

Institutional Effectiveness: Major Change and Graduation

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Abstract: In this study, we set out to investigate the relationship, if any, between students changing their majors and graduation. Through both descriptive and inferential statistics, it is found that a relationship does exist. Changing major is predicted to increase the likelihood that a student will graduate by about 15%-20%. The initial change of a major has a strong, positive effect on graduation. However, each additional change has less of an impact, and becomes negative upon reaching the third major change.

Background: The data used for this study is on all undergraduate students who have had at least one declared major from Fall 2015 through Spring 2021 (N = 19,358), 3,941 of which remain persisting, or still enrolled, at the university. Number of major changes range from zero to four, with 17,814 having no change, 2,317 having one change, 211 having two, 15 having three, and one having four.

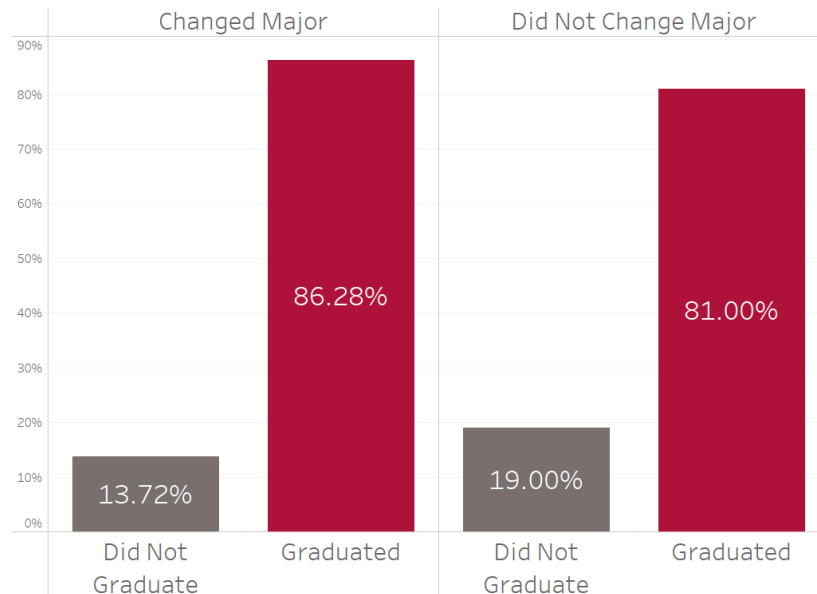
Descriptive Statistics: Initial review of the data shows that 13.14% of the sample changed their major at least once, and on average student experience 0.14 major changes. Thus, it is most common for a student to not change their major. Of those that do, they do so an average of 1.1 times.

Turning focus only to those who have graduated, a greater proportion of them, 14.87%, have changed their major at least once. The opposite is true for students who have stopped-out, so are no longer persisting and did not graduate. 10.59% of students who have changed their major at least once have gone on to stop-out.

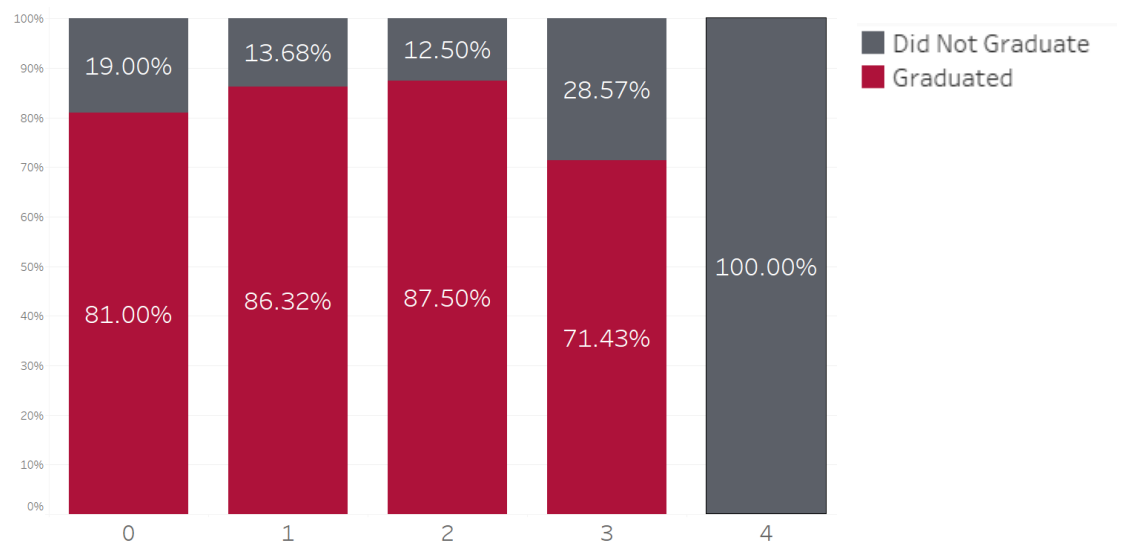
For further exploration into these statistics, visit:

