Investigating How Computer Science Teachers and Instructional Coaches Navigated Remote Professional Development During COVID-19

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Abstract

This paper investigates how Chicago Public Schools (CPS) computer science (CS) teachers and instructional coaches navigated remote professional development (PD) during the pandemic. In March 2020, a long-standing research-practice partnership (RPP) between university computer science faculty, educational researchers, and CPS teachers and administrators designed a series of remote PD workshops for teachers, various one-on-one and small group coaching opportunities, and a Coaching Professional Learning Community (PLC). Based on our analysis of qualitative data, we found that the PD series reinforced instructional strategies and increasingly centered teacher engagement and wellbeing. Teachers primarily valued the relational aspects of PD, including collaboration with other teachers and personalized support from the instructional coaches. Leveraging an ecological perspective, we found that the pandemic and remote learning contexts amplified, rather than created, the PD challenges experienced by teachers and coaches, while also providing opportunities for innovation with different PD and coaching structures. Findings suggest that districts expand and invest in individual and small group instructional coaching opportunities and that PD can be designed to address teachers' instructional and emotional needs.

Investigating How Computer Science Teachers and Instructional Coaches Navigated Remote Professional Development During COVID-19

In 2016, Chicago Public Schools (CPS) became the first district in the U.S. to establish Computer Science (CS) as a high school graduation requirement (Barrow et al., 2020). This policy pressed CPS to not only rapidly recruit CS teachers and train other content teachers to teach CS, but to also develop multiple and differentiated professional development (PD) opportunities for CS teachers with varied professional backgrounds and experiences (McGee et al., 2022). Yet, COVID-19 and the rapid transition to remote instruction threatened to halt the district's progress in building capacity for equitable CS education. Since effective teacher PD is associated with improved student outcomes (Darling-Hammond et al., 2017; Desimone & Garet, 2015) and teacher retention (Nguyen et al., 2020; Shub & Maaz, 2021; Smith & Ingersoll, 2004), maintaining a robust system of CS teacher PD is imperative to the district's goal to ensuring equitable access to CS education across the city.

As schools nationwide shifted to remote instruction in March 2020, the Chicago Alliance for Equity in Computer Science (CAFÉCS) – a long-standing RPP supporting CS education in Chicago – developed a remote PD series to support CS teachers with remote instruction. Drawing on qualitative data, this study investigates how CS instructional coaches and teachers in CPS navigated remote PD and teaching during the pandemic. We found that, consistent with their original goals, the coaching team emphasized several key instructional strategies and supported teachers in translating those strategies to the remote learning environment. Additionally, responding to their noticing of teachers' needs, the coaching team increasingly centered their PD design efforts on improving teacher engagement and wellbeing. Second, teachers primarily valued the relational aspects of PD, including collaboration with other

teachers and personalized support from the instructional coaches. Finally, our analyses showed that the pandemic and remote learning contexts amplified, rather than created, the PD challenges experienced by teachers and coaches, while also providing opportunities to innovate with different PD and coaching structures.

This study makes several contributions to research, policy, and practice. First, findings contribute to our emerging understanding of teacher PD in general (Brown et al., 2021; Giffin, 2020; Jackson & Keirstead, 2020) and teacher PD specific to CS education (Crick et al., 2020, 2021; McGill et al., 2022) during COVID-19. Further, leveraging recent research on effective professional development (Darling-Hammond et al., 2017; Desimone & Garet, 2015; Short & Hirsh, 2020) and an ecological perspective on teacher professional development (Ehrenfeld, 2022), this paper demonstrates the analytic utility of situating teacher learning within multiple, interacting contexts, and suggests that future research on COVID-19 effects should account for pre-pandemic institutional conditions. Finally, this study highlights the challenges and innovations in teacher PD that emerged during the pandemic and suggests that PD can be designed to focus both on content and teacher wellbeing and provide multiple opportunities for teachers to build community.

This paper is organized as follows. We begin by overviewing the context of the PD series. Next, we present our conceptual framework and describe our methodology. We conclude by discussing our findings and implications for research, policy, and practice.

NEXT PD Series

In March 2020, responding to the immediate challenges of transitioning to remote instruction during the emergence of COVID-19, CAFÉCS, which is comprised of university computer science faculty, educational researchers, curriculum designers, and CPS teachers and

administrators, received a RAPID Collaborative Research Grant from the National Science Foundation (NSF) to support experienced *Exploring Computer Science* (ECS) teachers in the remote learning environment. ECS is an inquiry-based, introductory CS course taken by most CPS students to fulfill the high school graduation requirement (McGee et al., 2022). The RAPID project, "Mitigating the Impact of Forced Remote Learning of Exploring Computer Science (ECS) due to COVID-19," was guided by the following questions:

1. How can online professional development be designed to support ECS teachers' transition to teaching the course fully or partially online during the 2020–21 school year?
2. How can the instructional coaching model be adapted to support teachers in moving ECS to a remote learning format and to provide remote coaching when school access is restricted?

CAFÉCS designed the "Navigating Remote ECS Teaching" (NEXT) PD series to support experienced ECS teachers with their implementation of equitable and inclusive instructional strategies for the remote learning context, to encourage peer coaching and collaboration among ECS teachers, and to generate strategies for supporting teachers remotely. CAFÉCS anchored the design of NEXT in Desimone and Garet's (2015) framework, which outlines five core tenets of effective professional development: 1) content focus; 2) engagement; 3) coherence with schoolwide goals, teacher knowledge, student needs, and local conditions; 4) collective participation; 5) sustained duration.

The NEXT PD series consisted of five workshops throughout the 2020-2021 schoolyear, one-on-one and small-group instructional coaching opportunities, and a professional learning community (PLC) to support the instructional coaches' professional growth. The first two-day workshop in August 2020 focused on re-grounding teachers in the ECS philosophy, developing

instructional strategies to recreate the ECS experience online, and providing teachers with strategies for fostering social-emotional connections with students. The subsequent four workshops throughout the schoolyear focused on adapting effective instructional strategies for remote instruction and supporting teachers' use of Google suite tools to implement those strategies. Table 1 shows the dates of each workshop and the number of attending teachers. After each workshop, teachers completed a survey with close-ended and open-ended responses about their general satisfaction with the workshop and specific instructional takeaways. Although feedback surveys showed that teachers were generally satisfied or highly satisfied with the workshops, workshop attendance declined over the course of the school year (see Table 1).

Table 1

NEXT Summer and Quarterly Workshop Attendance

Date	Participants
August 24–25, 2020	22
October 21, 2020	15
December 9, 2020	8
March 3, 2021	7
April 28, 2021	6

As part of the NEXT series, teachers had several options for accessing instructional coaching: a Coaching Café, a Teachers' Lounge (Google classroom forum), and a teacher peer coaching program based on the Goals, Reality, Options, Will, Tactics, Habits (GROWTH) framework (Whitmore, 2010). The Coaching Café provided opportunities for teachers to engage in informal but structured discussions about different pedagogical topics. The Teachers' Lounge was designed to provide opportunities for small groups of ECS teachers to collaborate with the coaches on effective practices and teaching strategies regarding specific ECS lessons and computer science content. Finally, to build the capacity of the coaching program and provide

coaches with professional support, CAFÉCS created a Coaching PLC, comprised of two leaders in CS curriculum development and CS education research and the two instructional coaches (hereafter, the "coaching team"). The coaching team shared responsibilities for designing and facilitating the NEXT workshops and met twice a month throughout the schoolyear as a PLC. The Coaching PLC meetings occurred 19 times and were organized around several goals: to reflect on teachers' feedback from the previous workshop, discuss teachers' needs, plan for the subsequent NEXT workshop, and develop a set of coaching strategies for the remote learning environment.

The design and implementation of NEXT and data collection were closely integrated. In addition to disseminating feedback surveys to teachers at the end of each workshop, researchers conducted focus groups and semi-structured interviews (Weiss, 1995) with a total of 13 ECS teachers who participated in various components of the NEXT series. Further, at the end of each Coaching PLC meeting, the coaching team revisited and updated a coaching strategies document. One member of the team summarized the group's discussion into generalized meeting notes with the goal of capturing the groups' concerns and experiences at a specific time point while preserving the confidentiality of the PLC discussions.

