

# Modeling Twelve Semesters of Retention and Graduation

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LaGuardia Community College, despite a number of apparently successful retention initiatives, has found graduation-related outcome measures, like the six-year graduation rate, remarkably resistant to change. To understand better the reasons why graduation rates resist change, we developed an enrollment model that could show how graduation rates moved as we plugged in changes that would mimic the impact of some of our retention and graduation programs. In this paper we look at the impact of improving retention in the early semesters and the impact of slowing the shift from full-time to part-time attendance.

For the purposes of this paper, we have only looked at a cohort of first-time, full-time students, using fall 2010 data to build the rates used in our model. In the same manner, however, we have the capability to examine the impact of graduation improvement programs on those students who start part-time, who start as new transfer-in students, and who start in the spring semester. In theory we could also examine mixed cohorts. In this way, we could help a new program define feasible graduation rate goals, based on achievable semester retention figures and full-time status maintenance rates.

## Findings

- A one-semester intervention for *all* students in a first-time, full-time cohort that improved retention to the second semester by a minimum statistically significant amount ( $p<.05$ ) would cause six more students to graduate within six years. This number, however, is too small to change the six-year graduation rate from 28% (Table 4).
- A one-semester intervention for *all* students in a first-time, full-time cohort that improved retention to the second semester by ten percentage points (from 81% to 91%) would cause 30 more students to graduate within six years. This number increases the six-year graduation rate from 28% to 29% (Table 4).
- A three-semester intervention for *all* students in a first-time, full-time cohort that improved retention to the second, third and fourth semester by a minimum statistically significant amount ( $p<.05$ ) each semester would cause 27 more students to graduate within six years. This number increases the six-year graduation rate from 28% to 29% (Table 6).

- A three-semester intervention for *all* students in a first-time, full-time cohort that improved retention to the second, third and fourth semester by ten percentage points each semester would cause 132 more students to graduate within six years. This number increases the six-year graduation rate from 28% to 32% (Table 6).
- If half the students who normally convert from full-time to part-time in a first-time, full-time cohort could be convinced to stay full-time in every one of the twelve semesters, 95 more would graduate. This would increase the six-year graduation rate from 28% to 31% (Table 8).

## Results

### *Impact of changing retention rates*

Table 1 shows cohort graduation, retention and non-enrollment figures as we normally view them. Graduation and non-enrollment are cumulative, while enrollment rates are shown as a percentage of the original cohort, in this case separated by full- and part-time. These rates generally decline over time, although part-time can increase as students move from full-time more quickly than they graduate or stop enrollment. Note that one-quarter of the first semester's full-time enrollment moved to part-time in the second semester.

### First-time, full-time new students from fall 2010

	Fall 2010	Sp 2011	Fall 2011	Sp 2012	Fall 2012	Sp 2013	Fall 2013	Sp 2014	Fall 2014	Sp 2015	Fall 2015	Sp 2016
Cumulative graduation rate		0%	0%	0%	5%	10%	13%	20%	21%	26%	27%	28%
Current full-time enrollment % of cohort	100%	56%	46%	36%	24%	14%	14%	5%	4%	2%	2%	1%
Current part-time enrollment % of cohort		25%	20%	19%	17%	16%	12%	9%	11%	4%	3%	3%
Cumulative % not enrolled		19%	34%	45%	54%	60%	61%	66%	64%	68%	68%	68%
	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%

**Table 1**

Table 2 shows the likelihood that full-time students and that part-time students will return the next semester by semester. In spring 2013, for example, full-time students from fall 2012 returned or graduated at an 85% rate, while part-time students from fall 2012 returned or graduated at a 65% rate. That semester full-time students were 31% more likely to return or graduate than part-time students. These differences are important factors to be built into the model.

