Abstract Title Page
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Title: A Random Assignment Evaluation of Learning Communities Seven Years Later: Impacts on Education and Earnings Outcomes

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Abstract Body
Limit 4 pages single-spaced.

Background / Context:
Empirical evidence confirms that increased education is positively associated with higher earnings across a wide spectrum of fields and student demographics (Barrow & Rouse, 2005; Card, 2001; Carneiro, Heckman, & Vytlacil, 2011; Dadgar & Weiss, 2012; Dynarski, 2008; Jacobson & Mokher, 2009; Jepsen, Troske, & Coomes, 2009; Kane & Rouse, 1995; Marcotte, 2004). College degree holders earn higher salaries and experience unemployment less frequently than those who do not have college degrees (Dadgar & Weiss, 2012), and those who attended college, regardless of degree receipt, report higher rates of job satisfaction, promotion opportunities, increased work responsibilities, and improved work performance (Hoachlander, Sikora, & Horn, 2003).

For many low-income students, the pathway to higher education and increased earnings begins in community colleges, which currently enroll about one-third of American degree-seekers (Digest of Education Statistics, 2012). However, community college students' persistence and completion rates leave much room for improvement. Among students beginning at public two-year colleges, fewer than half earn a credential or transfer to a four-year institution within six years after their initial enrollment (Radford, Berkner, Wheeless, & Shepherd, 2010). Many community college students stop or drop out long before graduation day, losing out on the full complement of higher earnings and employment outcomes associated with higher education.

One factor contributing to these low success rates is the fact that many students arrive on campus only to find that they are required to take non-credit-bearing courses, called "developmental" or "remedial" education courses, prior to enrolling in college-level courses (Duke & Strawn, 2008). One estimate of the prevalence of students required to complete developmental coursework suggests that among students whose first institution attended was a community college, around 60 percent took a remedial course at a postsecondary institution (Adelman, 2004; Bailey, Jeong, & Cho, 2009). Unsurprisingly, degree or certificate attainment rates among students who need developmental education are even lower than those of the general population (Attewell, Lavin, Domina, & Levey, 2006). Students in need of developmental education are not just failing to earn a credential – the majority never complete the developmental course sequence to which they are referred (Bailey 2009). One popular strategy aimed at addressing the issues of students referred to developmental courses (as well as students in college-level courses) is called "learning communities," or LCs.

The LC evaluated in this study produced positive short-term impacts on academic outcomes including credits attempted and credits earned and students' progression through the developmental reading sequence of courses. Given these positive results, similar learning communities for developmental reading and math students in community colleges were replicated and evaluated at five other schools.

Purpose / Objective / Research Question / Focus of Study:
Although LCs have been popular for decades, there have been few experimental tests of their efficacy. A variety of studies have looked at LC students' outcomes compared to a constructed comparison group, but generally, comparisons were made between students who were in learning communities and those who were not, despite the fact that students typically self-select into learning communities and are not directly equivalent. The first large sample random assignment evaluation of learning communities was conducted by MDRC in 2003-2005

to evaluate the effectiveness of Kingsborough Community College's (KCC) learning communities program. The primary objective of this study is to estimate the causal effect of the opportunity to participate in a learning communities program at KCC. Program effects are estimated for academic (credit accumulation and degree completion) and economic (employment and earnings) indicators.

Setting:
Kingsborough Community College, located in Brooklyn, New York, is part of The City University of New York (CUNY) system, the largest urban public university system in the country. KCC is has about 18,000 students, of whom about 75% receive financial aid. KCC offers a one-semester learning community in which all courses are linked together.

Population / Participants / Subjects:
The study randomly assigned over 1,500 students to either a program group, which had the opportunity to participate in the Opening Doors Learning Community, or a control group, which could enroll in the colleges' usual unlinked courses. More than two-thirds of the sample required developmental English at the start of the study (and the learning communities to which they were assigned included a developmental English course as one of the linked courses).

Intervention / Program / Practice:
Learning communities involve the *co-enrollment* of a cohort of students into two or more courses. Typically, the *curricula* of these courses are intentionally linked or integrated, sometimes around a theme. For example, a learning community with an overarching theme and title called "Poverty and Inequality" might link a developmental English course and a college-level sociology course. The courses could require that students learn various elements of essay writing and argumentative rhetoric in their English course and then use those techniques to write a paper in their sociology course, exploring the relationship between income status and race. Learning communities tend to require *faculty collaboration*, which enables teachers to communicate about their shared students and to integrate the curriculum across courses through, for example, joint assignments and readings. Some definitions of learning communities also include a *pedagogical* component, usually focusing on "active engagement," "active pedagogy," and/or "collaborative learning." Notably, it is not always clear how the preferred pedagogical techniques of learning communities are different from what many consider good pedagogy more broadly. Finally, some learning communities include add-on *student supports*, like enhanced counseling, tutoring, or other student services (Minkler, 2002; Richburg-Hayes, Visher, & Bloom, 2008; Smith, 2001; Smith et al., 2004).

