Connecting Solutions
Technology Interventions in Economically Disadvantaged Communities

Program Adaptation Lessons from the i3/EIR Program

i3/EIR Cross-Project Analysis

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Introduction

The U.S. Department of Education's Investing in Innovation (i3) and Education Innovation and Research (EIR) grant programs are designed as opportunities to fund local education agencies (LEAs) and organizations that partner with LEAs. Grantees are located across the country and are in the midst of various stages of implementing education programs. Since 2010, the Department has awarded 211 grants to support innovation and bolster student achievement. All grants must have an external evaluator, as the grantees contribute to the field critical education research on the effectiveness of their program models. One of the main priorities of the i3/EIR program is serving economically disadvantaged populations, as evidenced by the requirement for grantees to commit to serving a high-needs student population, including students from low-income families.

In light of this priority, and considering the critical importance to the i3/EIR program of offering innovative and effective interventions to economically disadvantaged students, this paper analyzes the experiences of i3/EIR grantees who use technology for learning, teaching, and/or professional development in economically disadvantaged contexts. Digital technology plays an increasingly important role in pedagogy as well as a central role in the modern economy. The featured i3/EIR grantees are implementing technology interventions that employ various strategies to improve student outcomes – some of the interventions are targeted at teachers, while others are directly integrated into the classroom and used to support instruction or personalized learning.

This paper uses an exploratory, qualitative approach to analyze the experiences of grantees operating in a variety of rural and urban economically disadvantaged areas. Schools in these areas often lack critical resources and supports such as staff, curriculum materials, administrative oversight, technology solutions, and professional development. Individual students living in these communities tend to face challenging socioeconomic circumstances at home, such as un- or under-employed family members, lack of access to the Internet in the home, food insecurity, and unreliable transportation.

For the purposes of this paper, we asked grantees to define *economically disadvantaged* for their programs. While school systems commonly categorize economic disadvantage based on the percentage of students receiving free and reduced-price lunches (FRPL), we provided grantees the flexibility to define the term as they felt best reflected the circumstances of the populations they serve. In addition to FRPL status, grantees considered characteristics like Title I status and remoteness of the district. Rather than focusing on socioeconomic indicators, some grantees took a holistic approach that accounted for the portion of students in other high-need groups. One grantee said that, by definition, all rural students are economically disadvantaged.

In sharing the stories of i3/EIR grantees working in a range of economically disadvantaged contexts, this paper looks at some potential solutions identified by grantees to address common circumstances experienced in these contexts. To facilitate this analysis, the paper considers the following guiding questions:

- How do technology interventions address the challenges common to economically disadvantaged schools?
- How are these types of interventions valuable in the economically disadvantaged context?
- What are some key obstacles these interventions face in this context?

Featured i3/EIR Grantees

The Curators of the University of Missouri

eMINTS Expansion Project
Cohort: 2015 – Present
Other i3/EIR Grants: eMINTS Validation Project (2010)
Project Type: Expansion (EIR)
Results: Not yet available
Setting: Rural
Description: eMINTS helps schools implement standards-based reform to improve student academic achievement and prepare them for the realities of a technology-rich workplace. Teachers transform classrooms into highly engaging, student-centered learning communities using the four components of the eMINTS instructional model: classroom community, authentic learning, high-quality lesson design, and powered by technology.
Appears in this paper as: "eMINTS"

Kentucky Valley Educational Cooperative

C3R: Creating College and Career Readiness
Cohort: 2011 – 2017
Other i3/EIR Grants: N/A
Project Type: Development (i3)
Results: Impact Evaluation
Setting: Rural
Description: The Kentucky Valley Educational and Green River Regional Educational Cooperatives partnered to implement the Creating College and Career Readiness in Kentucky initiative. Through the initiative, they invited schools to use a suite of personalized software from WIN Learning that had not yet been used in the Kindergarten–12th grade setting.
Appears in this paper as: "C3R"

McREL International

Academic Success as an Identity-Based Journey
Cohort: 2015 – Present
Other i3/EIR Grants: N/A
Project Type: Development (i3)
Results: Not yet available
Setting: Rural
Description: The objectives of this project are to: 1) develop a digital serious game, Pathways, that uses the core components of identity-based motivation (IBM) as operationalized in School-to-Jobs; 2) test and implement this game in 7th – 10th grade classrooms; and 3) document its effects on IBM, school engagement, and academic success.
Appears in this paper as: "McREL"

National Center for Research in Advanced Information and Digital Technologies

United2Read: Scaling Personalized Literacy Instruction to Ensure Strong Student Achievement
Cohort: 2017 – Present
Other i3/EIR Grants: N/A
Project Type: Expansion (EIR)
Setting: Rural/Suburban/Urban
Results: Not yet available
Description: United2Read brings Learning Ovation's "A2i" technology professional support system to students and teachers nationwide with the goal of improving literacy skills and closing the achievement gap. A2i is a research-based instructional tool that informs teachers on the right amount and type of reading instruction so that they can effectively differentiate instruction for all students' needs.
Appears in this paper as: "United2Read"

National Writing Project

The National Writing Project College Community and Career Writers Program (formerly called the "College-Ready Writers Program")
Cohort: 2012 – 2016; 2016 – Present
Other i3/EIR Grants: Scaling Up the National Writing Project's College-Ready Writers Program: Expanding Access, Reach, and Leadership for Ongoing Improvement (2016)
Project Type: Validation (i3); Scale Up (i3)
Results: Not yet available
Setting: Rural
Description: The National Writing Project offers strategically designed, intensive, and sustained professional development to improve both classroom practices for writing instruction and students' writing achievement. The program implementers engage teachers in professional development, use of high-quality instructional resources, and analysis of students' writing for instructional planning.
Appears in this paper as: "National Writing Project"

New Visions for Public Schools, Inc.

