similar to the 2009 report, transfer students who followed a specialized transfer track had earned fewer hours on average than had both direct-entry and transfer students who did not follow a specialized track.

Key Findings

- Most graduates have excess credit accumulation at graduation with a first-time bachelor's degree regardless of whether they are direct-entry or transfer students.
- Complex statistical modeling is able to explain only a modest amount of the variance in excess credit accumulation between and within groups. Much of the variance is unexplained by these models.
- Pursuing a STEM major, participating in an honors program, spending more time at the university, and attending multiple institutions are correlated with having excess credit at graduation.
- Students with a history of academic probation are less likely to accumulate excess credits.
- Most students are aware of the reasons they lost credit at transfer and/or have earned more than the standard 120 credit semester hours by the time they graduate.
- Most students are neither pleased nor displeased with the excess credits and/or credit loss at transfer and know why one or both of these situations occurred.
- Among students who are displeased, better academic advising was listed as the service that could have helped prevent credit loss and/or excess credits at graduation.

Three working papers from the Community College Research Center (CCRC) from 2012, 2017, and 2018 examine excess credit accumulation (Community College Research Center 2017; Fink 2018; Zeidenberg 2012). Zeidenberg examined excess credits earned by associate degree completers and found the mean number of excess credits to be fourteen and the median nine. The excess credits accounted for approximately 12 percent of all credits earned by those who earned a degree. He concludes that while colleges can address some of the causes of excess credit accumulation, it is not necessarily a problem for all students. He states that "it is unrealistic to envision a system where every degree completer obtains only the credits required and no more" (Zeidenberg 2012, 26). The CCRC 2018 working paper used a transcript data-mining approach to examine course-taking behaviors along with other readily available student data to attempt to identify why students have excess credits at graduation. The authors of the article also sought to identify whether differences in the number of excess credits exist between direct-entry and transfer students. They conclude that there is a correlation between how a student—direct entry or transfer—takes courses and whether the student will have excess credit accumulation. Comparably, the 2017 working paper found no meaningful difference in excess credit accumulation between transfer students who did or did not complete an associate degree (Community College Research Center 2017). They did find, however, that direct-transfer

students (from Macomb Community College to a University Partnership Advisory Council institution) who participated in dual enrollment were slightly more likely to have excess credit accumulation than were those who did not (51 percent and 48 percent, respectively).

Possible Contributing Factors to Excess Credit Accumulation

Those who work directly with students, particularly in professional areas related to student success, have insight into the factors that may contribute to excess credit accumulation. Research supports these professional insights. For example, the 2017 CCRC working paper references *Redesigning America's Community Colleges: A Clearer Path to Student Success* (2015) and its presentation of reasons students have excess credit at graduation. Reasons include exploration of interests through course taking, changing majors, repeating a course for a better grade, articulation issues at transfer, and a lack of a clear set of goals that results in taking courses that do not apply toward the degree ultimately earned (Community College Research Center 2017). A recent National Center for Educational Statistics (NCES) Data Point notes that roughly 30 percent of undergraduates change their major at least once in the first three years, and one in ten change their major more than once (National Center for Educational Statistics 2017). Students often lose credits toward their bachelor's degree when they change majors. This is particularly true when the majors are not closely related academically or the student changes majors after completing most general education requirements and lower-level major-specific courses. In addition, transfer courses' limited applicability to a particular major may play a role in excess credit accumulation. Although such courses may be accepted for transfer, they may not apply toward the major in which the student ultimately enrolls. In the 2012 CCRC working paper, the author hypothesizes that excess credit accumulation for associate degree earners is likely related to degree exploration, limited access to academic advising (also noted by college presidents [Lederman 2018]), course repeat behaviors, taking courses to acquire needed skills but not to meet a program requirement, structural/scheduling barriers, and whether the student is interested in transferring and how many credits the receiving institution will accept.

Some argue that student demographics, student ability, and family background (*e.g.*, parents' educational attainment, family income, etc.) influence credit accumulation and time to degree (Cullinane 2014). Cullinane also notes research by Volkwein and Loran (1996) and Adelman (2006) that suggests that high-ability students sometimes accumulate excess credit to "delay graduation, to protect high GPAs, or to build skills for graduate school or the labor market" (150).

Impetus for Research

This research is a result of an organizational interest in gaining understanding as to why students have excess credit accumulation at graduation and whether students themselves have any concern about it. Further research is needed to understand whether being a transfer student contributes to additional excess credits at graduation (as compared to those earned by direct-entry students) and, if so, how institutions can better assist students who want to limit excess credit accumulation. The author of the 2017 CCRC working paper "Building Transfer Student Success at Macomb Community College: A Report on Transfer and Degree Completion" states that "a strategy to eliminate excess credits must be based on an understanding of the factors that lead students to accumulate more credits than they need for their degrees" (Community College Research Center 2017, 20). This research builds on the work of others in an effort to help institutions address the issue in practice.

Research Questions

- Are there any characteristics of direct-entry and transfer students (*e.g.*, demographics, major, change of major, etc.) and/or institutional engagement behaviors (*e.g.*, use of student success resources) that capture explained variance in having excess credits?
- What does independent student choice contribute to excess credit accumulation at graduation, if anything?
- What do students think about excess credit accumulation?

Methodology

AACRAO examined demographic data as well as institutional academic, financial, and student success resource proxy data for first-time bachelor's degree completers from spring 2012 through spring 2017. Because an intent of this research was to build upon current understanding, the authors also took into consideration the variables others have used to examine excess credit accumulation and the availability of certain opportunities variables available in the university data set. Some of the same variables in other analyses were used in this one (*e.g.*, student demographics, first-generation, STEM major at graduation, and dual enrollment), and others were added (*e.g.*, need-based aid recipient, merit-based aid recipient, honors program participant, count of changes in major, and participation in a student success cohort).

The 2012–2017 data set was examined using both logistical discriminant analysis (LDA)[1] with the Mahalanobis procedure and odds ratio logistic regression (logit).[2] Variables found significant during the LDA procedures were the only ones examined during the logistic regression. This methodology was selected due to the similarity in the two techniques, with each contributing a slightly different understanding of the data. Several different analyses were performed using the variables below plus the categorical variable of transfer student, as needed, to examine between- and within-group differences. In addition to performing a comparison of students with excess credits at graduation to those without any excess credits, those with twelve or fewer excess credit hours were compared to those with more than twelve excess credits hours. The thinking behind examining the twelve or fewer versus twelve or more was that twelve or fewer excess credit hours represents a single extra full-time semester for most students compared to more than one extra semester.