In Fall 2022, the research team developed a technical report to share with funders and CAFÉCS members, based on an analysis of teacher feedback surveys, interviews, and focus groups, and notes from the Coaching PLC meetings (Blaushild et al., 2022). Preliminary analyses of these data not only provided a unique snapshot into teaching and learning in the COVID-19 context, but also yielded emergent themes related to how the coaching team understood and responded to teachers' specific needs during the pandemic and how those efforts

were experienced by teachers. These emergent themes sparked several new research questions, which we explore in this paper.

Research Questions

1. How did teachers and coaches navigate remote professional development during the pandemic?
2. How did the coaching team adapt PD to address teachers' specific needs during the pandemic?
3. What elements of remote PD were most valued by participating teachers?

Conceptual Framework: Analyzing Effective Teacher PD in the Context of COVID-19

Effective PD refers to "structured professional learning that results in changes in teacher practices and improvements in student learning outcomes" (Darling-Hammond et al., 2017). According to the typical framework for analyzing the impact of effective teacher PD, shown in Figure 1, professional development ultimately leads to improved student learning outcomes by fostering shifts in teachers' knowledge, skills, beliefs, and attitudes and subsequent changes in teachers' practice (Desimone, 2009; Desimone & Garet, 2015).

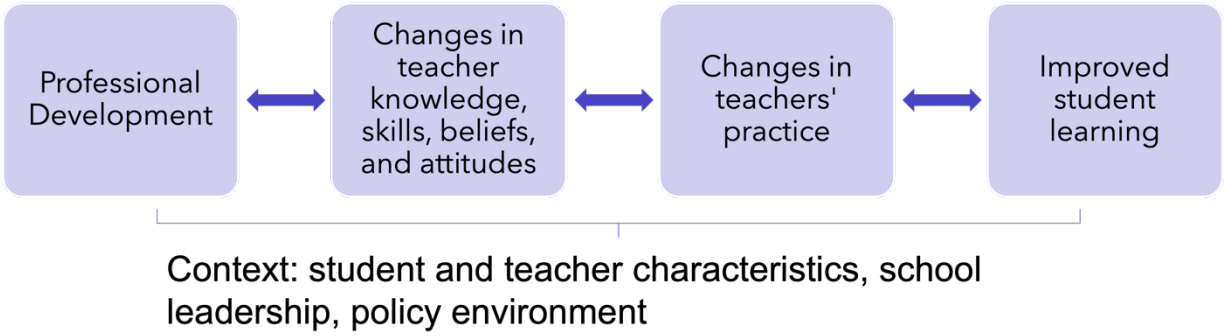

Figure 1. Typical model used to analyze effectiveness of teacher professional development (Desimone 2009, p. 185).

Combining insights from recent literature on effective teacher PD (Darling-Hammond et al., 2017; Desimone, 2009; Desimone & Garet, 2015) and curriculum-based professional learning (Short & Hirsh, 2020), we identified nine core components of effective teacher PD, defined in Table 2.

Table 2

Core Components of Effective Teacher Professional Development

Component	Definition
Content Focus	Intentional focus on discipline-specific content, curriculum, and pedagogy
Active Learning	Opportunities for teachers to design, practice, get feedback on, and experience teaching strategies that they will use with students
Coherence	Content, goals, and activities are consistent with school and district curricula and goals, teacher knowledge and beliefs, students' needs, and school, district, and state policies
Sustained Duration	Activities that are ongoing throughout the schoolyear and provide teachers with adequate time to learn, practice, implement, and reflect upon new strategies
Collective participation	Supports teacher collaboration and provides opportunities for groups of teachers from the same grade, subject, or school to participate in PD activities together and to build an interactive learning community
Modeling of Effective Practices	Includes curricular and instructional models that provide teachers with a clear vision of what practices and materials look like, including lesson plans, unit plans, sample student work, observations of peer teachers, videos, and/or case studies
Opportunities for feedback, coaching, and reflection	Provides access to coaching and expert support related to content, evidence-based practices, and their individual needs
Focus on equitable instruction	Develops teachers' understandings of how to prioritize and promote equitable instruction through high expectations for students, culturally relevant instruction; builds teachers' empathy for students, challenges their beliefs about what students can do
Change Management	Support individual and organizational change by treating teachers as learners, addressing individuals' concerns and group challenges when implementing new instructional materials, and providing opportunities to discuss and troubleshoot issues

Given the unique and unprecedented set of circumstances created by COVID-19, we also draw on an ecological framework to situate our analysis of the NEXT PD series within its specific context(s). Ehrenfeld (2022) argues that the typical PD model overlooks how multiple contexts, and the interactions of those contexts, shape teacher learning, and applies Ecological Systems Theory (Bronfenbrenner, 1992) to PD research. This ecological perspective draws attention to the different levels of context of teacher learning, the interconnectedness of these contexts and teacher learning activities, and how teacher learning in PD is shaped by different phases of teacher learning trajectories (Ehrenfeld, 2022). As shown in Figure 2, we situate the NEXT PD series in its immediate context (microsystem), the school and district institutional context and remote instruction policies (mesosystem), the context of teachers' professional backgrounds and experiences with PD, and the broader sociopolitical context (macrosystem), including the pandemic, economic uncertainty, and protests in Summer 2020 against racial injustice.

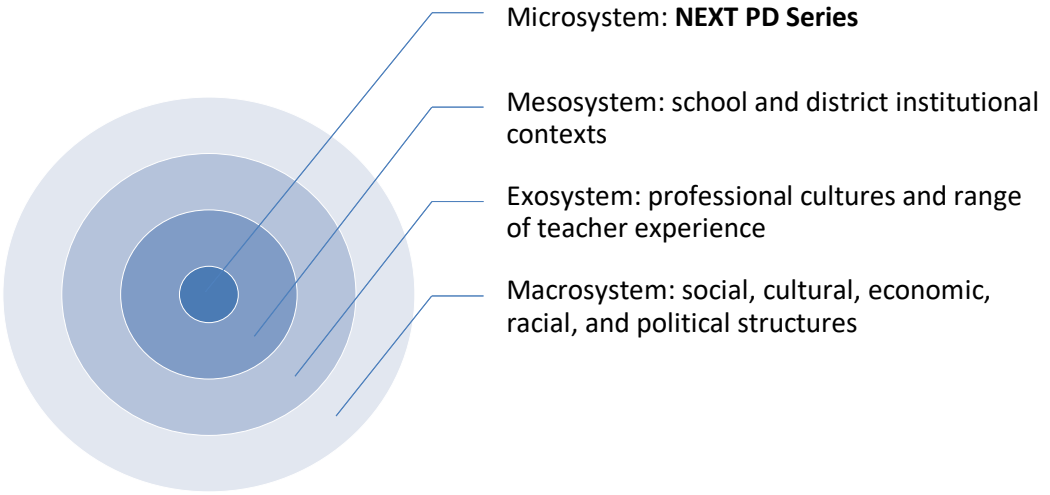

Figure 2. Ecological perspective of NEXT teacher PD series, adapted from Ehrenfeld, 2022.

Methods and Data

For this qualitative case study (Yin, 2018), data collection and analysis were closely integrated (Miles & Huberman, 1994). After each workshop, teachers completed a survey with close-ended and open-ended responses about their general satisfaction with the workshop and specific instructional takeaways. The coaching team met twice a month (19 times throughout the school year) and took meeting notes, which captured their discussions of teachers' needs, their priorities for PD workshops and coaching, and development of new coaching strategies.

Data Collection and Analysis: Phase I

To understand how teachers and coaches experienced grant-supported professional learning opportunities, we collected multiple sources of qualitative data, summarized in Table 1. First, after the two-day workshop in 2020, all participating teachers (N = 22) completed a survey about their experiences in the workshop, perceptions about equitable instruction in CS, and their concerns about the upcoming school year. In September 2020, the research team conducted two focus groups via Zoom with a sample of teachers who attended the NEXT workshops to gain a deeper understanding of teachers' experiences and to share general feedback from teachers to the coaching team. To understand how teachers experienced the NEXT workshops and coaching activities in the 2020-2021 schoolyear, the research team conducted semi-structured interviews (Weiss, 1995) with teachers and an additional teacher focus groups. Due to a low initial response rate from teachers, the research team conducted an additional set of interviews between in spring and summer 2022 to accommodate teachers' availabilities. Interviews focused on participants' CS teaching background, general perceptions of professional growth, initial and current teaching challenges, and their experiences with the NEXT series and other professional learning opportunities. Finally, the coaching team took notes at each of their bi-weekly PLC meetings

during the 2020–2021 school year. These notes documented how the two coaches and two facilitators understood and responded to teachers' needs during the 2020–2021 school year and how they planned the quarterly NEXT workshops. The PLC meeting notes represented a synthesis of the discussions without attribution to individual members." were anonymized and shown to all members before sending to the research team.

