# Immediate Changes, Trade-Offs, and Fade-Out in High-Quality Teacher Practices During Coaching

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Coaching is an increasingly used professional development approach involving ongoing, individualized teacher-coach exchanges hypothesized to drive immediate changes in teachers' practices with students. Examining this hypothesis, the present study quantifies marginal changes after individual coaching cycles in a set of commonly considered, high-quality teacher practices using a teacher fixed effects approach. It draws on panel data from 169 early childhood educators participating in a 9-month coaching intervention using the MyTeachingPartner approach intended to improve practices outlined in the Teaching Through Interactions framework. Results indicated that emotional support and classroom organization practices improved immediately after any coaching cycle, whereas others, like instructional support and literacy focus practices, only changed after cycles focused on those specific practices. Some immediate postcycle differences in practices endured over time, whereas others dissipated quickly.

**Keywords:** descriptive analysis; early childhood; econometric analysis; instructional practices; professional development; regression analyses; teacher education/development

Teachers shape children's day-to-day experiences in school and, in turn, children's learning through their practices, or the everyday actions they take with students (Hamre, 2014; Hanno et al., 2021). To improve teacher practices, districts and schools allocate extensive resources toward professional development programs and there is growing consensus that coaching is a particularly promising investment (Egert et al., 2018; Kraft et al., 2018; Weiland et al., 2018). Common elements of coaching programs hypothesized to underly its effectiveness include active learning, sustained duration, feedback and reflection, and an explicit content focus (Darling-Hammond et al., 2009; Desimone & Pak, 2017; Elek & Page, 2019). These features often manifest in repeated observation-feedback-action cycles, during which (a) coaches observe teachers' classroom practices, (b) offer feedback and encourage teacher reflection on observed practices, and (c) meet with the teacher to outline concrete action steps (Elek & Page, 2019; Rush & Shelden, 2020). Together these components are thought to create the conditions under which educators can then return to their classrooms and rehearse the specific practices they have just been coached on (or engage in "deliberate practice"; Ericsson & Pool, 2016). Yet, as most empirical research on coaching focuses solely on educators' practices at the *end* of coaching interventions, it is largely unknown whether educators are indeed able to take immediate action after individual coaching cycles to change and improve their practices. Understanding the mechanisms through which coaching improves educator practices is essential for those charged with designing and enacting coaching programs.

Addressing this research gap, I use panel data on teacher practices collected over the course of a 9-month coaching intervention with early childhood educators to examine whether individual coaching cycles led to immediate changes in a core set of high-quality teacher practices. I also consider whether immediate changes in educator practices varied based on the content focus of the preceding coaching cycle and whether changes endured or faded out over the course of several weeks after cycles. These analyses push beyond the dominant focus on the *products* of coaching to unpack the *processes* underlying the positive, average impacts many coaching programs have had on educator practices.

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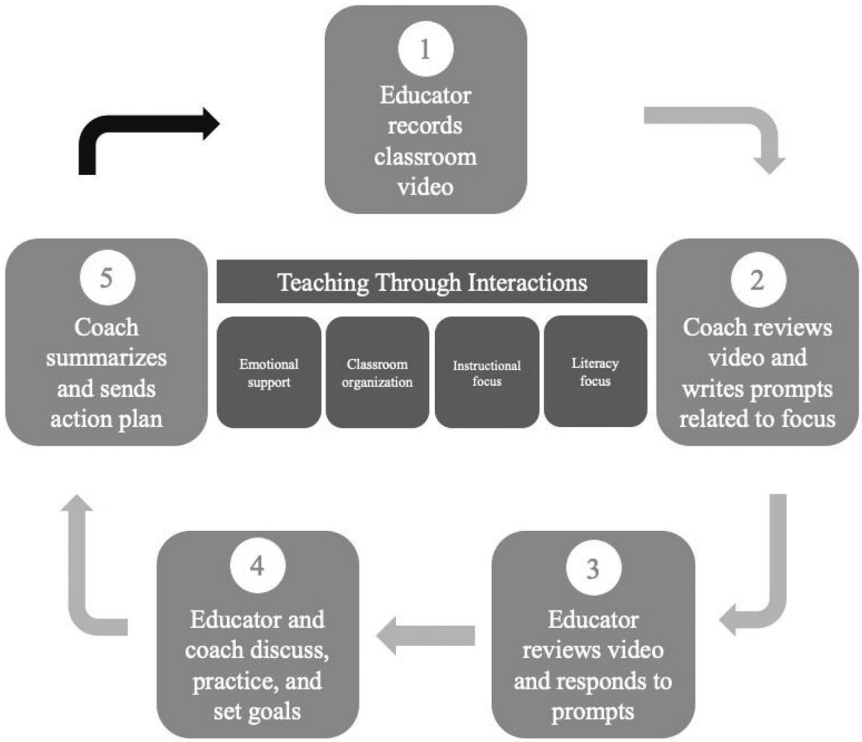