### Return or graduate rates of fall 2010 first-time, full-time new students

Return or grad rates by enrollment status of previous semester	"To" this semester											
	Fall 2010	Sp 2011	Fall 2011	Sp 2012	Fall 2012	Sp 2013	Fall 2013	Sp 2014	Fall 2014	Sp 2015	Fall 2015	Sp 2016
Full-time enrolled who return or graduate rate		81%	83%	83%	83%	85%	100%	82%	81%	78%	69%	79%
Part-time enrolled who return or graduate rate			64%	60%	60%	65%	66%	65%	100%	61%	65%	62%
Not enrolled who graduate rate			0%	0%	0%	0%	1%	0%	1%	0%	0%	0%

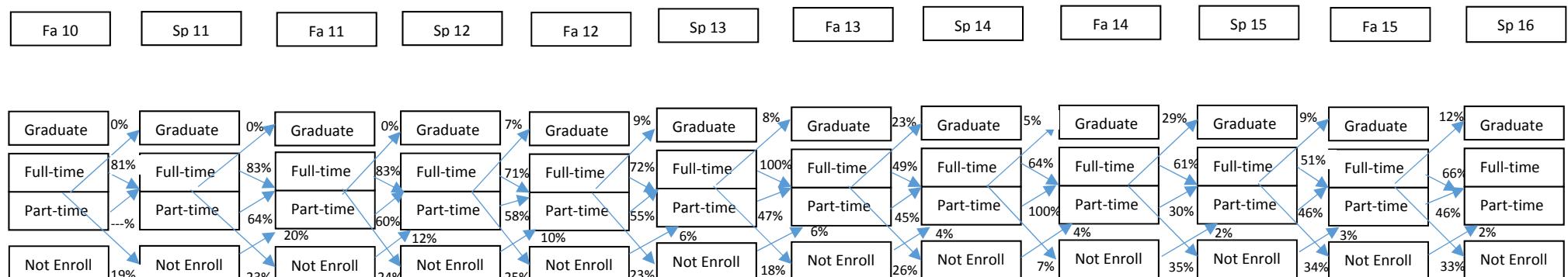
**Table 2**

Table 3 shows some of the rates derived from fall 2010 data built into the model. In fact, for each cohort (we have data for 8 cohorts: full-time and part-time for both first-time and transfer for fall and spring cohorts, although this paper focuses on just the fall first-time, full-time cohort) there are 16 possible transitions. Students in one semester may be either graduated, full-time, part-time or not enrolled. Since the next semester also has these four conditions, we have 16 different possible transitions (although one, going from graduate to not-enrolled, was not allowed).

"Model" rates	"To" this semester											
	Fall 2010	Sp 2011	Fall 2011	Sp 2012	Fall 2012	Sp 2013	Fall 2013	Sp 2014	Fall 2014	Sp 2015	Fall 2015	Sp 2016
Graduated % of all enrolled		0%	0%	0%	7%	9%	8%	23%	5%	29%	9%	12%
Full-time return as % of FT enrolled		81%	83%	83%	71%	72%	100%	49%	64%	61%	51%	66%
Part-time return as % of PT enrolled		0%	64%	60%	58%	55%	47%	45%	100%	30%	46%	46%
Re-enroll as % of not enrolled		0%	20%	12%	10%	6%	6%	4%	4%	2%	3%	2%
Not returned as % of enrolled		19%	23%	24%	25%	23%	18%	26%	7%	35%	34%	33%

**Table 3**

Figure 1 is a simplified view of the transitions between semesters that our model tracks. From fall 2010 to spring 2011, for example, 19% of enrolled students moved from enrolled to not enrolled. A first-semester retention program would aim at reducing that 19% loss. That would allow spring 2011 enrollment to increase, but that increase would add more supply to the eleven remaining times when students move from enrolled to not enrolled, as well as more supply to the graduation output of the following semesters.



**Figure 1**

Table 4 shows the results of improving the first semester retention rate of 81%, first by a minimally statistically significant amount to 83%, then to 86% then to 91%. More students graduate after each improvement, but the graduation rate only moves from 28% to 29% with a ten percentage point improvement in first semester retention to 91%.

