Outcomes and Costs of a District Level One-to-One Digital Learning Policy

SREE "In the Pipeline" Poster Session Submission

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Background

Digital learning is thought to be an important educational component in preparing students to enter our dynamic global economy. Digital learning tools allow teachers to analyze student performance in new and more fine-grained ways, while students have access to a wider array of content and experiences. (Bando, Gallego, Gertler, & Fonseca, 2017; Banerjee, Cole, Duflo, & Linden, 2007; Bergman, 2015; Best & Dunlap, 2012). However, these theoretical impacts of digital learning on student achievement are not well-documented in the literature. Much of the literature focuses on the impact of one specific program or application on student performance, while the impacts of a system-wide digital learning policy are scarce in the literature (Fago, Grantham, Muenchau, & Shaw, 2013; Hull & Duch, 2018). More research is needed on the impact of system level implementation of global digital learning policies.

North Carolina has made significant investments in digital learning to enhance statewide connectivity infrastructure, provide devices for students and teachers, and train staff to use technologically enhanced instruction (NC G.S. 115C-296, 2013; NC SL 2013-12, 2013; NC SL 2016-96; H.B. 1030, 2016). Policies and legislation support and encourage the adoption of digital learning programs across the state; however, the state affords each district the autonomy to determine their own digital learning pathway. As a result, districts use a variety of models to implement digital learning.

There are several districts across the country who have embraced one-to-one digital learning policies. One such district is the Rowan-Salisbury Public School District in western North Carolina. This district experienced a paradigm shift around the use of digital tools for instruction and learning using district-based innovation and the North Carolina Digital Learning Initiative Plan to guide many of their decisions (Bowden & Danks, 2019). Their exceptional implementation provides a critical opportunity to analyze the impacts that a one-to-one digital learning program has on student outcomes. Furthermore, their timeline of implementation provides an important chance to understand the true costs associated with their policy. This work contributes to the literature by isolating the effects of a district-wide digital learning policy to understand the impact on student achievement and the associated costs.

Purpose

Digital learning in North Carolina was a combination of sweeping changes, yet districts were autonomous in how they implemented the North Carolina Digital Learning Plan. The timeline of one-to-one digital learning implementation in Rowan Salisbury provides a unique opportunity to study the impact of such a policy. This work aims to exploit this natural experiment to estimate the impact of digital learning on student achievement.

The costs associated with a one-to-one digital learning program are also important to inform future investment decisions. Incorporating cost estimates contributes to the body of knowledge used by policymakers and researchers to understand the value of programs. This

work estimates the total cost of the digital learning initiative in Rowan-Salisbury at the per student level allowing for a single-case cost-effectiveness measure.

Research Questions:

- What impact does a district wide one-to-one digital learning initiative have on student achievement?
- What is the overall per student cost of a district-wide one-to-one digital learning initiative?

Program Policy:

In April of 2014, the district leadership in the Rowan-Salisbury Public School System fast tracked the adoption of a one-to-one digital learning program. After a summer of quick preparation, the 2014-15 schoolyear opened with devices for every student, digitally enhanced instructional methods, and specialized training around digital learning. This swift implementation draws a clear line between Rowan's educational program with and without one-to-one digital learning, creating a quasi-experimental opportunity to study the impact of digital learning and the associated costs. Rowan is also situated within the greater NC context which provides an array of infrastructure, financial, and training support around digital learning. This unique context allows this work to focus more accurately on the impact and associated costs of a one-to-one district wide digital initiative.

Research Design:

This analysis builds off the work by Hull and Duch (2018) by using a difference-in-differences approach to analyze the outcomes of the digital learning policy in the Rowan-Salisbury. Two approaches will be used to model a comparison group. The first approach will use the entire state as a control group (Hull & Duch, 2018). Some districts in the state also have well-developed digital learning programs; however, using the state as a comparison, with over 100 districts, will lead to conservative estimates of effectiveness. The second approach will leverage data to locate a similar district using observable characteristics to act as the comparison.

The ingredients method will guide the cost analysis portion of this work. The ingredients method is based on the idea of opportunity costs and assigns prices to all resources implicated in the production of the outcome (Levin, McEwan, Belfield, Bowden, & Shand, 2018). After identifying and specifying all resources, prices are assigned, and costs are calculated. Cost and effect estimates will be combined to produce a single case cost-effectiveness measure.

Data:

The bulk of data for this study will come from the North Carolina Education Research Data Center (NCERDC). Data from the NCERDC will be leveraged to create a student-level data panel for all students enrolled in North Carolina traditional public schools from 2012-2018. This time frame provides an opportunity to establish student achievement trends leading up to the policy shift, along with a post-shift period to analyze outcomes. Student, school, and district characteristics will be used in the model to enhance the accuracy of estimates and to identify the most appropriate district to use as a comparison district.

Secondary data from the Economic Evaluation of the North Carolina Digital Learning Initiative will be used to calculate the costs associated with digital learning in Rowan. These data include interviews and observations that describe what resources are implicated in the production of the one-to-one digital learning initiative in Rowan. Using publicly available pricing data and resource specification information, costs will be assigned, and prices calculated. The outcome and cost information will be linked to contextualize findings.