Switching Majors at Cosumnes River College:

Impact on Timely Completion and Potential Mitigating Factors

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Background

In recent years, various collegewide initiatives, programs, and plans at Cosumnes River College (CRC) have acted to facilitate on-time completion of a degree, certificate, or transfer goal. The investigation described here concerns one potential barrier to on-time completion. Specifically, students who switch majors frequently may take longer to complete, e.g., because the additional coursework required to change major directions. Although this assertion makes sense anecdotally, it has not been tested using local data at CRC. With this in mind, this study described herein had three major goals:

1) to confirm that switching majors is a barrier to on-time completion,
2) describe the frequency and prevalence of major switching and describe some factors predicting major switching,
3) and identify some potential strategies for major selection that might reduce indecisiveness.

Summary of Findings

Conclusion 1: Students who switch majors take longer to complete a degree.

1) Prior to completing a degree for the first time, students switched their major discipline (e.g., English, Math, etc.) about 1.7 times. They switched their sub-discipline (e.g., CIS – Computer Programmer to CIS – Database Analyst) an average of 0.8 times (*Table 1*, page 3).
2) First-time degree completers earn an average of 69.2 units upon completion (at CRC; not including units from other colleges). Asian/Pacific Islander and male students earned the most units on average upon degree completion (*Table 1*; Page 3).
3) Students who switched their major discipline and sub-discipline more often earned more units upon degree completion. A single major discipline switch resulted in a 6.73 unit increase on average (*Table 2*, Page 4), and a single sub-discipline switch resulted in 5.23 unit increase on average.

Conclusion 2a: A majority of continuously enrolled students switch their major discipline by their 4th major term (fall/spring).

1) Roughly 34% of continuously enrolled students switch their discipline by their second term. 57.9% switch their discipline by their fourth term (*Table* 4, page 6).
    a. Students in the Auto., Const. & Design Technology CAC had the lowest rates of discipline switching (*Table 4*, page 6).
2) Older students and male students had a reduced chance of switching majors (*Table 4,* page 6).

Conclusion 2b: Prior term course success and completion of transfer-level math are associated with a reduced risk of major switching, but the effects are very small.

3) Prior term course success rate and prior term transfer-level math completion was associated with a reduced chance of switching majors. However, these predictive effects were very small.
    a. Projected percentage of students not switching majors by course success rate and transfer-level math completion can be found in Appendix A (page 10).

Conclusion 3: Students in the Fall 2018 cohort who selected a major based on long-term passion or career/financial prospects reported a lower likelihood of switching majors than students who did not use these strategies.

1) Of 111 surveyed students with declared majors in the fall 2018 cohort, roughly 31.5% (35) stated that they were slightly, somewhat, or very likely to switch their major in the future (*Table 6,* page 8).
2) Only 12.5% of students who selected their major based on long term interest said they were slightly, somewhat, or very likely to switch their major (*Table 6*, page 8).
3) Only 11.8% of students who selected their major base on career/financial prospects said they were slightly, somewhat, or very likely to switch their major (*Table 6*, page 8).

Further Limitations

Due to the correlational nature of the studies described here, it is difficult to draw a causal conclusion for many of the findings. For example, with regards to conclusion 1, it may be that students were enticed to enroll in more units and terms by another variable (other than major switches), and the additional enrollment time gave students more of a chance to change majors. Moreover, with regards to conclusion 2, the study criteria resulted in a sample that was slightly different than the fall 2015 – fall 2018 cohort demographics. Finally, with regards to conclusion 3, self-reported likelihood of switching majors may not entirely reflect the eventual behavior of students. For example, describing their strategies for major selection may have biased some students to report more or less likelihood in switching. In addition, and perhaps most importantly, sample sizes for this study were small, and therefore findings should be interpreted with caution.

Conclusions and Recommendations

Despite these limitations, the findings presented here still provide a foundational basis for further research and provide guiding insight for decisions. Students who switch their majors more may enroll in more units and take longer to complete. This provides support for the assertion that major switches may delay completion. One could potentially reduce switching by encouraging success and early completion of transfer-level math or by encouraging major selection based on a career or long-term interest.

