INCREMENTAL CHANGE AS AN ALTERNATIVE TO AMBITIOUS PROFESSIONAL DEVELOPMENT

Samuel Otten
University of Missouri
ottens@missouri.edu

Zandra de Araujo
University of Florida
zdearaujo@coe.ufl.edu

Amber G. Candela
University of Missouri, St Louis
candelaa@umsl.edu

Courtney Vahle
University of Missouri
courtneyvahle@mail.missouri.edu

Maria E. N. Stewart
University of Missouri
mntkd@umsystem.edu

F. Paul Wonsavage
University of Florida
wonsavagef@ufl.edu

Faustina Baah
University of Missouri
fa6nz@missouri.edu

Mathematics professional development (PD) has had many small victories but has not brought about a widespread change in what constitutes typical mathematics instruction. This theoretical essay argues that many PD projects have been based on an assumption that the aims of the PD should be ambitious, but ambitious PD requires that a large set of criteria be satisfied (active learning, coherence, duration, teacher buy-in, etc.). Even then, ambitious PD may only reach a minority of teachers who are ready to make the transformation. An alternative approach is incremental PD, which starts with a teacher's contextual constraints and ubiquitous practices, offering modest but meaningful "nudges" for their instruction. These nudges are intended to be easily taken up by teachers, providing a sense of success that leads to them sustaining the practices and being portable enough to be easily shared with other teachers, allowing for scale.

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There have been vast investments of both time and money for teacher professional learning, yet despite these investments, mathematics instruction in the United States has remained largely unchanged (Karp & Schubring, 2014; Stigler & Hiebert, 1999). Professional development (PD) focused on teachers' instructional practice often faces three overarching challenges: (1) making a direct impact on the teachers in the PD, (2) sustaining outcomes beyond the life of the PD project, and (3) scaling up the PD (Heck et al., 2019; Karsenty, 2021). In attempts to overcome these challenges, scholars have made progress studying the characteristics of effective PD (e.g., Desimone, 2011; Wilson & Berne, 1999) and mechanisms by which the PD might spread (e.g., Morris & Hiebert, 2011). Still, despite these efforts, the lack of widespread reform in mathematics instruction persists (Wilkie, 2019).

We contend there is an important assumption underlying these challenges—namely, that PD should be targeted at instructional change that is ambitious or transformational (e.g., Kazemi et al., 2009; Kraft & Hill, 2020). Ambitious instruction, characterized by being disciplinarily rich and student-centered (Cohen, 2011), is something many mathematics education scholars strive toward and make the centerpiece of their PD for teachers. But what if we instead start with a more modest goal? Like Star (2016) and Litke (2020), we argue incremental changes could also be the goal of PD. In this paper, we discuss how this shift from ambitious to incremental goals for PD changes the instructional foci (Litke, 2020; Star, 2016) and leads to redefining success, rethinking the starting points for PD, and new mechanisms for sustainability and scaling.

Starting Points for Incremental PD

Teachers' Constraints

Many professional developers adhere to researchers' recommendations for effective PD in format, duration, and contextual features (e.g., Desimone, 2011, Feiman-Nemser, 2001). It is generally agreed upon, though with some dissent (Sims & Fletcher-Wood, 2021), that attending to criteria such as active learning, coherence, substantial duration, and teacher buy-in are necessary for implementing PD aimed at promoting ambitious instruction; however, it is unclear that PD aimed at modest incremental improvements needs to meet these same criteria. Central to the idea of incremental PD is that professional developers offer small suggestions for improvement—which we refer to as nudges—based on a teacher's current practice. Thus, we argue the starting place for incremental PD is teachers' constraints and contextual realities, which typically include limited planning time, conventional curriculum and resources, conventional expectations from students and parents, limited professional collaboration structures, and more.