To examine teachers' and coaches' overall experiences with PD throughout the 2020-2021 school year, we compiled all teacher interview and focus group data into a single project in Dedoose and applied structured codes (Saldaña, 2013) aligned to the project's research questions (see Appendix A). Researchers then used inductive coding (Miles et al., 2014) to explore emergent themes in the data. Preliminary analyses showed that, consistent with the objectives of the RAPID grant, the coaching team designed the NEXT series to reinforce several instructional strategies integral to the *Exploring Computer Science* (ECS) curriculum framework. We also noted emergent themes related to the coaching team's discussions of teacher wellbeing and ongoing development of coaching strategies to respond to a rapidly changing context (district policies) and COVID related challenges, which motivated our research questions for this paper.

Data Collection and Analysis, Phase II

To investigate our emergent research questions, we conducted additional interviews and analyzed previously collected qualitative data (see Table 3). Table 4 shows participants' background characteristics and level of involvement the PD series and research activities.

Table 3

Data

Data Source	Timeline of Data Collection	Number of Sources
Workshop Feedback Surveys	August, 2020 – April, 2021	5
Teacher Focus Groups	September, 2020; April, 2021	3
Teacher Interviews	April 2021 – January 2023	10
PLC Meeting Notes	September, 2020 – June, 2021	19
Instructional Coach Interviews	January-February, 2023	2

Table 4

Participant Demographics, PD Exposure, and Research Participation

			PD Exposure		Research Participation	
Pseudonym	Gender	Race	Workshops Attended	Coaching	Interview	Focus Group
Teachers						
Blake	M	Black	4	X		X
Shawn	F	White	1	X	X	X
Aaron	M	White	5	X	X	X
Simone	F	Black	3	X		X
Kelsey	F	White	4	X	X	X
Joe	M	White	1	X		X
Sarah	F	Black	1			X
Ruth	F	Black	5	X		X
Stephanie	F	White	4	X	X	
Eve	F	Latinx	5	X	X	X
Elena	M	Latinx	0	X	X	
Jay	M	White	0	X	X	
Kyle	M	White	0	X	X	
Sadie	F	White	3	X	X	
Instructional Coaches						
Jordan					X	
Morgan					X	

Note: Given the small sample size of instructional coaches, we use gender-neutral pseudonyms and pronouns to describe the coaches and do not disclose their demographic information.

Our analysis involved a mix of deductive and inductive coding strategies (Miles et al., 2014). We first developed a codebook with deductive codes aligned to the study's conceptual framework. These codes included the nine elements of effective PD (e.g., content focus) we identified in recent literature and the four different contexts defined in Ehrenfeld's ecological perspective for PD (e.g., macrosystem). After applying these deductive codes to all data, we

conducted several rounds of inductive coding capture emergent themes and participants' unique experiences, and systemically applied these inductive codes to our data (see: Appendix A). Finally, we used matrices (Miles et al., 2014) and code co-occurrence charts using Dedoose to explore and examine patterns in the data. We paid particular attention to how participants adapted to the challenges of remote instruction and which PD contexts and core components were most salient to participants' experiences.

Limitations

Low teacher response rates in the Spring of 2021 prompted the researchers to continue recruitment into 2022 and early 2023. Although this extended recruitment allowed for the research team to include more teacher and instructional coach perspectives, their accounts may be less detailed than data captured closer to the PD series. However, we use workshop feedback surveys, taken by teachers immediately after each workshop and the Coaching PLC notes, taken immediately after each bi-monthly meeting, to triangulate teachers and coaches' retrospective interview accounts. Further, while interviews are not designed to capture individual's situated behaviors or in-the-moment accounts, they are uniquely positioned to capture individuals' meaning making, imagined scenarios (e.g., ideal professional development programming), and cultural scripts (e.g., perceptions of equitable CS education; Lamont & Swidler, 2014).

Findings

While the primary goals of the NEXT PD series were to reground teachers in key ECS instructional strategies, the coaching teams' primary PD adaptations and teachers' most salient takeaways from remote PD were relational. The coaching team increasingly centered teacher wellbeing as an explicit goal of instructional coaching and PD workshops and devised multiple opportunities for teachers to engage with coaching and PD. Teachers primarily valued

opportunities for collaboration and community-building with other CS teachers, sharing instructional strategies and resources with other teachers, and the personalized instructional support and emotional support provided by coaches. Finally, while the macro-level impact of COVID-19 disrupted teaching and learning on an unprecedented scale, many of the challenges surfaced by teachers and the coaching team stemmed from their school and district institutional contexts, which predated, though may have been exacerbated by the pandemic. While the remote learning context created opportunities for innovation with new PD structures, preexisting challenges in the institutional environment inhibited the expansion of those innovations.

Centering Instructional and Emotional Support through PD

Consistent with the original goals of the RAPID grant, the coaching team primarily designed the NEXT series to help teachers implement the ECS curriculum remotely. However, as shown in Figure 3, the coaching team also frequently discussed teachers' wellbeing.

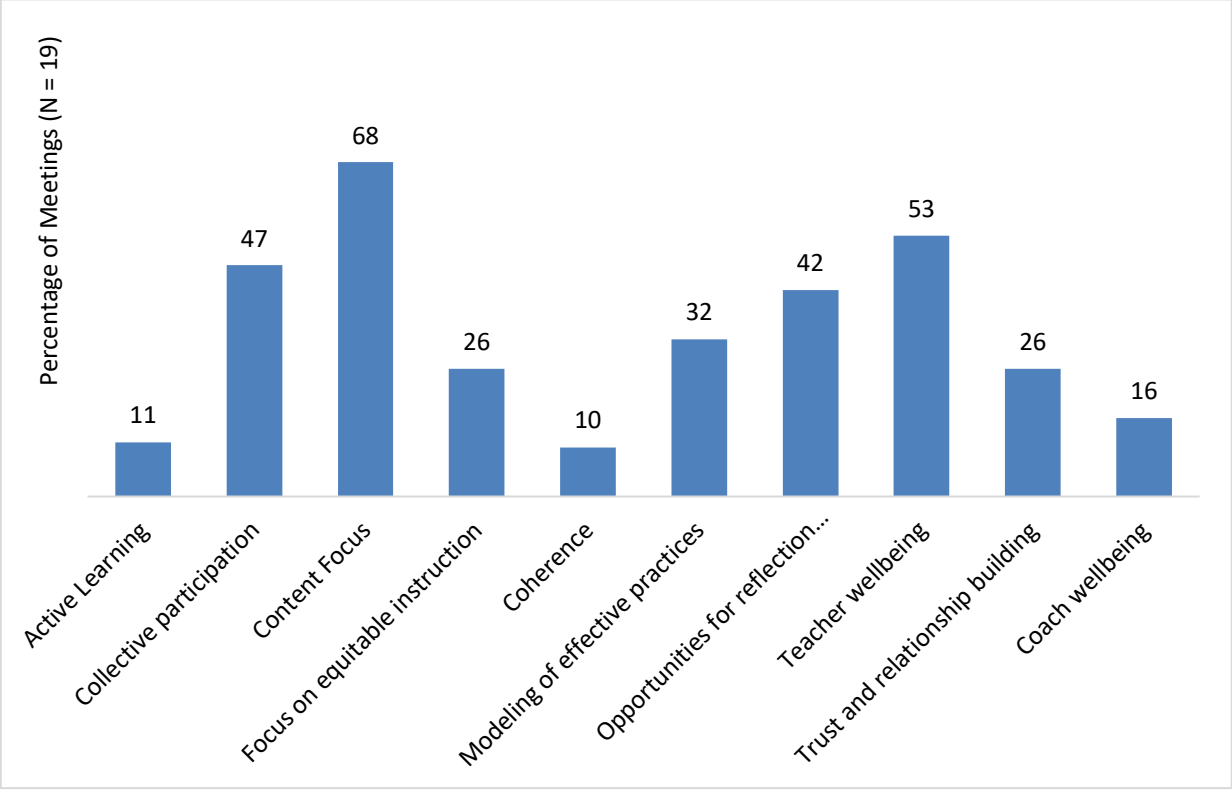

Figure 3. Topics Covered in Coaching PLC Meetings.