Variables

- Academic probation history
- Age categories
- Binary for remedial coursework
- Count of D grades at the university
- Count of major changes at the university
- Count of previous institutions
- Dual enrollment participation[3]
- Excess credits at transfer
- First-generation student
- Full-time student
- Gender
- General education certificate completed
- Honors program student
- Merit-based aid recipient
- Need-based aid Recipient
- Residency at enrollment
- STEM major at graduation
- Student success cohort
- Time at the university
- Transfer student[4]
- Underrepresented minority
- Veteran benefits recipient

In addition, the graduating class of spring 2018 was surveyed and interviewed regarding their course-taking behaviors, institutional engagement behaviors (*i.e.*, use of student success resources), and personal opinions about the cause of and their feelings about their excess credit accumulation. The same data elements examined for the 2012 through 2017 cohorts were pulled for the spring 2018 graduates who completed the survey; these data were added to the survey data in a separate analysis to determine whether the student-supplied data added to the explained variance in the regression models. There was particular interest in helping identify what Cullinane (2014) describes as "unobservable characteristics (*e.g.*, taking particular courses, exhibiting particular study behaviors or motivation, a strong appreciation for

[1] *See* (Statistics Solutions n.d.).

[2] LDA assumes a normal distribution of data. Box's M test is sensitive to "small departures from homogeneity" in large data sets. In these analyses, the Box's M results suggest that the models are suspect. Logit odds ratio analyses were completed to help validate the results of the LDA models (IBM n.d.).

[3] Dual enrollment data were considered accurate for direct-entry students only. Therefore, it is only included in the within-group analyses of direct-entry students.

[4] Transfer student is used as a variable in the first two analyses.

learning or academic exploration)" that could influence the accumulation of excess credits.

Identifying and Defining Excess Credit Accumulation at Graduation

How one defines excess credits can change the outcome of research on excess credit accumulation. For example, Complete College America (CCA) excludes dual enrollment students and AP/IP credits from their first-time bachelor's degree student metrics and uses 120 semester credit hours as the quantity required for a bachelor's degree (Complete College America n.d.; 2017). Others have included or excluded developmental education courses, counted dual enrollment, used attempted and earned, and adjusted the number of credits required for a bachelor's degree to be equal to a particular major at a particular institution. Cullinane (2014) defined this last example as *net excess credits*—the number of credits required for a student's institution and major.

Another set of considerations in defining excess credits is whether to count academic choices such as a double major, extended for-credit internships, a non-required minor, or certificate as excess credits, or just a bachelor's degree that requires more hours than the semi-standard 120 credit hours. These academic choices are made by the student and thus are likely not considered excess credits.

For the purpose of this research, excess credit accumulation was defined by the university as the number of earned credits in excess of the institution's credit requirement for a particular major. Thirty-six percent of majors at the university require more than 120 credit hours; some also require a minor. It is also noteworthy that public universities in this particular system in the southwestern United States charge an excess credit tuition surcharge (120 percent of the tuition rate) after 145 credit hours have been earned unless one of the following conditions is met:

- Degree programs that require credit hours above the credit hour threshold;
- Credits earned in the pursuit of up to two baccalaureate degrees;
- Credits earned in the pursuit of up to two state-regulated licensures or certificates;
- Credits earned in the pursuit of a teaching certification;
- Credits transferred from a private higher education institution;
- Credits transferred from a higher education institution in another state;
- Credits earned at another higher education institution but that are not accepted as transfer credits at the university where the student is currently enrolled; and
- Credits earned by students who enroll at a public university in this study more than 24 months after the end of the student's previous enrollment at a public university in this state.

Contrary to previous work, a 2018 analysis by Kramer and Holcomb on the costs and consequences of excess credit hour policies found that there is "no systemic evidence that excess tuition surcharges affect student course-taking behaviors or provide incentive for degree completion" (22). The authors note further that excess tuition charges only have an impact on students when it is too late for "significant modifications to course plans" (22).

Data Definitions

- Direct-entry student (DE): Domestic direct-entry students are any students who enrolled at the university without first attempting or earning any postsecondary credit after earning a high school diploma (or equivalent) and excluding the readmitted student population.
- Transfer student (TR): Domestic transfer students are any students who enrolled at the university in pursuit of their first bachelor's degree after attempting or earning credit from another postsecondary institution after graduation from high school.
- Excess credits at graduation: Counted as any credits earned above and beyond the credits required for a particular program. This does not include attempted credits or credits for which a failing grade was earned.
- Excess credits at transfer: Any units over the maximum of 64 allowed by the university. All units are

transferred in, but a maximum of 64 may be counted toward a degree.

- Age category: Binary variable of age at the time of admission to the university: 23 years old and younger or 24 years old and older.

Findings: Graduates, 2012–2017

Similar to research cited in the introduction, the majority (91 percent) of the students in the sample (n=29,589) had excess university credit at graduation. Of those, 55 percent had more than twelve excess credit hours earned at the university. On average, transfer students spent 3.32 years enrolled at the university compared to direct-entry students' 4.48 years, and they changed their major at the university 2.5 times. Fourteen percent of the sample graduated from degree programs that required more than 120 credit hours. Among students who had transfer credit that could have been earned prior to and/or after enrollment at the university, 24 percent had credits that did not count toward their degree.

An estimated 29 percent of the sample population may have been assessed the excess credit hour tuition surcharge for those who have earned more than 145 credit hours. (This percentage is an estimate because the data were not sufficiently detailed to eliminate all of the exceptions to this surcharge.) Table 1 (on page 47) highlights additional descriptive statistics about the students.

Several analyses were completed using different group comparisons (*see* Table 2, on page 47). To assess what, if any, relationship there was between transfer and excess credits at graduation, the first two included as a variable whether a student was a transfer student.

One of the primary reasons for using LDA for this project was to confirm that there is, in fact, a difference between the groups. Both techniques provide a calculated explained variance (*i.e.*, R-squared). Because of the similarity in the techniques and for the sake of simplicity, only the LDA R-squared is reported. R-squared helps put the results in the context of the relative importance of the variables in the equation.