By co-enrolling students into two or more courses, learning communities are intended to foster stronger connections among students (Smith et al., 2004). Through sustained academic relationships among students and faculty, students are expected to feel more integrated into a community of peers and college life, leading to a greater level of commitment. In addition, integrating course materials may help students understand connections between disciplines and between what they are learning in school and their personal lives, and in doing so, engage students more deeply in learning. Curricular integration may be particularly effective when a developmental-level course and college-level course are paired in a learning community since this allows students to use the basic skills being taught in developmental classes in their college-level coursework. Broadly speaking, learning communities are theorized to lead to improved

academic outcomes by fostering stronger connections among students and between students and faculty, integrating students into campus life, and providing a more engaging academic environment. This is hypothesized to improve students' academic attainment and increase their likelihood of persisting in school.

Research Design:
This study uses a random assignment research design. Random assignment creates two groups of students that are similar in characteristics that can be measured, such as age and gender, and in those that are more difficult to measure, such as tenacity and motivation. As a result, subsequent differences in outcomes (for example, credit accumulation) can be attributed with a high level of confidence to the program. The random assignment procedure and process was designed and controlled by the researchers.

Data Collection and Analysis:
This study tracked students for seven years, the longest follow-up period of a learning communities evaluation. The study gathered data from a number of sources to track students' academic outcomes. The primary data sources for academic outcomes were transcript data from CUNY and degree data provided by the National Student Clearinghouse and are based on data from all colleges that report to the Clearinghouse – more than 96% of American colleges and universities. To track employment and earnings, we analyzed individual-level employment records and aggregate earnings data from the New York State Department of Labor Unemployment Insurance Data.

Findings / Results:
- **Increase in enrollment.** Program group students enrolled in higher rates than control group students in 8 of the 28 terms (including winter and summer sessions) tracked during the study. For example, during the first-year winter session, 60.0 percent of program group members enrolled compared to 54.5 percent of control group members, an estimated impact of 5.5 percentage points (*p=.03*). See Figure 1.
- **Increase in credits earned**. Program group students earned an estimated 4.0 additional credits over seven years, a 7.5 percent increase (*p=.09)*. See Table 1.
- **Possible increase in graduation rates**. Although not statistically significant, program group students' graduation rate was 3.3 percentage points higher than that of control group students: 39.5 percent graduated, compared to only 36.2 percent of control group students. This positive estimate, which follows positive estimates in each of the preceding four years, is encouraging for an intervention of such a short duration, but the estimated effect on graduation is only on the borderline of what is sometimes conventionally viewed as statistically significant in year six (*p=.1)*. See Table 1.
- **Underpowered to detect meaningful effects on earnings**. Although this study was not designed to be powered to detect effects on employment and earnings, as one of the largest scale experiments in higher education history, it provides a unique opportunity to reflect on the possibility of connecting higher education interventions to effects on employment and earnings. Although not statistically significant, the program's estimated effect on average earnings is over $1,000 during years six and seven. The estimated effect represents an increase of around 8 percent over the control group's base of $12,700 in year six and $14,700 in year seven. Despite its large sample size, this experiment is not

sufficiently powered to detect an effect of $1,000. The authors find that an adequately powered study of an educational program's impact on employment and earnings would require an extraordinarily large sample size or effect size to find impacts (under certain assumptions – see conclusion section below).

Conclusions:

Our conclusions fall into two categories: first, we offer some lessons learned regarding designing a higher education evaluation of an intervention intended to improve future earnings. Second, we offer some thought regarding learning communities.

The authors find that this study, despite its large sample size among higher education evaluations, is underpowered to estimate impacts on employment and earnings. To offer insight into designing evaluations of college programs aimed at improving economic outcomes, Table 2 presents scenarios that one might encounter in an evaluation and calculates the minimum detectable effect (MDE) required to find a statistically significant impact on earnings.

The first row of the first panel in Table 2 parallels our study, where n is around 1,500, the MDE is around $2,874, and the estimated degree effect is 3.3 percentage points. *If effects on earnings derive solely from effects on earning a degree*, then the first row shows that the required returns to a degree would need to be $87,878 in the seventh year, which constitutes a 592 percent increase over the average earnings in the control group.

