

April 2012

Probability of Retention and Graduation after an Unsuccessful Course Attempt

Highlights:

- ❖ There is a strong negative association between unsuccessful course attempts and retention
- ❖ There is also a strong negative association between unsuccessful course attempts in students' first and fourth years and six year graduation
- ❖ Generally, the negative association between unsuccessful attempts and retention or graduation is consistent no matter the course or the student's college of major

For the current study, the association between successful or unsuccessful course completion with subsequent student success was explored. Six courses were selected for inclusion because most freshmen attempt at least one of them and they produce the lowest successful course completion rates of all lower-level undergraduate courses. The courses selected were CHEM111, LIFE 102, MATH 141, MATH 155, MATH 160, and PH 141.

Table 1 displays the N and observed retention and graduation rates for students who were successful (defined as A, B, C or S grade) and unsuccessful (defined as D, F, W or U grade) in each of the six courses. About 30% of students who attempt these courses are unsuccessful. Compared to students who successfully complete one or more of these courses, unsuccessful students have an average retention rate that is eight percentage points lower and a six-year graduation rate that is twenty-nine percentage points lower.

Table 1.

Student Success Rates Across Successful/Unsuccessful Completion of Certain Courses for New Freshmen at CSU (FA02 through FA10)				
	N	N (6-year grad)	Freshman Retention	Graduate in 6 years
Unsuccessful attempt at CHEM111				
Yes (26.41%)	2,781	1,005	81.4%	40.7%
No (73.58%)	7,748	3,334	92.7%	76.3%
Unsuccessful attempt at LIFE102				
Yes (19.64%)	2,014	574	75.4%	37.1%
No (80.35%)	8,237	3,493	90.5%	73.2%
Unsuccessful attempt at MATH141				
Yes (15.54%)	986	436	92.6%	62.6%
No (84.45%)	5,358	2,238	94.3%	83.3%
Unsuccessful attempt at MATH155				
Yes (27.98%)	842	287	94.18%	61.67%
No (72.01%)	2,167	923	96.12%	87.22%
Unsuccessful attempt at MATH160				
Yes (33.40%)	1,242	357	84.8%	44.5%
No (66.59%)	2,476	1,063	92.4%	73.6%
Unsuccessful attempt at PH141				
Yes (23.47%)	845	375	83.2%	51.7%
No (76.52%)	2,754	1,098	91.5%	78.2%
Unsuccessful attempt at CHEM111, LIFE102, MATH141, MATH155, MATH160, or PH141				
Yes (31.43%)	6,964	2,491	83.2%	48.9%
No (68.56%)	15,190	6,559	91.5%	78.7%

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Table 2 shows the logistic regression coefficients' odds ratios for a model that predicts retention based on one or more unsuccessful course attempts and first-year retention. The corresponding predicted probability is provided for additional interpretive value. For instance, the odds ratio of .465 indicates that a student who unsuccessfully attempts one or more of these courses in their first year has 53.5% (1-.465) lower odds of being retained after controlling for demographic variables compared to a student who successfully completes one or more of these courses in their first year. The majority, 90%, of students who attempt these courses do so in their first year.

Table 2.

Retention Odds Ratios (FA02 through FA10)	
Demographic Characteristics	
Minority (non-minority)	NS
Male (female)	0.834
Non-resident (resident)	0.590
Pell Recipient (non-Pell)	NS
First Generation (Non-First Generation)	0.769
CCHE Index	1.004
Unsuccessful Course Completion	
Unsuccessful Course Attempt in First Year (successful course attempt in first year)	0.465

- ✚ All else equal¹, a student who **successfully completes** one of these courses has a predicted first year retention rate of **93.4%**
- ✚ However, the same student who **unsuccessfully attempts** one of these courses has a predicted first year retention rate of **86.9%**,
- ✚ All else equal, the model predicts a 6.6 percentage point gap in first year retention between a student who successfully completes one or more of these courses and a student who does not.

Table 3 shows the logistic regression coefficients' odds ratios for a model that predicts six year graduation based on the timing of unsuccessful course attempts. A student who unsuccessfully attempts one of these courses in their first year has 75% (1-.250) lower odds of graduating in six years compared to a student who successfully completes one of these courses their first year after controlling for various student attributes. All else equal, 75% lower odds results in a 29 (.81-.516) percentage point gap in predicted six year graduation rates between students. The remaining corresponding predicted probabilities are provided for additional interpretive value.

Table 3.