To explain the usefulness of R-squared, consider this example: Imagine that an amusement park wants to know why some people ride rollercoasters and others do not so it can market tickets to those who do. The dependent variable in this equation is rider or not a rider. It is also known whether this group of people (riders and not riders): (1) has gotten sick on a roller coaster in the past, (2) is afraid of heights, (3) likes speed, and (4) is left handed (the independent variables). The LDA output shows that these four variables explain 80 percent of the difference in whether or not a person will ride a roller coaster. The amusement park could produce a targeted marketing effort with a high degree of accuracy to people about whom it knew these independent variables. If, by contrast, the independent variables only captured 5 percent of the difference between the two groups, the amusement park would not be nearly as excited because 95 percent of the difference between the two groups would not be explained by these variables but by other unidentified factors. Marketing efforts would not be targeted and therefore would be less likely to be effective.

Regarding the current research on excess credit accumulation at graduation, the outputs indicate which variables contribute most to the variance in excess credit accumulation and provide context about the importance of those variables (or not) to understanding the difference between groups. Even though the LDA analyses had more than 20 independent variables, the explained variance of the models never exceeded 18.8 percent (Table 3, analysis 4, on page 49) and was as low as 2.1 percent (Table 3, analysis 5, on page 50). This means that the variables remaining in the equations were important, but they were not the primary determinants of why students had accumulated excess credit by graduation. The variables with negative values indicate that students with those characteristics were less likely to have accumulated either excess credits by graduation or more than twelve excess credits.

The LDA analysis was used to preselect variables for the odds ratio logistic regression. One of the logit outputs is an odds ratio[5] that provides the comparative contribution of each of the variables to whether a student will have earned excess credit accumulation

[5] *See* (Statistics Solutions n.d.).

at graduation. When the odds ratio is greater than one, there is a positive relationship between the variable and the outcome. Values close to one have little effect on the dependent variable.

As mentioned in the literature review, the impact of being a transfer student on bachelor's degree completion has been well studied. Transfer student status was used as an independent variable in analyses 1 and 2. It remained in the equation when comparing excess credits at graduation to no excess credits at graduation (analysis 1). However, given that the explained variance for that analysis was only 5.8 percent, the contribution of being a transfer student to whether a student had excess credit accumulation was quite minimal, supporting other research on the topic even though transfer students in this sample were 2.87 times more likely to have excess credits at graduation (significance versus strength).

The variables that had a positive correlation with either excess credit accumulation at graduation or more than 12 hours of excess credit were:

- STEM major at graduation;
- Honors program student;
- Count of previous institutions attended; and
- Time at the university.

TABLE 1 ➤ Sample Population Descriptive Statistics

Variable	Percent
Transfer Student	30
Female	53
Younger than 24 Years Old at Time of Admission (age category)	90
STEM Major at Graduation	26
In-State Resident	67
First-Generation Student	16
Honors Program at the University	15
Full-Time Status at Time of Admission	92
Need-Based Aid Recipient	19
Merit-Based Aid Recipient	26

TABLE 2 ➤ Description of Analyses

Analysis 1	No excess credits at graduation (0)[a] versus has excess credits at graduation (1)[b]
Analysis 2	12 or fewer excess credits at graduation (0) versus more than 12 excess credits at graduation (1)[c]
Analysis 3	Direct entry without excess credits at graduation (0) versus direct entry with excess credits at graduation (1)[a]
Analysis 4	Direct entry with 12 or fewer excess credits at graduation (0) versus direct entry with more than 12 excess credits at graduation(1)[d]
Analysis 5	Transfer without excess credits at graduation (0) versus transfer with excess credits at graduation (1)
Analysis 6	Transfer with 12 or fewer excess credits at graduation (0) versus transfer with more than 12 excess credits at graduation (1)

[a] Included dual enrollment as a variable. Dual enrollment data were not sufficiently accurate for transfer students to be used in the other analyses.
[b] Included transfer student as a variable.
[c] See (Statistics Solutions n.d.).
[d] R-squared calculated by squaring the canonical correlation value.

The one variable with a negative correlation in all six analyses was a history of academic probation. This seems intuitive: Students on academic probation are closely monitored for subsequent course completion. This increased scrutiny of course-taking behavior and course success likely explains why these students were less likely to have excess credit accumulation by graduation.

Direct-entry students who attended full time were more likely than those who attended part time to have both excess credits at graduation and more than twelve excess credits at graduation (Analyses 3 and 4). For transfer students, being older than 24 years at the time of enrollment at the university was correlated with excess credit accumulation and more than 12 excess credits accumulated by graduation.

Note that even with the complicated large-scale data analyses, these variables do not contribute much to an understanding of why students have excess credits at graduation.

TABLE 3 ➤ LDA and Logit Summary for Graduates 2012–2017

Analysis	R^2 from LDA[1]	LDA Canonical Discriminant Function Coefficients[2,3] and Logit Odds Ratio[4]		
			Coef.[5]	Odds Ratio
Analysis 1: No excess credits at graduation[6] (0) versus has excess credits at graduation (1)	5.80	STEM Major at Graduation	0.928	3.31
		Transfer Student	1.010	2.87
		Honors Program Student	0.602	2.55
		Residency at Enrollment	0.764	1.69
		Count of Previous Institutions	0.362	1.54
		General Education Certificate Earned	0.288	1.49
		Merit-Based Aid Recipient	0.451	1.48
		Full-Time Student	0.407	1.45
		Time at the University	0.261	1.44
		Count of Major Changes	0.090	1.13
		Gender	0.102	1.09
		Need-Based Aid Recipient	-0.173	0.85
		Academic Probation History	-0.817	0.57
Analysis 2: 12 or fewer excess credits at graduation (0) versus more than 12 excess credits at graduation (1)[6]	16.4	STEM Major at Graduation	0.963	2.45
		Excess Credits at Transfer	0.798	2.21
		Honors Program Student	0.734	2.02
		Age Categories	0.377	1.61
		Count of Previous Institutions	0.463	1.60
		Residency at Enrollment	0.454	1.42
		Time at the University	0.302	1.41
		Remedial Coursework	0.289	1.29
		General Education Certificate Earned	0.213	1.26
		Underrepresented Minority	0.203	1.18
		Count of Major Changes	0.145	1.18
		Gender	0.162	1.16
		Full-Time Student	0.151	1.15
		Merit-Based Aid Recipient	0.153	1.15
		Count of D Grades	-0.033	0.97
		Need-Based Aid Recipient	-0.132	0.88
		Academic Probation History	-0.395	0.70

[1] R-squared calculated by squaring the canonical correlation value.
[2] These are the coefficients of the equation and require care in interpretation. "These would be used like unstandardized b (regression) coefficients in multiple regression—that is, they are used to construct the actual prediction equation which can be used to classify new cases" (Bian n.d., 29).
[3] All significant to 0.000 for LDA.
[4] Slight differences in the relative magnitudes of the LDA coefficients and the logit odds ratio are due to differences in the two procedures.
[5] A positive coefficient correlates with condition 1. A negative coefficient correlates with condition 0.
[6] Included dual enrollment as a variable. Dual enrollment data were not sufficiently accurate for transfer students to be used in the other analyses.
[7] *See* (Statistics Solutions n.d.).

