Early Findings from the Implementation and Impact Study of Early College High School

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Proposal for Paper Presentation in Reform Initiatives Section

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Background and Context

Starting in 2002, the Bill & Melinda Gates Foundation, partnering with other funding agencies, created the Early College High School Initiative, which is leading to the widespread creation of ECHSs throughout the country. Over 200 ECHSs have been started since 2002. While there is little research to support the ECHS design (American Institutes for Research & SRI International, 2005; Jacobson, 2005), evaluations in Middle College programs suggest that middle colleges can increase the graduation rates and college attendance of low-performing students (Cullen, 1991; Houston, Beyers, & Danner, 1992). However, an experimental study of the Middle College model as implemented in Portland, Oregon found that the model had no impact on graduation or dropout rates (Dynarski, Gleason, Rangarajan, & Wood, 1998). With widespread creation of ECHS across the country, and in particular in North Carolina, there is a pressing need to understand whether ECHS works and for whom.

Purpose and Goals of Study

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 a first of its kind by utilizing longitudinal experimental design to assess impacts on student outcomes. 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.

The primary goal of the ECHS model is to increase the number of students who graduate from high school and who continue on and succeed in college. Therefore, the anticipated long-term outcomes for the program include increased high school graduation rates, increased enrollment in college, and increased graduation from college. To track progress toward those long-term outcomes, the conceptual framework identifies intermediate outcomes that are associated with continued enrollment in high school and enrollment in and success in college. These intermediate outcomes include student attendance (Lee & Burkam, 2003), higher-level course-taking (Adelman, 1999; Lee & Burkam, 2003), student attitudes toward self and school (House, 1993; Lan & Lanthier, 2003), student behavior in school (Lee & Burkam, 2003), student aspirations toward college, and student achievement. The intermediate and long-term outcomes form the basis for the impact questions in the Study of the Efficacy of North Carolina's Learn and Earn Early College High School Model.

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 specific model components are associated with positive impacts by site.

For the purpose of this paper presentation proposal, we present early findings from the first cohort of students in our study. We will be updating our analyses to include the most up-to-date data for the SREE conference. Here, we present findings based on implementation and impact of the ECHS model on students' attitudes, behaviors, and engagement based on Student Opinion Survey data from one year of data (2008), and impacts on students' course-taking and course-progression patterns in the ninth grade using three years of data (2006-2008).

Setting

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. ECHSs are intended to make a priority of serving students who are typically under-represented in the college-going population, such as students who are first generation college-going, students from low-income families, those who are members of a minority group and those who have met with failure in conventional schools. During the 2007-08 school year, 42 ECHSs were open for students in North Carolina. Of those 42, four are partnered with a University of North Carolina constituent institution, 37 are partnered with a community college, and one school is partnered with a virtual college partner. Currently, there are approximately 70 ECHS in North Carolina.

Subjects

Twenty one ECHSs are in our study. We have been recruiting ECHSs to participate in the study since the 2006-2007 school year. We recruited 2 ECHSs for our pilot study in 2006, with 4, 6, and 9 new schools recruited in the 2007, 2008, and 2009 school years. Most of these schools agreed to provide multiple cohorts of students; for example, in one school, we will have four cohorts of 9th graders. Therefore, by the end of this study, we anticipate on having approximately 4,000 students. Table 1 presents an overview of the sampling design by school year. As seen in this table, by the end of the study (2010-2011), we will have three cohorts of 9th and 10th graders, 2 cohorts of 11th graders and a cohort of 12th graders.

The sample used to estimate the impact of ECHS on students' course taking and progression patterns comprises 718 ninth grade students who were randomly assigned to the ECHS or control group (416 treatments and 302 control) in 6 sites between 2006 and 2008. Table 2 shows the baseline characteristics of the full sample as a whole and by treatment/control status. While the majority of the students is Caucasian (68%), about 20% is African American and 10% of other ethnicities such as Hispanic, Asian, Native American, and multiracial. Approximately half (46%) of the sample is considered first-generation college bound, and 44% qualify for free or reduced-price lunch.

We also examined whether baseline characteristics of the treatment and control students were balanced, which should be the case for most characteristics because of random assignment. The last two columns in Table 2 show the treatment-control difference for each characteristic and the p-value corresponding to the test of statistical significance. As seen, the treatment and comparison group appear to be statistically equivalent, except for three characteristics (retained in the past, and passing math and reading in the eighth grade).