https://tableau.ewu.edu/t/ewu/views/MajorChanges/MajorChanges?:showAppBanner=false&:display_count=n&:showVizHome=n&:origin=viz_share_link

Excluding persisting students, 86.28% of students have graduated who changed their major. This is proportionally greater than those who graduated who did not change their major, which is 81%.



When looking at the number of major changes opposed to whether major is changed, there is some variation in the proportion of students who graduate in each group. 81%, 86.32%, 87.50%, 71.43%, and 0% of students have graduated with zero, one, two, three, and four major changes, respectively. However, it is important to note that the sizes of these subpopulation vary greatly in size, and so this comparison can not be the only measure considered.



These statistics indicate that major changes, especially low amounts of them, have a positive effect on whether a student graduates. Proportionally more students have graduated who changed majors two, one, and zero times, in that order.

Inferential Statistics: In addition to the descriptive analysis, logistic regressions using the probit method are used. Graduation is the dichotomous outcome being predicted, where a student has graduated, 1, or has not, 0. Persisting students are excluded from these models because we do not yet know their graduation outcome with the university. This leaves a population of 15,417 students who have either graduated or stopped out. Student covariates like gender,

primary ethnicity/race, Pell grant status, first generation student status, transfer status, and cumulative GPA are used in addition to major change to create a more accurate and realistic model.

The first model used considers whether a major has been changed regardless of number of times through a change indicator:

	Estimate	Std. Error	Z Value	Pr>(z)
Intercept	-1.39266	0.15222	-9.149	2×10^{-16} ***
CHANGE INDICATOR	0.18931	0.03819	4.957	7.14×10^{-7} ***
MALE	-0.12202	0.02604	-4.687	2.78×10^{-6} ***
GENDER NOT REPORTED	2.66588	36.57338	0.073	0.94189
ASIAN	-0.15293	0.14982	-1.021	0.30735
BLACK/AFRICAN AMERICAN	-0.44576	0.14709	-3.030	0.00244 **
HISPANIC/LATINO	-0.25099	0.13759	-1.824	0.06813
HAWAIIAN/PACIFIC ISLANDER	-0.57999	0.25666	-2.260	0.02384 *
TWO OR MORE UNKNOWN	-0.26422	0.14314	-1.846	0.06490
WHITE	-0.494482	0.435426	-1.136	0.25611
PELL GRANT	-0.199586	0.083040	-2.403	0.01624 *
F GEN	0.051002	0.081622	0.625	0.53207
TRANSFER	-0.202754	0.076339	-2.656	0.00791 **
GPA	1.336728	0.084351	15.847	2×10^{-16} ***

This model predicts that a student changing their major increases the likelihood that they will graduate by 20.84%. The associated p-value, (Pr>|z|), is also very small, which indicates that the relationship is highly statistically significant.

The next model instead uses the number of major changes that a student experiences in place of the indicator for the whole population:

	Estimate	Std. Error	Z Value	Pr>(z)
Intercept	-1.39090	0.15214	-9.143	2×10^{-16} ***
MAJOR CHANGES	0.14501	0.03347	4.332	1.48×10^{-5} ***
MALE	-0.12148	0.02603	-4.667	3.06×10^{-6} ***
GENDER NOT REPORTED	2.66272	36.57338	0.073	0.94196

ASIAN	-0.15042	0.14974	-1.005	0.31509
BLACK/AFRICAN AMERICAN	-0.44209	0.14700	-3.007	0.00263 **
HISPANIC/LATINO	-0.24887	0.13751	-1.810	0.07032
HAWAIIAN/PACIFIC ISLANDER	-0.57927	0.25671	-2.257	0.02404 *
TWO OR MORE	-0.26147	0.14306	-1.828	0.06759
UNKNOWN	-0.12700	0.14569	-0.872	0.38339
WHITE	-0.27685	0.13453	-2.058	0.03959 *
PELL GRANT	-0.13748	0.02853	-4.819	1.44×10 ⁻⁶ ***
F GEN	-0.03569	0.02786	-1.281	0.20018
TRANSFER	-0.04909	0.02626	-1.870	0.06154
GPA	0.87119	0.02218	39.284	2×10 ⁻¹⁶ ***

This model predicts that each additional major change increases the likelihood that a student will graduate by 15.61% with high statistical significance.

