Abstract Title Page
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Title: The Impact of the Early College High School Model on Core 9th and 10th Grade Student Outcomes

Author(s): Julie A. Edmunds, SERVE Center at UNCG*; jedmunds@serve.org

Lawrence Bernstein, RTI; lbernstein@rti.org

Fatih Unlu, Abt Associates; funlu@abtassoc.com

Elizabeth Glennie, RTI; eglennie@rti.org

Nina Arshavsky, SERVE Center at UNCG; narshavs@serve.org

Abstract Body

Limit 5 pages single spaced.

Background / Context:

Description of prior research and its intellectual context.

To address concerns about low graduation rates and a lack of workforce readiness, states and districts have been experimenting with different models of high school reform. One of the most popular models has been the Early College High School (ECHS) model, small schools that blur the line between high school and college. Since 2002, over 200 ECHSs have been created under the auspices of the Early College High School Initiative, which is primarily funded by the Bill & Melinda Gates Foundation. North Carolina has the largest concentration, with over 70 ECHSs across the state. Given the rapid expansion of this model, it is critical to understand if the model works and for whom it works.

Purpose / Objective / Research Question / Focus of Study:

Description of the focus of the research.

The purpose of this study is to rigorously examine the implementation and impact of the Early College High School model in North Carolina. This study is the first to utilize a longitudinal experimental design to assess the impact of the ECHS model on student outcomes. The study has three main goals:

- Determine the impact of the model on selected student outcomes;
- Determine the extent to which impacts differ by student characteristics; and
- Examine the implementation of the model by site and the extent to which variation in specific model components is associated with impacts.

The primary goal of the ECHS model is to increase the number of students who graduate from high school and who continue into and succeed in college. Figure 1 presents a conceptual framework showing the Design Principles of the Early College Model and the program's anticipated key intermediate and long-term outcomes. This model forms the basis for the study's questions on implementation and impact.

--Figure 1 about here--

For the purpose of this proposal, we will present core impact findings for students enrolled in the study from four cohorts of students (Pilot 1, Pilot 2, Cohort 1, and Cohort 2). At the 2010 SREE conference, we presented findings for 718 9th graders (Bernstein, et al., 2010) from Pilot 1, Pilot 2 and Cohort 1. For the upcoming conference, we will present 10th grade findings for this same sample of students as well as 9th grade impacts for an additional 1,044 students who were in Cohort 2 of the study. The specific research questions addressed in this paper include the following:

1. What is the impact of the ECHS model on students' enrollment and success in core college preparatory courses in 9th and 10th grade?
2. What is the impact of the ECHS model on students' behavior in 9th and 10th grades, including attendance and suspensions?
3. What is the impact of the ECHS model on students' persistence in school?
4. What is the impact of the ECHS model on students' college-going aspirations?
5. Do any of these impacts vary by whether students are low-income, the first in their family to go to college, or members of a racial/ethnical group underrepresented in college?

Setting:

Description of the research location.

Primarily located on the campuses of two- or four- year colleges and universities, ECHSs are expected to provide an academically rigorous course of study with the goal of ensuring that all students graduate with a high school diploma and two years of university transfer credit or an associate's degree. The schools in this study are located in districts throughout the state of North Carolina, in rural and urban settings, and with different student demographics.

Population / Participants / Subjects:

Description of the participants in the study: who, how many, key features or characteristics.

Nineteen ECHS in North Carolina are participating in the study. To be eligible for the study, schools had to have more applicants than they had slots and all had to agree to use a lottery to select students. Over the course of the study, we have continued to recruit schools and students through the 2010-2011 school year. Most of these schools agreed to provide multiple cohorts of students; for example, in one school, we will have four cohorts of 9th graders. Through the 2010-2011 school year, our sample will include an estimated total of 3,100 students in 33 cohorts in 19 sites.

Two schools had implemented lotteries prior to the study beginning. Pilot 1 used a lottery to decide who would be accepted among spring 2005 applicants, and Pilot 2 used a lottery to decide who would be accepted among spring 2006 students. After the study began, the research team conducted lotteries for Cohort 1 (spring 2007 applicants) and Cohort 2 (spring 2008 applicants).