A sub-set of students in 9th grade in the spring of 2008 also took the Student Opinion Survey. We present impact results from 220 students (171 treatment and 49 control) in 4 schools completing their 9th grade year.

Intervention: Early College High School

The ECHS initiative is administered jointly by the North Carolina Department of Public Instruction (NCDPI) and the North Carolina New Schools Project (NCNSP), a non-profit school development organization established in 2003 by the Office of the Governor and the North

Carolina Education Cabinet with support from the Bill & Melinda Gates Foundation. The ECHS initiative is designed to improve high schools, to better prepare students for college and career, to create a seamless curriculum between high school and college, and to provide work-based learning experiences to students.

In order for students to be able to accomplish the goal of two years of college credit or an associates degree by the time they graduate from high school, the ECHS must develop, in collaboration with their higher education partner, an aligned, seamless curriculum plan that provides the high school and college courses that 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, 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

This study is based on a multi-site randomized field trial. From a pool of eligible students, ECHSs enrolled students based on random assignment, and the study compares the students who were assigned to the treatment group (ECHS) with students who were assigned to the control group (business as usual). We refer to each ECHS and business-as-usual schools that enroll control group students as a "site". Therefore, within each site, students are randomly selected to attend an ECHS school or another high school.[1] As schools continue to add new 9th grade classes via random assignment each year, those students are added to the study sample; hence some sites have multiple cohorts of students.

Data collection and analysis

Data used in impact analyses include: 1) 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; and 2) Student Opinion Survey data, administered by the study team, starting in 2008. We administer the survey to a subset of students who also have administrative data. Taken together, outcomes include attendance, course-taking patterns, aspirations, academic achievement, and school-leaving and dropout status. The impacts of ECHS on these outcomes are estimated within an Intent-To-Treat (ITT) framework, in which a student's experimental status as a treatment or control student, rather than actual participation in an ECHS, serves as our measure of treatment. We use multivariate binary choice models (e.g., logistic regression), hierarchical linear models (HLM, as necessary), and

[1] Other high schools can include traditional comprehensive high schools, charter schools, magnet schools, or private schools.

analysis of variance (ANOVA) to analyze the administrative and survey data. In our regression-based models, we employ baseline student characteristics and site indicators as covariates.[2]

Data on implementation are gathered by student and staff surveys, and qualitative site visits. The *student survey* (Student Opinion Survey) includes both questions about the student's school experience (instructional activities, support activities, college awareness activities, and expectations for students) as well as questions about short-term outcomes such as student-teacher relationships, and measures of student engagement. The *staff survey* asks about implementation of the design principles' indicators. Each participating school receives a *site visit* once over their four-year participation in the study. Each site visit includes a tour of the school, observations in two classes, and interviews with the principal, the college liaison, two staff members, two college faculty members, and a focus group of students. Implementation analyses will include qualitative analysis of the site visits, and conducting psychometric analyses to develop latent variables of implementation from the surveys.

Results

Impact Findings. As part of its accountability system, students are required to take End-of-Course exams following the completion of certain subjects including Algebra 1, English 1, and Geometry. Students must pass exams in Algebra 1 and English 1 to graduate. In this study, we identify those who have taken the course by whether they have taken the end-of-course exams (TAKEUP) and consider those who passed the exam to have progressed (PROGRESS). Utilizing administrative data, Table 3 shows the early impact results of ECHS on ninth grade course take-up (0 = no, 1 = yes) and course progress (0 = no, 1 = yes). Impact estimates are reported in marginal effects, which represent the difference in the average probabilities of the treatment and control groups taking-up or progressing in a course. In looking at course taking of students in ECHS versus the control group, we found a positive impact of ECHS in math courses, such as Algebra I and college-preparatory math courses (a composite that measures taking and progressing in Algebra I, Algebra II, and Geometry). Specifically, there is a 14 percentage point difference in Algebra I take-up between ECHS and control students, and a 10 percentage point difference in Algebra I progress. With college-preparatory math courses, there is an 11 percentage point difference that ECHS students would take at least one course, and a fourteen percentage point difference that ECHS students would take at least two courses than the control group students. There are no statistically significant differences in the English I and Geometry take-up and progression patterns of treatment and control students.