Statistical significance only means that the change is probably not a result of random variation (although in 5% of the cases, the change is predicted to be random at  $p < .05$ ). Statistical significance means that the intervention probably had an impact that was stronger than the background noise. It doesn't mean that we will see our graduation rate improve. That is, statistical significance is not always significant significance.

<b>First semester interventions targeting first-time, full-time students</b>				
<b>Outcome goal: improve six-year graduation rate</b>				
<b>Fall 2010 cohort: 2,818</b>				
<b><i>Intervention: improve retention to second semester</i></b>				
<b>Intervention:</b>	<b>Status Quo</b>	<b>Minimum Statistically Significant Increase</b>	<b>5 Percentage Point Improvement</b>	<b>10 Percentage Point Improvement</b>
<b>Number returned 2nd semester:</b>	2,283	2,340	2,424	2,565
<b>Return rate to 2nd semester:</b>	81%	83%	86%	91%
<b>Increased # of grads:</b>	0	6	15	30
<b>6-year graduation rate:</b>	28%	28%	28%	29%

**Table 4**

Table 5 shows the impact on graduation rates of two-semester intervention programs. In each semester, the retention rate is improved over the improvement of the previous semester, first by a minimally statistically significant amount, then by five percentage points each semester, and then by ten percentage points.

A two-semester statistically significant improvement still did not change the six-year graduation rate. Two semesters of five percent retention improvement moved the rate from 28% to 29%. Two ten percentage point improvements brought the rate to 30%.

The retention rate from the second to the third semester is shown as 77% and is a weighted average of the 83% for full-time and 64% for part-time students shown in Figure 1. A ten percentage point boost brings that to 87%.

<b>1st &amp; 2nd semester interventions targeting first-time, full-time students</b>				
<b>Outcome goal: improve six-year graduation rate</b>				
<b>Fall 2010 cohort: 2,818</b>				
<b><i>Intervention: improve retention to 2nd and 3rd semesters</i></b>				

Intervention:	Status Quo	Minimum Statistically Significant Increase each Semester	5 Percentage Point improvement 1st semester & 5 pp more for 2nd	10 Percentage Point improvement 1st semester & 10 pp more for 2nd
<b>Number returned 2nd semester:</b>	2,283	2,340	2,424	2,565
<b>Return rate to 2nd semester:</b>	81%	83%	86%	91%
<b>Number returned 3rd semester:</b>	1,867	1,951	2,069	2,285
<b>Return rate to 3rd semester:</b>	77%	79%	82%	87%
<b>Increased # of grads:</b>	0	15	36	74
<b>6-year graduation rate:</b>	28%	28%	29%	30%

**Table 5**

Table 6 shows that a minimally statistically significant improvement to the retention rate of students applied in each of the first three semesters of the cohort moves the six-year graduation rate up one percentage point to 29%.

A ten percentage point improvement in retention in each of the first three semesters of the cohort moves the six-year graduation rate up four percentage points to 32%.

**1st, 2nd and 3rd semester interventions targeting first-time, full-time students**

Outcome goal: improve six-year graduation rate

Fall 2010 cohort: 2,818

*Intervention: improve retention to 2nd, 3rd and 4th semesters*

Intervention:	Status Quo	Minimum Statistically Significant Increase each Semester	5 Percentage Point improvement 1st semester & 5 pp more for 2nd & 3rd	10 Percentage Point improvement 1st semester & 10 pp more for 2nd & 3rd
<b>Number returned 2nd semester:</b>	2,283	2,340	2,424	2,565
<b>Return rate to 2nd semester:</b>	81%	83%	86%	91%
<b>Number returned 3rd semester:</b>	1,867	1,951	2,069	2,286
<b>Return rate to 3rd semester:</b>	77%	79%	82%	87%
<b>Number returned 4th semester:</b>	1,535	1,637	1,768	2,033
<b>Return rate to 4th semester:</b>	76%	79%	81%	86%
<b>Increased # of grads:</b>	0	27	62	132
<b>6-year graduation rate:</b>	28%	29%	30%	32%

**Table 6**

*Impact of changing the rate at which students move to part-time*

In Tables 2 and 3 the reader could see that part-time students are less likely to return or graduate than full-time students. We can change variables in the model to test whether a slowdown in the rate at which students move from full-time to part-time affects graduation.