Future investigations will focus prospectively on cohorts of new students (particularly the FYE program) to replicate and expand the findings reported here and promote the development of programs that help students select and commit to a major. In particular, one expansion of future research should focus on success in core coursework for a student's major.

Major Switches and On Time Completion

Method

The primary purpose of this investigation was to test whether or not major switching was a barrier to on-time completion. For the purposes of this investigation, *time to completion* was defined as the number of units earned at CRC upon completion of a degree. Data were gathered for student completers at CRC from Fall 2015 to Fall 2018. Only students who completed a *single* degree for the first time were included because students who completed multiple degrees would have inflated units. Additionally, major data were gathered for each first-time completer. Students were assigned one major per term by determining which major was declared closest to the start of the given term. Finally, gender and ethnicity were gathered for each student.

Next, major switches were counted for each student prior to degree completion. *Major switches* were defined as the number of distinct declared majors minus one (to exclude the student's first major). This number was broken down into *Discipline Switches* – the number of switches to a new discipline (e.g., Art to Architecture) - and *Sub-Discipline Switches* – the number of major switches within a discipline (e.g., CIS – Computer Programmer to CIS – Database Analyst). Note that this definition does not count returns to a previous major. For example, If a student switched from Accounting to English and back to Accounting. This would be counted as 1 total switch (two distinct majors minus one).

Analysis

Between Fall 2015 and Fall 2018, there were 1674 first-time degree earners. Upon completion, students earned 69.2 units on average (at CRC). Students switched disciplines an average of 1.7 times and sub-disciplines and average of 0.8 times. Students who are White switched majors the least, although the number of major switches did not vary greatly from group to group. Students who are Asian/Pacific Islander and/or male earned the most units upon degree completion.

Table 1. Unit, Number of Majors, and Term Averages by Demographic Group.

Demographic	Headcount	%	Major Discipline Switches	Sub-Disciplines Switches	Average Units
African American	130	7.8%	1.8	0.9	71.6
Asian/Pacific Islander	584	34.9%	1.8	0.9	72.1
Latinx	314	18.8%	1.6	0.8	68.7
Native American	22	1.3%	1.6	0.5	61.0
Other/Unknown Ethnicity	202	12.1%	1.9	0.9	70.6
White	422	25.2%	1.4	0.7	64.6
Female	1030	61.5%	1.7	0.8	67.9
Male	612	36.6%	1.6	0.9	71.3
Unknown Gender	32	1.9%	1.9	0.9	68.8
Total	**1674**		**1.7**	**0.8**	**69.2**

Data were analyzed using ordinary least squares regression (commonly used to test for statistical significance with a normally-distributed continuous outcome variable). Gender and ethnicity were both significantly correlated with units earned ($F(2) = 3.89$, $p < .05$; $F(5) = 5.47$, $p < .001$, respectively). These variables were therefore used as control variables for further analysis. The number of discipline switches was significantly correlated with units earned, $F(1) = 219.08$, $p < .05$, such that students who changed their discipline more earned more units upon completion of their first degree (*Table 2*). Additionally, the number of sub-discipline switches was significantly correlated with units earned, $F(1) = 77.50$, $p < .001$, such that students who changed their sub-discipline earned more units upon completion (*Table 2*).

One discipline switch was associated with an average increase of 6.73 units, whereas a sub-discipline switch was associated with an average increase of 5.23 units. These increases were not significantly different, $F(1) = 3.45$, $p = .06$. However, the effect size of a discipline was more than twice that of sub-discipline switches (*Table 2;* Partial r-squared). If one were to plot the association between switches and units earned, the impact of discipline switches would be readily visible, whereas the impact of sub-discipline switches would not be.

Table 2. Regression Slopes and Significance for Earned Units at Degree Completion

Predictor	Slope	Standard Error	*t*-value	*p*-value	Partial *r*-squared	Effect Size
Discipline Switch	6.73	0.4799	14.02	<.001	0.110	Medium
Sub-Discipline Switch	5.23	0.5941	8.80	<.001	0.047	Small
Full equation				<.001	0.181	Medium

Note. Prior to analysis, overly influential observations were removed using the Cooks Distance > 4/n rule. In total, 80 influential observations were removed. This removal did not impact statistical significance and minimally impacted slope estimates.