Utilizing survey data to augment outcomes data (performance on standardized statewide assessments) with measures of attitudinal and behavioral outcomes, the Student Opinion Survey includes 6 outcome subscales: English Language Arts Self-Efficacy (ELASE), Math Self-Efficacy (MSE), College Instructor Expectations (CEXP), High School Instructor Expectations (HSEXP), Behavior, and Schoolwork Engagement. Due to our smaller sample, we ran ANOVAs, though we anticipate regressions to control for the same covariates as in our analysis above. Our ANOVA findings include no statistically significant differences for MSE, and a small statistically significant effect on ELASE ($F_{1,371} = 6.34$, $p = .01$, partial $\eta^2 = .02$) favoring the control group, leading us to conclude that the ECHS has not yet produced a measurable effect

[2] Following Schochet (2008), these regressions do not include a school-level since this is student-level random assignment and we will not seek to generalize the results outside our sample.

on student perceptions of themselves as learners. Students in ECHSs do perceive higher teacher expectations ($F_{1,371} = 19.77$, $p < .01$, partial $\eta^2 = .05$) than did THS students, though these effect were small. The remaining constructs were found to have no statistically significant effects or detailed interactions that require more space to discuss.

Implementation Findings. Results show that the ECHS are implementing the design principles as intended and that many of these components are experienced at a much higher level by ECHS students as compared to students in the traditional high school. Table 4 shows statistically significant results for some key implementation scales on the Student Opinion Survey (2008). Highlights include higher staff-student relationships and student support activities for ECHS students compared to the students in traditional high schools.

Conclusions

This study represents a unique opportunity to investigate impacts of the early college high school model, a type of high school reform that focuses on intense college preparation particularly for first-generation college bound students. Highlighting early findings from both the impact and implementation results, we found that schools are implementing the Design Principals as intended, where students are reporting higher levels of support and interactions with school staff. According to the logic model, this should lead to higher course ECHS students have high expectations of college attendance and frequents college facilities. ECHS students also take more Algebra courses than the control group, indicating early positive impacts on ECHS. However, we are finding limited impacts on student's engagement, expectations, and attitudes towards school work.

We will update our analyses and results to include the 2009 Student Opinion Survey for the implementation and impact analyses, and controlling for the same students covariates and site indicators as the analyses using the administrative data.

Further, while these are early signs of promise in the ECHS model, we will also investigate the impacts of ECHS on other outcomes of interest, such as attendance, achievement, and motivations. The next phase in our analyses is to utilize the implementation data to understand associations between how well ECHS is implemented and how students achieve. Additional analyses will include understanding the relationship between implementation of ECHS and student outcomes.

Appendix A: References

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Appendix B: Figures and Tables