Drive to Write
Cohort: 2015 – Present
Other i3/EIR Grants: Accessing Algebra Through Inquiries (2011)
Project Type: Development (i3)
Results: Not yet available
Setting: Urban
Description: Drive to Write leverages technology to support writing instruction that is personalized to student needs and aligned with Common Core State Standards. The goal is to support high school teachers in high-poverty urban classrooms in establishing a low cost "technology infrastructure" and adopting digital tools built in the Google Apps for Education environment to improve their workflow in distributing, collecting, and grading assignments.
Appears in this paper as: "Drive to Write"

Waterford Institute

Expanding School Readiness to Rural States with Poor Preschool Access: The UPSTART Great Plains TASK Force
Cohort: 2018 – Present
Other i3/EIR Grants: Working with Utah's Rural School Districts to Expand and Enhance UPSTART
Project Type: Expansion (EIR)
Results: Not yet available
Setting: Rural
Description: UPSTART is an early education program that prepares kids for kindergarten. The program's implementers employ technology to offer personalized learning, home-based digital curricula, and interactive books for rural Pre-K students. They also provide Internet access to families of students that lack connectivity.
Appears in this paper as: "UPSTART"

Methods

The authors of this paper initially identified eight i3/EIR grantees implementing technology interventions in economically disadvantaged communities. The selected grantees came from both the i3 and EIR programs, were drawn from each developmental stage, and had a range of experiences in rural, urban, and suburban contexts. Grantees' intended intervention targets varied as well: Some grantees used technology interventions directly with students, while others implemented new technologies with teachers or administrators.

To gain an initial understanding of some of the issues, lessons learned, and implementation practices these grantees applied in the field, we developed a survey (included in Appendix A) and invited the eight selected grantees to participate. The survey was open from September 16th, 2019 through October 11th, 2019, during which time we sent reminders via email to encourage grantees to respond. Upon closing the survey, seven of the eight grantees had completed a survey response. Based on our initial review of the survey responses, we developed a focus group protocol (included in Appendix B) to probe further into the emerging themes evident from the responses.

We invited all seven participating grantees to attend the focus group. The focus group was held with representatives from five of the seven featured grantees during a one-hour Skype meeting. Afterward, we transcribed and coded the responses from the focus group alongside the survey responses so that we could discover and analyze the prominent themes and trends the grantees shared. Each of the three authors reviewed and coded these responses, coming to a consensus on the top emerging themes, current challenges, and promising solutions grantees identified. The authors also reviewed other grantee documents, such as evaluation reports and i3 profiles. In addition, for each challenge identified by grantees, we conducted a literature scan to ensure the topic's relevance to the field at large. Exhibit 1 below displays the grantees who responded to the survey and participated in the focus group.

Exhibit 1: Grantee Research Participation

Selected Project/Grantee	Responded to Survey	Participated in Focus Group
C3R	✓	
Drive to Write	✓	✓
eMINTS	✓	
McREL	✓	✓
National Writing Project	✓	✓
United2Read	✓	✓
UPSTART	✓	✓

Context and Framework

Across both the survey and focus group, grantees' responses reflected their original motivation for selecting a technology-based intervention and their deliberate and purposeful approach to doing so. Grantees recognized a set of circumstances in economically disadvantaged contexts that made it difficult to implement a traditional intervention. They then crafted an intervention that used technology to meet the needs of students and teachers in these

circumstances. Their experiences implementing these interventions and overcoming obstacles and barriers drive this paper.

Reflecting on their progress to-date, the grantees who participated in our research identified three problems they often encounter in economically disadvantaged contexts that they feel are well-suited to a technology-based intervention: a lack of resources needed to effectively differentiate instruction; the difficulty of forming professional networks for teachers in economically disadvantaged areas; and the sense of student disenfranchisement that educators encounter in these areas.

Structure of the Analysis

In each of the sections that follow in the discussion, we begin by **describing the problem that grantees identified**. The three problems selected for analysis in this paper were each raised by multiple grantees and are in line with education research identifying challenges that are particularly prevalent in economically disadvantaged schools and communities. We then **present the solutions that grantees used to address these challenges**, along with the benefits of these solutions. Because each grantee operates in a unique geographical, grade level, and content area context, and navigates project-specific factors, they identified multiple different solutions to the same problem.

Finally, we conclude each section by **providing some considerations for current and future grantees**. Because the focus group portion of this investigation encouraged open conversation among grantees, grantees sometimes offered differing opinions about the efficacy of an approach or contrasting experiences with the proffered solution. We highlight these contrasting views as considerations for program developers and implementers working in the same contexts.

Therefore, rather than providing definitive conclusions, this paper presents some approaches from the featured grantees for the consideration of the broader i3 community. This will provide future education program developers with the opportunity to reflect on these solutions as they design and implement their own programs. We thus follow the framework described here – **problem, solution, considerations** – in order to present the diverse experiences of the grantees while still allowing the reader to interpret these experiences according to their own program needs, rather than leading the reader to a particular determination.

Overarching Consideration: Connectivity and Access

One universal consideration to note at the outset is that while the vast majority of schools are now connected to broadband Internet (EducationSuperHighway, 2019), the basic technological infrastructure needed to support a technology-based intervention still posed a problem for some grantees operating in economically disadvantaged rural areas. Even in schools that have stable Internet connections, slow connection speeds may make it difficult for large numbers of students to participate in a technology-based intervention simultaneously. Additionally, grantees whose projects require student and family action outside of the school environment reported that connectivity in the broader community posed a challenge (C. Miner, personal communication, November 5, 2019).

Moreover, grantees working in both rural and urban areas pointed to insufficient staffing as a challenge common in economically disadvantaged schools. In particular, economically disadvantaged schools may be less likely to have staff dedicated to technology support (D.