Trends and Predictors of Major Switching

Method

Given the potential impact of switching majors, the purpose of this portion of the investigation was to describe and predict when students switch their major *for the first time*. Three first-time fall student cohorts at Cosumnes River College (fall 2014, fall 2015, and fall 2016) were tracked over 4 major terms. Because of the larger predictive effect of discipline switches over sub-discipline switches, only discipline switches were tracked. For students with the educational goal of general education for transfer, their area of study was taken as their major. Various additional behavioral factors were gathered for each student at the term level including course success rate, enrollment, transfer-level math completion, and transfer-level English completion. Gender, ethnicity, and age were also gathered. These demographics and behavioral characteristics were used to predict major discipline switches.

The correlation between various term level factors (e.g., course success) and persistence could potentially introduce confounding factors into predicting discipline switches. For example, a student who enrolled for two terms without switching majors could withdraw due to a lack of course success. This could lead to an odd correlation wherein students with lower success rates are less likely to switch majors – because they leave prior to switching a major. With this in mind, only students who were

enrolled continuously for four terms were included in the analysis. Additionally, only students with declared majors or areas of study (in the case of general education) in their first term were included.

Inclusion Analysis

As previously stated, only students who were continuously enrolled for four terms were included in the analysis. *Table 3* below compared the demographic distribution of the included students to that of all students in the three aforementioned fall cohorts. A total of 2328 students were included in the analysis. Student ethnicity was significantly correlated with inclusion in the analysis, $\Delta\chi^2(9) = 68.58$, $p < .001$, such that African American, Hispanic/Latino, and Male students were less likely to persist four terms. Age was also significantly correlated with inclusion, $\Delta\chi^2(1) = 6.19$, $p < .05$, such that older students were less likely to persist four terms. These findings suggest that the students included in the analysis are not entirely representative of the complete cohort of students.

Table 3. Demographic description of students included in the analysis vs. all students in the fall 2014 through 2016 cohorts.

	All Students		Included In Analysis		
Demographic	**Headcount**	**%**	**Headcount**	**%**	**Difference**
African American	384	12.13%	198	8.51%	-3.62%
API	785	24.79%	789	33.89%	9.10%
Hispanic/Latino	1019	32.18%	667	28.65%	-3.52%
Multi-Race	255	8.05%	175	7.52%	-0.53%
Other/Unknown Ethnicity	28	0.88%	15	0.64%	-0.24%
White	696	21.98%	484	20.79%	-1.19%
Female	1516	47.87%	1168	50.17%	2.30%
Male	1577	49.79%	1110	47.68%	-2.11%
Unknown Gender	74	2.34%	50	2.15%	-0.19%
24 and Younger	2875	90.78%	2146	92.18%	1.40%
25 and Older	292	9.22%	182	7.82%	-1.40%
Total	**3167**		**2328**		

Description of Discipline Switching

Table 4 below presents the percentage of students switching disciplines for the first time across the four tracked terms. About 34% of students switched disciplines at the start of their second term. A total 57.9% switched disciplines by the start of their fourth term. Asian students were the most likely to switch majors, although there was not substantial variability in major switching across ethnicities. Female students were also more likely to switch majors. Additionally, students in general education were the most likely to switch their discipline, whereas students in Auto., Const. & Design Technology were the least likely.