Findings from 2018 Graduates

Just under 1,000 students (n=988) responded to the survey; thirteen respondents were interviewed by phone or in person. Three-quarters of respondents were direct-entry students, and the remainder were transfer students. In both response groups, 83 percent had excess university credit accumulation at graduation. Among transfer students who responded to this survey, 93 percent had excess credit accumulation from other institutions.

The survey included questions about the following:

- Use of student support services at the university;
- Perceptions about the level of support provided by the university to complete educational goals;
- Perceptions and understanding of why credits earned at another institution were not all accepted by the university;
- Personal feelings about excess credits at the transfer institution, the university, or both (if applicable); and
- Perceptions of what, if anything, the university or the transfer institution could have done to help the student avoid losing credits upon transfer or earning more than needed for the bachelor's degree.

Figure 1 (on page 51) details which university student support services were used by respondents. Figure 2 (on page 52) highlights

that with the exception of orientation, placement testing, and belonging to a student cohort, the majority of students used the other services voluntarily. Six percent of respondents indicated they did not use any of the student support services at the university. Nearly all (96 percent) agreed with the statement "The university has programs and/or services in place that help me reach my educational goal."

Of the transfer students who had previously earned some credit that was not accepted at the university, 65 percent knew why their credits did not transfer: Nearly 30 percent selected "grade earned in a course was not transferable," "change of major when transferring," and "too many credits earned at the previous institution" as the reasons their credits did not transfer (*see* Figure 3, on page 53).

When asked how they felt about the loss of credits at transfer, 60 percent indicated "neither pleased nor displeased. I expected there to be some credits that would not transfer"; 25 percent were "somewhat displeased"; and 14 percent were "extremely displeased." Those who were displeased were asked what the institution could have done to help them avoid losing credits: "Better academic advising"—selected by 58 percent of respondents—was at the top of the list (*see* Figure 4, on page 54).

Among respondents who would earn more than 120 credits from the university by the time they graduated, nearly all (89 percent) knew why that would be so; reasons included pursuing a minor that was not required, change of major after enrollment at the university, earned dual enrollment in high school but chose to complete more

TABLE 3 ➤ LDA and Logit Summary for Graduates 2012–2017

Analysis	R^2 from LDA[1]	LDA Canonical Discriminant Function Coefficients[2,3] and Logit Odds Ratio[4]		
			Coef.[5]	Odds Ratio
Analysis 3: Direct entry without excess credits at graduation (0)[7] versus direct entry with excess credits at graduation (1)	6.50	STEM Major at Graduation	0.910	3.14
		Honors Program Student	0.667	3.02
		Full-Time Student	0.908	1.67
		Residency at Enrollment	0.645	1.61
		Time at the University	0.388	1.61
		Dual Enrollment	0.372	1.51
		Merit-Based Aid Recipient	0.387	1.50
		Count of Previous Institutions	0.309	1.41
		Gender	0.170	1.15
		Count of Major Changes	0.089	1.14
		Count of D Grades	-0.030	0.97
		Need-Based Aid Recipient	-0.206	0.80
		Academic Probation History	-0.818	0.61
Analysis 4: Direct entry with 12 or fewer excess credits at graduation (0) versus direct entry with more than 12 excess credits at graduation (1)[7]	18.8	Honors Program Student	0.914	2.48
		STEM Major at Graduation	0.847	2.27
		Full-Time Student	0.631	1.87
		Time at the University	0.453	1.69
		Dual Enrollment	0.547	1.66
		Count of Previous Institutions	0.388	1.49
		Residency at Enrollment	0.347	1.34
		Merit-Based Aid Recipient	0.205	1.23
		Count of Major Changes	0.152	1.21
		Gender	0.202	1.21
		Underrepresented Minority	0.188	1.17
		Count of D Grades	-0.041	0.95
		First-Generation Student	-0.115	0.90
		Veteran Benefits Recipient	-0.447	0.65
		Academic Probation History	-0.544	0.58

[1] R-squared calculated by squaring the canonical correlation value.
[2] These are the coefficients of the equation and require care in interpretation. "These would be used like unstandardized b (regression) coefficients in multiple regression—that is, they are used to construct the actual prediction equation which can be used to classify new cases" (Bian n.d., 29).
[3] All significant to 0.000 for LDA.
[4] Slight differences in the relative magnitudes of the LDA coefficients and the logit odds ratio are due to differences in the two procedures.
[5] A positive coefficient correlates with condition 1. A negative coefficient correlates with condition 0.
[6] Included dual enrollment as a variable. Dual enrollment data were not sufficiently accurate for transfer students to be used in the other analyses.
[7] *See* (Statistics Solutions n.d.).

TABLE 3 ➤ LDA and Logit Summary for Graduates 2012–2017

Analysis	R^2 from LDA[1]	LDA Canonical Discriminant Function Coefficients[2,3] and Logit Odds Ratio[4]		
			Coef.[5]	Odds Ratio
Analysis 5: Transfer without excess credits at graduation (0) versus transfer with excess credits at graduation (1)	2.1	STEM Major at Graduation	1.290	4.16
		Age Categories	0.472	1.49
		Count of Previous Institutions	0.383	1.45
		Honors Program Student	0.453	1.44
		First-Generation Student	0.446	1.39
		General Education Certificate Earned	0.359	1.38
		Time at the University	0.277	1.30
		Count of D Grades	0.115	1.11
		Merit-Based Aid Recipient	-1.640	0.48
		Academic Probation History	-1.220	0.45
Analysis 6: Transfer with 12 or fewer excess credits at graduation (0) versus transfer with more than 12 excess credits at graduation (1)	5.7	STEM Major at Graduation	1.570	3.38
		Age Categories	0.609	1.55
		Time at the University	0.320	1.32
		Count of Previous Institutions	0.325	1.28
		Honors Program Student	0.285	1.22
		Underrepresented Minority	0.266	1.20
		Gender	0.223	1.18
		Excess Credits at Transfer	0.193	1.17
		Count of Major Changes	0.106	1.09
		Academic Probation History	-0.434	0.72