Voloch, personal communication, November 5, 2019; T. Fox, personal communication, November 5, 2019). The implications of this lack of staffing ranged from difficulty for teachers attempting to connect to virtual training to a lack of ongoing maintenance of the computers needed to implement the intervention. While grantees acknowledged that infrastructure and staff support issues are not exclusive to economically disadvantaged areas, they did report that the prevalence of these challenges in such communities created barriers to implementing a technology innovation.

We elaborate further on these issues as part of our "Considerations" sections within each grantee challenge and solution discussed below.

Discussion

Personalized Learning

Problem

A primary challenge grantees identified was a need to provide targeted, differentiated instruction for students entering school with varying skill levels, prior knowledge, and/or educational experiences, particularly those who were the least prepared for academic success. Districts serving economically disadvantaged students generally lack the resources to do this effectively. In light of this challenge, several grantees used technology-based interventions to provide personalized learning.

Responding to our survey, Danny Voloch from Drive to Write indicated that most schools in the program had "a significant percentage of students who were entering with below grade level reading and writing skills, and core content teachers were not always given support in teaching both content and skills" (D. Voloch, personal communication, September 27, 2019). The program's developers chose to address this challenge through technology because of the lack of resources. United2Read's implementers shared a similar perspective in their survey response, stating that:

> In more affluent communities… students enter school more prepared for kindergarten. Additionally, affluent schools tend to have a high proportion of students reading above grade-level in their classrooms, so teachers tend to feel less pressure to truly differentiate instruction to meet the needs of all students. However, … many of the kindergarten students we currently serve have not received prior schooling or participated in pre-K programming. As a result, teachers require more time and support to establish classroom routines and basic skill development with their students. (A. Jacobs, S. Siegal, Z. Kasad, & V. Young, personal communication, October 2, 2019)

The research bears out these challenges. Many studies have found that students in low-income communities begin school with more limited vocabularies and numeracy skills compared to those in more affluent areas (O'Day & Smith, 2016). Economically disadvantaged students are also more likely to lack the socialization experiences that are required to take full advantage of kindergarten (O'Day & Smith, 2016). In addition, states and districts tend to have low capacity to provide additional resources to help low-performing schools improve these outcomes (Scott & McMurrer, 2015). Low-income rural areas also face specific resource constraints stemming from their geographic isolation and low population density, which makes it difficult to recruit and

keep high-quality teachers, engage parents, and involve students in after-school activities (Rosenberg, Christianson, & Hague Angus, 2015). The geographic isolation of rural districts also makes it more challenging to provide external professional development resources and technical assistance (Scott & McMurrer, 2015).

Solution

To address these challenges, grantees used technology to differentiate and group students appropriately and to deliver personalized learning. United2Read's leadership captured the benefits of this approach when they told us about the technology platform they used in their intervention, the A2i Professional Support System. In their view, this platform enables teachers to differentiate literacy instruction more effectively, determine the type and quantity of literacy instruction students need, group students according to their needs, and use a lesson planning tool to manage different forms of instruction (A. Jacobs, S. Siegal, Z. Kasad, & V. Young, personal communication, October 2, 2019).

The implementers of the National Writing Project echoed this strategy, proclaiming that they use technology to "encourage local sites and districts to tailor instructional resources for their specific student population, especially the nonfiction texts that students draw on to support their arguments" (T. Fox, personal communication, September 30, 2019). Moreover, using technology in this way brought the additional benefits of giving students an opportunity to learn at their own pace and enabling easy data collection for teachers, including formative assessments. Implementers from UPSTART, an early education program, extolled these types of benefits, telling us that "technology offers the option of personalized learning, which is particularly helpful with some of the disadvantaged populations we're talking about, because it gives them additional chance for instruction, and at their own pace" (C. Miner, personal communication, November 5, 2019).

Technology's capacity to collect and present data in an efficient and compelling way also addressed the lack of teacher resources and need for differentiated instruction. United2Read's administrators, for example, found that the technology intervention allowed for more flexibility and easily accessible real-time data points, making assessment scores and recommendations up-to-date and instantly available (A. Jacobs, S. Siegal, Z. Kasad, & V. Young, personal communication, October 2, 2019).

Expanding on this provision of resources and information to teachers, United2Read's implementers indicated in the focus group that technology was a particularly effective medium to deliver this type of support. They informed us that "technology provides the vessel to present… information to teachers in a useful, actionable way. And I think without that sort of interface change and making it user-friendly, it would be a lot less impactful" (A. Jacobs, S. Siegal, Z. Kasad, & V. Young, personal communication, October 2, 2019). Technology platforms also allow teachers to use formative assessments to gauge student progress on a regular basis and adjust the personalized learning that individual students may require over time. Tom Fox of the National Writing Project illustrated this benefit in his comment that "We also created a formative assessment tool, the Using Sources Tool, that… is only for teachers' use and only to inform instruction and guide our program development" (T. Fox, personal communication, September 30, 2019).

Considerations

Although the use of technology to facilitate personalized learning provided significant benefits for both pedagogy and student learning in these grantees' programs, achieving these benefits required addressing critical factors and limitations. These critical factors included tailoring technology to the school and/or district, conducting teacher training in a way that mitigated teacher turnover, and providing appropriate supports for students' families.

With regard to customizing a technology intervention to the infrastructure of a school or district, this process may entail adjusting the scope of the technology platform being used in the intervention or providing additional resources to enable communities to receive the full benefits of the intervention. C3R's implementers emphasized the importance of navigating this limitation, stating, "The most important lesson is to work with the school system to ensure the technology is needed for that population and that the technology works with the infrastructure at the school." In particular, C3R's administrators noted the importance of actually going into the "schools/classrooms to work with teachers and let the students know that a resource is available for them to use anywhere/anytime and how they can access it outside of school" (D. Bowling, personal communication, October 8, 2019).

