

# **Towards a Framework for Collaborative Design in PBL-centered Instructional Coaching**

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## Towards a Framework for Collaborative Design in PBL-centered Instructional Coaching

While extant research advocates for the use of instructional coaching in helping teachers develop project based learning (PBL) related skills and materials, this literature largely overlooks the perspectives of the coaches themselves. In response, we present findings from an instrumental case study of a PBL-focused instructional coaching initiative centered on the practices and conceptualizations of two coaches engaged in a year-long professional development program with thirteen teachers from four US schools. Our findings reveal that the coaches positioned this work as collaborative and situated within the specific learning ecologies of teachers. Our analysis also produced a four-part framework (including design parameters, narrative mapping, prototyping, and meta-practice) that structured how the coaches engaged teachers. We conclude with a discussion of how instructional coaches (both within and outside of PBL-focused PD programs) can take up this framework to help facilitate professional development experiences centered on the collaborative development of curricular materials.

Keywords: instructional coaching; project based learning; design for learning; professional development; situated learning

### **Introduction**

Since its inception, Project Based Learning (PBL) has provided an alternative approach to pedagogy and instructional design that challenges contemporary forms of teaching, learning, and school organization (Fitzgerald, 2020; Guo et al., 2020; Kokotsaki et al., 2016). PBL represents a form of inquiry learning and constructivist teaching based on five key features: posing open-ended driving questions or problems to solve; exploring these questions in authentic and situated ways; collaborating to find solutions with students, educators and community members; scaffolding technology use to access forms of learning beyond traditional curricula; and, most importantly, students embodying their solutions within publicly shared, novel artifacts (Jacques et al., 2019; Krajcik & Blumenfeld, 2005). But effectively implementing PBL can prove challenging: teachers often need to embrace attitudes, instructional approaches, and

pedagogical knowledges that greatly diverge from their normal way of teaching to ensure successful implementation of PBL, implying a need for novel forms of professional development (PD) that are contextualized and allow space for teachers to plan for implementation (Barron et al., 1998; Dole et al., 2016; Kokotaski et al., 2016).

In turn, instructional coaching represents a potential avenue for context-specific PD centered on PBL. As defined by Gibbons & Cobb (2017), this form of PD “involves teachers working with a more accomplished colleague as a primary form of job-embedded support to improve instructional practices” (p. 411) with coaches tailoring their efforts within the particular context of the school and the immediate needs of the teacher. Because instructional coaching shifts PD towards an intensive, iterative, and one-on-one approach to working with teachers, this form of teacher education can help enact the fundamental changes involved in shifting schools towards a PBL model (Rader, 2020; Knight, 2006). Yet despite the reported efficacy of instructional coaching, Gibbons & Cobb (2017) also argue that research has largely overlooked what coaches do as they work with teachers to accomplish these results. This claim holds especially true for instructional coaching efforts related to helping teachers implement PBL, with little to no research exploring how coaches conceptualize this work (Rader, 2020).

Following this provocation, we respond to the following research question: how do instructional coaches support teachers in shifting their pedagogical practices towards PBL? In doing so, we not only present novel findings on how instructional coaches conceptualize their practice, but also explore the affordances of a particular model of instructional coaching. To address this question, we present findings from an instrumental case study (Stake, 1995) centered on two instructional coaches as they worked with teachers on developing PBL curricula and teaching practices. Through analyses of interview data and observations, we present a four-part framework

employed by the coaches that emphasizes contextual knowledge and teacher agency: setting design parameters, engaging teachers in narrative mapping, supplying prototypes, and employing PBL as a model for instructional coaching. By foregrounding Zugelder's (2019) concept of collaborative coaching, the coaches helped teachers develop their craft while simultaneously co-constructing a contextualized and situated understanding of PBL. Additionally, we extend our argument beyond the context of PBL-focused PD by asserting the value of collaboratively designing classroom materials and developing teaching practices in all pedagogical contexts.

### **Literature review**

To further situate this work within contemporary research, we present an overview of PBL and instructional coaching literature. In doing so, we draw connections between these bodies of scholarship to advocate for instructional coaching in PBL-centered professional development efforts.

### ***Project based learning***

Building on Krajcik & Blumenfeld's (2005) five key features (question posing, exploration, collaboration, technology scaffolding, and producing/sharing artifacts), Kokotsaki et al. (2016) further define PBL as "a student-centered form of instruction which is based on three constructivist principles: learning is context-specific, learners are involved actively in the learning process and they achieve their goals through social interactions and the sharing of knowledge and understanding" (p. 267-268). This approach to learning therefore positions the lived realities and interests of students within authentic learning processes that emerge through self-directed explorations (Dymond et al., 2015). Because of this, the driving questions students consider through PBL need to exist within an ill-defined problem space (to allow for multiple solutions

and learning pathways) and teachers need to place control of student learning in the hands of students themselves (Diehl et al., 1999; Svihla & Reeve, 2020). In terms of its efficacy, extant research shows that students learning through PBL either match or exceed students in traditional classroom environments on most standard achievement measures (such as standardized tests) while also developing improved attitudes towards learning and 21<sup>st</sup> century skills like collaboration and divergent thinking (Chen & Yang, 2019; Remijan, 2017).

