

Data Brief

Knowledge to Work Lord Fairfax Community College

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January 3, 2018

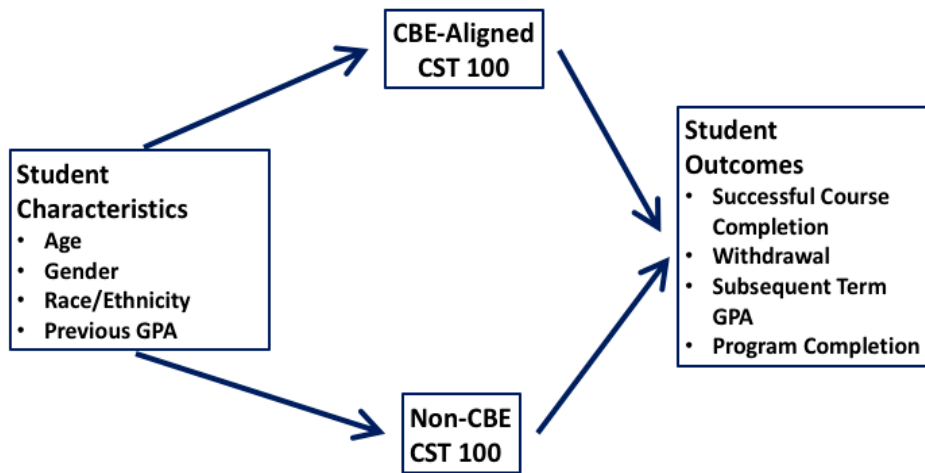
Introduction

This short report summarizes demographic and short-term outcomes for fall 2016 students enrolled in a competency-based education (CBE) course and compares these statistics to students enrolled in traditional (non-CBE) courses. Fall 2016 marked the first term that course-based CBE was offered at the College; prior to that time, CBE students were enrolled in direct assessment CBE. The outcome data depicted below are of a short-term nature because of the short time that elapsed between course enrollments in fall 2016 and data made available by the college one term later, spring 2017. It should be noted also that students were not selected for this study based on a common entry point to the College; rather they were included in this study because they enrolled in a common course but for which the instructional technique differed (CBE instruction versus non-CBE instruction).

The largest number of students in any CBE-aligned course in fall 2016 was CST 100, Principles of Public Speaking. Forty-three (43) students were enrolled in CST 100 CBE sections. A small number of students were also enrolled in other CBE-aligned courses that term, but these numbers were very small ($n = 3, 5, 1,$ and 7) and inadequate to develop a comparison group with the size necessary to make solid conclusions. A decision was made therefore to only use CBE-aligned CST 100 students as the intervention (or treatment) group and to use all other non-CBE sections of CST 100 as the comparison (control) group. According to LFCC staff, students did not self-select into either CBE-aligned or non-CBE sections of CST 100. It is not likely therefore that selection bias is a major factor when comparing differences between groups.

A propensity analysis was also performed to test whether CBE-aligned courses result in true differences in short-term outcomes. Propensity score matching is a statistical technique employed when random assignment to intervention or treatment (CBE-aligned classes) and control or comparison (non-CBE classes) is not possible. It seeks to match students in the intervention group with students in the comparison group based on each student's propensity score. The effect is to control for one or more variables that could influence outcomes so that any differences in short-term outcomes detected are more likely to result from participation in CBE versus non-CBE classes. Figure 1 illustrates the relationship between student characteristics selected for analysis and short term-outcomes.

Figure 1. Student Characteristics and Outcomes



Student Descriptive Statistics

The statistics presented below describe those student characteristics present in the initial groups as used in the Propensity Analysis as covariates.

Comparison of Initial Groups						
	CBE Students (n=43)			Non-CBE Students (n=317)		
<i>Ordinal Data</i>	<i>Minimum</i>	<i>Maximum</i>	<i>Mean</i>	<i>Minimum</i>	<i>Maximum</i>	<i>Mean</i>
Age	17	60	23.8	17	51	22.5
Previous GPA (Spring 2016 Cumulative GPA)	0.00	4.00	3.22	0.00	4.00	2.98
<i>Categorical Data</i>		<i>Yes</i>	<i>No</i>		<i>Yes</i>	<i>No</i>
Female		21	22		184	134
Minority Status		10	33		78	240

Short-Term Outcomes and Propensity Analysis

Analysis of short-term outcomes in this data brief is intended to shed light on whether the CBE-enabled courses made a difference during the term they were offered and immediately afterward. These variables include Subsequent Term GPA (Spring 2017), Passed CST 100 with a grade of C or Better, CST 100 Course Withdrawal, and Program Completion. Of these outcomes, it should be noted that students who were far along in their academic career at LFCC were most likely to complete by fall 2017, irrespective perhaps of enrollment in either CBE-aligned or non-CBE sections of Principles of Public Speaking. To test for true differences between instructional modes, Propensity Analysis was used.