The National Writing Project's leadership addressed this issue directly by creating more support for schools and educators. Their experience was that the "infrastructure necessary for online professional learning supports – cameras on the computers, consistent WiFi, up-to-date devices, and use of Google apps – was difficult in some locations." In practice, this meant that, in their words, the project implementers "included a process for requesting a hotspot to assist with Internet access; reduced our reliance on consistent, high-quality Internet; and created training tools that cover general 'how to' directions for video conferencing and other tech tools" (T. Fox, personal communication, September 30, 2019). United2Read's leadership followed a similar approach, as they "found it helpful to communicate technology requirements and needs much sooner and be available to provide as much hands-on support as needed." To that end, they "created more step-by-step guides for teachers and school leadership to aid them with the set-up of their virtual PD sessions" (A. Jacobs, S. Siegal, Z. Kasad, & V. Young, personal communication, October 2, 2019).

In addition to tailoring technology interventions to available technological resources in economically disadvantaged schools, program implementers must design teacher training and professional development in a way that accounts for the high frequency of teacher turnover in low-income school districts, particularly rural ones. eMINTS' implementers dealt with this problem by adapting their intervention to design a customized training course. The course brought "teachers who are joining the professional development mid-year up to speed so they can quickly join in and learn with the cohort of their peers" and acquire "a foundation from which they can understand the context and goals of the program" (C. Wylie, personal communication, October 3, 2019).

The other solution to this limitation is to have repeated trainings, as Danny Voloch of Drive to Write indicated when reflecting on the sustainability of the program:

> Oftentimes, we think of training as one-and-done. We've done training for a couple of years. We've trained a cohort of teachers. Now, they're very comfortable in using the technology to facilitate instruction. But in some of our schools where there's tremendous teacher turnover,

thinking about what sustainability looks like, if there is no longer that ongoing training and coaching, is really challenging. (D. Voloch, personal communication, September 27, 2019)

Furthermore, to be successful, technology interventions in economically disadvantaged schools also have to provide appropriate support and training for families. As Claudia Miner of UPSTART indicated, this can take a variety of forms, including the mode or medium of the technology intervention, the technology infrastructure used, and the language of communication. Thus, she told us that UPSTART's developers had to develop new technology as families' preferred mode of communication changed over time to favor text messaging (C. Miner, personal communication, November 5, 2019). She also related that for families lacking Internet connectivity and sometimes electricity, the project's implementers adapted to use satellite technology and solar power to provide families with the required technology. Currently, the program's implementers are "using a very special computer that…downloads things as the satellite goes by for tomorrow's lesson" (C. Miner, personal communication, November 5, 2019). Furthermore, she said that UPSTART program staff also had to address the needs of English Language Learners (ELL), such that they "had to have staff who could support the parents in whatever home language they chose. And we're now up to, I think, twenty-five languages" (C. Miner, personal communication, November 5, 2019).

Cultivating Professional Networks

Problem

In addition to confronting the challenge of having limited resources for differentiated instruction, facing the obstacles that come with working in an economically disadvantaged school may be made more difficult if teachers do not have access to a network of peers that can help them develop professionally. Whether they are located in urban or rural areas, teachers without a network of professional relationships may feel isolated and less able to be effective in their roles. In his survey response, Tom Fox of the National Writing Project stated the importance of these relationships succinctly when he told us, "We have learned through the 40 plus years of the work in the National Writing Project that the relationships created during professional learning are key to success. They must be cared for, developed, deep, respectful, and mutually informing" (T. Fox, personal communication, September 30, 2019).

The importance of these connections is supported by the literature: Using a team structure and forming close collaborative relationships among teachers has been found to be a key part of teacher's professional development in both urban and rural areas. Cultivating a professional community of teachers creates shared learning goals and alignment on whole school issues as well as a forum for teachers to give and receive constructive feedback on their work (Newmann, King, & Youngs, 2000). Rural teachers, in particular, may have "few opportunities for professional development or collaboration" in their schools (Letgers, 2017). When a teacher has few local peers working in the same grade level or subject area, it can be difficult to establish a network of professionals with similar needs and concerns simply due to the small population (Letgers, 2017).

Many of the featured grantees highlighted the importance of ensuring that teachers implementing the intervention had access to a network of peers. Grantees reported that in their experience operating in economically disadvantaged contexts, these relationships may not be pre-existing and will therefore require active cultivation. Some grantees pointed to the high

turnover prevalent in economically disadvantaged schools as a contributing factor to this problem (C. Wylie, personal communication, October 3, 2019; T. Fox, personal communication, November 5, 2019; D. Voloch, personal communication, November 5, 2019). This posed a problem for grantees in several respects.

For example, as mentioned above in the discussion of turnover with respect to personalized learning, Danny Voloch of Drive to Write noted the need to have repeated and ongoing training and coaching to address this issue (D. Voloch, personal communication, November 5, 2019). In addition to losing training that has been invested in teachers that depart the school, program implementers operating in economically disadvantaged contexts must be prepared to establish a support network for the new teacher implementing the intervention. Losing a trained teacher "means you take like 12 or 15 steps backwards and start at a different place with a different teacher," according to Tom Fox from the National Writing Project (T. Fox, personal communication, November 5, 2019). Grantees operating in rural areas also pointed to the geographic isolation and small number of teachers in each region as contributing factors. For McREL, the difficulties associated with training rural teachers was one of the major factors that led the project's implementers to pursue implementing technology to facilitate teacher training. Casey O'Donnell shared that "once you start delivering with rural and semi-rural schools, it's really hard to get all of the teachers into one place and have an actual cost-effective way of doing that kind of training" (C. O'Donnell, personal communication, November 5, 2019).