Yet despite its student-centric nature, the effectiveness of PBL often rests on teachers' ability to successfully implement and manage this approach to teaching and learning. According to Barron et al. (1998), the success of PBL directly relies on curriculum design as teachers need to intentionally scaffold student learning. At the same time, involving teachers in curriculum development allows them to develop their practice, shifting attitudes, pedagogical approaches, and knowledge (Dole et al, 2016). This shift often happens as teachers continually employ PBL models in their classroom, leading to an increased sense of self-efficacy and ownership over their practice (Havice et al., 2018), a broadened and more defined professional identity (Tsybulsky & Muchnik-Rozanov, 2019), and an improved understanding of their students as learners (Potvin et al., 2021). But for teachers to accrue these benefits, the shift from traditional pedagogical models to PBL-based instruction requires high quality PD experiences that attend to PBL specifically (Dunbar & Yadav, 2022; Young, 2018). This holds true because PD focused on helping teachers develop pedagogical skills and curricular materials related to PBL (or PBL-focused PD) leads to more successful implementation over generalized PD experiences (Ravitz et al., 2012; Hixson et al., 2012).

While more research on what defines high quality PBL-focused PD is needed (Kwietniewski, 2017; Whitlock, 2020), extant research does provide some insight.

Structurally, PBL-focused PD requires both generalized curricula and direct mentoring that centers PBL (Becker & Riel, 1999; Whitlock, 2020). Additionally, PBL-focused PD should happen over extended periods of time with multiple opportunities for feedback and iterative components that address more complicated aspects of PBL (i.e. meta-cognitive strategies) (Chiu et al., 2021; Shernoff et al., 2017). Along with the need for mentoring, high quality PBL-focused PD needs to be contextual and adaptable to teacher environments with explicit support for this work from school leaders (Lammert, 2023; Potvin et al, 2021; Young, 2018). For Miller et al. (2021), this implies PD designers and coaches must “deeply engage teachers in the PBL practices of situated learning to engender productive adaptation of materials” and “provide opportunities for teachers to set up and reinforce practices that promote... teaching responsive to the cultures and ideas of students” (p. 762). Teacher educators can further facilitate this approach by applying PBL as a model for PD, guiding teachers through project based experiences where they design materials for their classrooms (Chookaew et al., 2017; Ravitz et al., 2012; Reid-Griffin et al., 2019). In spite of these promising findings, more research into PBL-focused PD that directly considers and compares different PD models needs to occur to fully develop a holistic and thorough understanding of how teacher educators can support teachers engaging in PBL. With these concerns in mind, we now turn towards instructional coaching as one possible mode of PD that can attend to these concerns.

### ***Instructional coaching***

According to Campbell & Malkus (2011), instructional coaching involves an experienced educator (who often does not have a responsibility to teach beyond PD instruction) working directly with active teachers on Desimone’s (2009) five components of high quality professional development: developing pedagogical content

knowledge; collaborating on active learning experiences (co-teaching, developing curricular materials, etc.); establishing coherence between new and old knowledge and institutional policies; provoking and providing sustained attention to context-specific areas of growth; and facilitating collective explorations of new ideas within the school's community of practice. Education researchers have repeatedly shown that instructional coaching can dramatically improve teacher practice in ways that non-targeted professional development opportunities do not (Kotze et al, 2019; Reddy et al., 2021; Teemant et al, 2011). Importantly, the benefits of instructional coaching emerge specifically out of coaches' ability to situate the work in the immediate learning context and provide tailored and specific feedback to teachers (Hammond & Moore, 2018; Hannan & Russell, 2020; Stoetzel & Shedrow, 2020), an ability that comes from the non-authoritative nature of instructional coaching wherein coaches serve multiple roles (implementer, advocate, educator, etc.) for teachers (Woulfin, 2018). Through this approach, teachers develop a sense of agency regarding the improvement and refinement of their practice as educators that emerges from the relationships they form with their coaches (Capello, 2020; Richardson et al., 2019). In turn, research has shown that instructional coaching can play a critical role in both pedagogical and institutional school reforms.

Moreover, previous studies have shown that instructional coaching provides a valuable tool in helping teachers implement innovative teaching strategies such as PBL (Devine et al., 2013; Knight, 2019). The success of this specific approach to PBL-focused professional development comes from the increase in self-efficacy teachers feel when supported by instructional coaches (Havice et al, 2018; Rader, 2020; Richardson et al., 2019). Fallick et al. (2008) argue that this shift in teacher mindset and improvement in practice comes from the teachers' feelings of ownership over the

curriculum and the confidence and ability to independently customize that curriculum to their needs. Additionally, Dougherty (2014) asserts that teachers interested in PBL learn best through instructional coaching practices that position teachers and coaches as equal, foregrounding a collaborative process of teacher development. These findings once again align with the situated nature of instructional coaching, since the collaborative and iterative approach to professional development inherent to this method of PD helps teachers shift their teaching practice and vision of pedagogy towards PBL instructional models (Krajcik et al., 1994).

However, instructional coaching generates its own unique challenges. For instance, successfully implementing instructional coaching requires that both teachers and coaches shift their mindset by embracing teacher self-efficacy and long-term development over immediate fixes or improvements (Joyce & Showers, 1982; Tobin & Espinet, 1989). Additionally, this mindset shift demands a dialogic and collaborative approach to professional development, one situated within the school itself that embeds the considerations of all stakeholders (Stoetzel & Shedrow, 2020; Haneda et al., 2019; Tanner et al, 2017). To address these ongoing challenges, researchers and educators need to reimagine the boundaries of instructional coaching. Dimitriadis & Goodyear (2013) and Kickbush & Kelly (2021) take a theoretical approach by advocating for an expansive framing of instructional coaching that not only considers coaching for “learntime” (what teachers do while teaching) but “design for learning” (the development of curricular materials prior to teaching). This conceptual broadening draws on Zugelder’s interpretation of The New Teacher Center’s (2017) three-part differentiated coaching framework: instructive coaching, “where the coach provides support for specific situations, offers solutions to problems, and leads conversations;” collaborative coaching, “where the coach and teacher share stake in the conversations,

and solutions are co-constructed,” and facilitative coaching, “where the teacher leads the conversations and the coach may probe for problem-solving” (Zugelder, 2019, p. 182). By exploring approaches to coaching that intentionally draw on these models, researchers and practitioners can attend to Kraft et al.’s (2018) call to continue developing a deeper understanding of instructional coaching practices and features that make coaching successful while reimagining the boundaries of this approach to PD.