FIGURE 1. *MyTeachingPartner coaching model.*

*Note*. Adapted from Gregory et al. (2017) and Hamre et al. (2012). Black arrow between Steps 1 and 5 represents time when educators have the opportunity to implement and rehearse new practices.

## Unpacking Coaching's Impacts on Teacher Practices

The present study focuses on the web-mediated MyTeaching-Partner (MTP) coaching model, which includes several of the aforementioned components of coaching programs thought to support educator development (Allen et al., 2011; Hamre et al., 2012; Pianta, Mashburn, et al., 2008). MTP has dominated the literature on coaching (one in six of the studies included in the most comprehensive meta-analysis of coaching programs to date evaluated MTP [Kraft et al., 2018]) and it is rooted in two theoretical frames. First, it draws on several learning theories, including situative, social cognitive, and experiential perspectives, to motivate ongoing repeated observation-feedback-action cycles (Hamre et al., 2012). Second, it relies on the Teaching Through Interactions (TTI) framework to distinguish a core set of high-quality teacher practices that are the focus of the cycles (Gregory et al., 2017; Hamre, 2014; Hamre et al., 2013). Together, the coaching cycles and their focus on TTI practices are hypothesized to allow teachers to incrementally develop intentional teaching practices through targeted, scaffolded opportunities to learn by doing (Hamre et al., 2012; McDonald et al., 2013)

### *Coaching Cycles to Promote Learning by Doing*

Figure 1 illustrates the five steps of MTP coaching cycles, intended to occur over the course of 2 weeks (14 days). In line with situative perspectives on learning (Putnam & Borko, 2000), these cycles are grounded in educators' own practices and school contexts, and in line with social cognitive and experiential learning theories (Bandura, 1986; Ericsson & Charness, 1994; Kolb et al., 2000), they offer educators the chance to learn through observation and experience (Hamre et al., 2012). Coaching cycles began when teachers recorded and mailed their coach a 30-minute video of their classroom practices. The coach then reviewed the video, selected three 1-minute clips, and wrote prompts to spur teacher reflection on their practices in the clips. Next, the educator watched the clips with the associated reflection prompts in mind. Once the educator had responded to the prompts, the coach and educator discussed the clips and prompts, and set intentions for the future. After, the coach sent the educator a summary of the conversation and an action plan including things to read (e.g., articles on specific practices), watch (e.g., video exemplars), and do (e.g., try specific practices) prior to the next cycle. The time represented by the black arrow in Figure 1 thus represents a critical moment in the coaching cycle in which educators may return to their classrooms and deliberately rehearse the practices they have just discussed with their coach. Over time, these incremental improvements are thought to accumulate, contributing to more intentional teaching (Hamre et al., 2012).

Consistent with this hypothesis, prior research on MTP shows growth in educator practices from the start to end of the intervention is positively associated with the number of coaching cycles teachers complete (Pianta et al., 2014). However, while this association could reflect accumulated cycle-induced improvements in teacher practices, it could also reflect other factors related to teachers' responsiveness in coaching interventions and their practices, as the number of coaching cycles individual

educators engage in is not random (Downer et al., 2009). For example, highly motivated teachers may engage in more cycles than less motivated teachers and motivation may positively predict growth in educator practices. In addition, the association between the number of completed cycles and educator practices at the end of multiple coaching cycles likely captures both immediate and delayed effects of coaching cycles. Whereas cycles may induce immediate changes in educator practice, as hypothesized above, they may also drive delayed changes in practice that emerge only after educators have multiple opportunities to develop their knowledge of high-quality practices (perhaps through readings and video exemplars coaches also used). As in Clarke and Hollingsworth's (2002) Interconnected Model of Teacher Professional Growth, it could be that cycles, at least initially, induce changes in teachers' knowledge, beliefs, and attitudes that only gradually facilitate the rehearsal of new practices. Traditional dosage analyses are unable to disentangle delayed impacts from immediate postcycle changes, highlighting the need for research that clarifies whether coaching cycles can empower educators to rapidly rehearse the practices they have just been coached on.