Solution

For grantees experiencing these difficulties, technology played a critical role in helping teachers form connections. The National Writing Project's staff, for example, "created a number of online resources and platforms to increase the contact and intimacy of face-to-face interactions" (T. Fox, personal communication, September 30, 2019). For example, web conferencing tools made it easy to hold meetings with large numbers of geographically dispersed teachers while still encouraging the formation of professional relationships by using the breakout room feature to facilitate small group work. Accordingly, Tom Fox told us that the administrators of the National Writing Project "have found this to be very much like face-to-face work, with the intimacy of the small group being especially important. These meetings have the advantage of creating and sustaining whole-program identity" (T. Fox, personal communication, September 30, 2019).

Other grantees stated that technology and online meeting tools helped them establish strong virtual professional learning communities. United2Read's staff fostered virtual professional learning communities between coaches and teachers: "[T]he technology allows them to have more consistent contact with the teachers at a lower cost compared with in-person supports" (V. Young, personal communication, October 2, 2019). Grantees reported that developing this type of professional learning community is key to successful program implementation, and is something that may be less challenging to implement in more economically advantaged schools:

> Higher-income communities often have more staffing to coordinate and support school improvement initiatives. In this project we established an implementation team at each school consisting of the principal, trainer, fiscal manager, data-collection point of contact, and a teacher. Our staff met with the teams at least three times per school year. The implementation team meetings have been critical for helping schools balance these roles, find ways to compromise, and establish priorities. (C. Wylie, personal communication, October 3, 2019)

These learning communities may also take the form of mentorship from an experienced teacher rather than a larger group of professionals. The National Writing Project's implementers took this approach by connecting teachers with a leader "to support their implementation of [the program's] resources, co-plan a lesson sequence, and answer any questions" (T. Fox, personal communication, September 30, 2019). Overall, many grantees pointed to the use of technology to cultivate professional networks among teachers as providing a chance for teachers to critically examine their own teaching, learn from others, and develop relationships that helped support implementation of the intervention. These networks are an opportunity for previously isolated teachers to build a support system and foster continued learning and growth.

Considerations

While many grantees experienced success with cultivating professional networks through technology, some encountered obstacles with this approach. Even when virtual supports were in place, some grantees related that the lack of an in-person presence from their program posed challenges for teachers implementing the intervention. Casey O'Donnell from McREL shared that when the field operations team took a hands-off approach, "it made our stakeholders feel like they weren't part of the process, that there wasn't someone really paying attention to it" (C. O'Donnell, personal communication, November 5, 2019). Similarly, Danny Voloch of Drive to Write told us that using these types of supports to cultivate relationships "was a slow process that required a tremendous amount of in-person support, especially in the beginning" (D. Voloch, personal communication, November 5, 2019). Tom Fox of the National Writing Project also shared his reflection that without a large amount of in-person support from local professional development facilitators, "teachers would have just followed directions instead of actually learning about teaching writing" at a deeper level (T. Fox, personal communication, November 5, 2019).

These examples illuminate that technology-based supports for teachers to cultivate professional networks cannot be implemented in isolation. On-the-ground supports, particularly in the early stages of implementation, are critical to ensuring that teachers are able to fully participate in and learn from virtual professional networks and implement the program effectively.

Development of Voice, Agency, and Opportunity

Problem

Similar to the feelings of isolation teachers in economically disadvantaged contexts experience, students in economically disadvantaged communities often feel isolated, disenfranchised, and disconnected from various resources and dialogues in their local and regional contexts, as well as from the larger national and global context. Teachers in these communities also feel that interventions are being done without their professional expertise or consent, and that they are not given an opportunity to strategize with program developers and administrators or choose the best course of action for their students and classrooms.

Featured grantees identified this particular challenge in working with economically disadvantaged populations. In some cases, this was the specific rationale for their intervention, while others noted it was a byproduct but not the original intention. Specifically, Tom Fox of the National Writing Project noted that "cultivating the voices of youth in civic discourse, both local and national" and countering the "sense of isolation" was an important rationale for the project

(T. Fox, personal communication, September 30, 2019). C3R's implementers recognized that providing opportunity and agency to students in economically disadvantaged contexts was a matter of equity: "students and families from higher income communities have agency, voice and choice for their educational experiences… These [economically disadvantaged] students need to have hope that their voice matters. They need to have agency, voice and choice for their educational experiences" (D. Bowling, personal communication, October 8, 2019).

In confronting this type of challenge, the research literature indicates that as technology continues to increase in importance in our society, schools "have a responsibility to incorporate digital learning into modern-day classrooms" (Preston et al., 2015). This imperative extends to the economically disadvantaged context: If teachers do not effectively incorporate technology in their classrooms, these students are likely to be left further behind. Additionally, promoting student agency is of critical importance for educators who wish to promote engagement and discourse, since agency builds connections among students and between teachers and students (Preston et al, 2016) and also elevates critical 21st century skills such as meaningful decision making, critical thinking, and opinion formation (Carver, 2016; Mitra, 2004; Rector-Aranda & Raider-Roth, 2015).

Teachers and stakeholders also recognize the critical importance of teaching and incorporating technology skills into the classroom for future college and career preparation, but often struggle with the appropriate ways in which to do so (Carver, 2016). For this issue as well, studies indicate that technology solutions can increase student motivation, attitude, engagement, and self-confidence and positively impact student achievement and growth (Carver, 2016). Further, fostering student voice is an opportunity to improve student outcomes and school reform efforts (Mitra, 2004; Rector-Aranda & Raider-Roth, 2015). These challenges and solutions coincide with some of the themes shared from the grantees in implementing their projects in economically disadvantaged contexts. Bearing out the research literature, grantees recognized the benefits of using technology platforms to build voice, opportunity, and agency in students and staff alike.