The sample for the analyses reported in this paper includes a total of 676 treatment and control students in 10th grade[†] and an estimated 1,700 students in 9th grade. For each sample, we examine baseline characteristics of the treatment and control students to verify that there is a statistical balance between the two groups as predicted by the random assignment. Table 1 shows the 8th grade demographic characteristics of the 10th grade sample (Pilot 1, Pilot 2, and Cohort 1). As seen, the treatment and comparison group appear to be statistically comparable, except for three characteristics (retained in the past, and passing math and reading in the eighth grade). A similar table will be provided for the expanded 9th grade sample (that includes Cohort 2 students) in the final presentation.

For most analyses, students who are missing from the data are excluded from the analyses. An exception applies to the continuous enrollment outcome, which is explained in more depth in the outcomes section.

---Table 1 about here---

Intervention / Program / Practice:

Description of the intervention, program or practice, including details of administration and duration.

Small schools serving students in grades 9-12 or 13, Early College High Schools are designed to increase the number of students graduating from high school and better prepare those students for college and career. At the end of their four or five years of schooling, students are expected to graduate with a high school diploma and an associate's degree or two years of transferable college credit. In order for students to be able to accomplish this goal of substantial credit and a high school diploma, the ECHS must develop, in collaboration with their higher

[†] In general, students who are not enrolled in North Carolina public schools are excluded from all analyses, with the exception of the continuous enrollment outcome.

education partner, an aligned, seamless curriculum plan that provides the high school and college courses students need to take to complete both degrees and that avoids unnecessary duplication and/or omission of critical content.

Each ECHS is expected to implement and exhibit a specific set of principles, known as Design Principles, developed by the NCNSP. Those Design Principles, as articulated by the NCNSP and as shown in Figure 1, are as follows:

- Ensuring that students are ready for college;
- Instilling powerful teaching and learning in schools;
- Providing high student/staff personalization;
- Redefining professionalism; and
- Implementing a purposeful design (North Carolina New Schools Project, December, 2007).

Research Design:

Description of research design (e.g., qualitative case study, quasi-experimental design, secondary analysis, analytic essay, randomized field trial).

This study is based on a multi-site randomized field trial, supplemented by survey, interview and observational data collected on implementation. From a pool of eligible students, ECHSs enrolled students based on random assignment, and the study compares the students assigned to the treatment group (ECHS) with students assigned to the control group (traditional school). Each ECHS and the traditional high schools that enroll control group are considered a "site." Therefore, within the pool of applicants to each site, students are randomly assigned to attend an ECHS school or to "business as usual," generally the traditional high school in the district. As schools continued to add new 9th grade classes via random assignment each year, those students were added to the study sample; hence some sites have multiple cohorts of students.

With the exception of two pilot schools (their students are in Pilot 1 and Pilot 2) that conducted lotteries prior to the study beginning, all lotteries were conducted by the study team. Each student was assigned a random number and the list of students was ordered from lowest to highest. Schools admitted students in the order in which they appeared on the list. If requested by the school, the lottery was stratified to accommodate different needs. For example, one district required that there be proportional representation from each home high school attendance zone. For all students participating in the lottery, the odds of getting in were recorded and used to create student-level weights for the impact analyses.

Data Collection and Analysis:

Description of the methods for collecting and analyzing data.

The data used in the analyses come from administrative data, collected by the North Carolina Department of Public Instruction (NCDPI), and merged and de-identified by the North Carolina Education Research Center (NCERDC) at Duke University. The specific outcomes examined include the following:

- *College Preparatory Coursetaking and Success.* We examine outcomes for core college preparatory courses, including: English I, Algebra I, Geometry, Algebra II, Biology, and Civics and Economics. For each outcome, we present three measures. The first is whether the student took the course or not and serves as a measure of access. The second outcome is a traditional pass rate, the number of students who passed the test out of the number who took it. The final outcome, and the one we see as most important, is entitled success and collapses the first two measures. Success represents the number of students who took the course and passed the test. We report this outcome because more students are taking specific courses in

the treatment group than in the control group, making straight comparisons of pass rates (i.e., of course takers only) problematic.

- *Attendance:* Each school reports the number of days each student is present in school, broken out by whether the absence was excused or unexcused.
- *Student behavior*: Schools report students who have received short term suspensions and long term suspensions.
- *Dropout status:* When students drop out of school, they are expected to complete a form confirming they have dropped out. All students who are identified as having dropped out are coded as such by the school, and that information is submitted to NCDPI. These data are being cleaned and will be analyzed for the final presentation.
- *Continued enrollment in a North Carolina high school:* Because we have concerns about the completeness of the dropout dataset,[‡] we also look at continued enrollment in a North Carolina public school as an outcome. This outcome looks at the proportion of students from the original 9th grade sample still enrolled in a North Carolina school, and is the only outcome using the original sample size (including students missing in 10th grade) as a denominator, while the others exclude missing students.
- *Aspirations to attend a 4-year college or university.* In conjunction with each state-mandated test, students are asked to identify their future plans. This outcome is based on the proportion of students who indicated they intended to attend a 4-year college or university.