With Kraft et al.’s (2018) challenge in mind, we explore one possible approach to instructional coaching within a PBL context. In doing so, we build on the small but growing body of research into PBL-focused instructional coaching by illuminating how the coaches themselves frame their own instructional coaching practice. Extant research has clearly illuminated the benefits of instructional coaching for teachers (and schools as a whole) shifting towards a PBL model (Dougherty, 2014; Odell et al., 2019; Rader, 2020). Yet research has generally overlooked the conceptions of coaches in developing these professional development interventions, despite the inherent value these perspectives provide in understanding and improving on instructional coaching practices (Gibbons & Cobb, 2017; Smith, 2012). While teachers, administrators, and students contribute significant insight into the efficacy of PBL-centric instructional coaching, coaches also provide invaluable perspectives on the pedagogical practices within these PD contexts. Furthermore, this line of research can inform researchers and teacher educators interested in understanding best practices for coaching and training coaches both within and beyond PBL models. In turn, we now present new empirical data to illustrate one framework PBL coaches use in their practice.

## **Methods**

To further explore how coaches support teachers in the transition from traditional pedagogies to PBL, we employed an instrumental case study design. This methodology

centers on investigating phenomena within a unique case as opposed to exploring a “typical” research site. Instrumental case studies therefore highlight the affordances of particular contexts instead of producing generalizable results and provide a valuable tool in developing theories or frameworks that can speak to practices and problems within other contexts (Stake, 1995). For this study, we illuminate the process that two instructional coaches used to support teachers as they developed classroom practices and collectively redesigned school curricula to center PBL across all subject areas. While this professional development program did help teachers build pedagogical skills, it more intensely focused on the creation of new curricular materials. This study therefore focuses on the less common approach to coaching wherein teachers focus on the creation of new materials rather than building their “learntime” skills (Dimitriadis & Goodyear, 2013; Kickbush & Kelly, 2021). It is because of this novel focus on developing PBL knowledges and skills through curricular design that we employ an instrumental case study.

### ***Study context and participants***

Findings for this study come from a professional development program focused on supporting teachers and administrators in school change initiatives to become PBL focused schools. The program involved three separate components (a week long colloquia, school-wide PD sessions, and just-in-time supports) specifically focused on helping teachers transition into PBL instructional models that remained contextualized within the immediate school environment (e.g. allowing the goals of the school to structure how PBL manifested in that context). Figure 1 shows a timeline of both the year long PD experience and the activities for the week long summer colloquium during the 2019-2020 academic year.

Taking a design based approach (Anderson & Shattuck, 2012) to the development and subsequent study of this program, a group of instructional coaches worked together to create and implement an initial week-long colloquium where teachers and administrators from across the United States developed PBL-related pedagogical skills and materials. The colloquium involved a wide range of activities, ranging from hands-on PBL experiences and guided discussions to open-ended studio time and facilitated critique sessions. After this first colloquium, coaches collected feedback from participants to refine the week-long experience before implementing with a new group of teachers and administrators. Figure 1 displays the schedule for the third and final iteration of the colloquium in summer 2019.

To help teachers deepen their PBL practice, instructional coaches facilitated school-wide PBL professional development workshops and provided just-in-time support during the academic year following the colloquium. In doing so, coaches further aided schools in their shift towards PBL in two key ways. First, workshops and just-in-time support extended the reach of the instructional coaching to everyone in a specific school beyond those who attended the colloquia. Second, coaches situated their work within a specific school as opposed to having to design learning experiences that addressed the needs of participants from across the United States. The workshops again centered PBL as both a pedagogical and school reform tool and regularly involved activities taken from the colloquia, but the coaches tailored these activities to each school with input from administrators and veteran teachers. The workshops therefore differed from school to school, with instructional coaches aligning the specific activities and intended outcomes to a given context. For example, at one school the coaches lead a workshop for teachers to think through the assets they and their students bring and how they can leverage these assets in the classroom.

Similarly, the coaches also routinely provided just-in-time support to both individual teachers and school communities. The coaches worked with individual teachers to address challenges they faced in their classrooms. This work ranged from exchanging potential new lessons via email to synchronously collaborating on solutions to problems of practice during video conferences. The coaches also worked with school communities in person to uncover and address shared issues as needed. Instructional coaches iterated on these just-in-time supports, using input from teachers and administrators to adapt and improve on workshops and one-on-one coaching sessions.

Taken together, the entire program attended to the structural components of high-quality PBL-focused PD acknowledged in the literature: generalized curricula and direct mentoring focused on PBL (Becker & Riel, 1999; Whitlock, 2020), extended duration with opportunities for feedback and iteration (Chiu et al., 2021; Shernoff et al., 2017), and learning experiences situated within the context of the school (Miller et al., 2021; Potvin et al., 2021; Young, 2018). For our instrumental case study, we will explore how the coaches manifested these overarching practices in the third and final year-long implementation of the program. In doing so, we share insights from the most refined (and, ostensibly, most effective) iteration of the colloquium, workshops, and individual coaching sessions.