6 Year Graduation Odds Ratios (FA02 through FA05)	
Demographic Characteristics	
Minority (non-minority)	NS
Male (Female)	NS
Non-resident (resident)	0.747
Pell Recipient (non-Pell)	0.762
First Generation (Non-First Generation)	0.829
CCHE Index	1.007
Unsuccessful Course Completion	
Unsuccessful Course Attempt in First Year (successful course attempt in first year)	0.250
Unsuccessful Course Attempt in Second Year (successful course attempt in second year)	0.532
Unsuccessful Course Attempt in Third Year (successful course attempt in third year)	NS
Unsuccessful Course Attempt in Fourth Year or Later (successful course attempt in fourth year)	0.224

- ✚ All else equal, the predicted probability of six year graduation for a student who **successfully completes** one or more of these courses is **81.0%**.
- ✚ The predicted probability of six year graduation for this student, if she **unsuccessfully attempts** one or more of these courses in her **first** year, is **51.6%**.
- ✚ When the first **unsuccessful attempt** is in her **second** year her predicted probability increases to **69.4%**.
- ✚ When the first **unsuccessful attempt** is in her **third** year her predicted probability increases **72.8%**.
- ✚ When the first **unsuccessful attempt** is in her **fourth or later** year her predicted probability is **48.8%**.

¹ All else equal indicates a non-minority, female resident student who is not first generation or a Pell recipient and has an index of 113.

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Additionally, appendix A displays results from logistic regressions run for each of the six courses for both student outcomes. The purpose of running the models for each course is to evaluate if the negative association of any unsuccessful attempt, discussed above, can be mostly attributed to one or two of the individual courses. Generally, the results indicate that unsuccessfully attempting any one of these courses results in lower odds of first year retention. However, the association is strongest for students who unsuccessfully attempt LIFE 102 and weakest for students who unsuccessfully attempt MATH 155.

The second table in appendix A indicates that no matter the specific course the strongest negative association is when a student unsuccessfully attempts a course in their first year. This association is strongest for LIFE 102 and weakest for MATH 155. The fourth year trend seen in table 3 also holds; however, caution should be used when interpreting the fourth year results since very few students (139 out of all four cohorts) first attempt these courses so late in their undergraduate programs. The strong associations seen in these results could perhaps be reflective of variables that are not being accounted for in the model, such as avoidance of math courses.

Appendix B displays the logistic regression results evaluating the association of any unsuccessful course completion on first year retention and six year graduation by a student's initial college of major. This additional analysis helps address questions about whether certain majors have stronger or weaker associations between unsuccessful course attempts and student outcomes. Generally, students from all colleges have lower odds of first year retention if they unsuccessfully attempt on or more of these courses; however, statistically the odds ratio is similar to one for students from the College of Liberal Arts. Care should be taken when interpreting this finding since students from the College of Liberal Arts are not represented as well as students from other colleges since a smaller proportion of them attempts these courses. For instance, only 16% of the students with a major in the College of Liberal Arts attempted these courses while over 60% of students from the other colleges (besides intra-university which is 52%) attempted these courses. This lack of statistical significance is most likely due to the smaller N and increased uncertainty around the odds ratio. The second table in appendix B shows that the trends, previously discussed, for six year graduation are maintained by college.

Conclusions from this study indicate the following:

- ✚ Students who unsuccessfully attempt these select courses have lower observed retention and graduation rates.
- ✚ Unsuccessful course completion is associated with lower predicted retention and graduation rates even after controlling for influential student characteristics. This is most true for students who unsuccessfully attempt LIFE 102.
- ✚ The predicted probability of graduation is highly associated with the year in which a student makes their first unsuccessful attempt at one of these courses. For example, if the first attempt is in the first year; the negative association with the predicted probability of graduation is stronger than if the first attempt were in year two or three. This holds true until the fourth year at which point the predicted probability of graduation is lowest.

As suspected, identification of and academic intervention with students who unsuccessfully attempt these select courses may be an important student success strategy. Identification of these students through the Early Grade Feedback Program may therefore be particularly important.

