

Abstract Title Page

Title:

Evidence of Deeper Learning Outcomes: Findings from the Study of Deeper Learning

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Abstract Body

Problem / Background / Context:

Concerns persist that not enough students are acquiring the complex knowledge and skills that transfer to the novel situations they will confront in college, career and civic life. As a result, there has been increased interest in research to evaluate whether a *deeper learning* approach is associated with improved educational outcomes for students of all backgrounds. However, to date there is little rigorous empirical evidence on whether deeper learning approaches produce better student outcomes (National Research Council (NRC), 2012; Yuan & Le, 2010).

Purpose / Objective / Research Question / Focus of Research:

The *Study of Deeper Learning: Opportunities and Outcomes*, funded by the William and Flora Hewlett Foundation, is a *proof-of-concept* study to determine whether students attending high schools with a mature and at least moderately well-implemented approach to promoting *deeper learning* experience greater deeper learning opportunities and outcomes than they would have had they not attended these schools. The study includes a set of high schools belonging to networks that are aligned with a deeper learning approach. In paper #2 of this proposed symposium, we have established that students in network high schools did indeed experience greater opportunities to learn deeply, that those opportunities were broadly spread across students, and that deeper learning opportunities were associated with deeper learning outcomes.

The purpose of this paper is to provide quasi-experimental empirical evidence on whether or not students who experienced these network schools' approaches achieved better outcomes than they would have otherwise. Specifically, did students attending these network schools

- 1) score higher on measures of content knowledge and critical thinking skills associated with the OECD PISA-based Test for Schools
- 2) report higher levels of intra- and inter-personal competencies and dispositions
- 3) attain a higher rate of graduation or
- 4) attain a higher rate of post-secondary matriculation

than they would have if they had not attended the network schools?

Improvement Initiative / Intervention / Program / Practice:

As discussed in the abstract for paper #2, the *Study of Deeper Learning* examined a sample of network schools that were implementing instructional approaches aligned with deeper learning. The networks and schools differed in their approaches to deeper learning, but some features were common across network schools. For example, all schools engaged students in some form of project-based learning that focused on the development of problem-solving skills, collaboration skills, and/or communication skills, while engaging students in real-world experiences. Schools were engaged in authentic assessment practices including portfolios and exhibitions, and teachers used frequent formative assessments to gauge student learning and inform instruction. In addition, schools provided personalized learning environments to engage students in learning and provide individualized support.

Setting:

As in the previous papers, this analysis relies on student-level data from schools located in six districts across two states: California and New York.

Population / Participants / Subjects:

As in the previous papers, the sample of schools for this analysis included a set of moderate to high-implementing network high schools and a set of schools serving similar student populations in the same jurisdiction as the network school, but not belonging to one of the 10 networks. Our goal was to identify and recruit a “non-network” school with similar student characteristics for each network school so that we could conduct student-level analyses with similar student populations across the two groups of schools. Specific criteria for sampling of the network and non-network schools are included in the abstract for paper #1.

For the analysis and findings described in this paper, we collected data from students within 12 network high schools, which represented 8 of the 10 networks and were located in five different districts across two states.¹ Analyses also include students attending 10 non-network schools located in six districts across two states. One non-network school was matched to two network schools, for a total of 11 school pairs.²

Research Design:

See the abstract for paper #1 in this symposium for a detailed summary of the research design. It is important to note again that this quasi-experiment has several limitations. As a proof of concept study, designed for internal validity within a focused set of schools, this study is not designed to be generalizable across all possible contexts. Due to the type of design, the study is vulnerable to unmeasured selection bias. We matched and weighted students on a series of measured characteristics (8th grade incoming achievement, etc.), but the design does not account for any unmeasured characteristics associated with students’ attendance at network schools. Further, as discussed below, although the measures have reasonable reliability and quality, at the time of data collection, the field lacked extensively validated measures of some of the deeper learning constructs we sought to measure.

Data Collection and Analysis:

This study presented several measurement and data collection challenges. We aimed to examine a range of deeper learning competencies: mastery of core academic content, critical thinking and complex problem-solving, effective communication skills, collaboration skills, ability to learn how to learn, and development of academic mindsets and dispositions. However, the field lacks established assessments for all of these competencies. For instance, existing state tests do not typically measure the deeper learning competencies, and there are few validated measures of the non-cognitive outcomes hypothesized to support college and career success. Furthermore, because deeper learning is expected to result in improved graduation rates, college attendance, and ultimately career success, the study required us to track student cohorts to the end of high school and beyond to examine postsecondary outcomes.

In response to these challenges we conducted multiple data collections:

¹ Two of these network schools were combined for analyses since they had small student populations eligible for the study and were co-located on one campus.

² An additional eight network schools participated in the study but were excluded from this analysis either because 1) we did not identify a matched comparison school that met our criteria and was willing to participate, or 2) we were unable to obtain parent consent for a sufficient number of students for certain data collections.