Table 4. Percentage of student switching disciplines for the first time by term, demographic, and Career Academic Community

Demographic	Cohort Size	Second Term	Third Term	Fourth Term	Total Switched
Ethnicity					
African American	198	30.3%	17.7%	6.6%	54.5%
Asian	634	38.3%	13.6%	9.9%	61.8%
Filipino	129	30.2%	11.6%	10.9%	52.7%
Hispanic/Latino	667	32.2%	17.1%	6.6%	55.9%
Multi-Race	175	32.6%	16.6%	8.6%	57.7%
Native American	3	33.3%	0.0%	0.0%	33.3%
Pacific Islander	26	46.2%	3.8%	11.5%	61.5%
Unknown	12	41.7%	8.3%	16.7%	66.7%
White	484	33.1%	14.0%	11.2%	58.3%
Gender					
Female	1168	36.7%	15.4%	9.0%	61.1%
Male	1110	31.4%	14.2%	8.6%	54.2%
Unknown	50	30.0%	22.0%	14.0%	66.0%
Career Academic Community					
Ag., Food & Natural Resources	83	36.1%	15.7%	8.4%	60.2%
Arts, Media & Entertainment	186	31.7%	15.1%	6.5%	53.2%
Auto., Const. & Design Technology	105	31.4%	12.4%	3.8%	47.6%
Business & Computer Science	418	26.1%	14.4%	10.0%	50.5%
English & Language Studies	41	26.8%	4.9%	19.5%	51.2%
General Education	389	50.6%	11.6%	7.5%	69.7%
Health & Human Services	356	34.0%	17.4%	8.4%	59.8%
Science, Math & Engineering	534	30.7%	15.9%	10.7%	57.3%
Social & Behavioral Sciences	216	31.5%	19.0%	8.8%	59.3%
Total	**2328**	**34.0%**	**15.0%**	**8.9%**	**57.9%**

Prediction of major switching

A Cox Regression was used to identify factors that predict student discipline switching. This form of regression is typically used in the medical field to evaluate factors that predict survival. Hence Cox Regression is typically referred to as a form of "Survival Analysis". In this case, the Cox Regression was used to predict the threat of switching major disciplines for the first time.

Cox Regression calculates proportionate increase or decrease in threat of discipline switching from a baseline threat level. Here threat is roughly interpreted as the probability of switching majors up to and including a given term. For example, using Cox Regression one might find that students who are more successful have a proportionately lower chance of switching disciplines – compared to the baseline threat. One assumption of survival analysis is that this baseline threat of switching disciplines is the same regardless of group membership. This assumption must be tested prior to conducting analyses.

Unfortunately, the baseline risk of switching disciplines for students in the Automotive, Construction, & Design Technology CAC ($\Delta\chi^2(1) = 5.17$, $p < .05$) and General Education CAC ($\Delta\chi^2(1) = 10.63$, $p < .01$) was not consistent with the other CACs. Therefore, CAC was not included in the analysis. Rather it was used to calculate different baseline threat within each CAC (a process called stratification).

In the next step of the analysis, demographic variables were entered into the Cox regression as control variables. Specifically, age was significantly associated with the likelihood of discipline switching, $\Delta\chi^2(1) = 19.25$, $p < .001$, such that older students had a reduced threat of switching disciplines. Gender was also significantly associated with the likelihood of discipline switching, $\Delta\chi^2(2) = 11.92$, $p < .01$, such that male students had a lower probability than female students. Gender and age were therefore entered as control variables prior to further analysis.

Finally, the aforementioned term based behavioral characteristics were entered as predictors (course success, unit load, transfer-level math completion, and transfer-level English completion). Course success rate in the prior term was significantly associated with the likelihood of discipline switching, $\Delta\chi^2(1) = 7.53$, $p < .01$. A student with a 100% success rate would have a 17.6% reduction in the baseline threat of major switching. Additionally, transfer-level math completion in the prior term was significantly associated with the likelihood of major switching, $\Delta\chi^2(1) = 8.48$, $p < .01$. A student who completed transfer-level math would have a 24.9% reduction in the baseline threat of major switching. Projected survival rates using course success and transfer-level math can be found in Appendix A (page 10). No other term based behavioral characteristics were predictive of discipline switching. The predictive capacity of gender, age, course success, and transfer-level math completion combined was very small, $R^2 = .01$.

