

The Possibilities and Limitations of Infrastructuring with a No-Excuses Charter Network

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Abstract: This design-based study details the infrastructuring efforts of a no-excuses charter network and university partners to support the implementation of physics instruction aligned with the *Next Generation Science Standards*. A team of teachers, administrators, researchers, and curriculum developers worked in partnership to redesign the network's Instructional Guidance Infrastructures (IGIs) to better reflect instructional improvement goals. We found that some components of IGIs were more mutable than others.

Introduction

As a solution for improving the academic outcomes of students from historically marginalized communities, no-excuses charter networks have been particularly controversial. Proponents have praised no-excuses networks for their high academic standards, coherent instructional model, and orderly classrooms, while critiques have argued that these features contribute to the usage of didactic instructional practices that do not prepare students for participation in a complex, democratic society. Although some no-excuses networks are attempting to reform their instruction in response to critiques (e.g. Fine, 2017), there have been few attempts by researchers to aid, document, or analyze these improvement efforts. Our design-based study contributes to this work by describing preliminary findings from a multi-year infrastructuring effort of a no-excuses charter network, which we name as College for All, and a university-based team of researchers and curriculum developers. Infrastructuring entails the ongoing redesign of arrangements and artifacts that shape and are shaped by conventions of work practice (Pipek & Wulf, 2009). A key difference between infrastructuring and professional design is leveraging the expertise of users during design, as infrastructures are embedded in usage patterns that may or may not align with intended design. Infrastructuring efforts focused on redesigning the network's Instructional Guidance Infrastructures (IGIs) to support physics instruction aligned with the *Next Generation Science Standards* (NGSS). IGIs include learning standards, curriculum materials, assessments, pacing guides, sustained professional development (PD), instructional coaching routines, and other artifacts that codify what counts as effective instruction (Penuel, 2019). This study analyzes ethnographic data collected during infrastructuring efforts, including IGI artifacts, interviews with designers, and participant observations. In doing so, we attempt to answer the following questions:

1. How can the IGIs of a no-excuses charter network be modified to support NGSS-aligned physics instruction?
2. What do modified IGIs reveal about the possibilities and limitations of instructional improvement efforts in no-excuses charter networks?

Approach to infrastructuring

Infrastructuring took place in four distinct stages: 1) establishing a negotiated vision of effective science instruction, 2) surfacing tensions between existing IGIs and this vision, 3) participatory redesign of IGIs, and 4) iterative redesign of IGIs in use. To create a negotiated vision, stakeholders first identified a focus for instructional improvement, assessing both current instructional practices and targeted growth areas. Then, using scaffolded questions, stakeholders identified what they should see in classrooms if improvement efforts were successful, including teacher/student and student/content interactions. The resulting vision was, "*Usage of instruction that increases student engagement in scientific practices through the inductive method, while also supporting conceptual science learning, college access, and the development of mathematical knowledge and skills.*"

Stakeholders then surfaced tensions between the network's original IGIs and the improvement goals outlined by the partnership. In particular, stakeholders surfaced design conflicts and practical concerns that had to be negotiated through compromise. For example, teachers expressed concern that the amount of content contained in the network's original pacing guide would limit their ability to implement university-designed lessons in which students were responsible for producing knowledge. Administrators expressed concern that they lacked the capacity to provide instructional coaching grounded in the negotiated vision of effective instruction, or fairly evaluate reform teachers. Surfacing these and other tensions provided focus to redesign efforts.

Stakeholders then began the process of redesigning existing IGIs, including teachers, district leaders, and university-based researchers, particularly the first author. Meeting facilitators used intentional protocols to elicit

practitioner and administrator ideas about ameliorating tensions between existing IGIs and the negotiated vision of effective instruction. For example, when redesigning instructional effectiveness rubrics, teachers first collaboratively brainstormed the instructional moves that administrators would observe in their classroom if they were enacting instruction consistent with the reform vision. Administrators and researchers then reviewed these observables, added input, negotiated with teachers, and then modified the existing observation rubric.

The experiences of IGI users during implementation were used to inform downstream revisions to IGIs. To facilitate this process, this article's first author was relied upon to document the experiences of infrastructure users, including observing lessons, conducting interviews, and documenting informal conversations. He then presented the findings of these inquiries to stakeholders as a method of both documenting and influencing change.

Data collection and analysis

Data collection and analysis followed an ethnographic case study approach, as we attempted to produce thick descriptions of infrastructuring efforts and the artifacts they produced (Hammersley & Atkinson, 2003). Artifacts included College for All's IGIs before and after changes were negotiated through the partnership. Additionally, audiotapes and fieldnotes from 24 infrastructuring sessions that varied in length from an hour to an entire day were collected. We also interviewed all stakeholders involved in infrastructuring efforts. Finally, although not reported on in these findings, we observed over 90 lessons of teachers involved in infrastructuring.

For our first analytic step, we identified characteristics of College for All's IGIs before and after infrastructuring efforts. We then made inferences regarding similarities within the mutable elements and similarities within the immutable elements in efforts of roughly generalizing what types of things are subject to change in a context similar to the one under study. These inferences were drawn from inductively coded field notes and transcripts, specifically those that included rationale behind design decisions. Finally, interpretive memos concerning why certain IGI elements were more mutable to design than others were developed.

Findings

To work towards its goal of NGSS-aligned physics instruction, College for All was eager to collaborate with university partners to redesign IGI elements that help shape daily physics instruction. These redesigns included changes to the 1) instructional practices considered effective by the network, 2) expectations for student learning, and 3) focus of professional learning. These resulting IGI components were better aligned with ambitious science teaching practices, showcasing the potential of infrastructuring to disrupt the usage of instructional techniques solely focused on transmitting content. What counted as effective instruction was mutable, even in a network that had previously received national and local praise for closing achievement and access gaps. College for All's broader mission of eliminating educational inequity was a major catalyst for this change, as stakeholders theorized that NGSS-aligned physics instruction would promote more equitable outcomes in STEM courses.

On the other hand, components of IGIs that help maintain instructional consistency and predictable outcomes across the network's physics classrooms proved less susceptible to infrastructuring efforts. These included the network's expectations of 1) consistent instruction across classrooms, 2) data-driven instruction and evaluation, and 3) standards coverage. This commitment to instructional coherence and test-based decision making has both benefits and drawbacks. From a student achievement sense, instructional consistency may help College for All maintain its success preparing students for standardized exams and continue to ensure that 100% of graduates are accepted into a four-year college. However, a continued emphasis on standard coverage may influence teachers to interrupt student engagement in scientific practices in order to use more didactic techniques when coverage pressures are present. A College for All teacher described this tension, stating that the pressure to cover standards caused her to implement some student investigations as demonstrations. In her words, the impact of this decision on students was to "Jib them of learning it on their own. Because I knew they could do it. But I just didn't have time." Although enforcing standard coverage may ensure that all students are exposed to disciplinary content, it may also interrupt teachers' attempts to engage students in NGSS-aligned instruction.

References

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