Appendix A

Retention Odds Ratios by Specific Course						
(N)	CHEM 111 (9701)	LIFE 102 (9270)	MATH 141 (4709)	MATH 155 (2143)	MATH 160 (3407)	PH 141 (3124)
Demographic Characteristics						
Minority (non-minority)	NS	NS	NS	NS	NS	NS
Male (female)	NS	0.772	NS	NS	NS	NS
Non-resident (resident)	0.566	0.583	0.493	0.563	0.536	0.596
Pell Recipient (non-Pell)	NS	NS	NS	0.598	NS	NS
First Generation (Non-First Generation)	NS	0.721	NS	NS	NS	NS
CCHE Index	NS	1.008	NS	NS	0.992	NS
Unsuccessful Course Completion						
Unsuccessful Course Attempt in First Year (successful course attempt in first year)	0.328	0.325	0.555	0.626	0.406	0.245

6 Year Graduation Odds Ratios by Specific Course						
(N)	CHEM 111 (4338)	LIFE 102 (4066)	MATH 141 (2674)	MATH 155 (1210)	MATH 160 (1420)	PH 141 (1473)
Demographic Characteristics						
Minority (non-minority)	0.815	NS	NS	NS	NS	NS
Male (Female)	1.251	NS	NS	NS	1.497	1.804
Non-resident (resident)	0.779	0.674	0.734	NS	NS	NS
Pell Recipient (non-Pell)	0.788	NS	NS	NS	NS	NS
First Generation (Non-First Generation)	NS	0.737	NS	0.626	NS	NS
CCHE Index	1.008	1.011	NS	NS	1.006	1.007
Unsuccessful Course Completion						
Unsuccessful Course Attempt in First Year (successful course attempt in first year)	0.224	0.194	0.279	0.213	0.339	0.321
Unsuccessful Course Attempt in Second Year (successful course attempt in second year)	0.393	0.473	0.455	0.279	0.321	0.261
Unsuccessful Course Attempt in Third Year (successful course attempt in third year)	0.232	NS	NS	0.269	0.043	NS
Unsuccessful Course Attempt in Fourth Year or Later (successful course attempt in fourth year)	0.110	NS	0.170	0.235	0.044	0.124

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Appendix B

Retention Odds Ratios for Any Unsuccessful Course by College									
(N)	AS (1151)	AHS (2048)	BU (1798)	EG (2984)	IU (4749)	LA (597)	NS (4703)	VM (1458)	WCNR (589)
Demographic Characteristics									
Minority (non-minority)	NS	NS	NS	NS	NS	NS	NS	NS	NS
Male (Female)	NS	0.723	NS	NS	NS	NS	NS	NS	NS
Non-resident (resident)	0.599	0.597	0.587	0.569	0.583	0.317	0.596	0.540	NS
Pell Recipient (non-Pell)	NS	NS	NS	NS	NS	NS	NS	NS	NS
First Generation (Non-First Generation)	0.663	0.635	NS	NS	NS	NS	0.762	0.634	NS
CCHE Index	NS	NS	NS	NS	NS	NS	1.010	1.014	NS
Unsuccessful Course Completion									
Unsuccessful Course Attempt in First Year (successful course attempt in first year)	0.414	0.433	0.587	0.308	0.548	NS	0.528	0.481	0.483

6 Year Graduation Odds Ratios for Any Unsuccessful Course by College									
(N)	AS (476)	AHS (776)	BU (825)	EG (1188)	IU (2248)	LA (403)	NS (2182)	VM (687)	WCNR (264)
Demographic Characteristics									
Minority (non-minority)	NS	NS	NS	NS	NS	NS	NS	NS	NS
Male (Female)	NS	0.574	1.564	1.545	NS	NS	1.221	NS	NS
Non-resident (resident)	0.627	NS	0.518	NS	0.645	NS	0.750	0.446	NS
Pell Recipient (non-Pell)	NS	NS	0.546	0.648	NS	NS	0.697	NS	NS
First Generation (Non-First Generation)	NS	NS	NS	NS	NS	NS	0.704	NS	NS
CCHE Index	NS	NS	NS	NS	NS	1.026	1.009	1.011	NS
Unsuccessful Course Completion									
Unsuccessful Course Attempt in First Year (successful course attempt in first year)	0.292	0.216	0.228	0.248	0.268	0.335	0.254	0.224	0.305
Unsuccessful Course Attempt in Second Year (successful course attempt in second year)	NS	NS	NS	NS	0.407	0.398	NS	NS	NS
Unsuccessful Course Attempt in Third Year (successful course attempt in third year)	NS	NS	NS	NS	NS	0.223	NS	NS	NS
Unsuccessful Course Attempt in Fourth Year or Later (successful course attempt in fourth year)	NS	NS	0.107	NS	0.159	0.194	NS	NS	NS