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

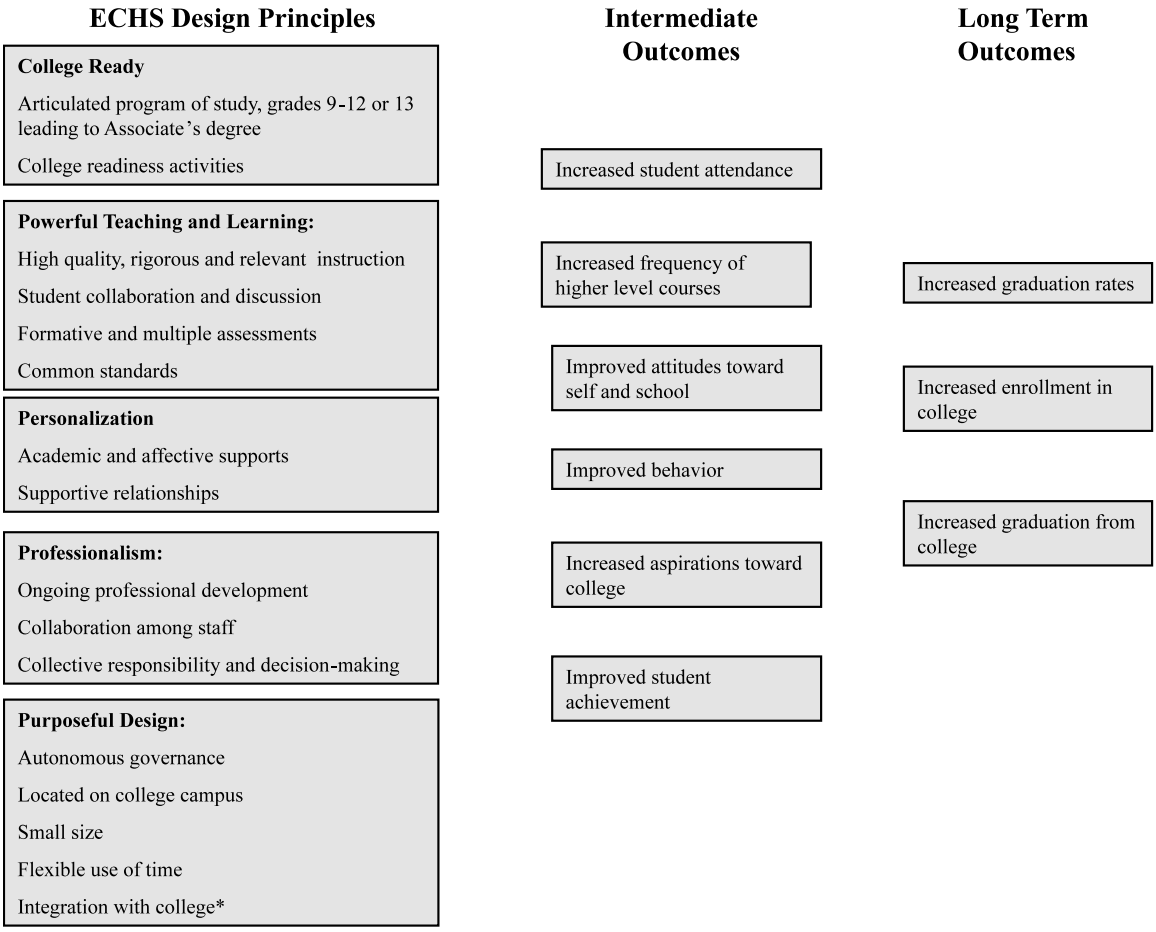

Table 1. Experimental Design Sample by Cohort and Year

	2006-2007		2007-2008		2008-2009		2009-2010		2010-2011	
	Grade	Students	Grade	Students	Grade	Students	Grade	Students	Grade	Students
Pilot	9th	293	10th	249	11th	211	12th	179		
Cohort 1			9th	369	10th	314	11th	267	12th	227
Cohort 2					9th	1113	10th	946	11th	804
Cohort 3							9th	1342	10th	1141

Notes: Sample assumes a study attrition rate of 15% per school year. There are 21 ECHS schools in the sample, most providing multiple cohorts of data.

Table 2: Descriptive Statistics of the Sample from the Administrative Data

	Whole Sample (N=718)		Treatment 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 *.

Table 3: Impact of ECHS on Student Course Taking and Completion using the Administrative Data

	Odds-Ratio	P-Value	Marginal Effect	P-Value
Algebra I				
Take-up	10.971	<0.001*	0.136	<0.001*
Progress	1.820	0.007*	0.102	0.008*
English I				
Take-up	1.430	0.373	0.008	0.397
Progress	1.172	0.530	0.015	0.534
Geometry				
Take-up	0.927	0.742	-0.011	0.744
Progress	0.821	0.393	-0.013	0.460
College Prep. Math Course-taking				
At least one course	15.938	<0.001*	0.108	<0.001*
At least two courses	2.465	<0.001*	0.139	<0.001*

Notes: Statistically significant results (at the $p<0.05$ level) are denoted by *.

Table 4: Student Opinion Survey Significant Main Effects for Implementation Scales

	Control Group		Treatment Group				
Scale	**Mean**	**SD**	**Mean**	**SD**	**F**	**sig.**	**d**
Staff-Student Relationships	26.23	4.00	28.34	3.62	10.81	0.00	0.57
Relevant Instruction	18.63	5.99	20.87	4.37	7.56	0.01	0.47
Rigorous Instruction	35.07	7.39	38.76	6.16	11.02	0.00	0.57
Student Support Activities	26.23	8.06	35.36	9.42	41.01	0.00	1.00

Notes: * df = 1,181; d = Cohen's d