[1] R-squared calculated by squaring the canonical correlation value.
[2] These are the coefficients of the equation and require care in interpretation. "These would be used like unstandardized b (regression) coefficients in multiple regression—that is, they are used to construct the actual prediction equation which can be used to classify new cases" (Bian n.d., 29).
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[5] A positive coefficient correlates with condition 1. A negative coefficient correlates with condition 0.
[6] Included dual enrollment as a variable. Dual enrollment data were not sufficiently accurate for transfer students to be used in the other analyses.
[7] *See* (Statistics Solutions n.d.).

credits than needed before graduating because they were able to do so, and major exploration (*see* Figure 5, on page 54). Those interviewed elaborated on their survey responses: a majority took extra courses because they could. In particular, they sought courses for exploration, personal interest, specific job skills acquisition, language acquisition, and study abroad experiences.

When survey respondents were asked how they felt about the credit earned in excess of 120 credit hours, eight out of ten indicated they were "neither pleased nor displeased. I expected there to be some credits that would not apply to my degree" or "neither pleased nor displeased. I expected the number of credits to be more than 120 because of my program of study (*e.g.*, a double major, major plus certificate, or a program that requires more than 120 credits normally)." Most of those interviewed were neither pleased nor displeased about their extra credits. They remarked that most of the extra credits were earned by choice or because of a mistake they had made (*e.g.*, poor grade and needed to repeat a course, not declaring a major soon enough, changing majors late, not understanding how dual enrollment courses would apply).

Once again, better advising was selected as the resource that could have helped students not graduate with excess credits, followed by better course scheduling (*see* Figure 6, on page 55). Approximately two-thirds of those interviewed remarked negatively about their experiences with either general academic advisors, major-specific advisors, or both. A couple were able to connect with good advisors who in their words "did more than check off courses from the list" during their advising session. Two students indicated that in order to meet the minimum financial aid requirements, they had to take a course they did not need (the courses they did need were not offered when they could take them).

Survey data were aligned with university data to examine whether the addition of the survey variables (self-reported student reasons for excess credits) added anything to the overall explained variance in the original models or changed which independent variables remained in the models. As in the 2012 through 2017 data set, survey participants graduating from a STEM major

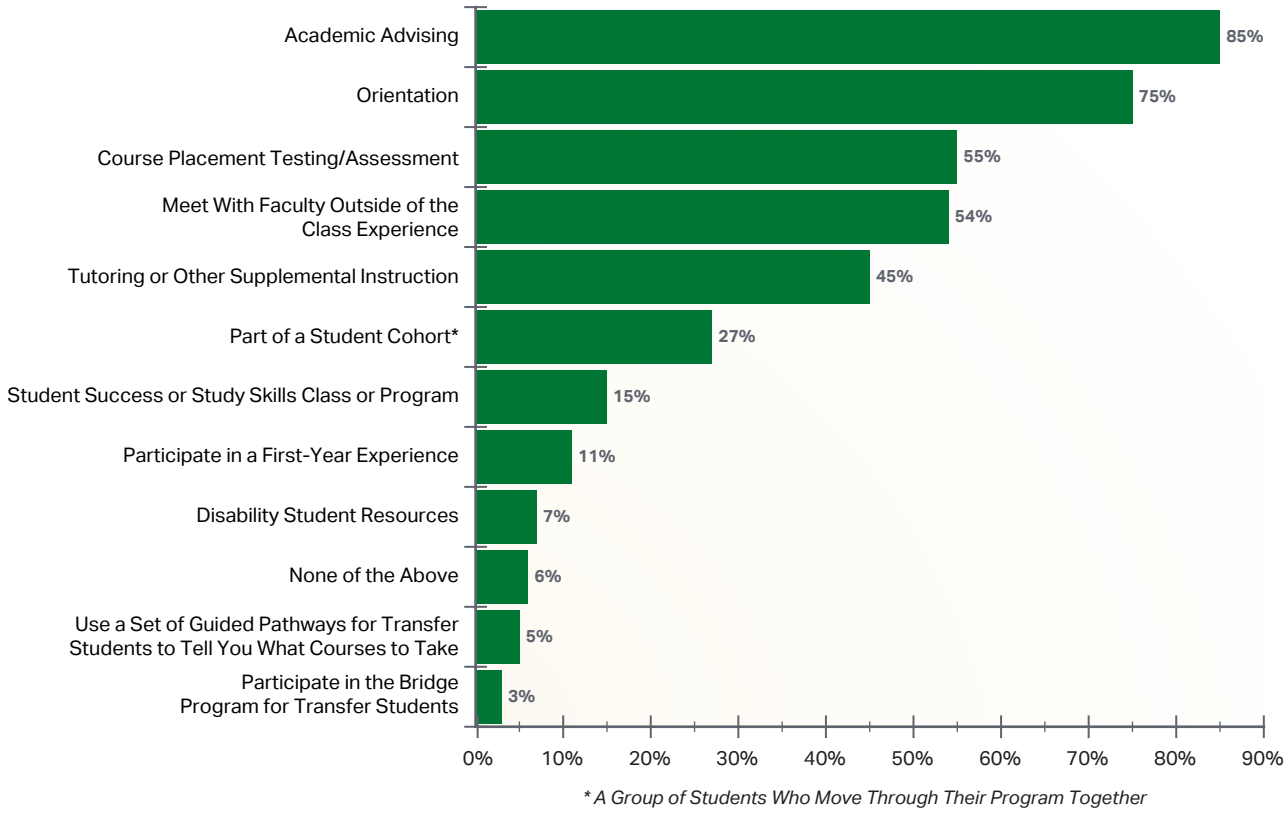

FIGURE 1 ➤ Programs and Services Used at the University

appeared to contribute to excess credit accumulation. On the other hand, self-reported participation in tutoring or other supplemental instruction was negatively correlated with excess credits—that is, such students were less likely to have excess credit accumulation. Counterintuitively, being part of a student cohort was correlated with the accumulation of excess credits. This may be due to a misunderstanding of the term "cohort" by survey respondents.