Initial evidence on whether and how teacher practices shift after specific coaching experiences comes from single-subject experimental designs (SSEDs), making within-educator comparisons between practices before and after coaching experiences (e.g., Coogle et al., 2015; Knight et al., 2018; Rakap, 2017). SSEDs typically focus on a handful of teachers (<5) receiving coaching, charting each teacher's practices before and after components of the intervention occur. Using this approach, Coogle et al. (2015) collected repeated measures of three early educators' use of communication strategies during a coaching intervention. The authors found participants used more communication strategies immediately after coaching sessions than before. Although SSEDs offer suggestive evidence on immediate changes in teacher practices, they do not provide insight into how teacher practices might change in the context of interventions operating at scale with more than a handful of educators. Moreover, they fail to quantify the magnitude of any immediate changes in teacher practices.

### *Grounding Coaching Cycles in a Clear Focus*

MTP coaching cycles have most often focused on promoting high-quality teacher practices outlined in the TTI framework and measured by the aligned Classroom Assessment Scoring System (CLASS) observational measure (Pianta, La Paro, & Hamre, 2008). The TTI is currently the dominant standard for understanding quality in early education settings, and the CLASS is used in thousands of programs as part of Quality Rating and Improvement Systems and the Head Start Designation Renewal System (Bassok et al., 2021). The TTI distinguishes between four domains of teacher–child interactions thought foundational for children's learning: emotional support, classroom organization, instructional support, and literacy focus. These domains are rooted in developmental theories, including attachment, self-determination, and sociocultural theories, emphasizing the role of interactions in extending children's knowledge and abilities beyond what they can do independently (Hamre et al., 2012; Markowitz et al., 2017). Practices captured by the emotional support and classroom organization domains are thought most closely linked to children's social and emotional well-being, including their self-regulation skills. Strong emotional support practices promote positive, respectful classroom climates, while classroom organization practices foster predictable routines that minimize behavioral challenges. Instructional support practices and literacy focus are hypothesized to support children's cognitive and academic development. Instructional support practices include teachers' concept development and language modeling, while literacy focus, a pilot domain at the time of the intervention, reflects teachers' integration of literacy concepts into activities (see online Appendix Table A1 [available on the journal website] for additional details on TTI domains).

A focus on one of these four domains in each MTP coaching cycle was hypothesized to act as a springboard for action, offering teachers concrete ideas about to do next with their students (Hamre et al., 2012). Examining the relevance of the content focus of coaching experiences during the MTP intervention examined here, Pianta et al. (2014) quantified observed associations between content-specific dosage and growth in CLASS scores from the beginning to end of the intervention. They found that a greater focus on instructional support and classroom organization was associated with stronger growth in instructional support and classroom organization practices, respectively, but that a greater focus on emotional support was not associated with growth in emotional support practices. (The authors did not consider literacy focus.) These findings suggest that focusing on certain areas of practice may be more effective at changing practices than others. Consistent with Pianta et al.'s (2014) findings, main impact findings of this MTP intervention illustrated large average improvements in instructional support but not emotional support (Downer et al., 2018). In contrast to what might be expected based on the dosage findings, however, there were no average impacts on classroom organization scores at the end of the intervention. This mismatch between findings from the main impact and dosage studies may be attributable to the endogeneity in what teachers focus on during coaching. Associations between content-specific dosage and cumulative changes in those practices may reflect systematic differences between teachers focusing on different content areas in factors like motivation, initial skill level, or engagement rather than impacts of the coaching cycles themselves.

Beyond offering suggestive evidence of the variable effectiveness of different content foci in coaching, Pianta et al.'s (2014) dosage findings additionally indicate there may exist reinforcing associations between certain areas of practice. A greater focus on instructional support, for example, was associated with not only stronger growth in instructional support but also in emotional support and classroom organization. Similarly, Blazar and Kraft (2015) found that K–12 teachers focusing on instructional delivery during coaching (analogous to the TTI's instructional support) became successful at planning and implementing rigorous lessons (instructional support-aligned practices) *and* promoting positive student behaviors (classroom organization-aligned

practices). These findings are consistent with holistic perspectives on teaching (Leinhardt et al., 1995), emphasizing the closely integrated nature of teacher practices, and recursive theories of teacher learning, suggesting that growth in one area may promote growth in another (Goldsmith et al., 2014). When educators are coached in one domain of practice and then deliberately practice that domain in their classrooms, it could ignite a "change sequence" in which educators reevaluate and subsequently adapt other practices (Clarke & Hollingsworth, 2002). It is also possible that improvements in one area may increase educators' capacity to implement higher quality practices in another. In the case of instructional support focused cycles, for example, resulting improvements in children's engagement in learning activities could also facilitate more positive, emotionally supportive interactions.