Solution

In the experience of some grantees, like those from the National Writing Project, the technology solution was of critical importance to developing voice, agency, and opportunity for students and teachers (T. Fox, personal communication, November 5, 2019). These practices, even when targeted at the teachers and staff, impacted student learning and voice as the new technologies enabled students and teachers to interact in different ways. In many cases, however, while the technology solution was the selected mode of change, secondary practices arising from the technology intervention were ultimately what fostered voice and opportunity. In working collaboratively to implement a new practice or integrate the technology solution, teachers and staff cultivated new practices around teaching and learning that elevated levels of engagement and participation. This, in turn, increased agency and opportunity.

The implementers of the National Writing Project utilized and engaged technology as a solution to elevate rural voices and provide them with an opportunity to engage in national or regional dialogues around civic issues. In doing so, the project's implementers identified argumentative writing as a mode to cultivate agency, connection, and voice for students in economically disadvantaged rural contexts. By providing students with the writing skills needed to establish an argument based on a national or regional conversation, the project's staff encouraged students to become more civically engaged. Technology was a critical support for

this effort because it connected students with larger audiences, thereby providing both teachers and students with a degree of opportunity and agency.

As Tom Fox related, "it's really empowering for the students and for their teachers to see their work as part of something larger" (T. Fox, personal communication, November 5, 2019). This approach allowed students to take part in conversations and foster connections with civic discourse beyond their immediate communities. It also demonstrated to teachers the meaning of their work and their power to create change and open doors of opportunity for individual students, classroom and school communities, and other teachers who in turn became more engaged in these dialogues and issues.

For example, one high school student in a rural location wrote an argument for purchasing a mobile health van for her rural, remote community. The foundation she wrote to responded by funding the request for the county office of health to employ a health van with three years of staffing. This experience demonstrates the power of cultivating voice for students: writing assignments for class go beyond just turning them into a teacher and getting a grade. As Tom Fox related:

> [T]his high school junior, probably, maybe, saved lives, but at least provided healthcare for a lot of people that wouldn't have had it… then there's school libraries and school gardens, and rerouting ambulances to reach remote areas. Students have done a lot of different things, but it's really the consequence of a buildup of agency over the year and confidence in their ability to write. (T. Fox, personal communication, November 5, 2019)

C3R's staff used an approach that emphasized relationship-building between students and teachers and involved mental models to identify resources, such as "emotional, mental, spiritual, support systems, role models" that acknowledged and addressed the "barriers created by poverty in economically disadvantaged communities… around money or the lack thereof" and promoted efficacy and opportunity (D. Bowling, personal communication, October 8, 2019). Therefore, "for an economically disadvantage[d] rural community it is about relationship building" and who students can go to in order to seek non-financial resources (D. Bowling, personal communication, October 8, 2019).

Under this approach, teachers and administrators placed equal emphasis on opportunities such as vocational or technical school and a four-year college degree, taking into account student goals and local opportunities in the work force and fostering a mutual respect with students, which Dr. Dessie Bowling of C3R posited helped "students work harder to transition to success" (D. Bowling, personal communication, October 8, 2019). Along these lines, for teachers in the C3R intervention, she related that programs were more successful when program implementers went to a school and worked "in concert with a teacher to integrate a technology-based program with daily instructional practices" (D. Bowling, personal communication, October 8, 2019). This practice, in turn, gave teachers a sense of professional agency and opportunity within the intervention by having them work on part of the intervention.

Drive to Write's implementers found that small-group coaching sessions had a positive impact on teacher voice and agency as teachers developed new skills around the technology itself and a new approach to teaching writing. Over the course of three years, teachers collaborated in small groups, presenting work to one another and slowly building rapport and professional agency in these circles. This method required a lot of upfront support and time to establish, but

ultimately had the effect of engaging teachers and cultivating further buy-in from them as they began "making the work their own" by contributing their own variations to the program and sharing what was working (D. Voloch, personal communication, November 5, 2019).

This approach also allowed the intervention to be further shaped and defined by feedback from users and stakeholders, demonstrating the value of these individuals' voices in the program. Moreover, the implementers from both Drive to Write and United2Read spoke to the way that the technology intervention "rejuvenated" teachers, and built capacity, professionalism, agency, and collaboration among staff through practices such as collaboration, coaching, critical reflection, and peer-sharing (D. Voloch, personal communication, November 5, 2019; V. Young, personal communication, November 5, 2019).

Considerations

Not all featured grantees agreed that technology interventions positively influenced agency, voice, and opportunity among students and staff. For example, as noted in the previous considerations section for professional networks, Casey O'Donnell (McREL) related that when field operations staff were less directly involved, stakeholders felt isolated from the process and from any additional support or attention to their work. Thus, "when the problems of the things like bandwidth and Internet connectivity became an issue, there wasn't someone there to be like, 'Oh, I hear you. Let's address that problem right now'" (C. O'Donnell, personal communication, November 5, 2019). Thus, the technology solution may have hindered experiences of agency and voice when it was implemented as a replacement for other forms of support. To this end, United2Read's implementers related that the school and district context matter more than the technology solution (V. Young, personal communication, November 5, 2019). Fostering agency, opportunity, and voice through a technology intervention, then, must be done intentionally and carefully, so that the technology intervention does not become a replacement for other supports.

Further, United2Read's leadership related that the technology intervention itself was not necessarily the cause of increased teacher agency and voice; rather, how the intervention was implemented within the district to engage teachers and cultivate a sense of buy-in was critical to developing further agency and voice with participants. According to the program leads of United2Read, the process of participating in the A2i technology intervention promoted the "specific literacy goals of the teachers or schools. These types of factors, I think, mattered much more in terms of giving teachers and students voice and agency as a result of implementing the program, rather than the program itself" (V. Young, personal communication, November 5, 2019). In this vein, staff from Drive to Write and the National Writing Project also posited that teacher supports were critical to developing teacher voice and agency, and that this occurred over a long process of multiple years. The respective models allowed for the creation and promotion of voice and agency through coaching rather than by following a prescriptive intervention or curriculum (T. Fox, personal communication, November 5, 2019; D. Voloch, personal communication, November 5, 2019).