The impacts of ECHS on these outcomes are estimated within an Intent-To-Treat (ITT) framework, in which a student's initial experimental status as a treatment or control student, rather than actual participation in an ECHS, serves as our measure of treatment. We report unadjusted means for the two groups. We also report adjusted impacts using logistic regression to analyze binary outcomes (e.g., coursetaking, dropouts, etc.) and linear regression for continuous outcomes, such as days absent. In our regression-based models, we employ baseline student characteristics and site-level indicators (or site fixed effects) as covariates.

Findings / Results:

Description of the main findings with specific details.

Analysis of the 10th grade results shows that the patterns established in 9th grade and reported last year (Bernstein, et al., 2010), continue on through 10th grade. Table 2 shows the results from the sample of 9th grade students for whom we are reporting 10th grade results. The 9th grade analysis will be expanded to include results from an additional 1,000 students from the second study cohort. Table 3 includes results for core 10th grade outcomes for treatment and control students.

Impact on students' enrollment and success in core college preparatory courses in 9th and 10th grade: For all core college preparatory subjects, the proportion of ECHS students taking and progressing in the courses was higher than the proportion of the students in the control group, although not all differences were statistically significant. The statistically significant differences occurred primarily in math and science courses. In 9th grade statistically significantly more students enrolled and succeeded in at least one core college preparatory math course. In 10th grade, statistically significantly more students had taken Geometry (the impact on

[‡] Because the dropout data are collected separately from all other student data, only 70% of the students in the dropout dataset can be linked to other data sets. In addition, there are many students who are not recorded formally as dropouts but simply stop coming to school. Thus, not all students who drop out are accurately identified as such.

success rates was not statistically significant) and statistically significantly more students had both taken and succeeded in Algebra II and Biology. The pass rates for these courses were lower in the ECHS, although not statistically significantly so. The lower pass rates in the ECHS are not surprising given the much larger proportion of students taking the courses in the treatment group.

--Tables 2 and 3 about here--

Impact of the ECHS model on students' behavior in 9th and 10th grades, including attendance and suspensions: In both 9th and 10th grade, ECHS students had fewer unexcused absences, and statistically significantly lower suspension rates. There was no statistically significant difference for either grade in the number of excused absences. It should be noted that the 10th grade suspension and attendance data are currently based on a much smaller sample that only includes students from the first two pilot schools conducting lotteries prior to the beginning of the study. The final presentation will include results for the full sample of 10th graders, as well as results for the expanded sample of 9th graders.

Impact of the ECHS model on students' persistence in school: Results show that the proportion of students still enrolled in North Carolina public schools in 10th grade is statistically significantly higher in the ECHS than in the control group (adjusted impact of 4.2 percentage points, p=.0007). The dropout data are still being validated and will be incorporated into the final presentation.

Impact on students' college-going aspirations: There was no statistically significant difference in 9th grade students' aspirations to attend college; however, there was a statistically significant difference in 10th grade students' aspirations to attend college (adjusted impact of 10.7 percentage points, p=0.013*).

Impact by sub-group: Almost all of the impacts that were statistically significant above were also statistically significant when analyzed by subgroup. Table 4 shows whether the estimated impacts for a subgroup of students is statistically significantly different from the impact on the rest of the sample (e.g. the impact on students who are eligible for free/reduced price lunch vs. the impact on those that are not). These results show that the model generally had a higher (although not necessarily statistically significantly higher) impact on students who are members of target populations, particularly minority and low-income students. The statistically significantly higher impacts occurred primarily for low-income students in math courses.

--Table 4 about here--

Conclusions:

Description of conclusions, recommendations, and limitations based on findings.

Early results from this study show that the Early College High School model is having a positive impact on many outcomes associated with remaining in school and becoming ready for college. These results suggest that the ECHS is making substantial progress towards its goal of graduating more students who are ready for college and work. Although these findings are very positive, they are restricted to the model as implemented in North Carolina. Other early colleges around the country may not follow the same design principles and may not receive the same level of assistance in implementation as the schools in North Carolina; as a result, their results may differ.