At the same time, it is possible that targeting practices in one area may reduce the quality or the quantity of practices in other areas as educators make conscious and subconscious decisions about how to allocate the fixed time they have with children. Prior work on teacher learning suggests efforts to transform one area of practice could undermine educators' capacity to enact improvements in other areas (Hill, 2009). In line with this hypothesis, Blazar and Kraft (2017) found suggestive evidence of trade-offs between educator practices, showing that when elementary school teachers focused intensively on classroom organization, students reported they had better behavior but were less happy. This implies, for example, that educators may lose sight of emotionally supportive practices that promote children's emotional well-being when focused intensively on improving classroom organization.

Taken together, there is growing empirical support for the central role of content focus in coaching. Yet, in addition to the challenge of endogeneity in traditional dosage analyses, existing research on content focus leaves unknown whether teachers are more apt to deliberately rehearse practices immediately after certain types of coaching cycles than others. As suggested by the interconnected model of teacher professional growth (Clarke & Hollingsworth, 2002), it could be that coaching experiences focused on certain practices motivate immediate improvements in those practices, but other areas of practice require additional time and shifts in other teacher competencies (e.g., beliefs, knowledge, attitudes) to result in changed practices. Current methodological approaches may also obscure short-lived changes in specific practices after coaching cycles that ultimately fail to stick. Teachers could quickly abandon new practices when they do not see the link between the practices and children's success (Guskey, 2002) or are confronted with competing job demands that absorb their attention (Hill, 2009). For example, teachers might improve their emotional supportive practices immediately after an emotional support focused cycle but switch their attention to regulating the classroom environment as challenging behaviors continue to crop up. In this case, analyses examining practices at the end of the intervention would indicate no change in emotional support practices. Understanding whether there are short-term changes that rapidly fade out can inform the development of more effective strategies to sustain deliberate practice and make new and improved practices well-integrated, habitual parts of teachers' pedagogy.

### *The Present Study*

The coaching literature suggests ongoing coaching cycles and their content focus are important drivers of coaching's impacts on educator practices. Yet little research sheds light on whether these features facilitate teachers' deliberate and immediate implementation of improved practices. Responding to this limitation of the coaching literature, I address three research questions in the current study:

**Research Question 1:** Do teacher practices change immediately after individual coaching cycles?

**Research Question 2:** How do immediate changes in teacher practices after individual coaching cycles vary based on the cycles' content focus?

**Research Question 3:** Do immediate changes in teacher practices after coaching cycles endure over the course of several weeks?

I do so using unique panel data to make within-teacher comparisons between practices immediately after coaching cycles and those from other times. As more and more early education programs and K–12 schools participating in quality improvement initiatives are tasked with designing coaching programs, this work can inform design decisions around the quantity and content focus of coaching experiences.

## Method

### *Sample and Data*

Data for this study came from the National Center for Research on Early Childhood Education Professional Development Study (NCRECE-PDS; Pianta & Burchinal, 2007), a multisite, multiphase randomized control trial of two professional development interventions. The present study focuses on the second phase involving a 9-month evaluation of the MTP intervention that was randomized at the teacher-level within a sample of 401 early educators working across nine U.S. cities. Teachers assigned to the intervention group engaged in ongoing web-mediated MTP coaching cycles, each focused on a domain of high-quality teacher–child interactions as outlined in the TTI framework and measured by the CLASS. Coaches had considerable experience with early childhood education (i.e., had teaching experience and a master's degree or higher in a related subject area; see Pianta et al., 2017, for additional details about coaches). Educators engaged with the same coach throughout the intervention. During the initial training, coaches were encouraged to follow a sequence of domains (see online Appendix Table A2, available on the journal website). This sequence served as a starting point, as coaches were also instructed to be responsive to educators and consequently there was wide variation in the implementation of this recommended sequence, with nearly every educator following a unique combination of cycles during the intervention (see online Appendix A [available on the journal website] for additional details on coaching cycles.)