In this study, we focus on the insights and experience of Dennis and Joni, the two instructional coaches from the final year of implementation. Dennis, a former high school language arts teacher and administrator of 10 years, helped develop and facilitate the program throughout its three-year run. Joni, on the other hand, joined the project after the final colloquium, facilitating the workshops and just-in-time supports only. Before that, she taught high school history for 10 years where she developed an interdisciplinary PBL program within her school. Dennis also regularly taught using

PBL, giving both lived experience with this pedagogical approach. We also included 13 participating teachers in our research population (see Table 1 for demographic details). We recruited teachers specifically to represent a wide range of subjects and all four schools that participated in the program's final year. All teachers participated in at least one of the coaching supports offered to their school. However, levels of participation from each teacher varied. While all four schools did send representatives to the colloquium, four participants in this study did not attend the colloquium. Additionally, the amount of one-on-one meetings and self-initiated support each teacher received varied based on their individual needs. Finally, while all teachers attended school-based workshops, the focus and duration of these experiences also varied between schools. To ensure anonymity, we use pseudonyms for all coaches, teachers, and schools.

### ***Data collection and analysis***

Data for this study comes from semi-structured interviews with instructional coaches and teachers as well as observations of in-person workshops. For coach interviews, we began by asking both coaches to write reflective memos on 5 separate occasions that chronicled the coaching work they did that day with either a school or an individual teacher. A member of the research team then conducted a 45-minute follow up interview, asking the coach to expand on the memo and further reflect on the meaning they ascribed to that particular session with questions such as "Where is the coaching and/or what coaching moves did you make in this interaction?," "What do you think prompted this interaction i.e. why do you think they reached out to you?," and "What are the next steps you and the teacher are taking after this interaction?"

Next, we interviewed each participating teacher at the end of the implementation year. These semi-structured interviews lasted roughly one hour and focused on two topics. First, the teachers discussed their experience teaching through PBL by answering

questions such as “What was it like teaching content through PBL lessons?” and “What do you believe your students took away from the PBL lessons?” Second, the teachers described their experience in the program as they worked with Dennis and Joni. We prompted discussion in this portion of the interview with questions like “what supports, if any, have you received to help you teach with PBL in your classroom?,” “what did you gain from your interactions with Dennis or Joni?,” and “Was there anything you wished you had gotten out of the interaction but were not able to?”

Finally, researchers observed two in-person and four online coaching sessions. Researchers conducted these observations by writing down concrete observations of the session (and inferences or impressions of those observations when applicable) every five minutes. Once the session ended, the observer wrote full ethnographic field notes based on these observations. Although this study primarily focuses on the interviews with Dennis and Joni, we include numerous insights gathered from both the teachers and observations to both expand on the coaches’ insights and ensure validity via triangulation (Denzin, 2012).

Once the program ended and we collected all of our data, two researchers independently coded the entirety of the dataset using an open and iterative approach to descriptive coding (Saldaña, 2015), specifically attuning to moments that highlighted the practices instructional coaches engaged when working with teachers. These codes ranged from concrete moments within the coaching process (such as coaches engaging teachers in “guided reflections” or teachers asking for help with “team management”) to more abstract conceptions of coaching practices (e.g., coaches developing their practice via “care work” or structuring the coaching through “co-design”). The researchers then combined their emergent codebooks, merging any codes that had significant overlap and removing other codes that did not hold relevance or seem applicable beyond a few

isolated applications. Once established, researchers independently re-coded all data with the combined codebook. Rather than calculating interrater reliability, researchers employed the consensus building process described by Harry et al. (2005) by discussing each misaligned code application and resolving any discrepancies. Finally, one researcher undertook a second round of open and iterative coding by grouping the codes into a smaller set of emergent themes via pattern coding (Saldaña, 2015). The four themes that the researchers constructed through this process are described in detail in the next section. The other two members of the research team then reviewed both the codes developed through this method and their application. Through this coding process, we construct an understanding of how coaches (and teachers) experienced and conceptualized this unique instructional coaching experience.

## **Findings**

To better understand the nuances of how participating coaches conceptualized their approach to PBL-focused PD, we use this section to explore the four themes we constructed (design parameters, narrative mapping, prototyping, and meta-practice) that collectively produce the framework at the core of Dennis and Joni's instructional coaching practice (see Table 2). Our analysis reveals that coaches began by establishing design parameters and using narrative mapping exercises to set the stage for further curriculum design work with the teachers. They then responded to the needs of teachers in real time by providing prototypes to further their practice. Finally, they employed PBL pedagogical approaches as a meta-practice. We also found that coaches use this framework to engage what Zugelder (2019) would describe as a collaborative coaching model that eventually builds towards a facilitative process, with Dennis and Joni working alongside teachers to develop their practice while also creating space for self-directed development. We use this section to further describe how coaches and

educators collaboratively designed materials and constructed new knowledge within the professional development program.

### ***Design Parameters***

When explaining the structure of their practice, the coaches describe a process of implementing design parameters (a term used by Dennis, see Table 1) within which teachers can develop their own curriculum or PBL approach. Dennis defines this as

coaching through posing questions: in some cases modeling thinking and in other cases sketching out a space of possibility. I think one of the value-add factors for us is that we're able to say, "here are some things that are going well and here are some ways to extend that forward." That offers them a way to look into the future without feeling overwhelmed and stressed.