Student Major Selection Strategies

Method

Near the end of the Spring 2019 semester, the Fall 2018 cohort ($N = 2435$) was sent a short survey on major selection at CRC. They were first asked if they had a declared major. Respondents who selected "yes" were then asked to describe their strategy for picking a major and rate their likelihood of switching majors on a seven-point scale (from very unlikely to very likely). Students who had not declared a major were asked how they would eventually decide. A total of 331 responses were gathered. Of those 331 responses, only 111 said they had a declared a major and described their major selection strategy. A total of 56 marked undeclared, but only 5 described their strategy for major selection. Therefore, data were analyzed for only the 111 respondents with declared majors and complete responses. Because the sample size and response rate was so low, any findings from this investigation should be interpreted with caution.

Next the described major selection strategies were categorized into seven emergent themes *(Table 6*). First, some students described *interest* in a subject as their strategy for selecting a major. Second, some students said that *long term passion* was their strategy for selecting a major. Third, some students cited *career/financial* motivations for selecting their major. Fourth, some students cited recommendation or direction from *personal relationships* (e.g., family/friends) as motivation for selecting a major. Fifth, some students cited *staff recommendations* from CRC as their strategy for selecting a major. Sixth, some

students selected a major because of their *strength in the subject* they selected. Finally, some students said that they were *currently taking classes to discover interests*. Note that a student's strategy could contain several of these themes. For example, a student could say that they declared a major in nursing because they were interested in the science of nursing and it had good career prospects. Responses that did not fit a general them were classified as "other". Analysis focused on how these themes were associated with a student's reported likelihood of switching majors.

Results

Table 5 below presents the percentage of students who stated they would be likely (slightly, somewhat, or very likely) to switch major by demographic. Data were analyzed with logistic regressions assuming quasi-binomial error (an analysis commonly used for a two-level outcome variable, e.g., likely/not likely). Both gender and ethnicity were not significantly associated with the reported likelihood of switching. However, ethnicity was nearly statistically significant ($F(4,106) = 2.43$, $p = 0.0524$). This lack of statistical significance may have been the result of very low sample sizes.

The aforementioned themes were entered (at the same time) into a quasi-binomial logistic regression to test for associations between theme and reported likelihood of switching majors. Staff recommendation and strength in subject area were not included in the regression due to low sample sizes. Students who described long term interest/passion ($t(1) = -1.81$, $p < .05$) and career/financial strategies ($t(1) = -1.75$, $p < .01$) were less likely to report that they may switch majors (compared to students who did not report these strategies; *Table 6*).

Table 5. Percentage of respondents stating they would be likely to switch majors by ethnicity/gender.

Demographic	% Likely	Headcount
African American	36.4%	11
Asian	48.4%	31
Filipino	0.0%	2
Hispanic/Latino	13.8%	29
Multi-Race	54.5%	11
Pacific Islander	0.0%	2
White	24.0%	25
Female	30.3%	66
Male	33.3%	42
Unknown Gender	33.3%	3
Total	**31.5%**	**111**

Table 6. Percentage of respondents stating they would be likely to switch by reported major selection strategy.

Strategy	% Likely	Headcount
Interest	29.4%	34
Long Term Interest/Passion	12.5%	24

Career/Money	11.8%	34
Personal Relationships	27.3%	11
Staff Recommendation	40.0%	5
Strength in Subject	75.0%	4
Currently taking classes to discover interests	38.5%	13
Other	33.3%	12
Total	**31.5%**	**111**

Appendix A

*Projected % of students who **do not** switch discipline by course success rate in the prior term*