The analytic sample for this study includes 169 early educators who were randomly assigned to the coaching intervention. Educators were included in the sample if they had participated

Table 1
Descriptive Statistics ($N$ = 169 Teachers)

| Characteristic | *n* | *M* or % | *SD* | Min | Max |
|---|---|---|---|---|---|
| Teacher characteristics | | | | | |
| Age | 162 | 42.47 | 11.30 | 20.00 | 69.00 |
| Sex (1 = male) | 162 | 5.56% | | | |
| Black | 162 | 43.83% | | | |
| White | 162 | 34.57% | | | |
| Hispanic | 162 | 16.05% | | | |
| Income-to-needs ratio | 161 | 3.13 | 1.77 | 0.52 | 8.67 |
| Years of education | 162 | 15.72 | 1.72 | 12.00 | 19.00 |
| Years of experience | 160 | 14.39 | 9.55 | 0.00 | 43.00 |
| Certified | 161 | 65.84% | | | |
| Has a mentor | 139 | 51.08% | | | |
| Hours of inservice training on: | | | | | |
| Language development | 139 | 6.37 | 5.73 | 0.00 | 16.00 |
| Emergent literacy skills | 139 | 5.86 | 5.34 | 0.00 | 16.00 |
| Phase 1 treatment status (Course) | 134 | 49.25% | | | |
| Added for Phase 2 | 169 | 20.71% | | | |
| Center characteristics | | | | | |
| Public school | 165 | 36.97% | | | |
| Head Start | 164 | 54.27% | | | |
| Coaching engagement | | | | | |
| Number of cycles | 169 | 10.17 | 4.12 | 1.00 | 21.00 |
| Length of cycles (days) | 166 | 10.04 | 6.35 | 2.08 | 40.00 |
| Days elapsed since previous cycles (days) | 163 | 17.49 | 12.37 | 1.33 | 109.00 |
| Number of videos submitted | 169 | 12.01 | 5.48 | 1.00 | 36.00 |
| Teacher practices in first video submitted | | | | | |
| Emotional support | 169 | 5.20 | 0.63 | 3.38 | 6.56 |
| Classroom organization | 169 | 5.08 | 0.87 | 2.33 | 6.67 |
| Instructional support | 169 | 2.33 | 0.82 | 1.00 | 5.33 |
| Literacy focus | 169 | 1.61 | 0.74 | 1.00 | 4.50 |

*Note.* Six educators were missing information on days elapsed since previous cycles as they only participated in one coaching cycle; three of these six educators were also missing information on the length of cycles because there was no reported completion date for their first (and only) cycle.

in at least one coaching cycle and submitted at least one video observation of their classroom practices. Of the 205 educators originally assigned to the coaching, 171 (83.41%) educators engaged in at least one coaching cycle and 169 (82.44%) educators also submitted at least one video. Online Appendix Table B1 (available on the journal website) compares teachers in the analytic sample with those who were excluded primarily due to never having engaged in coaching. Teachers in the analytic sample were more likely to be White, have more years of education, and be in public school settings than in the excluded sample. Descriptive statistics of educators in the analytic sample are presented in Table 1. Teachers were mostly women, racially and ethnically diverse, and had variable professional experiences and supports.

Panel data on these 169 teachers were constructed from two sources. First, information on each coaching cycle, the key predictor of educator practices, came from coaches' records and the website where teachers submitted videos and responded to coaches' prompts. These data included the start and end date of each coaching cycle, as well as the domain focus of each cycle. Throughout the intervention, teachers participated in a total of 1,718 coaching cycles, engaging in an average of 10.17 (*SD* = 4.12) coaching cycles each that lasted for an average of 10.04 (*SD* = 6.35) days. Of the 1,718 coaching cycles, 38.24% focused on emotional support, 36.15% focused on instructional support, 20.26% focused on classroom organization, and 5.36% focused on literacy focus.