Limitations and Implications for Practice

Examining data on degree completers excludes an important population: drop-outs. Fink, Jenkins, Kopko, and Ran (2018) assert that examining only completers likely "understates the consequences of credit transfer efficiency by not taking into account how inefficient credit transfer lowers students' chances of completing a bachelor's degree" (31). A similar study focusing on drop-outs might provide further insight into excess credit accumulation and its relationship to transfer students and drop-out behavior among all bachelor's degree–seeking students.

A series of questions about costs associated with excess credit accumulation could have furthered understanding of students' opinions on the matter. Although an estimated 29 percent of the students exceeded the excess tuition credit threshold "on paper," there are several exceptions to the excess tuition assessment, and the university estimates that only between 20 and 30 students per semester are charged an excess credit fee. New research recently concluded that tuition surcharges only affect students once they exceed a predetermined threshold, at which point it is too late for significant modifications to their course plans (Kramer 2018). It would be interesting to hear directly from

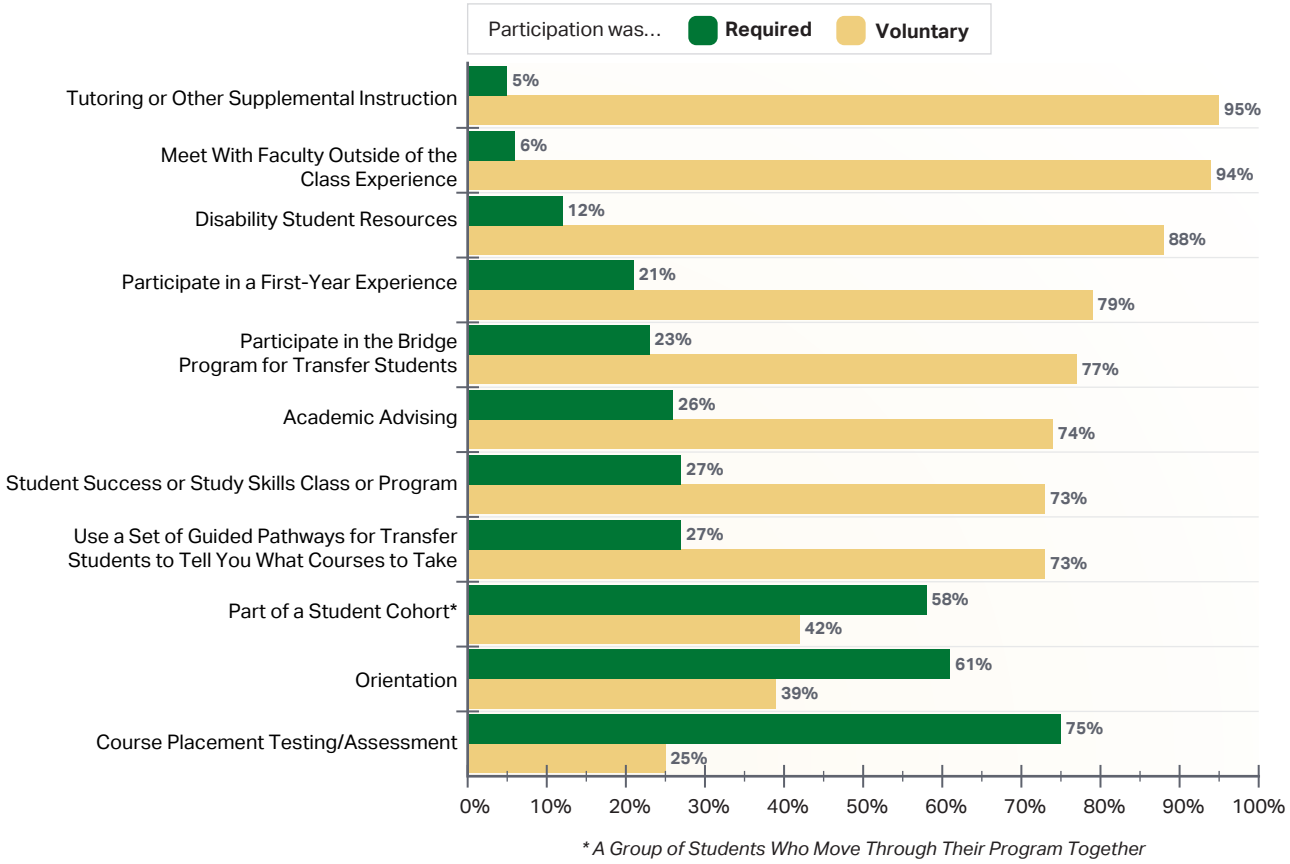

FIGURE 2 ➤ Participation in Services (Voluntary or Mandatory)

students about this practice. In particular, universities and those interested in student success would benefit greatly from understanding the student perspective on the relationship between course-taking choices related to major exploration and career skills building and the possibility of excess tuition charges as a result of those choices. Students in the current research population support the notion that excess credit accumulation is not necessarily a bad thing, supporting Zeidenberg's (2012) similar assertion.

Even when actual credits required were used to calculate excess credit accumulation, STEM majors were

TABLE 4 ➤ LDA and Logit Summary for 2018 Graduates

Analysis	R^2 from LDA	LDA Canonical Discriminant Function Coefficients and Logit Odds Ratio		
			Coef.	Odds Ratio
Analysis 1: No excess credits at graduation (0) versus excess credits at graduation (1)	8.2	STEM Major	1.52	3.98
		Part of a Student Cohort	1.25	1.75
		Excess Credits at Transfer	0.87	1.28
		Count of Major Changes	0.22	1.27
		Tutoring or Other Supplemental Instruction	-1.14	0.72