Focusing on a Narrow Set of Instructional Strategies

As the district rapidly transitioned to remote instruction in March 2020, Morgan, an instructional coach, reflected feeling "a little bit of panic" because they had no prior experience teaching lessons virtually. However, throughout the 2020-2021 school year, the coaching team committed to (re)grounding teachers in the ECS philosophy and supporting teachers in translating key ECS teaching strategies to the remote learning environment. Morgan explained:

> "We're still going to do journaling. We're still going to do think-pair-share in like the web unit or the programming unit… they're still going to do pair programming. They're going to work with a partner. It's just that managing it or how you set it up might look differently… And so once we had it like, 'Okay. Yeah, that's right,' then we felt a little bit more empowered [laughs]."

Teachers' feedback on the two-day summer workshop in August 2020 was largely positive, with all 22 teachers indicating that they were "satisfied" or "highly satisfied" with the workshop. 95% of participants reported that they agreed or strongly agreed that they had a "greater understanding of inquiry-based strategies as a result of participating in ECS PD." In open-ended survey responses, teachers shared that discussing strategies in small groups (breakout rooms), peer reviewing each other's lessons, experiencing activities from the "student perspective" in the online environment, and working with new resources as a group were beneficial to their preparation for the 2020–2021 school year. Teachers also reported that the summer workshop informed their own approach to teaching remotely by introducing them to "a lot of resources to help facilitate lessons remotely that I will be using this fall" and that "it was good to get concrete examples of how to teach each lesson." One teacher reflected on how the

workshop helped them realize that "we don't need to change the curriculum, just figure out how to use different tools to carry out the lessons with students."

However, some teachers expressed frustration with a lack of "CS content" in the summer workshops. Responding to this feedback raised in workshop feedback surveys at the first two teacher focus groups conducted in September 2020, the coaching team realized they needed to change how they framed and presented instructional strategies to teachers. Planning for the quarterly workshops, the coaching team noted that, when introducing an instructional strategy, they would provide teachers with a pre-reading or some other evidence to provide external validation of the importance of the strategy. They also planned to model the instructional strategy during workshops and coaching sessions and follow up the modeling with a discussion about how participants engaged in the strategy as learners. Later in the schoolyear, the coaching team formalized this idea into one of their instructional coaching strategies:

> "LESS is MORE. We need to keep focused on the one central goal of a PD session… and let that one goal drive the activities. With that, the activities need to be limited in scope to ALLOW time for modeling of effective questioning and elicitation of response/engagement." (Coaching PLC Meeting Notes, February 24, 2021)

Teacher Wellbeing and Engagement

In addition to focusing on a narrowed set of instructional strategies, the coaching team increasingly discussed and attempted to address teachers' wellbeing. Jordan, an instructional coach, reflected on their main priority at the beginning of the 2020-2021 schoolyear:

> "I believe just teacher wellness. Number one, making sure they were okay and their families were okay. And just allowing them the opportunity or just having that safe space to even share with us maybe what they were going through, you know, at that particular

> time. So really being a good listener, I feel, was extremely important and valuable. And it was just – yeah, just having that space to do that, and to also just have someone who could understand and who was willing to come inside their classroom and to really see what was happening."

During the winter and spring meetings, PLC meetings increasingly focused on teachers' and coaches' emotional needs, especially as CPS began to plan for the return to in-person instruction in 2021. The PLC meeting notes document how the instructional coaches were aware of teachers' growing anxiety about returning to in-person instruction. For example, on December 2, 2020, the coaching team included this observation in their notes:

> "There is a noticeable combination of fatigue and worry. CPS leadership is wrestling with the idea of returning to in-person learning after holiday break while simultaneously continuing with remote teaching and learning; there is no perfect solution and it's taxing for teachers to manage both audiences at once." (Coaching PLC Meeting Notes, December 2, 2020)

This general observation surfaced throughout PLC meetings in January and February 2021, with the coaching team noting how teachers appear "very exhausted and stressed" and that "all feels very overwhelming."

By early January 2021, CPS began incrementally reopening schools for in-person instruction, a decision met with mixed responses from parents and community members and intense opposition from the Chicago Teachers Union (CTU) (Koumpilova, 2021). High schools were the last to reopen in April, 2021, given the additional challenge of managing crowded hallways during transitions (Kunichoff, 2021). Since students were given the option to return to in-person instruction or continue learning remotely, teachers were required to simultaneously

deliver instruction in-person and virtually. The coaching team noted these changes during informal observations:

> "Teachers and students are back in school to some extent–not a lot of concrete data to report but informal observations by Jordan and Morgan indicate small numbers of students actually present in school classes (1–5 students, often) and teacher is present and working with in-person and online students at the same time" (Coaching PLC meeting notes, April 20, 2021).

The PLC meeting notes show the coaching team's awareness of how the uncertainty around the district's return to in-person instruction affected teachers emotionally and the coaches' commitment to keeping this source of stress in mind when planning for professional development and coaching.

The return to in-person instruction was not the only stressor noticed by the coaching team. The coaching team also discussed the feelings of isolation brought on by the pandemic and the trauma associated with recent incidents of community violence. During the March 25, 2021, meeting, the team noted:

> "This has been a dark week for everyone. We have teachers and students who have limited to no connection or interaction, and this is damaging. Not being able to process things is unhealthy. Additionally, two ECS teachers–one local and one national passed away and this has added to layers. To experience another shooting/tragedy just adds to the massive loss (layers of loss) for people this year." (Coaching PLC Notes, March 25, 2021)

These observations continued as the team planned the final NEXT workshop for April 28, 2021. The team noted how "this is a very hard time for everyone right now, especially teachers. Being

mindful of emotional health is critical." They acknowledged how these circumstances can impact people "differently and we must be respectful of that." Looking ahead to the final workshop, the team discussed their priorities of infusing the strategy of pair-programming into the workshop but also keeping teacher wellbeing front of mind. PLC notes in the spring included this discussion point about the coaching team: "If we can do something constructive and at the same time emphasize that survival is the number one goal… What are some ways we can help each other with this and acknowledge that perfection is not the goal?"

While the pandemic created unprecedented challenges for teachers' mental and physical health, focusing on teacher wellbeing was crucial, though not new, to the instructional coaches. Morgan described how they and Jordan attended training in the "dialogic model" of coaching, which emphasizes instructional coaching as a partnership. Morgan explained:

> "Another core point or reason to switch to that dialogic model was the idea of creating a trusting partnership. And one of the things that was high on our list was, first, you know meeting the teacher, learning about them, and trying to build that trust. And there are sometimes where, you know, I would go to a school and with the intent on, okay, we're going to learn – we're going to focus on the binary numbers lesson and think of some strategies to get students more engaged… [but] I ended up in the session just letting the teacher talk and we didn't talk about binary numbers. We talked about, you know, what's happening in the school or with them… sometimes I felt like a therapist [laughs]… and Jordan and I were completely okay with that."

While the coaches were accustomed to support teachers' wellbeing through instructional coaching, the coaching team confronted declining participation in NEXT workshops (from 22 teachers in August 2020, to 6 teachers at the final workshop in April 2021) and declining

response rates from teachers to emails throughout the year. Concerned about not reaching enough teachers, the coaching team devised several ways of communicating with and engaging teachers in professional development, including newsletters, virtual classroom visits, virtual one-on-one check-ins, and small group coaching sessions.

Since teacher feedback on post-workshop surveys was generally positive, it is possible that teachers' declining attendance indicated something other than not finding the workshops helpful to their practice. One teacher explained:

> "We just get so overwhelmed, you know, as teachers. … we just have so much going on, and so much to do constantly. And so, it's you know, it's like nice during summer, you meet some people, you talk to them. But when the school year really gets going, you know it's just a couple emails here and there, and then optional sessions that I don't even really feel like I have the time for." (Kyle, ECS teacher).

Still, the coaching team remained committed to reaching as many teachers as possible throughout the schoolyear. Throughout the Coaching PLC meetings, the team continued to acknowledge that despite participating teachers' positive feedback about workshops or surveys, there were still many teachers who, for whatever reason, were not engaging with instructional coaching or PD.