The remainder of Table 2 depicts scenarios for a program whose effects on degree receipt are larger than those estimated in this study (5, 10, 15, and 20 percentage points) along with a scenario where a study includes 10,000 sample members. With a sample size of 1,500, even a 20 percentage point effect on degree receipt would require the returns to a degree to be $14,370, or 98 percent, for the study to be adequately powered. In fact, even in an evaluation with 10,000 students where an intervention increases degree receipt by 20 percentage points, the return to a degree would have to be $5,565, or 38 percent, in order for the study to be adequately powered – this remains well above current estimates of the average returns to an associate's degree.

The information provided in Table 2 suggests that if a college programs' effects on earnings arise through effects on degrees alone, then identifying the causal effect of an educational intervention on earnings is probably more difficult than generally acknowledged.

As noted above, the promising short-term outcomes for this program led to a five-college replication of learning communities for students in developmental education classes. The colleges hoped that KCC's positive outcomes would be replicated at their own schools. However, the evaluations of these five learning communities programs suggest that the findings discussed here may be a bit of an outlier. While the aggregate effects for the five schools were positive on measures such as enrollment and credits earned, the results were quite modest, with multiple schools showing no impacts whatsoever. The importance of replication cannot be understated: learning communities may produce positive student outcomes in one location but no impacts in another, and are not the panacea for low community college graduation rates some might hope them to be.

Appendices
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Appendix A. References
References are to be in APA version 6 format.

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Appendix B. Tables and Figures
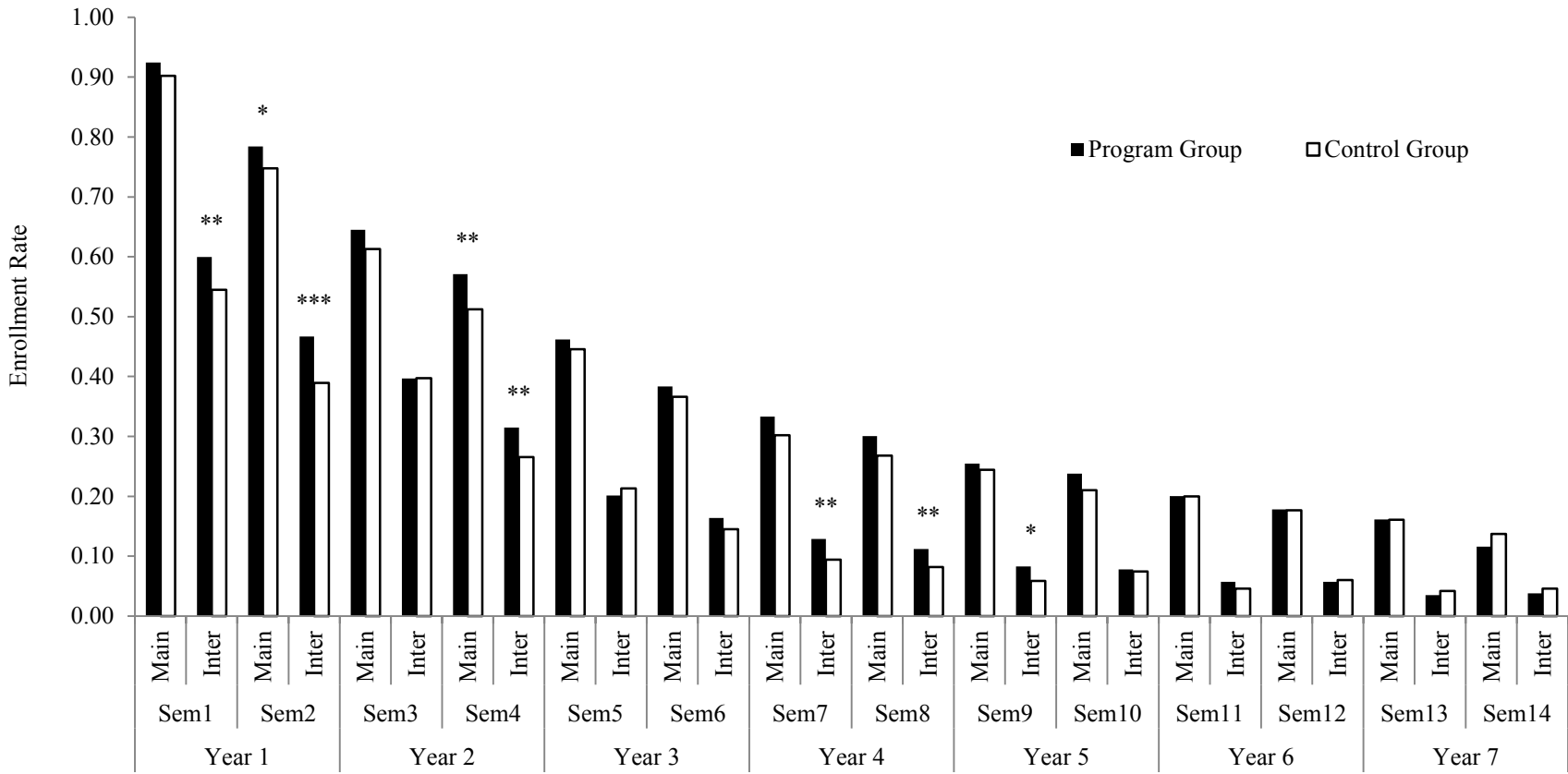*Not included in page count.*