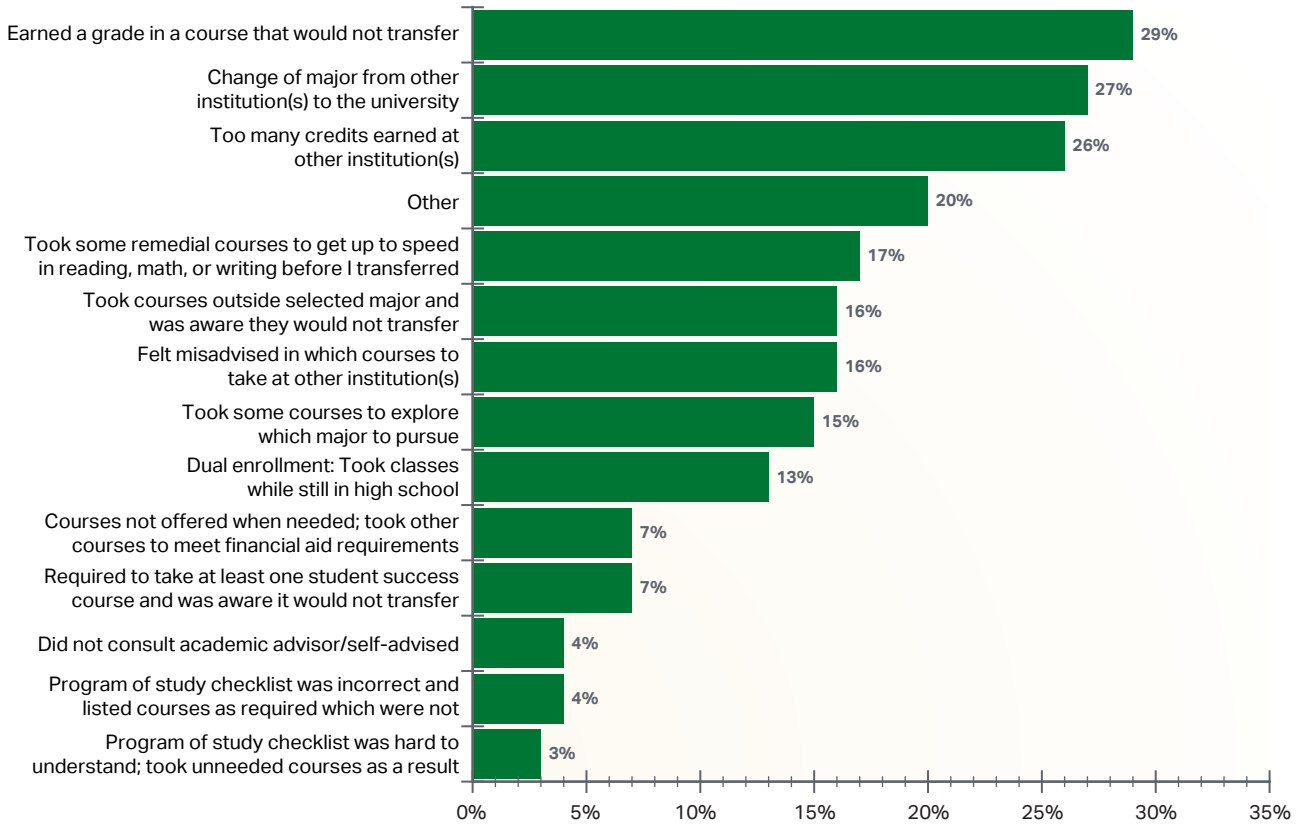

FIGURE 3 ➤ Reasons Credits Did Not Transfer

more likely to have excess credit than were non-STEM majors. Neither the survey data nor the student interviews aided understanding of this. Perhaps STEM majors repeat courses more often for a better grade than do other students. Even though the data set does not have a repeated courses variable, it does have a "count of D grades" variable that could be used as a proxy for course repeats since a course in which a grade of D is earned typically does not count toward major coursework requirements. Yet the data indicate no meaningful difference in either the number of Ds earned or the existence of any Ds between STEM and non-STEM majors. Thus it remains unclear why being a STEM major would correlate with excess credits at graduation. Although there is a strong effect (odds ratio), only a very small amount of explained variance is associated with this equation; an even smaller amount is associated with the variable of STEM major.

Time at the university was found to have a positive correlation with excess credit accumulation. Adelman (2006) notes that to reduce time to degree and to streamline course-taking behaviors, students must engage in course planning early in their program of study. Student survey data and interviews support Adelman's assertion: access to better academic advising was noted as a means by which to reduce excess credit accumulation and time to degree.

In addition to the quantitative results of this survey supporting the findings of prior research on the minimal impact of being a transfer student on excess credit accumulation at graduation, they shed additional light on how students feel about excess credits and, for those students who were dissatisfied with having excess credits, what institutional resources they believe are necessary to address the issue. Although the quantitative research summarized here could be refined further

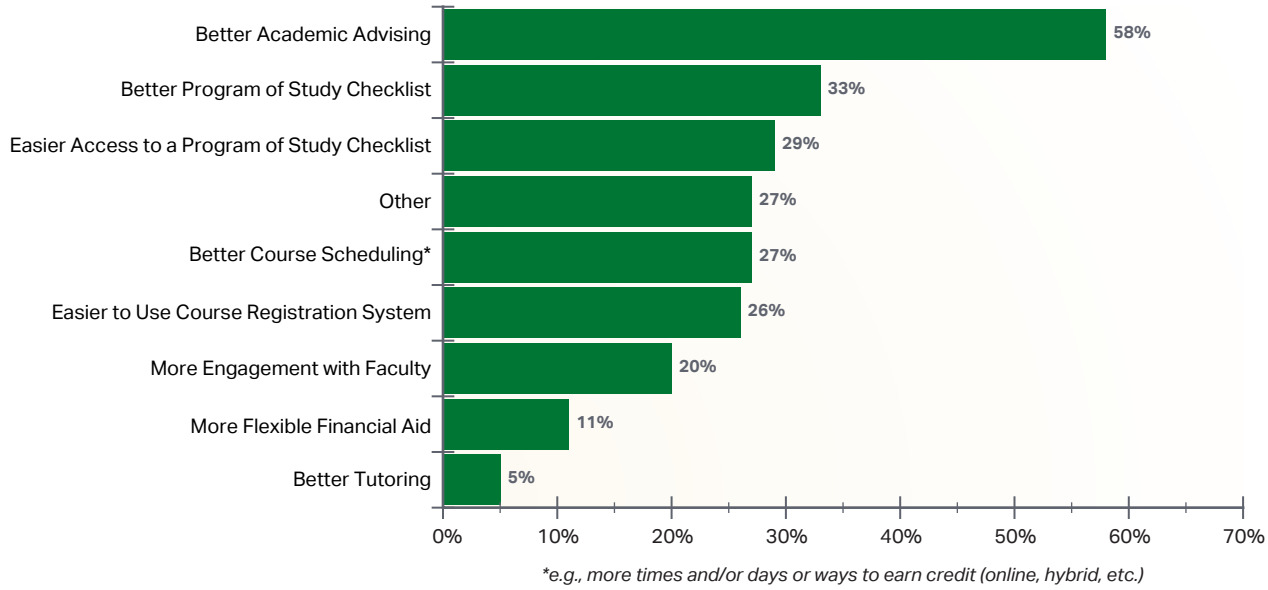

FIGURE 4 ➤ Transfer Institution Actions and Services That Might Have Helped Students Avoid Losing Credits