Second, information on teacher practices came from videos submitted by educators throughout the first two phases of the NCRECE-PDS. In the first phase of the study (prior to the MTP intervention), educators were instructed to submit videos on four specific dates. During the study's second phase involving MTP, educators in the intervention group were asked to submit videos continuously every 2 weeks to inform coaching cycles (Pianta & Burchinal, 2007). Teachers submitted a total of 2,029 videos across the study, with each teacher submitting an average of 12.01 videos (*SD* = 5.48). All 2,029 videos were included in primary analyses and were linked to coaching records using dates. Of the 2,029 videos submitted during the study, 36.18% were within 7 days after a coaching cycle, 54.26% were within 14 days after a coaching cycle, and 61.75% were within 21 days after a coaching cycle. Slightly more than a quarter of videos

were submitted prior to educators' participation in any coaching cycle. Coaching cycles were only considered insofar as they occurred proximally to a video submission. Online Appendix Figure A1 (available on the journal website) depicts the relative timing of coaching cycles and videos by illustrating a prototypical educator timeline during the intervention.

The quality of teachers' TTI practices in videos was evaluated using the CLASS. Trained coders used a 7-point scale to rate videos along 11 dimensions aggregated to represent the four TTI domains—emotional support, classroom organization, instructional support, and literacy focus—such that higher scores indicated high-quality interactions. Internal consistency was .75, .71, and .88 for emotional support, classroom organization, and instructional support scores, respectively. (Literacy focus comprised only one dimension.)

### *Analyses*

The study's analytic approach is inspired by work quantifying immediate changes in children's behaviors after exposure to violent crimes by comparing children's outcomes measured immediately after crimes with those from other times for either the same child or among groups of children living in the same communities (e.g., Cuartas et al., 2018; McCoy et al., 2015; Sharkey, 2010; Sharkey et al., 2012). In line with this approach, this work estimates immediate changes in educator practices after coaching cycles by leveraging the fact that teachers submitted videos intermittently throughout the coaching intervention. Specifically, to address the first research question, I used the following specification predicting each of the four CLASS domain scores for educator $i$ at time $t$:

$$CLASS_{it} = \beta_1 PostCycle_{it} + \beta_2 PriorCycles_{it} + \omega_{it} + \sigma_i + \varepsilon_{it} \quad (1)$$

In this specification, $PostCycle_{it}$, the variable of interest, is an indicator of whether time $t$ was within 14 days after the end of a coaching cycle. The coefficient, $\beta_1$, therefore represents the average difference between educator CLASS scores within 14 days after the end of a coaching cycle and scores from other moments. This 14-day window was selected given its alignment with the length of time coaching cycles were intended to last. Equation (1) additionally controls for the number of prior coaching cycles completed by educator $i$ at time $t$, $PriorCycles_{it}$, and the quarter of the year during which the video was submitted, $\omega_{it}$ (i.e., approximately September to November, December to February, March to May, and June to August). Both variables are time-varying factors likely related to educator practices across the sample. Specifically, $PriorCycles_{it}$ accounts for enduring, cumulative changes in educator practices associated with coaching cycles, and quarter indicators capture potential seasonality of educator practices (e.g., weaker practices at the start of the year). Finally, this specification includes teacher fixed effects, $\sigma_i$, which account for *all* time-invariant teacher-level factors. Standard errors were clustered by teacher.

The inclusion of teacher fixed effects constrains the model to make within-teacher comparisons in practices and therefore avoids bias attributable to between-teacher factors like differences in engagement in coaching cycles and video submission habits. For example, if highly motivated educators engaged in a greater number of coaching cycles than less motivated teachers and if motivation was positively related to educator practices, the practices of those with more postcycle videos might be better than those with fewer postcycle videos regardless of coaching cycles' true effects. Several studies suggest that these educator-level factors play a critical role in accounting for between-educator differences in intervention participation (Downer et al., 2009). Although the analytic approach accounts for *all* between-educator factors, it does not account for time-varying within-educator factors that may have influenced the timing of video submission relative to when coaching cycles took place. For instance, random positive and negative shocks, unrelated to the intervention, could have influenced the relative timing of video submission to coaching cycles. If after a refreshing school break, teachers had better practices and were relatively motivated to submit videos quickly after coaching cycles, the approach may bias upward estimates of cycles' impacts. The time-varying covariates included in the model account for some of these sources of bias, although they are unlikely to account for all time-varying factors at play. As previous research has focused on between-teacher differences in coaching engagement, little is known about the scope of within-educator across-time variation in intervention participation, highlighting the importance of future study on this topic.