Many of these constraints are often at odds with the criteria for effective PD. For example, Desimone (2011) and others have suggested PD requires a substantial investment of time, but we also know that many teachers do not have enough time for planning (Steen-Olsen & Eikseth, 2010). An incremental approach to PD would be designed with such constraints in mind. For example, the PD may simply offer a small nudge that does not take much time and that supplements existing curriculum materials, nudging toward a conceptual connection or a brief opportunity for student choice on their problems. These nudges, though small, could be more impactful than a teacher whose constraints prevent them from engaging with ambitious PD at all. If the nudge fits within the teacher's time constraints and aligns with the curriculum and their community expectations, and seems to be a slight shift in a positive direction, we hypothesize that this will yield high levels of buy-in, which is perhaps a necessary criterion for ambitious PD and incremental PD alike, but the latter can generate the buy-in from more teachers.

Ubiquitous Practices

Often PD is designed to promote ambitious practices such as robust classroom discourse (Herbel-Eisenmann et al., 2017), enacting cognitively-demanding tasks (Smith et al., 2008), argumentation, and reasoning (NCTM, 2009), and many others. These PD efforts aimed at ambitious practice are worthwhile. Yet, ambitious practices are difficult to achieve, typically resulting in pockets of success because they often require major shifts in teachers' existing practice. This discrepancy between current practice and ambitious practice can potentially position teachers in a deficit manner. We bear in mind Spangler's (2019) call to "consciously respect teachers and…avoid deficit approaches in our thinking about teachers" (p. 3).

Thus, in contrast, incremental PD would focus on the commonplace, daily pedagogical practices teachers are already comfortable with. For mathematics teachers, such practices might include demonstrations with worked examples (Atkinson et al., 2000), students' independent work time on problem sets (Otten et al., 2021), or the teacher going over homework at the board (Otten et al., 2015). An example might be comparing two procedural worked examples instead of simply doing one after the other (Litke, 2020). Another example is adding a single reversibility problem (Dougherty et al., 2015) to an existing exercise set. The intention is that teachers can immediately understand how they would incorporate these nudges into the practices they already employ, but also understand the nudges bring some modest yet meaningful benefit.

Sustaining and Scaling Incremental PD

Sustaining Modest Changes

Sustaining teacher change, especially ambitious change, has long been a challenge in teacher education (Liu & Phelps, 2020). We contend that an incremental approach can lead to sustainable change in at least two ways. First, incremental PD will focus on changes close enough to teachers' existing practices that the change is less disruptive and can be incorporated regularly. As Thaler and Sunstein (2008) have found regarding human change in general, if we want a change to take hold, we need to make it easy for people to do. Moreover, by attaching the incremental changes to common occurrences in the classroom, those changes can carry forward for the teacher by becoming their new instructional "habits," so to speak. As Star (2016) noted, it can be powerful to make a 10% improvement in a typical practice a teacher uses in 90% of their lessons rather than seeking a 90% improvement in a practice they only use 10% of the time.

Second, sustainability can come from the incremental PD delivery mechanism itself. When grant-funded (ambitious) PD projects are completed, the resources to continue teachers' learning are often depleted. The PD may involve summer workshops and follow-up sessions throughout the school year. Such models may impact teachers' instruction, but sustaining the change is challenging as projects end and teachers, administrators, and curriculum materials come and go. Instead, by aiming for incremental improvements to PD, delivered in small packages, teachers can learn them in a short time or more flexible formats (e.g., videos) and can try them relatively quickly. This would also allow the creation of artifacts that can be reviewed on demand. Thus, sustainability is gained from the low resource cost associated with delivering incremental PD, which also allows it to be shared among practitioners, leading us to the issue of scale.