Teachers Primarily Valued Collaboration and Community

Above all else, teachers primarily valued the relational aspects of the NEXT PD series, which included opportunities to collaborate with other computer science teachers and the professional community they created as a group. Figure 4 shows the PD elements teachers described in interviews and focus groups as being the most valuable.

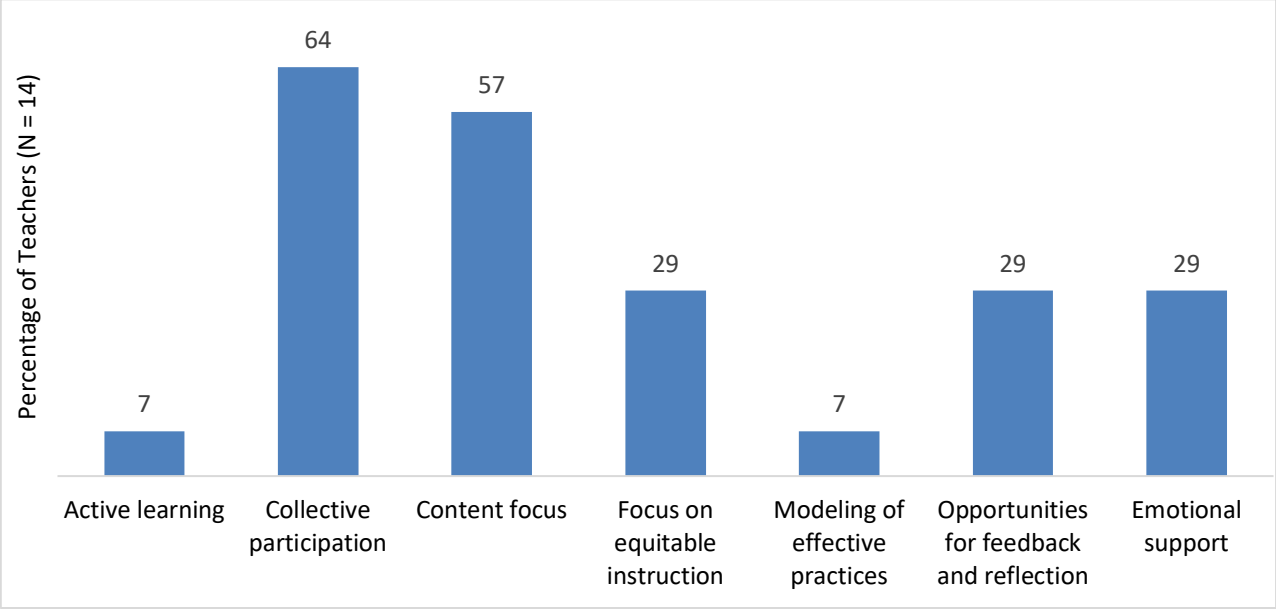

Figure 4. Most Valued PD Elements Described by Teachers in Interviews and Focus Groups.

While content focus was also highly valued, many teachers shared that they learned the most about different instructional strategies and resources from collaborating with other teachers.

In addition to the instructional benefits of sharing resources and ideas with other teachers, five teachers discussed gaining a sense of community with fellow CS teachers and coaches throughout the workshops and/or coaching sessions. As one ECS teacher explained:

> "It's just being able to hear other people's approaches to problems you're dealing with… And part of it is just the emotional connection of being able to connect with other teachers and share the struggle… I remember sitting down to [the last meeting] and being like I just really don't want to do this today but then really enjoying the meeting itself. Like, the hardest part is just like hitting the button to join. But then once you're there, you know, you remember. You're like, I like these people." (Aaron, ECS Teacher)

Notably, many teachers described being the only CS teacher in their schools and thus relied on PD to build community and collaborate with other CS teachers in the district.

Teachers also valued developing strong relationships with their coaches and receiving emotional support during coaching sessions. As one teacher explained:

> "I've come into it stressed, like it's been a hard week, I'm not sure what I am going to do. And they would always just kind of very professional, supportive. They would deflate any tension. And they, on more than one occasion, made, like, trips out to [my school] to plan with me… it made me feel like, okay, they are there for me beyond just like a transactional 'I'm your coach.' Like, they developed a lot of relationships" (Jay, ECS teacher).

This teacher's perception of his coach being there beyond a "transactional" relationship shows how the coaching team's extensive discussions about teachers' emotional needs and efforts to lead with empathy were evident to teachers.

While NEXT workshops focused on several key instructional strategies, small-group and one-on-one coaching allowed for personalized support. One teacher explained how she improved her practice by working one-on-one with Jordan:

> "I had a really, really hard time implementing group work in my classrooms, and so it was actually through guidance mainly from [them]. Like, they were, like, okay, explain what you have, like, what you have in your classroom. Give me like, a layout. They even came to visit. So it was like with their guidance, I was able to implement some of the strategies that we talked about. Some of the strategies didn't work out so well. So we tried new ones. So it was all about the suggestions they gave me, the ideas" (Elena, ECS teacher).

These responses – receiving targeted support on planning and implementing instructional strategies and individualized support from coaches – were common among teachers in interviews, focus groups, and NEXT workshop feedback surveys.

Interaction of Pandemic and Institutional Contexts

Leveraging Ehrenfeld's (2022) ecological perspective of PD in our analysis, we found that the pandemic amplified preexisting PD challenges at the district level, but also provided a unique opportunity to innovate with different PD and coaching structures. Prior to the pandemic, the CS graduation requirement necessitated the recruitment of new CS teachers and training other content area teachers (Barrow et al., 2020), whose PD needs differ. Additionally, there were only two CS instructional coaches for the district, the future of the instructional coaching program was often uncertain, and the CS program has undergone departmental and personnel changes (Coaching PLC notes).

When COVID-19 emerged, it overhauled schooling and created countless challenges for educators, affecting their PD needs, teaching challenges, and capacities to attend PD. However, the remote learning environment created an opportunity for the coaching team to innovate with different ways of supporting teachers, including small group coaching and remote classroom visits. And yet, while COVID-19 challenges surfaced throughout teacher focus groups and interviews, instructional coach interviews, and PLC notes, other PD challenges mentioned by participants reflected the school and district institutional context (mesosystem) more so than the pandemic (macrosystem).

Though teachers held generally positive views of NEXT workshops and coaching, some maintained their critiques that ECS professional learning opportunities do not offer enough CS content. Some of the survey feedback and teacher focus groups about the summer workshop

surfaced a common concern from many teachers about the lack of specific CS content included in the two-day workshop. As one teacher with two years of ECS teaching experience said:

> A lot of the PDs focus so much on the inquiry and equity strands that we don't ever get that third strand… we do need those three strands, but I feel like the PDs a lot of times ignore the CS concept strand because they're like "oh, well you can Google it" (Shawn, ECS teacher).

The coaching team was familiar with this common point of teacher feedback. During the October 28, 2021, PLC meeting, the coaching team noted: "There is always tension between teachers always wanting more 'content' and not wanting to focus on ECS-philosophy instructional strategies (equity/inquiry)." The team discussed that this critique from teachers could indicate a lack of confidence on their part, in that they feel more confident with their teaching practice overall but less confident teaching specific CS content.

Relatedly, three teachers mentioned that they hoped future district-run professional development would better meet the needs of experienced teachers ready to take the next steps in their CS teaching and to motivate newer teachers to get to this point. They hoped that future PDs could offer support for teachers who are ready for more than introductory support and want to teach AP CSP, and that workshops could provide opportunities for teachers and facilitators to work through more advanced materials together as an experienced group. As one teacher articulated, designing PDs for teachers who are ready to move forward with more advanced content could: "help build the confidence of those teachers to say that I want to do more than just ECS." He continued:

> "I think that we really still haven't defined like what is a transition to AP CSP. And a lot of teachers are not going to – if I'm coming from English, to think that I'm going to take

> a class after ECS is really hard for them to conceptualize because they really haven't gotten a chance to really get into that content and understand the ebb and flow to say I can visualize me going on to the next curriculum. But I don't think we foster that quite enough to get them excited about doing it" (Blake, ECS teacher).