Looking Forward

In addition to the benefits of facilitating personalized learning; building professional identity; and developing voice, agency, and opportunity for teachers and schools, some of the key features of technology interventions promote buy-in as well as scaling and sustainability. Principally, these features are virtual supports, rapid data analysis, and efficiency of delivery.

Regarding virtual supports for educators, technology platforms enable the creation of virtual professional development (PD) sessions, with the caveat that teachers must be provided with guides and in-school leadership to help them set up and navigate these virtual sessions (A. Jacobs, S. Siegal, Z. Kasad, & V. Young, personal communication, October 2, 2019). Technology interventions may also enable coaches to provide cheaper and more consistent support to teachers via virtual professional learning communities as compared to traditional in-person models (A. Jacobs, S. Siegal, Z. Kasad, & V. Young, personal communication, October 2, 2019). Alternatively, technology-based mentorship can be supplemented with traditional models in a blended approach, so that "virtual mentors also visit face-to-face to underscore the importance of their relationship and to understand more deeply the context of the classroom" (T. Fox, personal communication, September 30, 2019).

Implementing a technology-based intervention also enables program administrators to collect and analyze large quantities of data quickly, which they can then present to other stakeholders to build program buy-in and support for scale-up. C3R's implementers followed this strategy, telling us that, "We did not experience challenges with buy-in. We presented the curriculum to superintendents at our monthly KVEC board meeting and walked them through the system" (D. Bowling, personal communication, October 8, 2019). Tom Fox of the National Writing Project also honed in on the importance of this feature of technology, emphasizing, "what technology really does is… make the results of… analysis immediate for teachers, and in a form that they can share with their administrators to say, 'Hey, we're making progress.' So, it really is helpful in terms of buy-in and engagement" (T. Fox, personal communication, November 5, 2019). In addition, Claudia Miner from UPSTART told us that the program's data is "very, very compelling to decision-makers when it comes time to scale up, very compelling. They're usually surprised that anyone had that much data, and technology makes it easy" (C. Miner, personal communication, November 5, 2019). Technology's data analysis capabilities may also make programs more marketable, thereby aiding efforts to lobby for scaling resources from stakeholders like state legislators (T. Fox, personal communication, November 5, 2019).

Furthermore, technology lends greater efficiency to programs and services, a feature which can bolster scaling as well as long-term program sustainability. For Drive to Write's leadership, the path to scaling and sustainability lies in the efficiencies technology delivers to teachers. Danny Voloch of Drive to Write noted, for example, that "a challenge persists for even the most experienced teacher – how to provide actionable, timely, and individualized feedback on 150 student papers in the typical teaching load. In our project, we used technology to accomplish this critical instructional objective" (D. Voloch, personal communication, September 27, 2019). Regarding sustainability, Tom Fox of the National Writing Project told us that "The national office identifies promising practices with contracting… and shares them with the network… Additionally, we budgeted funding for a public-facing website that will include… open educational resources" (T. Fox, personal communication, September 30, 2019).

For potential future implementers of technology interventions in economically disadvantaged contexts, these grantees' experiences indicate that technology can be used to implement personalized learning; build professional identities and networks for educators; and develop greater agency, voice, and opportunity for teachers and students. These benefits address challenges common to economically disadvantaged schools. These challenges include wide variation in student preparation and skills, limited resources to provide differentiated instruction, the difficulty of creating professional learning communities in isolated, low-income rural areas,

students' sense of feeling disconnected from the larger world, and teachers' perception that they are not active agents in education interventions.

Although the benefits technology provides can help alleviate these challenges, that will also depend on several considerations. Principally, these considerations include:

- tailoring technology platforms to local technology capabilities;
- designing trainings that limit the downsides of teacher turnover;
- giving families the logistical resources needed to reinforce the intervention outside of the school environment;
- providing teachers with on-the-ground supports for building their professional networks; and
- enhancing technology's ability to promote agency, voice, and opportunity among students and teachers.

Looking forward, these grantees' experiences suggest that technology platforms will be a necessary component of future K-12 education, including data-informed assessment and instruction; classroom management; teacher professional development; and college and career preparation.

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Appendix A: Survey Questions

Dates that survey was open: **September 16 – October 11, 2019**

Thank you for participating in the EIR Program Dissemination Team's survey about technology interventions in economically disadvantaged populations. Each year, the Dissemination team produces two cross-project analyses on topics of interest to i3/EIR grantees. These papers are based on grantees' experiences and lessons learned, and aim to highlight promising practices, implementation successes and challenges, and findings around priority areas for the larger i3/EIR community and the field.

Your project has been selected to participate in this year's paper about serving economically disadvantaged communities with technology-based interventions. Serving economically disadvantaged populations is of key importance to the i3/EIR program, as evidenced by the requirement for grantees to commit to serving a high-needs student population. Additionally, this topic reflects the i3 Absolute Priority regarding the effective use of technology. Our goal in this analysis is to identify best practices and lessons learned from grantees like yourself in the area of implementing technology interventions in economically disadvantaged populations, and to share those findings with the broader i3/EIR community and the field.

At right, you will find 10 short answer questions. Please provide as much detail as possible in your responses. Once we have received and analyzed the survey responses from all grantees invited to participate in this paper, we will schedule a follow-up focus group to further define themes and critical lessons learned.