By "sketching out a space of possibility", Dennis acknowledges the value of coaches as co-creators, aiding teachers in the development of context specific materials to alleviate the extra work that comes with refining those tools. Additionally, the coaches maintain design parameters through the use of inquiry or question-based pedagogies. Joni connected to this notion when describing her work with one teacher in particular:

I never told her specifically what to do, when and where. I'd be like, "You could enter something here," but I would give her more options of things to do. I think that's where she needed that help. Then she would take it and then kind of make it her own.

In this moment, Joni specifically avoids dictating what the teacher should do and instead opts to allow the teacher to develop their own work while guiding them in that process.

In describing her experience with the coaches, participating teacher Kelsey describes the work in similar terms:

rather than just saying, “Here's what you should do and how you should do it,” they constantly are providing multiple options, multiple outlets for us to choose from. So that way we can fit [PBL] to our teaching style or what we're comfortable with. So that way we can really make it our own.

In providing multiple outlets or multiple ideas to work with, the coaches provide a space in which the teachers can develop their practice in a personalized way while also constructing what Desimone (2009) describes as coherence with their previous understanding of teaching. We also witnessed this work in practice, which we described in our field notes as follows:

Dennis continues to listen to the teacher, nodding his head and voicing agreement. Dennis offers metaphors/ways of thinking about what the participant is sharing (e.g. “you gotta go around, sniff everything, before you know where you want to focus”) and making gestures like brushing off his shoulders and making thumbs down signals. (3/2/2020, Workshop at Shippy High)

Again, Dennis creates a space for the teacher to lead the design process and explicitly invites them to explore the space in front of them. Rather than defining the goal and the process to get there, the coaches invite teachers to explore and discover what exists within the design space of PBL.

### ***Narrative mapping***

Moving towards a more involved component, the coaches described “narrative mapping” as an integral part of their process. Narrative mapping represents a bottom-up process, like crafting design parameters, where teachers define for themselves the path they will follow as they develop as professionals (Madsen, 2016). Coaches engage teachers in a dialogue that shapes their professional development into a narrative, through which coaches and teachers can find a desired outcome, figure out where they are in their process, and determine what their next steps might be. Ramona, a teacher in

this study, describes this process as follows:

They've just been there to untangle my web of ideas because I'm not really sure how to do it. The first time I brought it up, I just kind of spewed all of my ideas at them. They have organized them in an understandable way. So they've kind of taken everything I've told them, all of the ideas that I had, and put them in a usable form.

To foreground the bottom-up nature of this work, the coaches situate themselves with PBL scholarship by relying on questioning as a pedagogical technique to help teachers develop this narrative for themselves (Jacques et al., 2019). Dennis described this process explicitly:

I call it a narrative mapping, where I ask them, “What are you hoping to do? What's your current situation? How's it going? What are the things you're good at? What are your constraints? What are you envisioning being valuable?” We did that, and that set our work on a better course.

Similarly, Joni used an ongoing series of questions to help teachers construct a narrative map as well:

It was easy for me to walk around and look at what they were writing down and be like, “so if this is at the beginning and this is at the end (what you want [students] to be at the end of high school), what would it look like in the middle?” You're just asking them a lot of questions, getting them to think.

In both instances, the coaches rely on a collaborative coaching approach to help teachers define their own understanding of where they are in their development and their goals as professionals. In the example provided by Dennis, this involves helping teachers recognize where they are starting and where they want to end up while Joni's approach centers on guiding teachers through the process of developing a path between

these ends. In doing so, the coaches open the opportunity to engage a more self-directed process moving forward.

### ***Prototyping***

Turning towards the process of developing curricula and classroom materials, coaches would engage in a process of prototyping during which they would either design a tool with teachers for classroom use (e.g. a rubric) or share a tool they had used in their own classrooms for teachers to iterate on. For example, the coaches led a session on building school structures that we describe in our field notes as follows:

Joni responds: shares her experience teaching in [her home state] and how, being [a PBL] school, they might have some more wiggle room. [Joni] gives an example of how, when her school adopted a new model, it gave them more agency. It is about the students, but it is also about the teachers and their sustainability. Discussions continue at tables. (3/2/2020, Workshop at Shippy High)

In describing a model she used, Joni connects to the theme of design parameters by allowing participants to continue discussing and developing school structures but follows provides a concrete prototype for teachers to iterate on. This moment then acts as a precursor to future teacher-coach collaborations since the prototype does not provide the model teachers eventually use but instead acts as a tool in developing newer models.

For the coaches, prototyping represents a crucial step in the coaching process because it helps teachers grasp design skills and tools they may not initially have.

Dennis illustrates this process in the following example:

I sketched out really quickly, while they were talking, how I had gone about doing what they were wanting to do with the English curriculum. They wanted a thing, but had no real mechanism for how they'd go about doing this sort of alignment.

They ended up staying for the whole duration of a morning planning block that was four hours and made up a proposal.

Crucially, the end goal in this process does not involve the teachers adopting Dennis' structure in its entirety. Instead, the teachers develop their own proposal that embraces some of the mechanisms in his design. Joni describes a similar process when she says,

When we're brainstorming, I feel like there's always something that comes out of it. Like, 'Oh, yeah. We've seen something similar,' or, 'We've done something like this with this school.' And it's like, 'Okay, let me send you something,' or, 'Let me add to this,' and so I feel like that almost creates a domino effect.

The domino effect that results from sharing an initial prototype evolves as the teachers take up the design process after coaches share these artifacts.