ECS was designed for students with no prior CS experience and does not explicitly attempt to prepare students for more advanced CS courses. Unsurprisingly, then, the coaching team did not discuss developing teachers' capacities to deliver more advanced CS courses during PLC meetings. However, this sentiment from an ECS teacher was shared by several others – that some ECS teachers are interested in attending PD that deepens their CS content knowledge and prepares them to teach more advanced CS courses.

While these challenges predated the pandemic, COVID-19 and remote instruction amplified teachers' feelings of isolation, burnout, and challenges accessing PD that fit their specific needs. Whereas some of these challenges could be addressed by coaching innovations that emerged during the pandemic (e.g., small group coaching and virtual classroom visits), institutional barriers at the district level could inhibit these innovations from expanding. Describing the current (2022-2023) schoolyear, Jordan explained:

> "We are short staffed, so we don't necessarily have a group of or a team of instructional coaches…even though there are two of us, we still don't have opportunities to work together as a team."

They continued that the program has been unable to continue the small group coaching structures that emerged, and were valued by teachers, during the pandemic:

> "I just don't have the bandwidth to do all of that and so pretty much what we have done is to, we had to find another way to support new teachers. This year we have almost 50

> new teachers… So we've developed the ECS professional learning community… we have some of our veteran teachers and facilitators who are helping to lead those groups… I feel like although we've identified teachers who could be in those leadership roles, it's hard to just throw teachers in the role without training teachers… you still need to build their capacity. They need to have a space to learn, to grow, and to really reflect."

Here, Jordan speaks to the challenge of continuing small group coaching given the small staff of instructional coaches and the challenge of building CS teachers' capacities to become PD facilitators and teacher leaders without the appropriate resources for their professional development. These challenges, which were present and, in many ways, amplified by the pandemic, have persisted, despite the many strategies developed by Coaching PLC during the NEXT series. In that sense, teachers' experiences in and access to effective PD is shaped by the interaction of multiple contexts, including the macrosystem (COVID-19), mesosystem (district and school institutional context), and exosystem (range of teachers' PD experiences and professional cultures).

Discussion

This study investigated how teachers and instructional coaches navigated remote professional development during COVID-19. We found that the instructional coaching team designed PD to reinforce key instructional strategies and made efforts to address teachers' emotional needs throughout the school year. Teachers reported that focusing on key instructional strategies helped (re)ground them in the ECS framework and build community with and among students in the remote environment. Teachers also expressed feeling emotionally supported by their coaches and gaining a sense of community with other CS teachers throughout workshops and group coaching models.

This study provides both contextualized and retrospective accounts of how CS teachers and instructional coaches experienced their work during the pandemic, contributing to emerging research on the challenges and benefits of instructional coaching during the pandemic (Brown et al., 2021; Giffin, 2020; Jackson & Keirstead, 2020). Our findings add to the literature on effective PD by showing what professional development structures and practices best support teachers in times of crisis. Specifically, this research points to the need to account for the humanistic side of PD, as both teachers and instructional coaches discussed the importance of providing and receiving emotional – in addition to instructional – support. The Coaching PLC team's frequent discussions of teacher wellbeing raise questions about where an explicit focus on teacher wellbeing fits into the typical model of effective professional development (e.g., Darling-Hammond et al., 2017; Desimone & Garet, 2015). While the Carnegie Corporation's recently published framework for Curriculum-Based Professional Learning (CBPL) includes an acknowledgment of teachers' emotional responses to change, a focus on wellbeing is not often explicitly part of the effective PD model.

Our findings provide insight into how PD and instructional coaching structures, particularly those designed to support teachers both instructionally and emotionally, are key aspects of teachers' working conditions that could improve their practice and commitment to teaching during challenging circumstances. Relatedly, this report builds on several recent studies of CS education during COVID-19, which explored how practitioners perceived the pandemic's impact on CS education for students from higher and lower-income backgrounds (McGill et al., 2022) and the impact of "emergency remote teaching" on the CS education community in the United Kingdom (Crick et al., 2020, 2021). CPS provides a unique context to study the impact of COVID-19 on CS teaching and learning, given that the subject is now a graduation requirement,

and the fact that the district was working to rapidly expand students' access to CS when the pandemic hit. Moreover, the longitudinal, iterative, and variety of data collected provides unique insights into how instructional coaches made real-time adjustments in response to rapidly changing circumstances and attempted to meet teachers' emotional and instructional needs. Finally, leveraging an ecological framework in our analysis (Bronfenbrenner, 1992; Ehrenfeld, 2022) surfaced how teachers' experiences in PD and access to effective PD is shaped by the interactions of multiple contexts.

Implications for Policy and Practice

This research has several implications for practice and policy related to CS education. As school districts continue to experience the effects of the pandemic on student learning and teacher motivation, professional development and instructional coaching are crucial to ensure students' access to high-quality and equitable CS education. Our findings suggest that PD can be designed to focus both on content and teacher wellbeing and provide multiple opportunities for teachers to build community, which is crucial in the context of rising teacher burnout and turnover (Bacher-Hicks et al., 2021, 2023; Diliberti et al., 2021; Diliberti & Schwartz, 2023; Goldhaber & Theobald, 2023). Based on our findings, we present the following considerations for policymakers, practitioners, and professional development designers:

1) PD should be designed to address teachers' different professional needs.

Though teachers' responses to workshop surveys, interviews, and focus groups surfaced several common themes, these data also showed how teachers' professional backgrounds and needs varied significantly. Since CS became a high school graduation requirement, many teachers without CS backgrounds became CS teachers. While RAPID professional development and instructional coaching attempted to (re)ground teachers in key instructional strategies that

should support all students' learning in CS, some teachers were frustrated by a lack of opportunities to deepen their expertise in CS and/or learn areas of CS. Teacher turnover in CPS, the popularity of the ECS course, and continued need for CS teachers indicates that there will always be a need for introductory CS teacher training. However, our findings suggest that some experienced ECS teachers seek opportunities to expand their knowledge of CS content and teach more advanced CS courses. Thus, we recommend that the district provide or connect experienced ECS teachers with opportunities for continual PD around CS content, particularly for those without CS backgrounds.

2) Districts should invest in developing and supporting instructional coaches.

Although effective instructional coaching can be challenging to scale, it can be a highly effective strategy for improving instruction and implementing new educational policies (Blazar et al., 2023; Woulfin, 2018). Further, as our findings suggest, in times of crisis, coaches who are adept in supporting teachers' emotional and instructional needs can be crucial to teachers' motivation to grow their practice and persist through challenging teaching circumstances. Teacher interviews and focus groups revealed how teachers benefitted from working with the instructional coaches one-on-one or in small group settings. Further, the Coaching PLC notes and interviews with instructional supported showed that the coaches were aware of and able to quickly adapt to meet teachers' needs and benefited from reflecting on their own practices as coaches. Given teachers' needs for differentiated PD and the instructional coaches' capacities to meet teachers' personalized needs, CPS and other districts should consider investing in the expansion of instructional coaching programs and investing in coaches' professional growth to increase their effectiveness and reach.

3) Instructional coaches and PD providers should prioritize teachers' emotional needs.

The various coaching models designed and implemented by the coaching team, and teachers' perceptions of instructional coaching, show that PD can be designed to attend to teachers' emotional and instructional needs. Recent evidence suggests that, across teaching contexts during COVID-19, teachers experienced increased stress, feelings of burnout, and intentions to leave the profession (Diliberti & Schwartz, 2021; Gicheva, 2021; Pressley, 2021; Steiner & Woo, 2021) but that positive working conditions and feeling a "sense of success" with students helped sustain their commitment to teaching (Kraft et al., 2021). These emerging findings from the height of the pandemic suggest the need for school leaders, instructional coaches, and PD providers to focus on teacher wellbeing and commitment in addition to supporting instructional improvement.

Conclusion

This paper presented CS teachers' and instructional coaches' experiences and adaptations to the remote learning environment during COVID-19. In designing and implementing the NEXT PD series to help teachers translate the ECS curriculum online, the coaching team noticed and responded to teachers' emotional needs and developed several innovative coaching models to increase teacher engagement and support. While it is, perhaps, unsurprising that teachers highly valued the relational aspects of PD during the pandemic, school and district conditions and the ongoing effects of the pandemic on teaching, suggest that professional development programs and research on professional development should explore how PD can be designed to equally support teachers' instructional practice, sense of community, and wellbeing.