I. **Contact Confirmation**

Grantee:

Project Name:

Cohort Year:

Name of Person Completing Survey:

Contact Email or Phone Number:

II. **Background and Demographics**

1. What percentage of students served by your project are economically disadvantaged? Please note how you measure economic disadvantage (for example, percentage of students eligible for free and reduced-price lunch).

2. Describe the setting of your project. Are your implementation sites urban, suburban, or rural? What grade level does your program serve? Are there differences in the demographics of students served by your project across implementation sites?

3. What are some challenges that you experience working with an economically disadvantaged population?

4. What supports do you use to specifically address the needs of this population? Are these different from the supports you might provide if you were operating in a higher-income community?

III. Intervention and Implementation

5. If your program is not designed to teach a technology skill like coding, what led you to choose technology as the primary way to deliver your intervention?

6. Did the program fit the population, or did you have to make major adaptations?

7. Some i3/EIR programs are directed at teachers or school leadership rather than at students. For example, one program may provide professional development to teachers, while another provides a new technology for student use.

   a. If your program is directed at students: Were students able to adopt the technology smoothly and quickly? What sorts of challenges did you encounter, if any, in terms of resources and background knowledge? Did you notice any differences across implementation sites?

   b. If your program is directed at teachers or school leadership: Why did you choose to implement the program in this way? Did the demographics of the student population that you serve come into consideration at all?

IV. Sustainability and Lessons Learned

8. Do you have plans to continue this program after your grant ends? Do you have supports in place to make this program sustainable in an economically disadvantaged context?

9. How did you generate commitment and buy-in for the intervention from families and the local community? What strategies did you use? Did you experience challenges with getting buy-in?

10. What lessons have you learned that you could share with other grantees or those considering implementing a technology-based intervention with an economically disadvantaged population? Do you have resources or tips you can share?

Appendix B: Focus Group Protocol

Date of focus group: **November 5, 2019**

Thank you for participating in the EIR Program Dissemination Team's focus group about technology interventions in economically disadvantaged populations. The purpose of this focus group is to follow up to the survey that you recently completed on the same topic. We greatly appreciated your responses and want to delve more deeply into some of the issues you raised.

Over the course of the one-hour focus group, we will be asking you about some themes that came out of your survey responses. This will include challenges that your project may have encountered as well as lessons learned. Each question that we ask is open for group discussion. Please feel free to build off one another's responses or provide a differing perspective as we go along. We will raise approximately four questions for group discussion, depending on time.

Do you have any questions at this time about either the purpose of the focus group or how it will be conducted?

Please note that this focus group WILL be recorded; however, the recording will NOT be made publicly available. It will be used strictly for our internal notetaking purposes to improve the quality of this paper. Should we wish to include a direct quote in the paper, we will contact you first to receive permission.

1. Before we get started, we would like to verify who is joining us in the focus group today. When we call out your organization, please have each member of your team briefly introduce themselves, including your full name, role, and how long you have been involved with the project.

2. We were interested to find that many of you identified a major purpose or motivation for your project to be generating opportunity in the communities that your project serves. For this first question, we are interested in hearing more about why you chose a technology-based intervention specifically, and how the economically disadvantaged population may have influenced your thinking about implementing your project. Do you think that technology is uniquely suited to address either the problem you have identified or the economically disadvantaged context in which you work? Both?

   a. In your view, what makes technology such a useful intervention?

   b. Did you discuss the benefits and drawbacks of technology when designing the intervention? If so, did the benefits and drawbacks play out as expected?

3. Some survey responses mentioned that using a technology-based intervention gave voice, agency, and opportunity to students and teachers in economically disadvantaged communities. For example, the National Writing Project noted that "rural, economically poor communities often feel as if they are overlooked by public discourse. Our program, especially online instructional resources, counters this sense of isolation by carefully cultivating the voices of youth in civic discourse, both local and national." Even if you did not consider voice, agency, and opportunity in the planning phases, do you feel that this was a product of your program?

   a. What sorts of examples of agency, voice, and opportunity did you observe in practice?

b. Did specific elements of the technology intervention promote agency, voice, and opportunity to a greater extent than others?

c. Would you say that this was the purpose or rationale for implementing your project?

d. Do you feel that this is specific to technology-based interventions, or do you think that an intervention that didn't use technology would have the same effect?

4. Did you face any challenges in implementing your project that you feel were tied to the economically disadvantaged context? Was there anything that you did or approached differently because of the economically disadvantaged context?

a. By "challenges," we don't mean logistical challenges like computers that broke down or teachers that failed to complete all of their training. Rather, we want to focus on challenges that made you re-evaluate some fundamental aspect of the project (for example, whether a portion of the project should be structured differently because the students did not have Internet access at home).

Some examples from survey responses:

– a major emphasis on test scores and accountability

– not having sufficient resources (not enough computers open at the same time)

– high rates of teacher and administrator turnover

b. Did you find that your program's built-in supports were sufficient, or did you have to include more support than you would in other contexts? For example, some survey responses noted that classroom management was a bigger challenge than in a well-resourced context.

c. Did technology aid in differentiation and scaffolding strategies?

d. Was it a challenge to develop buy-in from teachers, administrators, or community members? Do you think this was related to the economically disadvantaged context?

5. Many of your survey responses mentioned plans to identify or secure funding that could sustain your project into the future beyond i3/EIR. What does it mean to you to plan for sustainability in an economically disadvantaged context?

a. Do you feel that you have to consider factors that may not be pertinent in a higher-income setting?

b. Do you have any tips for other grantees planning for sustainability in a setting like yours?

Conclusion

That concludes our questions. Do you have anything else that you would like to add or elaborate on? Before we wrap up, do you have any questions for us?

Thank you for your time. We will be in touch with a draft for your review by the end of the year. Please feel free to contact us directly if you think of anything else you would like us to know or if you have any additional questions or comments. Thank you again for your participation!