Appendices

Not included in page count.

Appendix A. References

References are to be in APA version 6 format.

Bernstein, L., Yamaguchi, R., Unlu, F., Edmunds, J., Glennie, E., Willse, J., et al. (2010). Early Findings from the Implementation and Impact Study of Early College High School. *Paper presented at the national conference of the Society for Research on Educational Effectiveness.* Washington, DC.

North Carolina New Schools Project. (December, 2007). *Design Principles for High School Innovation Projects.* Raleigh, NC: Author.

Appendix B. Tables and Figures

Figure 1: Conceptual Framework of North Carolina's Learn and Earn Early College High School Model

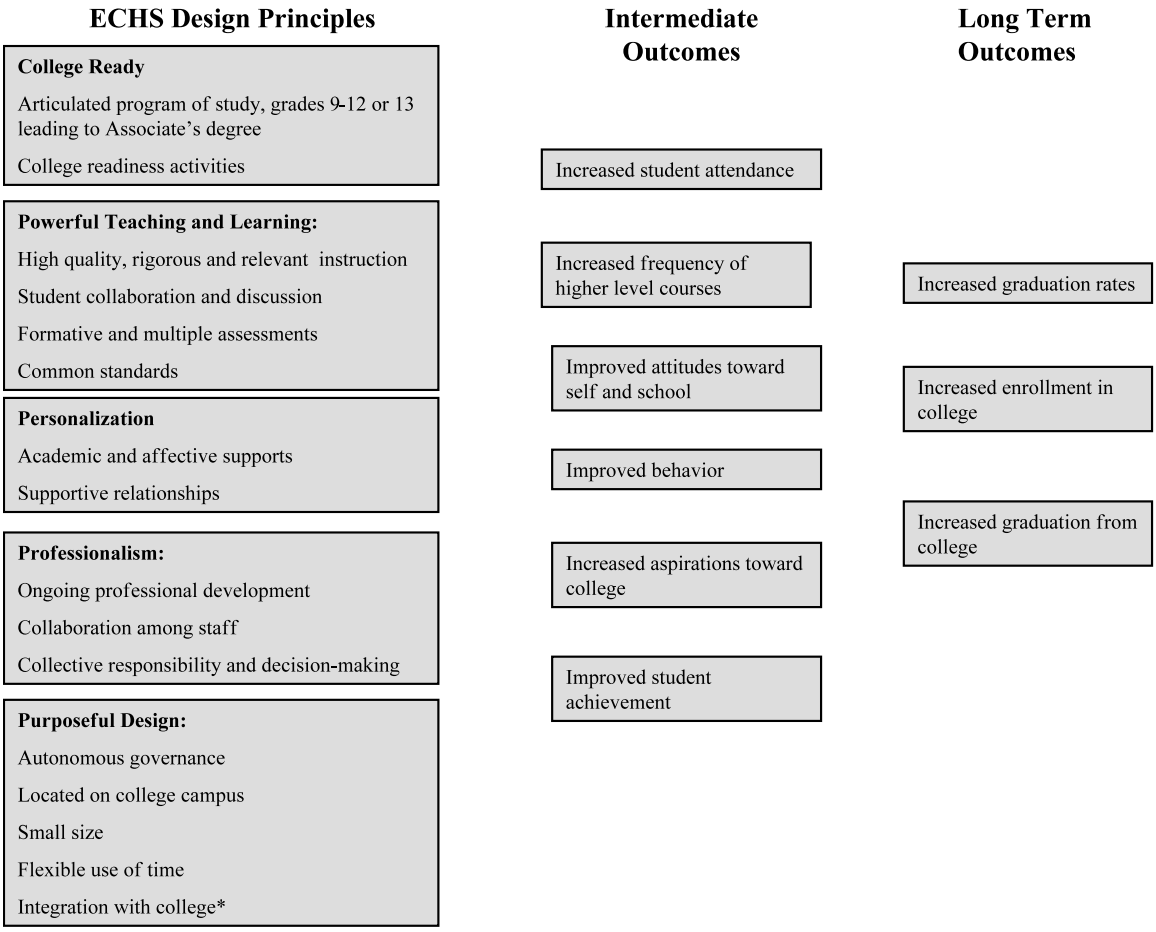

Table 1: Descriptive Statistics of the Sample for Cohort 1, Pilot 1 and 2

	Whole Sample (N=718)		ECHS Group (N=416)		Control Group (N=302)		T-C Difference	
	N	**Mean**	**N**	**Mean**	**N**	**Mean**	**Difference**	**P-Value**
Race & Ethnicity								
American Indian	718	0.56%	416	0.96%	302	0.00%	0.96%	0.088
Asian	718	1.25%	416	1.44%	302	0.99%	0.45%	0.594
Black	718	21.45%	416	21.63%	302	21.19%	0.44%	0.887
Hispanic	718	5.57%	416	5.77%	302	5.30%	0.47%	0.786
Multi racial	718	2.92%	416	2.40%	302	3.64%	-1.24%	0.332
White	718	68.25%	416	67.79%	302	68.87%	-1.09%	0.758
Gender								
Male	717	38.49%	415	38.07%	302	39.07%	-1.00%	0.786
Age	635	15.35	371	15.32	264	15.39	-0.07	0.086
Exceptionality								
Disabled/Impaired	687	3.78%	409	3.67%	278	3.96%	-0.29%	0.846
Gifted	701	11.98%	410	11.95%	291	12.03%	-0.08%	0.976
First Generation College	703	45.80%	406	43.84%	297	48.48%	-4.64%	0.223