Propensity Analysis is increasingly used in research to overcome the lack of random

assignment of students into intervention (treatment) and comparison (control) groups (see, for example, Rosenbaum & Rubin, 1983 and Daniel Ho; Kosuke, King; and Stuart , 2007). Propensity Analysis uses pretreatment variables that are believed to be related to differences in the dependent variable(s). The effect of the program is estimated by matching students who participated in the intervention with the comparison group (Harder, Stuart, & Anthony, 2010). PA removes bias due to all observed covariates across groups and is efficacious even with small sample sizes (Holmes and Olsen, 2010) report that PSA is efficacious even with small sample sizes. Because random assignment was not a possibility in this study Propensity Analysis was used.

Students were selected from the intervention and comparison groups and matched on age, previous GPA, gender and race/ethnicity (see Figure 1) utilizing the MatchIt package in R statistical software using nearest-neighbor 1-to-1 matching. Because of missing data in both groups, chiefly in cumulative GPA (from the previous spring term), the intervention group and comparison group were narrowed to 33 students. Table 2 depicts describes short-term outcomes between groups but does not provide a total picture of how the data elements in Figure 1 might interact to produce those outcomes.

CBE Status	Passed Course with C or Better	Withdrew	Subsequent Term GPA	Finished Program at End of Fall 2017
Enrolled in CBE-Aligned Course	27 (81.8%)	2 (4.2%)	2.65	17 (51.5%)
Not Enrolled in CBE Course	31 (93.9%)	2 (95.8%)	2.66	14 (42.4%)

The next step in the propensity analysis is to consider the influence of student characteristics, instructional technique (CBE-aligned and non-CBE), on short-term student outcomes. The technique selected for three of the four short-term outcomes in Table 2 is a Chi Square test, a statistical test appropriate for categorical level data. The results of testing whether enrollment in CBE-aligned CST 100 (no=0 and yes=1) are shown below. A second technique, an independent sample t-test, was used to test for relationships between CBE enrollment and the interval level data represented by subsequent term grade-point average.

Passed Course with C or Better

A Chi-square test of independence was calculated comparing enrollment in CBE-aligned Principle of Speech courses and the frequency of passing with a grade of C or better. The result was: X-squared = 1.2802, df = 1, p-value = 0.2579. There is no statistically significant relationship between passing and enrollment in CBE-aligned CST 100.

Withdrawal

A Chi-square test of independence was calculated comparing enrollment in CBE-aligned Principle of Speech courses and the frequency of withdrawal. The result was: $X^2 = 0$, $df = 1$, p -value = 1. Table 2 reveals no differences in matched pairs in withdrawal rates, accounting for the lack of variance in the resulting independence test. There is no statistically significant relationship between withdrawal and enrollment in CBE-aligned CST 100.

Subsequent Term GPA

A t-test for independence was calculated comparing enrollment in CBE-aligned Principle of Speech courses and subsequent (spring 2017) term grade point average: The result was: $t = 0.030001$, $df = 63.863$, p -value = 0.5119. There is no statistically significant relationship between subsequent term grade-point average and enrollment in CBE-aligned CST 100.

Program Completion

A Chi-square test of independence was calculated comparing enrollment in CBE-aligned Principle of Speech courses and the frequency of finishing a program by fall 2017. The result was: $X^2 = 0.24332$, $df = 1$, p -value = 0.6218.

Summary

The results of the Propensity Analysis should not be over-interpreted, especially to say that there is no causal effect short-term variables between CBE-aligned selected for analysis and non-CBE. More work is needed—especially to learn more about the techniques employed in CBE-aligned Principles of Public Speaking—to determine how instructional practice varies between CBE-aligned instruction and those courses deemed non-CBE.

References

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- Rosenbaum, P. R., & Rubin, D. B. (1983). The central role of the propensity score in observational studies for causal effects. *Biometrika*, 70(1), 41-55.

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