Scaling Modest Changes

Another long-standing challenge for the field is the ability to scale PD initiatives (Heck et al., 2019; Karsenty, 2021). Here, we consider scale in terms of reaching a large number of practitioners. Because of the profound change entailed for most teachers concerning ambitious mathematics instruction and the confluence of factors needed for this change to occur, it seems optimistic to expect that ambitious PD might eventually scale to 10% or more of mathematics teachers. But again, as Star (2016) pointed out, it can also be beneficial to many students if 90% of (conventional) teachers make some small improvements to their instruction. As mentioned above, PD aimed at incremental changes would not require the same extensive resources as more ambitious efforts. The freedom to deliver specific, actionable practices via on-demand formats, such as videos, downloadable documents, or social media suggestions will allow for the scaling of those efforts by the PD creators and practitioners themselves. Moreover, by offering an incremental improvement to a ubiquitous teaching practice, we are increasing the likelihood that the improvement can be shared from person to person because many other teachers will also recognize the applicability of the suggestion to their own teaching.

A second notion of scale is the consideration of whether or not the incremental practices will scale toward future, substantial changes. It seems plausible that when teachers enact small improvements, they may gain confidence and feelings of success, which may lead them toward the addition of more small improvements. These small improvements may eventually lead them quite far from the conventional instruction they began with. This is not to say that the accumulation of incremental changes is necessarily equivalent to an ambitious change, but sustained improvements that have the potential to spread to other teachers should be welcomed, nonetheless. And the relationship between multiple incremental changes and larger ambitious changes can be explored empirically, which is where we now turn.

Questions and Final Considerations

What are some of the empirical questions that we can ask about incremental PD for mathematics instruction? There are a few that are of immediate interest to us:

1. Because incremental PD should be rooted in a teachers' unique contexts and built upon their existing ubiquitous practices, to what extent will certain nudges work across multiple contexts and for various teachers? There are some commonalities in many teachers' situations, so we hypothesize some generality for certain nudges. Still, we have to examine the balance between the general applicability of nudges and the individualized preferences of teachers (what aspects of their teaching do they want to be nudged on?).
2. What are some of the characteristics of teachers who are likely to respond positively to incremental PD, and what are the characteristics of those who are able to proceed directly to ambitious PD? As discussed above, we hypothesize that a majority of mathematics teachers can be well served by incremental PD, particularly those who may be resistant to ambitious PD. Still, if teachers respond positively to ambitious efforts, then we would support ambitious PD in those particular cases. Further research is needed, as well as further input from teachers themselves, to help us understand the differences.
3. In what ways can we measure the incremental changes in teachers' instructional practice when some of the changes are designed to be subtle or modest? Some of our current methods for assessing the impact of PD hinge on larger changes, but with incremental PD, we will need to be able to track the small changes and whether they are sustained.
4. Can deep, systemic issues of inequity and injustice in mathematics education be meaningfully addressed in an incremental manner? We agree that, in many ways, transformational change is needed and time is of the essence, but is there a role for incremental change in immediately bringing about some equitable practices or in setting the stage for later, more profound changes?
5. Given the multitude of small changes that could be proposed to a teacher, how will we decide which to employ and when? Relatedly, what are the sequences of incremental changes in instruction moving toward? Perhaps incremental instruction could be guided by the larger goals of ambitious instruction. It is an open question, however, whether and how an accumulation of such small changes yield (or not) a more substantial change long-term. Munter (2014) found teachers' visions of high-quality mathematics instruction can gradually increase in sophistication, but can one type of vision or pedagogy gradually shift into a different type altogether? One hypothesis is that incrementally improving conventional instruction will eventually increase the likelihood that teachers will respond positively to ambitious PD. A second hypothesis is that improving conventional instruction will lead to teachers feeling more confident and affirmed in what they do, so they will not transform away from conventional instructional models. A third hypothesis is that the incremental changes are simply independent from ambitious goals for instruction.

In embracing an incremental approach to PD, meant as a complement to the ongoing ambitious PD efforts, we contend that many of the persistent challenges in relation to the limited impact, sustainability, and scale of efforts to improve mathematics teaching may be addressed, or at least explored and understood from a perspective distinct from the ambitious approach.

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