

*But what does it look like with my kids?*  
*Bringing a vision of high-quality math instruction to life using artifact analysis*

Katy Janik  
Vanderbilt University  
Peabody College  
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From the beginning of the capstone project, my interest was math teaching and learning. Because of my previous professional experience, I was specifically interested in a design that supported the work of secondary math instructional coaches. Although my research question developed over time, my imagined audience was never generic, and often took the face of the coaches and teachers with whom I worked prior to coming to Peabody. My work in New Orleans was primarily in public charter schools. Structures for support and coaching were already established and I had considerable flexibility in how I designed professional learning for teachers within those structures. Often, my work was considering how to create learning opportunities that were meaningful to teachers and told a cohesive story of support. When I proposed my capstone in the fall, I expected my design to address how novice math coaches create a coherent focus for teacher learning opportunities, such that they feel interconnected and relevant to individuals' practice. These initial ideas were grounded in my reading of work from the Middle School Mathematics and the Institutional Setting of Teaching (MIST) project (Cobb et al., 2018).

To explore a context outside of my experience, I interviewed four Metro Nashville Public Schools (MNPS) Numeracy Coaches and analyzed those interviews for themes. The interviews took place via Zoom over the course of a week early in the spring semester. Each was 30-45 minutes and included questions on coaches' visions of math instruction, their day-to-day responsibilities, frequently used resources and research, and how they selected and implemented coaching activities in their work. There was consistency in both content-specific and job-specific language used and this seemed to be because of the shared body of literature on which the coaches relied, which also intersects with much of the literature I reviewed for my capstone.

The coach interviews helped me immensely to focus my design. There were several themes that surfaced, but I focused on three that came up repeatedly and were mentioned by all

coaches interviewed. First, coaches named their primary goal as working towards a vision of high-quality math instruction (Munter, 2014) that supports productive views of students' mathematical capabilities (Jackson et al., 2017). These specific phrases were used repeatedly, and their definitions mimicked those of the MIST team as all MNPS coaches were familiar with *Systems for Instructional Improvement* (Cobb et al., 2018). Second, coaches felt this work could not happen without building strong relationships with teachers that allow for co-inquiry into practice and avoid an evaluative power dynamic. Most coaches noted that they were attempting to do the latter by framing their work in student learning. For example, using student work during an observation debrief rather than relying solely on the interpretation of the coach during an observation. Lastly, although coaches clearly identified practices of high-quality math instruction rooted in research, they also felt a responsibility to meet the needs and motivations of individual teachers based on their current practice.

The problems of practice surfaced by the MNPS Numeracy Coaches resonated with my own experience working with teachers. I found that a teacher and coach could experience the same lesson but have different interpretations or reach different conclusions about the effectiveness of the practices implemented. When planning together, teacher and coach could be saying the same things but imagining something different. In particular, when teachers were exploring a new practice, it was much more powerful when I could share examples from the teacher next door or through a model in their own classroom. There was always a desire to have examples of the work done within their own schools or from their colleagues.

These interviews led me to refine my research question to the following: *How can school-based math coaches clarify a shared vision of high-quality math instruction through their support of secondary mathematics teachers' instructional practice over a school year?* This

question encompasses elements that I was determined to include in my design, specifically, adaptability to varied contexts and school structures, and ongoing iterative work with explicit time for collaborative reflection and planning. Additionally, I chose the phrase “vision of high-quality math instruction” because this concept was referenced by all MNPS coaches. When they used this phrase, they were typically referencing literature from the MIST team. However, each of them still infused their own personal take on that vision in our interviews. I felt that although this phrase is specific to the literature, it is broad enough to indicate that teachers’ work is toward a specific shared vision and is influenced by their own beliefs about math teaching and learning.

My final design (linked in Appendix A) came after several iterations of coaching tools that were designed to promote reflection and action over the course of a school year. The purpose of the design is to clarify a shared vision of math instruction collaboratively in a secondary math department, which could be either a departmentalized middle or high school. The structure roots teachers’ ongoing professional learning opportunities in research-based practices using an anchor text, which could be selected in a variety of ways. Teachers collect and share artifacts representative of the instructional practices on which they are focused to ultimately create an archive of what the practices look like for them in their school and with their own students. This process is facilitated and supported by an instructional coach and is intended to be flexible for various contexts, anchor texts, coaching structures, and professional development schedules. The audience of my design is instructional coaches but the learners involved are the community of teachers within the department.