Now, this same idea of number of major changes will be applied to only those who have changed their major at least one time:

	Estimate	Std. Error	Z Value	Pr>(z)
Intercept	-2.317930	0.517943	-4.475	7.63×10 ⁻⁶ ***
MAJOR CHANGES	-0.139072	0.111619	-1.246	0.21278
MALE	-0.001304	0.076637	-0.017	0.98643
ASIAN	-0.075862	0.486382	-0.156	0.87605
BLACK/AFRICAN AMERICAN	-0.483221	0.463594	-1.042	0.29726
HISPANIC/LATINO	-0.292613	0.441979	-0.662	0.50794
HAWAIIAN/PACIFIC ISLANDER	-5.704025	95.030665	0.060	0.95214
TWO OR MORE	-0.427421	0.456510	-0.936	0.34913
UNKNOWN	-0.014916	0.472725	-0.032	0.97483

WHITE	-0.494482	0.435426	-1.136	0.25611
PELL GRANT	-0.199586	0.083040	-2.403	0.01624 *
F GEN	0.051002	0.081622	0.625	0.53207
TRANSFER	-0.202754	0.076339	-2.656	0.00791 **
GPA	1.336728	0.084351	15.847	2×10^{-16} ***

This model predicts that apart from the initial major change, each additional major change decreases a student's likelihood of graduation by 12.98%, though does not have a small p-value and so does not exhibit statistical significance.

These findings seem to be consistent with the previous ideas found from the descriptive statistics. Changing major is shown to have a positive influence on graduation, but this may only be to a certain extent as indicated by the negative relationship that emerges when only considering those with major changes greater than zero.

To more closely examine when the relationship becomes negative and acknowledge the lack of statistical significance in the previous model, additional simple models for subpopulations based on number of major changes are used where graduation is predicted as a function of number of major changes. First, focus is turned to only those who experience zero and one major change. That additional major change is predicted to increase likelihood of graduation by 24.24% with very high statistical significance. For those that change majors one or two times, the additional change is said to increase likelihood of graduation by 5.71%, though not with statistical significance. As those with two or three major changes are analyzed, the additional major change predicts that they are less likely to graduate by 4.54%, again lacking statistical significance. This negative relationship continues for those with three or four major changes, and the additional change is expected to decrease likelihood of graduation by 99.71%, though without statistical significance again.

It is important to consider that many of these models lacked statistical significance. This is however may be due to the small number of observations in each. For example, only one student has changed their major four times, and they did not graduate. The significance in the overall models could also be stemming from the very strong relationship exhibited from those with zero and one major change, which is also supported by the descriptive statistics and the high number of students who have changed majors zero and one time.

The relationships though are consistent with the preceding ideas and give insight deeper into the exact influence. Major changes are associated with greater odds of graduation, but the effects of each additional major change are diminishing and become negative with the third change.

Conclusions: The relationship presented in these analyses is one of diminishing effects. The relationship is positive and the strongest with the initial change, and then become less so with each subsequent change, becoming negative with the third. Changing major increases the

likelihood of graduation for a student with a declared major by about 15%-20%, but high numbers of changes can hinder this likelihood.

Notes and Future Research: As discussed earlier, the validity of this analysis has some discrepancies due to the lack of significance in certain models. Though this exists, there is still high significance when focusing on the change indicator and low number of changes, so results pertaining to the less specific points have evidence supporting them. The question of validity also calls the accuracy of the predictions to attention. The most accurate model created, which is the model with the change indicator, overpredicts how many students would graduate by 2,107 (12,602 students have graduated, and the model predicts 14,709 will). This also connects to the lack of significance that many of the covariates showed. Collecting more information on students and/or going back further in time to collect more students could help improve these predictions. It would also be interesting to delve into the reasons why this relationship is so and break away from a purely numerical standpoint.