References

Bacher-Hicks, A., Chi, O. L., & Orellana, A. (2023). Two Years Later: How COVID-19 Has Shaped the Teacher Workforce. *Educational Researcher*, 0013189X231153659. https://doi.org/10.3102/0013189X231153659

Bacher-Hicks, A., Chi, O., & Orellana, A. (2021). *COVID-19 and the Composition of the Massachusetts Teacher Workforce* (pp. 1–10). Wheelock Educational Policy Center. https://wheelockpolicycenter.org/effective-teachers/covid-19-and-ma-teacher-workforce/

Barrow, L., Freire, S., & de la Torre, M. (2020). *Trends in Computer Science Education: Access, Enrollment, and Performance in CPS High Schools*. University of Chicago Consortium on School Research.

Blaushild, N., McGee, S., McGee-Tekula, R., Blazquez, R., Yanek, D., Blazquez, R., Yanek, D., Curry, V., Chapman, G., Peterson, K., Rasmussen, A., & Dettori, L. (2022). *The Design and Impact of Remote Professional Development on Computer Science Instructional Coaching and Teaching in Chicago Public Schools During COVID-19*. The Learning Partnership. https://doi.org/10.51420/report.2022.3

Blazar, D., McNamara, D., & Blue, G. (2023). *Instructional Coaching Personnel and Program Scalability* (EdWorkingPaper No. 21-499). Annenberg Institute at Brown University. https://www.edworkingpapers.com/ai21-499

Bronfenbrenner, U. (1992). *Ecological Systems Theory*. Jessica Kingsley Publishers.

Brown, C., Correll, P., & Stormer, K. J. (2021). The “new” normal: Re-imagining professional development amidst the COVID-19 pandemic. *Middle School Journal*, *52*(5), 5–13. https://doi.org/10.1080/00940771.2021.1978787

Crick, T., Knight, C., Watermeyer, R., & Goodall, J. (2020). The Impact of COVID-19 and "Emergency Remote Teaching" on the UK Computer Science Education Community. *United Kingdom & Ireland Computing Education Research Conference.*, 31–37. https://doi.org/10.1145/3416465.3416472

Crick, T., Knight, C., Watermeyer, R., & Goodall, J. (2021). The International Impact of COVID-19 and "Emergency Remote Teaching" on Computer Science Education Practitioners. *2021 IEEE Global Engineering Education Conference (EDUCON)*, 1048–1055. https://doi.org/10.1109/EDUCON46332.2021.9453846

Darling-Hammond, L., Hyler, M., & Gardner, M. (2017). *Effective Teacher Professional Development*. Learning Policy Institute. https://doi.org/10.54300/122.311

Desimone, L. M. (2009). Improving Impact Studies of Teachers' Professional Development: Toward Better Conceptualizations and Measures. *Educational Researcher*, *38*(3), 181–199. https://doi.org/10.3102/0013189X08331140

Desimone, L. M., & Garet, M. S. (2015). Best Practices in Teachers' Professional Development in the United States. *Psychology, Society, & Education*, *7*(3), 252. https://doi.org/10.25115/psye.v7i3.515

Diliberti, M. K., & Schwartz, H. L. (2021). *The K–12 Pandemic Budget and Staffing Crises Have Not Panned Out—Yet: Selected Findings from the Third American School District Panel Survey*. RAND Corporation. https://www.rand.org/pubs/research_reports/RRA956-3.html

Diliberti, M. K., & Schwartz, H. L. (2023). *Educator Turnover Has Markedly Increased, but Districts Have Taken Actions to Boost Teacher Ranks: Selected Findings from the Sixth*

American School District Panel Survey. RAND Corporation. https://www.rand.org/pubs/research_reports/RRA956-14.html

Diliberti, M. K., Schwartz, H. L., & Grant, D. (2021). *Stress Topped the Reasons Why Public School Teachers Quit, Even Before COVID-19*. https://www.rand.org/pubs/research_reports/RRA1121-2.html

Ehrenfeld, N. (2022). Framing an Ecological Perspective on Teacher Professional Development. *Educational Researcher*, 0013189X2211121. https://doi.org/10.3102/0013189X221112113

Gicheva, D. (2021). Teachers' Working Hours During the COVID-19 Pandemic. *Educational Researcher*, 0013189X211056897. https://doi.org/10.3102/0013189X211056897

Giffin, J. (2020). *Teacher Observation, Feedback, and Support in the Time of COVID-19* (pp. 1–13). Center on Great Teachers & Leaders at the American Institutes for Research. https://gtlcenter.org/sites/default/files/Teacher_Observation_COVID-19.pdf

Goldhaber, D., & Theobald, R. (2023). *Teacher Turnover Three Years into the Pandemic Era: Evidence from Washington State* (No. 32-0223; CALDER Policy Brief). Center for Analysis of Longitudinal Data in Education Research.

Jackson, C., & Keirstead, C. (2020). Schools' First and Forever Responders: Preparing and Supporting Teachers in the Time of COVID-19. In *National Comprehensive Center at Westat*. Westat. https://eric.ed.gov/?id=ED609071

Koumpilova, M. (2021, January 5). Half of Chicago pre-K, special ed teachers report back to campuses. *Chalkbeat*. https://chicago.chalkbeat.org/2021/1/5/22215223/half-of-chicago-pre-k-special-ed-teachers-report-back-to-campuses

Kraft, M. A., Simon, N. S., & Lyon, M. A. (2021). Sustaining a Sense of Success: The Protective Role of Teacher Working Conditions during the COVID-19 Pandemic. *Journal of Research on Educational Effectiveness*, *0*(0), 1–43. https://doi.org/10.1080/19345747.2021.1938314

Kunichoff, Y. (2021, April 22). Chicago reopend high schools this week. Here's what we're watching. *Chalkbeat*. https://chicago.chalkbeat.org/2021/4/22/22397459/chicago-reopened-high-schools-this-week-heres-what-were-watching

Lamont, M., & Swidler, A. (2014). Methodological Pluralism and the Possibilities and Limits of Interviewing. *Qualitative Sociology*, *37*(2), 153–171. https://doi.org/10.1007/s11133-014-9274-z

McGee, S., Dettori, L., & Rasmussen, A. (2022). *Impact of the CPS Computer Science Graduation Policy on Student Access and Outcomes*. The Learning Partnership. https://doi.org/10.51420/report.2022.4

McGill, M. M., Snow, E., Vaval, L., DeLyser, L. A., Wortel-London, S., & Thompson, A. (2022). Practitioner Perspectives on COVID-19's Impact on Computer Science Education Among High Schools Serving Students from Lower and Higher Income Families. *ACM Transactions on Computing Education*, 3557047. https://doi.org/10.1145/3557047

Miles, M., & Huberman, A. M. (1994). *Qualitative data analysis: An expanded sourcebook*. SAGE Publications Ltd.

Miles, M., Huberman, A. M., & Saldana, J. (2014). *Qualitative Data Analysis* (3rd ed.). Sage Publications Ltd.

Nguyen, T. D., Pham, L. D., Crouch, M., & Springer, M. G. (2020). The correlates of teacher turnover: An updated and expanded Meta-analysis of the literature. *Educational Research Review*, *31*, 100355. https://doi.org/10.1016/j.edurev.2020.100355

Pressley, T. (2021). Factors Contributing to Teacher Burnout During COVID-19. *Educational Researcher*, *50*(5), 325–327. https://doi.org/10.3102/0013189X211004138

Short, J., & Hirsh, S. (2020). *The Elements: Transforming Teaching through Curriculum-Based Professional Learning* (pp. 1–64) [Challenge Paper]. Carnegie Corporation of New York. https://www.carnegie.org/our-work/article/elements-transforming-teaching-through-curriculum-based-professional-learning/

Shub, T., & Maaz, K. R. (2021). *Exploring ECS Teacher Persistence and Attrition in Chicago Public Schools* (pp. 1–68). The Learning Partnership. https://doi.org/10.51420/report.2021.3

Smith, T. M., & Ingersoll, R. M. (2004). What Are the Effects of Induction and Mentoring on Beginning Teacher Turnover? *American Educational Research Journal*, *41*(3), 681–714. https://doi.org/10.2307/3699442

Steiner, E. D., & Woo, A. (2021). *Job-Related Stress Threatens the Teacher Supply: Key Findings from the 2021 State of the U.S. Teacher Survey*. RAND Corporation. https://www.rand.org/pubs/research_reports/RRA1108-1.html

Weiss, R. S. (1995). *Learning From Strangers: The Art and Method of Qualitative Interview Studies*. Simon and Schuster.