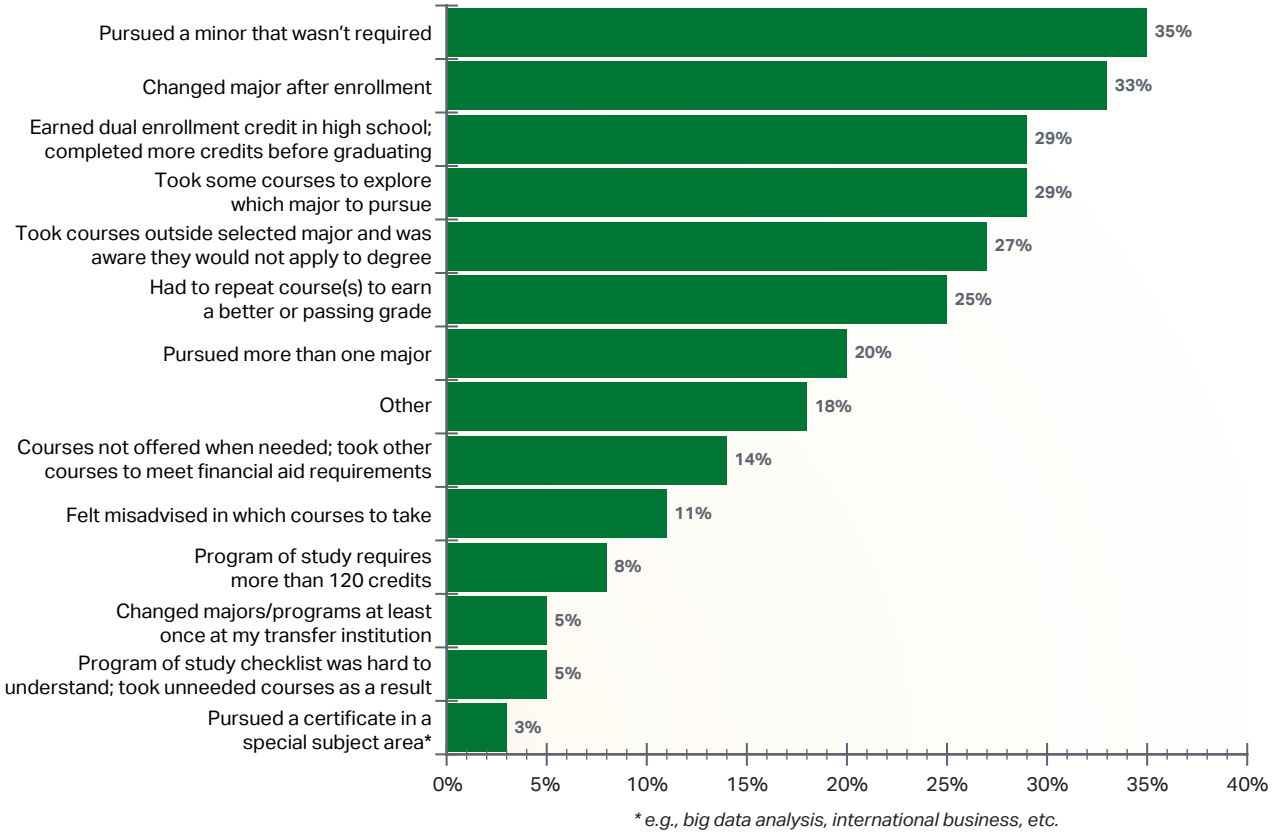

FIGURE 5 ➤ Reasons for More Than 120 Credits at Graduation

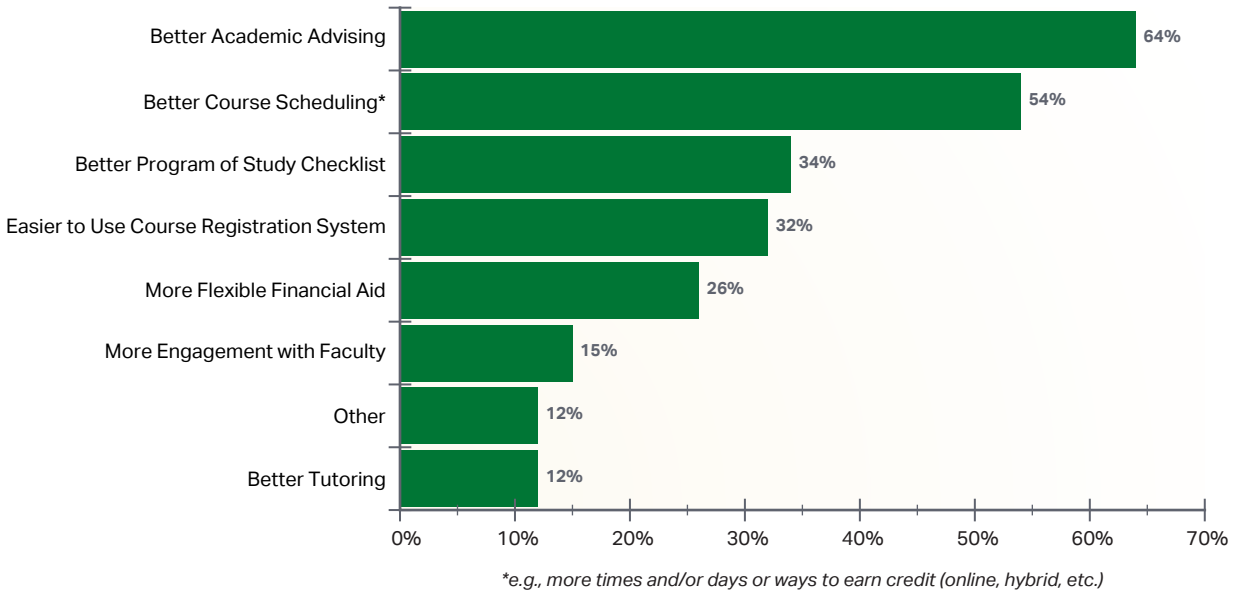

FIGURE 6 ➤ Actions and Services by the University That Might Have Helped Limit Excess Credit Hours

in order to capture additional explained variance, it is the qualitative student experience that adds most to understanding how institutions can address this issue in practice.

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