From the teacher perspective, prototyping represents an ongoing process through which teachers develop agency over time. Marsha describes her own development as follows:

Early in the year, they would come and give us teachery stuff. We would talk to them and we'd be like, "we just need a rubric." And they'd be like, "Do you want us to make it?" We'd be like, "Yeah, we do." So at the beginning it was much more concrete. And then as the year went on, their coaching became much more high-level.

In this quote, Marsha shows how prototyping played a role in her work as a teacher and how that developed over time. At the beginning of the year, she relied heavily on coaches to design materials for her. But as the year progressed, the role of the coach shifted away from concrete tool development (ostensibly because she was capable of designing these tools on her own) and towards "high level" considerations that created space for teacher-directed design.

## ***Meta-practice***

Connecting the work of coaching to PBL more explicitly, our final theme relates to the process of engaging instructional coaching as a meta-practice that mirrors the project development process with teachers. Specifically, we found that the coaches engaged teachers in thinking through complex and ill-defined problems, supported teachers to develop tangible and novel artifacts, and positioned themselves as facilitators and resource gatherers - moves that mirrored the ways in which PBL teachers work with students.

Initially, coaches challenged teachers to think through a complex and ill-defined problem space (in this case, improving classroom practices through PBL) a la Diehl et al. (1999). During one observation, we witnessed coaches not only positing a “wicked problem” but also providing a means for making thinking within that problem space visible:

Dennis kicks off the session and introduces using the poster for the session. Poster has sections named: Aspirations [early, mid, end], Assets, Realities, Design/Looking forward. Dennis mentions that he likes to see this time as a way for him and Joni to enable the teachers to be able to talk to each other and learn from each other. Dennis gives participants a prompt to start thinking and filling out the poster and discuss as small groups. (3/2/2020, Workshop at Shippy High)

At the other end of the process, teachers spent time after this initial meeting to develop tangible and novel artifacts that responded to this problem space in personally meaningful ways. This happens precisely because the coaches position teacher agency as the end goal of their process. According to Dennis, their brand of coaching is

super simple, but something to the effect of ‘do things that are relevant to their job and their position.’ Give them some freedom to make a thing that's going to be practical and believe in and trust their expertise. Help them to surface and use that.

How Dennis frames this creative process aligns perfectly with the aims of PBL defined by Krajcik & Blumenfeld (2005): allowing learners (here referring to the teachers) to develop their own practical and meaningful responses to challenging questions in the form of tangible artifacts, a process through which learning occurs. Engaging PBL as a pedagogical practice within instructional coaching therefore relies on coaches prompting teachers to explore certain ideas and then allowing educators to collaboratively develop their own solutions to wicked problems.

Further still, the coaches employed pedagogical moves consistent with PBL methodologies. As the teachers discussed, this involved coaches primarily acting as facilitators and resource gatherers rather than primary sources of knowledge (Lammert, 2023). In one simple example, teacher participant Nancy said “Dennis and Joni provide these scaffolds that get you thinking about how to develop a project,” showing that the coaches produced structural tools for teachers to develop their project design skills over time. Additionally, Daisy, another teacher, described the role of coaches as guides in finding valuable resources:

I think Dennis was really great in being able to just kind of off the cuff be like, “I know four books, and its page 342 that you need to be looking at.” That was really helpful, because he just out of nowhere is like, “I scanned these four books for you last night, and they're in your email.”

This approach to coaching, one that mirrors inquiry-based PBL pedagogies (Jacques et al., 2019; Lammert, 2023), allows the teacher to find an issue or develop a question and then let coaches provide resources that can help teachers solve that problem without the coaches necessarily producing a solution of their own. In terms of what happens after creating a final product, the coaches also discussed the importance of sharing these products with an audience. In one example provided by Joni, this involved distributing one teacher’s work with her colleagues:

I went through and looked at her unit plan and videos. I remember highlighting it and saying, “This was awesome. Learned a new tool. Can I share this with other people?” I think that really helps because it encourages the teacher to feel like, “Wow, I actually did something that I thought was just something that was for my classroom, but now can be used in other classrooms.”

The process of sharing curricular materials therefore embedded these artifacts with meaning. From question posing to sharing artifacts, Dennis and Joni’s design process mirrors the structure of PBL (Jacques et al., 2019; Krajcik & Blumenfeld, 2005) and aligns with research into using PBL for professional development (Chookaew et al., 2017; Du et al., 2020; Ravitz et al., 2012; Reid-Griffin et al., 2019).

## **Discussion**

Placed into conversation with each other, the four themes produced through our analysis build on Dougherty’s (2014) research into collaborative coaching practices within PBL-focused PD by producing a framework for collaborative and facilitative instructional coaching beyond this specific program: coaches can begin by establishing design parameters and using narrative mapping exercises to set the stage for collaborative and facilitative approaches to curriculum design, then respond to the needs of teachers in real time by providing models/prototypes to further their design practice, and finally encourage teachers to share and reflect on what they have created, thus mirroring the tenants of PBL. This model of coaching shifts between Zugelder’s (2019) conceptions of instructive, collaborative, and facilitative coaching, mirroring the fluidity of coaching roles described by Woulfin (2018). However, the coaches primarily foregrounded the collaborative aspects of this work, using instructive moments to bring teachers into a more collaborative process and eventually using that collaboration to shift towards a more facilitative relationship. In doing so, the coaches inherently center the specific

needs of the teachers by tailoring this work to particular school contexts, a necessary component of instructional coaching (Stoetzel & Shedrow, 2020).