For this design, I took a situative view of learning (Lave & Wenger, 1991). The design is intended to evolve teacher practice through ongoing collaboration in a community of practice and within their classroom spaces. Although there is a tangible outcome in the archive of

collected artifacts, the purpose of the design is for teachers to deepen their understanding of their current practices in relation to their vision of math instruction through shared negotiation, reflection, and subsequent action. That is, teacher learning happens through their participation in a collaborative community addressing problems of practice and continually clarifying their shared vision and beliefs about math teaching and learning.

When I began to consider the actual components of my design, that is, the activities in which teacher and coach would engage, I turned to Gibbons and Cobb's (2017) potentially productive coaching activities. This piece has two significant components which influenced the design. First, the elements of high-quality professional learning the authors outline were a consideration for the process by which teachers and coaches engage in the negotiation of artifacts that are representative of their vision. The design has opportunities to foster teacher community, incorporates elements of teachers' daily work, and utilizes discussion and reflection as well as planning and practice (Gibbons & Cobb, 2017). Second, the idea for potential artifact selections embedded within a book study came directly from their list of potentially productive coaching activities. Most of the examples for possible artifacts are inspired by this work. For example, in phase one, teachers and coach might co-design instruction or rehearse aspects of instructional practice (Gibbons & Cobb, 2017). In phase two, the coach might model instruction or co-teach lessons to support a teacher's enactment of a focus practice. In phase three, artifact negotiation might include analyzing classroom video or examining student work (Gibbons & Cobb, 2017).

The design has been created to consider the personal vision and experience of teachers, while also incorporating research-based practices. All MNPS coaches interviewed referenced the MIST team's work on visions of high-quality math instruction (VHQMI). While I did not use the VHQMI rubric explicitly, their frequent reference to this specific research inspired the idea to

use an anchor text to select focus practices for teachers to explore. Importantly, Munter's (2014) work on VHQMI indicates that teacher development is more effective when rooted in a shared, sophisticated vision. Later work shows that teachers developing visions are influenced by the relative sophistication of the visions of their colleagues, particularly in departments with frequent interaction (Munter and Wilhelm, 2020).

Jackson et al. (2017) also indicate that teachers' conceptions of their students' abilities is influenced by their context. I have included Jackson et al. (2017) in my theoretical framework because developing a productive view of students' mathematical capabilities is an underlying purpose for this design. The importance of productive views came up in all of my coach interviews. When pressed, most of them indicated that the way they address unproductive views in their work with teachers is by trying new practices in teachers' own classrooms so that they can witness their students engaged in rigorous mathematical tasks. A goal of the design is for teachers to consider how ambitious and equitable instructional practices look in their own schools and classrooms. However, coaches also noted that this may not always go to plan. For example, a teacher and coach may co-plan an activity that does not go well. Coaches then noted that they rely on their relationships with teachers to continue to encourage rather than to abandon a practice that was initially unsuccessful. The inclusion of flexibility in the type of artifacts teachers choose to share with their colleagues is a reflection of this potential situation. The design is intended to support development over time at the pace and level of support that is required by individual teachers.

Lastly, the ideal design includes collaborative meetings for teachers to analyze artifacts – both those that might be considered exemplary and those that represent problems of practice. To deepen my understanding of how teachers learn in communities of practice, I drew on Dr. Ilana

Horn's work exploring interactions in teacher workgroups (Horn, 2007; Horn & Little, 2010), as well as on teacher collaborative time (Horn et al., 2018). Her investigation of the participation structures and how interactions influence teachers' conceptualization of their practice led me to the idea of negotiating vision through artifacts. From the chapter in *Systems for Instructional Improvement* (Horn et al., 2018), I noted the importance of collaborative work feeling sustainable and meaningful over time, incorporating opportunities to try practices and reflect on the experience, and the benefits of expert facilitation.

The design is intended to function as a guide for coaches to enact this project with their teachers. The materials are coach facing and include guidance for planning and implementing teacher meetings. First, there is a coach consideration guide for use prior to implementation which includes suggestions for foundational and logistical planning as well as coach reflection on their personal vision. Second, there is a suggested structure and sample questions for a beginning of year meeting to frame the purpose of this collaborative project. Third, and the primary component of the design, is an iterative four-phase cycle of inquiry that would be repeated as many times as necessary or desired over the course of a school year.