Figure 1. CUNY Enrollment in Main Sessions and Intersessions.
Table 1. Academic Outcomes, Years One Through Seven.
Table 2. Necessary Returns-to-Degree, Assuming Earnings Effects Only Through Degree
Receipt.

Figure 1. CUNY Enrollment in Main Sessions and Intersessions

Sources: Calculations from CUNY Institutional Research Database (IRDB).

Notes: Estimates are adjusted by research cohort. Cluster-robust standard errors are used when calculating p-values – students are clustered by learning community link.

A two-tailed test was applied to impact estimates. Statistical significance levels are indicated as: *** p < .01; ** p < .05; * p < .10.

Table 1. Academic Outcomes, Years One Through Seven

Outcome	Program Group	Control Group	Estimated Effect	p-value
Cumulative credits attempted (at CUNY)				
Year 1	28.3	26.9	1.4	0.024
Year 2	47.4	44.6	2.7	0.024
Year 3	58.8	55.8	3.0	0.071
Year 4	67.1	63.1	4.1	0.045
Year 5	73.4	68.7	4.7	0.041
Year 6	77.9	73.0	4.8	0.054
Year 7	80.9	76.4	4.6	0.087
Cumulative credits earned (at CUNY)				
Year 1	20.3	18.2	2.1	0.002
Year 2	33.9	31.1	2.8	0.020
Year 3	42.0	39.4	2.6	0.098
Year 4	48.1	44.8	3.4	0.076
Year 5	52.8	49.0	3.7	0.074
Year 6	56.3	52.3	4.0	0.078
Year 7	58.8	54.7	4.0	0.092
Earned a degree (at any college) (%)				
Year 1	0.0	0.0	0.0	
Year 2	6.1	5.4	0.8	0.615
Year 3	20.2	17.0	3.2	0.202
Year 4	26.5	23.8	2.7	0.302
Year 5	31.9	28.4	3.5	0.210
Year 6	35.9	31.5	4.4	0.104
Year 7	39.5	36.2	3.3	0.236
Highest degree earned by Year 7 (%)[a]				
Bachelor's degree or higher	16.5	14.8	1.7	0.404
Associate's degree	22.2	20.5	1.7	0.434
Sample size (total = 1,534)	769	765		

Sources: Calculations from CUNY Institutional Research Database (IRDB) and National Student Clearinghouse data.

Notes: Rounding may cause slight discrepancies in sums and differences.

Estimates are adjusted by research cohort.

Cluster-robust standard errors are used when calculating p-values – students are clustered by learning community link.

A two-tailed test was applied to differences between research groups.

Cumulative credits include both college-level and developmental credits. Values of zero credits attempted/earned have been imputed for 9 students for whom CUNY data were unavailable.

[a]Percentage who earned bachelor's degree or higher and percentage who earned associate's degree do not add up to total because the degree type of some degree-earners was unknown.

Table 2. Necessary Returns-to-Degree, Assuming Earnings Effects Only Through Degree Receipt

Sample Size and MDE	Hypothetical Degree Effect (percentage points)	Necessary Returns-to-degree ($)	Necessary Returns-to-degree (%)
n = 1,500	**3.3**	87,091	592%
MDE = $2874	**5.0**	57,480	391%
	10.0	28,740	196%
	15.0	19,160	130%
	20.0	14,370	98%
n = 10,000	**3.3**	33,727	229%
MDE = $1113	**5.0**	22,260	151%
	10.0	11,130	76%
	15.0	7,420	50%
	20.0	5,565	38%

Notes: MDEs assume power is 80 percent, the significance level is 5 percent, and the standard deviation of the earnings outcome is $19,880.