		Male		Female	
CAC	Term	0% Success	100% Success	0% Success	100% Success
Social & Behavioral Sciences	2	69.1%	73.7%	64.2%	69.5%
Social & Behavioral Sciences	3	50.4%	56.8%	44.0%	50.9%
Social & Behavioral Sciences	4	41.4%	48.3%	34.8%	41.9%
Gen Ed/Undeclared	2	48.1%	54.7%	41.6%	48.6%
Gen Ed/Undeclared	3	36.2%	43.3%	29.7%	36.8%
Gen Ed/Undeclared	4	28.7%	35.7%	22.4%	29.2%
Agriculture, Food & Natural Resources	2	63.4%	68.7%	58.0%	63.9%
Agriculture, Food & Natural Resources	3	47.7%	54.3%	41.3%	48.2%
Agriculture, Food & Natural Resources	4	39.0%	46.0%	32.4%	39.6%
Arts, Media & Entertainment	2	68.2%	73.0%	63.3%	68.6%
Arts, Media & Entertainment	3	53.1%	59.4%	46.9%	53.6%
Arts, Media & Entertainment	4	46.6%	53.3%	40.2%	47.2%
Automotive, Construction & Design Technology	2	65.7%	70.8%	60.5%	66.2%
Automotive, Construction & Design Technology	3	52.7%	59.0%	46.5%	53.2%
Automotive, Construction & Design Technology	4	48.7%	55.3%	42.3%	49.3%
Business & Computer Science	2	71.8%	76.1%	67.3%	72.2%
Business & Computer Science	3	56.6%	62.6%	50.6%	57.1%
Business & Computer Science	4	46.2%	52.9%	39.7%	46.7%
English & Language Studies	2	72.9%	77.1%	68.6%	73.3%
English & Language Studies	3	68.1%	72.8%	63.1%	68.5%
English & Language Studies	4	47.7%	54.4%	41.3%	48.3%
Health & Human Services	2	65.8%	70.8%	60.6%	66.2%
Health & Human Services	3	48.0%	54.7%	41.6%	48.6%
Health & Human Services	4	39.5%	46.6%	33.0%	40.1%
Science, Math & Engineering	2	68.7%	73.4%	63.8%	69.1%
Science, Math & Engineering	3	52.6%	58.9%	46.4%	53.2%
Science, Math & Engineering	4	42.0%	48.9%	35.4%	42.6%

*Projected % of students who **do not** switch discipline by transfer-level math completion in the prior term*

		Male		Female	
CAC	Term	No Math	Math	No Math	Math
Social & Behavioral Sciences	2	71.9%	78.1%	67.5%	74.4%
Social & Behavioral Sciences	3	54.3%	63.2%	48.2%	57.8%
Social & Behavioral Sciences	4	45.6%	55.5%	39.1%	49.4%
Gen Ed/Undeclared	2	52.1%	61.3%	45.9%	55.7%

Gen Ed/Undeclared	3	40.5%	50.7%	33.9%	44.4%
Gen Ed/Undeclared	4	32.9%	43.4%	26.5%	36.9%
Agriculture, Food & Natural Resources	2	66.7%	73.8%	61.6%	69.5%
Agriculture, Food & Natural Resources	3	51.7%	61.0%	45.5%	55.4%
Agriculture, Food & Natural Resources	4	43.2%	53.3%	36.7%	47.1%
Arts, Media & Entertainment	2	71.1%	77.4%	66.5%	73.7%
Arts, Media & Entertainment	3	56.9%	65.5%	51.0%	60.3%
Arts, Media & Entertainment	4	50.7%	60.1%	44.4%	54.4%
Automotive, Construction & Design Technology	2	68.8%	75.5%	64.0%	71.5%
Automotive, Construction & Design Technology	3	56.5%	65.2%	50.6%	59.9%
Automotive, Construction & Design Technology	4	52.7%	61.8%	46.5%	56.3%
Business & Computer Science	2	74.5%	80.1%	70.3%	76.8%
Business & Computer Science	3	60.2%	68.4%	54.6%	63.5%
Business & Computer Science	4	50.2%	59.7%	43.9%	53.9%
English & Language Studies	2	75.5%	81.0%	71.5%	77.7%
English & Language Studies	3	71.0%	77.3%	66.4%	73.5%
English & Language Studies	4	51.8%	61.0%	45.5%	55.4%
Health & Human Services	2	68.9%	75.6%	64.0%	71.5%
Health & Human Services	3	52.1%	61.3%	45.8%	55.7%
Health & Human Services	4	43.8%	53.8%	37.3%	47.7%
Science, Math & Engineering	2	71.6%	77.8%	67.0%	74.1%
Science, Math & Engineering	3	56.5%	65.1%	50.5%	59.9%
Science, Math & Engineering	4	46.2%	56.0%	39.7%	50.0%