In phase one, teachers and coach explore a focus practice from an anchor text through discussion and practice with colleagues in a shared setting. For example, teachers might focus on a practice from *Principles to Action* such as "establish mathematical goals to focus learning". In phase two, teachers and coach then gather artifacts, such as video clips, student work, lesson plans, or teacher reflections, that represent the focus practice or represent a current problem of practice related to their instructional focus. This phase may also include an iterative analysis of artifacts or additional work between an individual teacher and coach. In phase three, teachers analyze artifacts collected during phase two with their department in a shared space. In phase

four, selected artifacts that the team feels exemplify these practices in their classrooms will be archived over the course of the year in a shared document, such as a Google Doc, with artifacts linked and organized by instructional focus. This phase also includes reflection for both teacher and coach on impact and possible next steps.

Additional components of the design include a quarterly reflection to reflect on the impact of shared work to date in a given school year. This provides space to consider what is and is not working, where individuals feel they have made growth, and if adjustments are needed to better support teacher learning. Lastly, there are two appendices which show an example of how the meeting planning and artifact gathering could look for a practice from the text *Principles to Action*, as well as a list of ten other resources that could fit the structure of the design.

Although the design can be tailored to the needs of the teachers and coach in a particular context, there are a few logistical requirements for use of this design. The two primary assumptions are an existing, or able to schedule, shared meeting time for teachers at a minimum of one hour per month and a math instructional coach with both the capacity and skill to plan and facilitate meetings. Additionally, while perhaps not a prerequisite, I imagine that this design is best used by a coach who takes a stance of co-inquiry into teacher practice and works in other capacities with the teachers. I created the design for use in a middle or high school because of the context within which I was researching, but it could be used in primary school with little adjustment. Other examples of how the design might be tailored for context are whether phases are enacted in shared or one-on-one coaching settings, the frequency and duration of collaborative meetings, and through choice of anchor text or the selection of focus practices from that text. Notes for potential adjustments and considerations can be found throughout the design.

During the capstone presentations, Dr. Rowe asked if this design is a bit like “reinventing the wheel at each school”. While I understand the desire to have ready-made materials and examples to support teachers’ learning opportunities, my decision to keep this specific to the particular math department is responsive to the context from which I was drawing. When I asked coaches in their interviews what they would do when a teacher was resistant to a new or underutilized practice, most responded similarly to a coach who explained, “it’s just ‘let’s try it and see’ and like I said not taking the stance that ‘this is what you need to do, and you do it because I said’, but ‘hey, let’s try this see and see how it works” (personal communication, 2021). While I do think there could be tremendous value in future use of the artifacts collected, I also believe that much of the value of this process comes through the selection and negotiation of the artifacts with a coach and group of teachers. Learning happens through engagement in the various design activities and the resulting archive of artifacts might then support future teacher learning opportunities.

At various points throughout the design process, I was able to share, and receive feedback on, pieces of the design from one of the MNPS Numeracy Coaches, instructional coaches and leaders from a variety of other contexts, and Dr. Horn’s SIGMa team. Their suggestions and questions show up in many ways that helped me reach the final iteration for my design. In my conversations with them I also gleaned several possible implications of this design in addition to the potential benefits for teachers engaging in the cycle. The collection of artifacts could be added to, revised year over year, and used by a coach to support their work with individual teachers. Over time, the collection of artifacts that a department creates together could be used to support a school-wide productive view of students’ mathematical capabilities (Jackson et al., 2017), it could be used as a resource for new teachers as they become acclimated to the practices

of a department, or for returning teachers to see the evolution of their practice. It could also be used as an example for other schools or departments interested in implementing the design.

Finally, Dr. Dunleavy asked a question during presentations that I knew would likely come from her as she and I also met a few times throughout the capstone process. My conversations with her always left me reflecting on the ways in which I was, or was not, centering equity in my design, which was the crux of the question she asked. In its current iteration, I think that the extent to which this design promotes equity in math instruction is perhaps too largely dependent on the implementation and decision making of the math coach. First, coaches could select an anchor text such as *The Impact of Identity in K-8 Mathematics Teaching: Re-thinking Equity-Based Practices* (Aguirre et al., 2013) that explicitly identifies equity-based practices. This would support teachers' work in reflecting on the inclusivity of their current practices and developing norms that foster positive mathematical identity and shift mathematical authority to students. Second, the beginning of year and quarterly reflections are constructed for teachers to consider the ways in which their personal visions of math instruction may be influenced by their experiences or biases. However, I think that this could be a more central focus of the reflections and work throughout the design. Additionally, reflection could include student interviews or video analysis of identified equity-based practices to root teacher reflections in evidence.

**Appendix A**  
[Final design](#)

## References

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