This teacher-centered approach to instructional coaching not only exists as an overarching theme but manifests within each theme individually, thus responding to Gibbons & Cobb's (2017) call for more research into the practices of instructional coaches. First, the design parameters set by the coaches specifically emerge from the goals set by the teacher, with coaches only providing a series of questions or prompts to help teachers define the space of PBL for themselves. Second, narrative mapping materializes directly out of the context of the school and the teacher's specific practice, with teachers defining this map throughout. Third, the process of prototyping relies on the coaches providing material catalysts for teachers to begin designing materials for themselves. Finally, relying on the tenants of PBL to frame instructional coaching draws on the learner-driven nature of PBL (Kokotaski et al., 2016) and brings that practice into this PD context.

Through the construction of this framework, our findings reaffirm Kickbusch & Kelly's (2021) claim that collaborative design can provide an effective model of instructional coaching, one that attends to all of the core components of high-quality PD described by Desmimone (2009) and extends this research by providing key processes for engaging that coaching philosophy. By defining a theoretical space in which teachers can develop new materials that help advance their practice, guiding teachers through a process of self-reflection and goal setting over time, and then initiating design processes by introducing prototypes for teachers to explore, the coaches in this study engaged teachers in learning content knowledge associated with PBL. Considering Barron et al.'s (1998) contention that the efficacy of PBL often rests on learning design, the process developed by the coaches in this study represents a potentially powerful

approach to PBL-centered professional development. Combined with Rader's (2020) assertion that instructional coaching can increase teachers' sense of self-efficacy in relation to implementing PBL, this study further advocates for the use of instructional coaching within PBL-focused PD. Future research should continue to expand on and explore the nuances of this model while instructional coaches can build their own practice through this framework.

Additionally, the deeply contextual nature of this work also responds to the ongoing call by multiple researchers to develop situated professional development programs focused on PBL teaching models (Miller et al., 2021; Potvin et al., 2021; Young, 2018). In relying on a blend of collaborative and facilitative coaching, the coaches in this study deeply root their work within the context of a particular school, calling on teachers to foreground their own experiences and their own understanding of their school environment in designing materials for their classroom. Moreover, the meta-practice embedded within the coaching process builds on previous studies that use PBL within teacher PD by showing how PBL-focused instructional coaching can help teachers develop both PBL materials through collaborative design processes and pedagogical skills, covering both forms of instructional coaching described by Kickbusch & Kelly (2021). This study therefore contributes to existing research into the use of instructional coaching in PBL-focused PD by forwarding the use of collaborative coaching models.

Although this study focused on instructional coaching related to PBL, our findings also indicate the value of foregrounding collaborative coaching outside of this particular teaching methodology. By using instructional coaching as a means for collaboratively developing classroom materials, and not just developing "learntime" skills (Dimitriadis & Goodyear, 2013), the coaches in this study unintentionally respond

to Kickbush & Kelly's (2021) assertion that coaching can and should shift towards a design-based model to both produce materials that teachers will implement in their classroom and contextualize the work of instructional coaching in the teacher's environment. In turn, this study continues to challenge instructive models of instructional coaching (Zugleider, 2019) that rigidly define the teacher as learner and the coach as educator. Instead, participating coaches situate their work in the context of the teacher while simultaneously allowing teachers to guide the learning process in ways that recognize situated knowledge. In framing their pedagogy around design parameters, narrative mapping, and prototyping, other instructional coaches can attend to the same kind of situated and collaborative PD described here. Future research should expand on these themes to consider other conceptualizations of collaboration within instructional coaching as well. Instructional coaching rooted in the knowledge of teachers and the context of the school holds value far beyond the development of PBL-related skills and materials. As Hannan & Russell (2020) have shown, the value in instructional coaching comes from the affordance of contextualizing this work in the lives of educators and students. Instructional coaching experiences that center the development of contextualized curricular materials and pedagogical innovations, like the one described in this study, represents one potential model for achieving this goal.