The actual numbers for the first-time, full-time cohort of fall 2010 are shown in Table 7. Going from fall 2010, when all 2,818 students in the cohort began as full-time (by selection), 31% (703) changed to part-time in the spring 2011 semester. For the fall 2011 semester 20% (267) of the spring 2011 full-time students changed to part-time, but this was mostly offset by 208 who changed from part-time back to full-time, netting to a 4% change (as a percentage of spring 2011 full-timers) or 59 students.

Table 1 shows that by spring 2013 (the sixth semester) a cohort that began as all full-time has more part-time than full-time students attending. Table 7 shows the conversion rates that made that happen.

	Fall 2010	Sp 2011	Fall 2011	Sp 2012	Fall 2012	Sp 2013	Fall 2013	Sp 2014	Fall 2014	Sp 2015	Fall 2015	Sp 2016
<b>Full-time enrollment</b>	2,818	1,580	1,302	1,012	671	404	387	150	101	66	46	34
<b>Part-timers who were full-time</b>		703	267	236	208	183	108	94	48	26	14	15
<b>Rate of conversion of full-time (less those who graduated or left) in last semester to part-time</b>		<b>31%</b>	20%	22%	29%	38%	27%	49%	51%	42%	42%	50%
<b>Part-timers who were full-time less part-timers now full-time (net)</b>		703	59	125	113	122	52	56	20	3	5	7
<b>Net rate of conversion of full-time (less those who graduated or left) in last semester to part-time</b>		<b>31%</b>	4%	12%	16%	25%	13%	29%	21%	5%	15%	23%

Table 7

In Table 8 we show what happens when we cut the full-time to part-time conversion rate in half for every semester (assuming that students who would have been part-time behave in terms of graduation and retention the same as full-time students simply by making them take a higher number of credits). Putting these numbers in the model we find that after six years 95 more students graduate, raising the six-year graduation rate to 31%. This makes cutting the full-time to part-time conversion rate in half is roughly equivalent to a three-semester retention program that improves retention by eight percentage points.

	Fall 2010	Sp 2011	Fall 2011	Sp 2012	Fall 2012	Sp 2013	Fall 2013	Sp 2014	Fall 2014	Sp 2015	Fall 2015	Sp 2016
<b>Full-time enrollment</b>	2,818	1,932	1,594	1,298	909	612	603	267	174	110	68	51
<b>Part-timers who were full-time</b>		352	163	144	133	124	82	73	43	22	12	11
<b>Rate of conversion of full-time (less those who graduated or left) in last semester to part-time</b>		<b>15%</b>	10%	11%	15%	19%	13%	25%	25%	21%	21%	25%
<b>Part-timers who were full-time less part-timers now full-time (net)</b>		352	59	77	72	82	42	44	20	3	4	4
<b>Net rate of conversion of full-time (less those who graduated or left) in last semester to part-time</b>		<b>15%</b>	4%	6%	8%	13%	7%	15%	12%	3%	7%	9%

Table 8

We can also evaluate combinations of efforts. A program that boosts retention ten percentage points in each of the first three cohort semesters and which cuts the conversion of full-timers to part-timers in half in all 12 semesters adds 258 graduates and raises the six-year graduation rate to 37%.

Note also that any initiative that works with a portion of the students in a cohort has only that portion of an impact. An initiative that works with 300 students out of this cohort of 2,818, would have less than an 11% impact as described above. A one-semester retention program for 300 students that improved first-semester retention by ten percentage points (as in Table 4) would add only three students to the graduation rolls.