- **OECD PISA-based Test for Schools:** To assess students' content knowledge, and critical thinking and problem solving skills, we administered the OECD PISA-based Test for Schools to all sampled and consented 11th and 12th grade students in each network and non-network school in spring 2013. For the purposes of this research we received approval to use the test with older age students than the international norming sample and to use Maximum Likelihood Estimates for individual students as our primary outcome. In total we administered the assessment to 1,267 students, with an average response rate of 61%.³
- **Student survey data:** To measure the intra- and inter-personal competencies and dispositions that are considered important to college and career readiness, we administered a one-hour survey to all sampled and consented 11th and 12th grade students in each network and non-network school in spring 2013. For a list of the constructs measured in the survey, see Appendix Exhibit 1. The survey enabled us to gather data from a large representative sample of students across both network and non-network schools. In total, we administered surveys to 1,762 students from the 11 pairs of schools with an average response rate of 76%.
- **Extant District Data:** We collected district administrative records to examine effects of network school attendance on high school graduation within four years (for students who graduated within the same district) and achievement test scores.
- **National Student Clearinghouse data:** We requested data from the National Student Clearinghouse (NSC) for all students who began the 9th grade within our selected schools between 2007-08 and 2009-10. NSC data allow us to measure postsecondary enrollment, institution type (i.e., two-year, four-year, selective institution⁴), and persistence into the second year of college.

The quasi-experimental study also presented several analytic challenges that are described in the first paper of this symposium. Briefly, in response to those challenges, we analyzed data collected from students within pairs of similar network and non-network schools operating in the same or similar district contexts. We used propensity score matching to identify students in the comparison schools who at entry to 9th grade matched those in the treatment schools. We followed 5 cohorts of students – those entering 9th grade in fall of 2007 to 2011. For the results reported in this presentation, we focused on a survey and assessment administered to students in 11th and 12th grade in 2012-13. We performed doubly robust ordinary least squares regression models and logistic models for binary outcomes that applied propensity score weights and accounted for student demographics and pre-high school (i.e., middle school) achievement. In addition to propensity score weights, we also calculated and applied weights that accounted for consent, sampling, and non-response. We performed student-level analyses separately within each pair of network and non-network schools, and then calculated the precision-weighted average difference between network and non-network students across the 11 pairs of schools using a fixed effects meta-analysis.

³ One pair of schools was included in the survey sample but not the OECD PISA-based Test for Schools sample.

⁴ Information about institutional selectivity was merged using data from the Integrated Postsecondary Education Data System. Selective institutions are defined as four-year institutions in which at least 80 percent of students are full-time students, and students' test scores place the institution within the top quintile of baccalaureate-granting institutions in the United States.

Findings / Outcomes:

Below, we summarize the overall results of our analyses of student survey and OECD PISA-based Test for Schools Data, based on a meta-analysis that pools results across the 11 school pairs. The results are shown in Appendix Exhibit 2. The primary findings include:

- *Students in participating network high schools scored significantly higher on the OECD PISA-based Test for Schools in reading, mathematics, and science than students in the paired non-network schools.* Effect sizes for all three test subjects were similar in magnitude, with the scores of students attending network schools exceeding the scores of students in non-network schools by approximately 0.11 standard deviations.
- *Network students reported higher levels of academic engagement, motivation to learn, self-efficacy and collaboration skills relative to similar students who attended comparison schools.* Effect sizes ranged from 0.12 standard deviations (for motivation to learn) to 0.20 standard deviations (for academic engagement). On the other intrapersonal competencies (perseverance, self-management, creative thinking skills, and locus of control) there were no significant differences between network and comparison students.

In addition to the results presented above, we are currently analyzing district extant data so that we can measure the effect of attending a network school on state achievement test scores and on attainment of graduation. We have also obtained data from the National Student Clearinghouse (NSC) for the oldest cohorts of students so that we can observe whether attending a network school influenced postsecondary enrollment, postsecondary persistence, and the selectivity of the institutions that students attended. These preliminary findings are currently embargoed until internal reviews are completed but will be available in the summer allowing for presentation at the conference in the fall.

Conclusions:

Rigorous research on deeper learning has lagged behind the political and educational interest in this instructional approach. As deeper learning gains momentum across the country as a means to prepare *all* students for college and careers, it is essential that policymakers and practitioners have evidence of its effectiveness. This quasi-experimental study starts to build this empirical evidence base by indicating positive effects of students' attendance in a deeper learning network school on the content knowledge and complex problem solving skills measured by the OECD PISA-based Test for Schools, as well as on several intra- and interpersonal competencies and dispositions that are considered important for college and career readiness. This study provides promising initial evidence that a deeper learning approach may have the potential to make a difference in students' educational experiences and academic skills. The findings in this study suggest the potential merit of further research to replicate the findings with a larger sample of schools across a wider range of contexts. Additional research recommended includes following students through college and beyond to determine longer-term effects, and conducting an experimental study with a lottery assignment of students to schools.

Appendices

Appendix A. References

- National Research Council. (2012). *Education for Life and Work: Developing Transferable Knowledge and Skills in the 21st Century*. Washington, DC: The National Academies Press.
- Yuan, K. & Le, V. (2010). A Review of Model School Networks That Emphasize Deeper Learning. Santa Monica, CA: RAND.

Appendix B. Tables and Figures

Exhibit 1: Rasch Reliabilities for constructs measured in the student survey

	Rasch reliability
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<i>Opportunities for deeper learning</i>	
Opportunity for Complex Problem Solving	0.9
Opportunity to Communicate (combined)	0.83
Opportunities to Collaborate	0.69
Opportunity to Learn How to Learn	0.52
Assessments Aligned with Deeper Learning	0.77
Feedback to Students	0.75
Interdisciplinary learning	0.78
Opportunities for Creative Thinking	0.79
Real World Connections	0.84
<i>Dispositional outcomes</i>	
Collaborative Orientation	0.83
Creative Orientation	0.77
Perseverance	0.79
Self-Management	0.81
Academic Engagement	0.74
Motivation to Learn	0.75
Self-Efficacy	0.84
Locus of Control	0.73
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Exhibit 2: Estimated Network School Effects for Outcomes

Estimated Network School Effects: Outcome Meta-Analysis Results