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**Table 1**

Demographic information of participating teachers

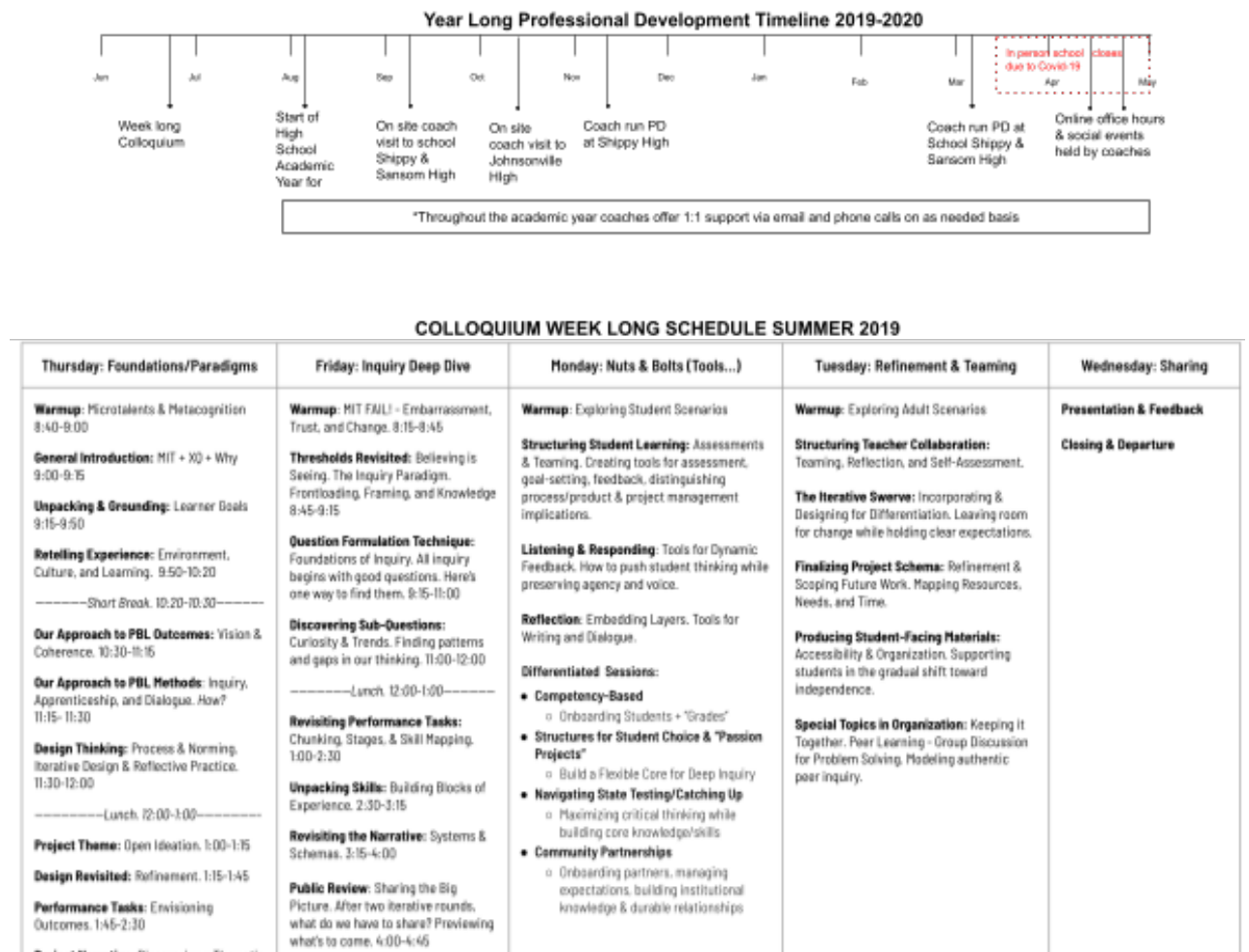
| School            | School type          | Name    | Subject taught        | Grade level taught | Years of experience | Attended colloquium? |
|-------------------|----------------------|---------|-----------------------|--------------------|---------------------|----------------------|
| Johnsonville High | Urban public Charter | Kelsey  | English               | 9                  | 7                   | No                   |
|                   |                      | Leslie  | Sociology             | 10                 | 5                   | Yes                  |
|                   |                      | Marsha  | Environmental Science | 10                 | 3                   | Yes                  |
| Shippy High       | Rural public         | Nancy   | Biology               | 9                  | 10                  | Yes                  |
|                   |                      | Riley   | Design                | 9                  | 12                  | Yes                  |
|                   |                      | Dave    | Aviation              | 9-12               | 10                  | No                   |
|                   |                      | Ramona  | Biology               | 9-12               |                     | Yes                  |
|                   |                      |         |                       |                    |                     |                      |
| Rittman High      | Urban public charter | Daisy   | Algebra 1             | 9                  | 7                   | Yes                  |
|                   |                      | Jon     | Civics, English       | 9                  | 5                   | Yes                  |
| Samson High       | Urban public charter | Amy     | Reading               | 9-12               | 20                  | Yes                  |
|                   |                      | Elliot  | English               | 9-10               | 4                   | No                   |
|                   |                      | Everett | Math                  | 9-10, 12           | 0.5                 | No                   |
|                   |                      |         |                       |                    |                     |                      |
|                   |                      | Tanya   | Business              | 9-12               | 2                   | Yes                  |

**Table 2**

Definitions and examples of pattern codes

| Code              | Definition                                                                                                                                                                                                    | Example                                                                                                                                                                                                                                                                                                                                                                                                       |
|-------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Design parameters | Coaches create an intellectual and social space where teachers can create new curricula materials, learn through the development of these tools. Parameters are maintained through question-based pedagogies. | My push to them was, “if you have this incredible opportunity to do an independent project with few constraints, how are you going to keep track of what works? What doesn't? Who gravitates toward it? Who resists it?” And so I gave them some ideas of how to create some containers, to perceive that in ways that might become actionable for the future, give them some design parameters (Dennis)      |
| Narrative mapping | Coaches guide teachers through a process of constructing a narrative of themselves as the shift from their current position to where they want to be as educators/a school community                          | The boiled down version of my coaching would be some sort of less structured listening where teachers generally talk. I might ask them "how are things going? What are you hoping to do right now? What are you aiming for? What is your goal?" The crucial piece is listening, restating what I'm hearing, and then narrowing in on one particular piece, latching onto one thing and tracing that. (Dennis) |
| Prototyping       | Coaches design or share a classroom tool or curriculum material for teachers to use or iterate on in their practice                                                                                           | We met with the English department and helped to facilitate their repackaging of the curriculum in an interdisciplinary-compatible way. I had [given them] a tool, a way that would over time set them up to be able to do better collaboration outside of the department or in cross or trans disciplinary ways. (Dennis)                                                                                    |
| Meta-practice     | Coaches structure their work with teachers through PBL, helping teachers create new curricula materials                                                                                                       | [The curriculum] becomes the product. [The teacher] created it and then sent it to [Dennis] for feedback. That process of creating a product and getting that feedback is really important. (Joni)                                                                                                                                                                                                            |

**Figure 1**



**Figure Captions**

Figure 1: Implementation schedules for 2019-2020 professional development program and week-long schedule for summer colloquium.