Free/Reduced Price Lunch	705	44.40%	405	43.95%	300	45.00%	-1.05%	0.782
Retained	647	2.47%	377	0.80%	270	4.81%	-4.02%	0.001*
8th Grade Achievement								
Math – pass	691	81.91%	401	84.79%	290	77.93%	6.86%	0.021*
Reading – pass	689	97.82%	402	98.76%	287	96.52%	2.24%	0.047*
Algebra 1 – pass	182	97.25%	115	96.52%	67	98.51%	-1.99%	0.432

Notes: Statistically significant differences (at the $p<0.05$ level) are denoted by *.
This table will be updated with data from the Cohort 2 sample containing an additional 1,000 students.

Table 2: 9th Grade Outcomes: Unadjusted Group Means and Adjusted Impact Estimates for Cohort 1, and Pilot 1 and 2.

	Unadjusted Means (N=413)		Adjusted Impact (N=294)	
	ECHS	**Control**	**Estimate**	**P-Value**
Algebra I				
% Take-up	97.0	76.3	11.3	<0.001
% Pass (takers only)	83.4	88.1	-4.0	0.081
% Progress	80.9	67.3	6.4	0.080
English I				
% Take-up	95.8	92.9	1.4	0.190
% Pass (takers)	91.3	89.6	0.2	0.900
% Progress	87.4	83.3	1.3	0.569
College Prep. Math Course-taking				
% At least one course take-up	97.5	76.3	11.0	<0.001
% At least two courses take-up	38.6	22.7	10.2	0.005
% At least one course progress	82.6	67.3	7.9	0.030
% At least two courses progress	34.1	22.5	7.0	0.137
Attitudinal and Behavioral Outcomes				
Excused Absences (days)	2.9	2.9	-0.2	0.556
Unexcused Absences (days)	3.8	6.4	-1.5	0.029
% Suspended at least once	2.7	20.6	-12.9	<0.001
% Planning to attend 4 yr college	73.2	68.7	2.1	0.59

Note: This table will be updated with data from the Cohort 2 sample containing an additional 1,000 students.

Table 3: 10th Grade Outcomes: Unadjusted Group Means and Adjusted Impact Estimates for Cohort 1, and Pilot 1 and 2.