Whitmore, J. (2010). *Coaching for Performance: GROWing Human Potential and Purpose: The Principles and Practice of Coaching and Leadership*. Nicholas Brealey Publishing.

Woulfin, S. L. (2018). Mediating Instructional Reform: An Examination of the Relationship Between District Policy and Instructional Coaching. *AERA Open*, *4*(3), 2332858418792278. https://doi.org/10.1177/2332858418792278

Appendix A

Codebook

I. Structured codes to index major categories or themes, specifically those asked about in interviews.

1. **Impact of NEXT workshops on professional growth:** Includes participants' descriptions of how NEXT workshops impacted (or not) their professional growth

2. **Impact of coaching on professional growth:** Includes participants' descriptions of how coaching (in SY21 or SY22) impacted their professional growth

3. **Impact of other professional learning experiences on professional growth:** includes participants' discussions of how other professional learning experiences (e.g., college or master's-level courses; external PD) impacted their professional growth (not NEXT workshops or coaching)

4. **Professional growth since beginning of CS teaching/coaching:** Includes participants' descriptions of how they have grown professional since they began teaching/coaching computer science

5. **Initial challenges:** Includes participants' descriptions of challenges that they recall facing when they first started teaching (or coaching) computer science

6. **Current challenges:** Includes participants' descriptions of challenges they are facing *currently* while teaching computer science

7. **Unmet professional learning needs from NEXT workshops/coaching:** includes participants' discussions of what the NEXT workshops or coaching did *not* include that they would have liked to experience during workshops or coaching sessions
*must refer specifically to what NEXT/coaching did not offer, not general hopes for PD (use code below for that)

8. **Unmet professional learning needs (in general):** includes participants' discussions of additional hopes/needs from professional development in general, not specific to NEXT/coaching (i.e., in response to: "what else might the district have done to support you better?")

9. **Valued PD Elements:** Includes specific PD structures, practices, or activities named by teachers as being valuable to their professional growth

II. Deductive codes aligned to conceptual framework

10. **Content focus:** Includes PD's intentional focus on discipline-specific content, curriculum, and pedagogy; this includes a focus on instructional strategies, such as those integral to the ECS curriculum (i.e., inquiry)

11. **Active learning:** Includes PD's opportunities for teachers to design, practice, get feedback on, and experience teaching strategies that they will use with their students; use authentic artifacts, interactive activities, and sensemaking strategies that they will use with their students; *not* passively listening to lectures

12. **Coherence:** the PD's content, goals, and activities are consistent with school and district curricula and goals, teacher knowledge and beliefs, students' needs, and school, district, and state policies

13. **Sustained duration:** PD activities that are ongoing throughout the schoolyear and provide teachers with adequate time to learn, practice, implement, and reflect upon new strategies

14. **Collective participation:** Supports teacher collaboration and provides opportunities for groups of teachers from the same grade, subject, or school to participate in PD activities together and to build an interactive learning community
*Includes discussions of sense of community, professional community for safe practice

15. **Modeling of effective practices:** PD includes curricular and instructional models that provide teachers with a clear vision of what practices and materials look like, including lesson plans, unit plans, sample student work, observations of peer teachers, videos, and/or case studies

16. **Opportunities for feedback, coaching, and reflection:** Teachers have access to coaching and expert support related to content, evidence-based practices, and their individual needs

17. **Focus on equitable instruction:** PD develops teachers' understandings of how to prioritize and promote equitable instruction through high expectations for students, culturally relevant instruction; PD includes efforts to builds teachers' empathy for students, challenges their beliefs about what students can do; includes efforts to support students' SEL needs ***Do not use if "SEL needs" are used to describe student behavioral issues. If the term is being used to describe behavioral issues, code as a challenge.*

18. **Change management:** The PD is designed to support individual and organizational change by treating teachers as learners, addressing individuals' concerns and group challenges when implementing new instructional materials, and providing opportunities to discuss and troubleshoot issues

19. **Mesosystem:** Includes discussions of school and district institutional contexts, such as policies, norms, and practices (e.g., covid/remote instruction policies)

20. **Exosystem:** Includes discussions of teachers' professional experiences, professional communities, and prior experiences with professional development; includes online (e.g., Facebook) communities if not directly aligned to NEXT workshops/coaching

21. **Macrosystem:** Includes discussions of social, cultural economic, racial, and political structures, including the neighborhood and school community context, and larger sociopolitical climate

III. Inductive Codes added throughout analysis to attend to emergent themes

22. **Teacher wellbeing:** Includes discussions of teachers' emotional and physical health, job satisfaction, sustainability of work, resilience, and feelings of stress, burnout, and secondary trauma

23. **Professional development challenges:** Includes challenges related to designing, implementing and reaching teachers through PD and teachers' barriers to attending/accessing PD

24. **Professional development adaptations:** Changes made by PD developers/coaches in response to perceived teacher need or other contextual factors

25. **Covid-19 challenges:** Includes discussions of instructional or other challenges specifically related to the pandemic (i.e., remote instruction, childcare, having to quarantine)

26. **Trust and relationship building:** Includes discussions of intentional efforts to build trust and relationships with and among colleagues, teachers, and students; coaching as partnership

Appendix B

Coaching Strategies Developed During Coaching PLC in 2020–2021

1. Build trust and community as top priority to obtain commitment to PD this year

2. Focus on listening/needs-sensing and collaboratively designing PD for teachers since we are amid many "unknowns" related to teaching environments, schedules, etc.

3. Keep "eye on the prize" which is identifying ways to ensure the experienced ECS teachers fully understand and practice inquiry and equity-based strategies in their classrooms

4. Regularly organize/prioritize different coaching levels/groups based on visible needs (e.g., general pool of ECS teachers for coaching, PLC, Teachers' Lounge, Coaching Café).

5. When instructing an instructional strategy, provide *evidence* such as a pre-reading during the PD to emphasize our focus on this instructional strategy, provide validation of the strategy, and gain teacher buy-in to the strategy

6. Model techniques (strategies) during coaching/PD, for example to elicit volunteers to talk (could do color-coding, counting off, or popsicle stick).
    a. Model Think/Pair/Share as an instructional strategy during the PD and follow up with a group discussion about the process they engaged in "as learners" and what benefits they see for this type of strategy used with their students.

7. Use Journaling checklists to allow (and scaffold/support) teachers' reflections on instructional strategies

8. Establish NORMS (expectations) for participating in breakout rooms/group activities

9. Have a concrete goal for the teachers that requires they do something between now and the next PD (accountability, productivity, engagement for students)

10. To engage at the start of class/session: set it up, build, make connections between parts

11. Student Care starts with Teacher Care. Weave elements from PLC PD Day into Coaching.

12. Work directly with teachers on three ECS "big strategies" that can and should involve questioning; specifically, how can these strategies be made better by good questioning? (Pair Programming; Think, Pair, Share; Gallery Walk)

13. Empathy continues to be instrumental in coaching and PD for teachers. COVID has caused at least two deaths of faculty in the district, and it hits home for many students and teachers; find out where teachers are in any moment and honor that in addition to providing appropriate support on content and strategies.

14. It is critical to not to focus on pushing through activities more than paying attention to making time for rich student conversation; this is where questioning skills come into play.

15. The choice of technical tool should be driven by the instructional goal, i.e., choose the Right Tool for the Right PURPOSE. Lead with pedagogy and selecting the tool that supports those goals.

16. LESS is MORE. We need to keep focused on the one central goal of a PD session, e.g., authentic questioning strategies to draw out student engagement, and let that one goal drive the activities. With that, the activities need to be limited in scope to ALLOW time for modeling of effective questioning and elicitation of response/engagement.

17. It is critical to highlight the work of teachers to provide support and recognition for their efforts – this also builds community and respect among the larger group of ECS instructors and provides models for new ECS teachers. One strategy for accomplishing this is to FEATURE ECS teachers and facilitators in monthly OCS newsletters.

18. The importance of self-care for coaches is critical. In addition, operating with the mindset of flexibility and adapting to changing circumstances.