Outcomes		Unadjusted Means		Adjusted Impact	
		ECHS (N=399)	Control (N=277)	Estimate	P-Value
Algebra I	% Take-up	98.7	90	2.9	0.008*
	% Pass (takers)	84.3	84.4	-2.3	0.357
	% Progress	83.3	76	0	0.995
Geometry	% Take-up	84.4	67.1	16.2	<0.001*
	% Pass (takers)	84.3	88.5	-4.6	0.057
	% Progress	71.1	59.4	7.2	0.128
Algebra II	% Take-up	56	31	22.2	<0.001*
	% Pass (takers)	81.2	89.6	-5.8	0.178
	% Progress	45.4	27.8	9.9	0.009*
Civics and Economics	% Take-up	91.6	83.1	2	0.207
	% Pass (takers)	87.1	85.1	1.6	.498
	% Progress	79.8	70.8	3.5	0.292
English I	% Take-up	98.7	96	0.6	0.101
	% Pass (takers)	92	89.4	0.8	0.635
	% Progress	90.8	85.8	1.6	0.412
Biology	% Take-up	76.8	57.9	16.3	<0.001*
	% Pass (takers)	87.9	91.4	-3.3	0.077
	%Progress	67.5	52.9	10	0.033*
College Prep. Math Courses	%At least one course take-up	99	90	2.9	0.014*
	%At least two courses take-up	92	67.8	18	<0.001*
	% At least three courses take-up	48.1	30.4	14.7	0.002*
	% At least one course progress	88.2	77.6	4.3	0.070
	% At least two courses progress	72.9	57.9	7.3	0.109
	% At least three courses progress	38.7	27.8	5.3	0.205
Additional Outcomes	Continued Enrollment (%)	94	89	4.2	0.007*
	Excused Absences (days)[1]	2.9	3.1	-0.6	0.379
	Unexcused Absences (days)[1]	4.6	8.1	-3	0.074
	Suspensions (% suspended at least once)[1]	5.5	20.9	-9.6	0.006*
	% Planning to Attend 4 Yr College	75.8	61.9	10.7	0.013*

Notes: Statistically significant differences (at the $p<0.05$ level) are denoted by *.
[1]Absences and suspension data only include pilot 1 and pilot 2; they will include Cohort 1 students in the final presentation.

Table 4: 10th Grade Outcomes: Comparison of Subgroup Impacts

Outcomes		Minority (N=189) vs. Non-minority (N=487)		Firstgen (N=296) vs. Non-Firstgen (N=368)		Free Lunch (N=275) vs. Non-Free Lunch (N=385)	
		Diff	P-Val	Diff	P-Val	Diff	P-Val
Algebra I	% Take-up	4.3	0.246	4.5	0.063	5.4	0.12
	% Pass (takers)	-6.2	0.247	-6	0.276	-6.5	0.293
	% Progress	-6.5	0.324	-3.7	0.572	-6.8	0.355
Geometry	% Take-up	12.9	0.129	6.2	0.431	16.9	0.056
	% Pass (takers)	2.1	0.747	-2	0.707	6.4	0.32
	% Progress	16.6	0.111	3.4	0.719	9.2	0.353
Algebra II	% Take-up	8.9	0.311	-1.5	0.872	18	0.056
	% Pass (takers)	4.8	0.318	-6.8	0.411	12.5	0.129
	% Progress	4.1	0.588	-1.2	0.876	13	0.109
Civics and Economics	% Take-up	3.1	0.519	9.7	0.019	11.3	0.007*
	% Pass (takers)	2.7	0.723	-3.7	0.522	6.3	0.327
	% Progress	5.5	0.525	1.3	0.86	17.7	0.017*
English I	% Take-up	-0.7	0.332	1.9	0.115	0.4	0.346
	% Pass (takers)	2	0.655	1.5	0.698	-2.5	0.502
	% Progress	1.2	0.811	2.8	0.515	-0.6	0.886
Biology	% Take-up	13.7	0.132	11.9	0.16	22.3	0.015*
	% Pass (takers)	-0.5	0.93	1.3	0.721	3.1	0.584
	%Progress	14.6	0.172	10.7	0.25	23.1	0.015*
College Prep. Math Courses	%At least one course take-up	5.1	0.165	5.6	0.008*	1.6	0.448
	%At least two courses take-up	6.7	0.406	11.4	0.089	20.2	0.004*
	% At least three courses take-up	14.9	0.087	-2.4	0.792	15.7	0.081
	% At least one course progress	5.5	0.37	2.3	0.674	4.2	0.481
	% At least two courses progress	12.7	0.266	0.5	0.957	5.2	0.594
	% At least three courses progress	7.4	0.387	-0.7	0.932	13.4	0.099
Additional Outcomes	Continued Enrollment (%)	-2.7	0.39	6.1	0.09	0.2	0.951
	Excused Absences (days)[1]	1.4	0.252	0.8	0.62	2.9	0.042*
	Unexcused Absences (days)[1]	0.5	0.831	1.8	0.566	-5	0.477
	Suspensions (% suspended at least once)[1]	-4.6	0.576	3.4	0.643	-7.4	0.36
	% Planning to Attend 4 Yr College	7.3	0.473	-24.4	0.005*	4.8	0.602

Notes: Statistically significant differences (at the $p<0.05$ level) are denoted by *.
[1]Only includes pilot 1 and pilot 2