To address the second research question testing whether educator practices after coaching cycles differed based on the content focus of the cycle, I estimated an analogous specification to Equation (1) with indicators for whether videos were submitted within 2 weeks after cycles focused on specific CLASS domains. As above, I estimated the CLASS scores of educator $i$ at time $t$ using the following specification:

$$CLASS_{it} = \beta_1 PostDomain_{it} + \beta_2 PostOtherCycle_{it} + \beta_3 PriorCycles_{it} + \omega_{it} + \sigma_i + \varepsilon_{it} \quad (2)$$

Where $PostDomain_{it}$ indicates whether the video was collected within 14 days after a coaching cycle focused on emotional support, classroom organization, instructional support, or literacy focus. Each domain-specific indicator was included in a separate model (i.e., four separate specifications for each of the four CLASS domains). $PostOtherCycle_{it}$ indicates whether the video was submitted after a coaching cycle of any other focus so that comparisons were made between practices immediately after the domain-focused cycle under consideration and those before the coaching intervention began or at least 2 weeks out from a cycle. All other variables are defined as above in Equation (1).

As in Equation (1), Equation (2) accounts for all teacher-level factors but does not account for all time-varying factors. Additionally, Equation (2) does not account for the potential nonrandom timing of cycles focused on particular domains for individual educators. This could introduce bias if within-teacher time-varying factors influenced both content focus and educator practices. For example, if in moments of high stress, educators requested coaching on emotional support and high stress is

**Table 2**
**Estimated Average Difference in Educator CLASS Scores Within 14 Days of the End of a Coaching Cycle ($N$ = 2,029)**

| | (1) | (2) | (3) | (4) |
|---|---|---|---|---|
| | CLASS: ES | CLASS: CO | CLASS: IS | CLASS: LF |
| Post cycle (any topic) | 0.06* (0.03) | 0.07* (0.03) | –0.01 (0.04) | –0.02 (0.03) |
| | (5) | (6) | (7) | (8) |
| | CLASS: ES | CLASS: CO | CLASS: IS | CLASS: LF |
| Post ES-focused cycle | **0.06 (0.04)** | 0.07† (0.04) | –0.03 (0.05) | –0.03 (0.04) |
| | (9) | (10) | (11) | (12) |
| | CLASS: ES | CLASS: CO | CLASS: IS | CLASS: LF |
| Post CO-focused cycle | 0.06 (0.04) | **0.06 (0.05)** | –0.17** (0.06) | –0.05 (0.05) |
| | (13) | (14) | (15) | (16) |
| | CLASS: ES | CLASS: CO | CLASS: IS | CLASS: LF |
| Post IS-focused cycle | 0.09* (0.04) | 0.06 (0.05) | **0.14* (0.07)** | –0.04 (0.04) |
| | (17) | (18) | (19) | (20) |
| | CLASS: ES | CLASS: CO | CLASS: IS | CLASS: LF |
| Post LF-focused cycle | –0.06 (0.09) | 0.13† (0.08) | –0.19† (0.11) | **0.29* (0.12)** |

*Note.* Standard errors clustered at the teacher-level in parentheses; boldfaced coefficient and standard error indicates targeted domain. All models control for number of prior cycles and include teacher and quarter fixed effects; models estimating differences after cycles focused on a particular content area additionally account for whether video was after another cycle. ES = emotional support; CO = classroom organization; IS = instructional support; LF = literacy focus.
†$p < .10$. *$p < .05$. **$p < .01$. ***$p < .001$.

inversely related to educator practices, then the true effect of emotional support cycles may be underestimated.

Finally, to address the third research question, determining the endurance of immediate differences in educator practices after coaching cycles, I estimated Equations (1) and (2) using varying bandwidths for the postcycle indicators (i.e., 7, 14, and 21 days). If positive differences in educator practices after coaching cycles diminished over time, the coefficient on the postcycle indicators would decrease in magnitude as the number of days increased. In the case of more than one marginally significant ($p < .10$) postcycle indicator for a particular CLASS domain, seemingly unrelated regression postestimation tests were used to determine whether coefficients on the different time band indicators were significantly different from each other.

*Sensitivity analyses.* I conducted a series of sensitivity analyses to confirm the robustness of results to various analytic decisions. First, in line with some of the acute violence literature, I excluded videos collected on the margins (within 28 days after a coaching cycle) to sharpen the so-called treatment contrast between postcycle videos and those from other times. Second, I replicated analyses excluding a minority of videos that were collected after multiple coaching cycles. Results of these analyses were largely consistent with primary results. (See online Appendix C [available on the journal website] for full details of sensitivity analyses and results.)

## Results

The first panel of Table 2 presents estimated differences in educator practices immediately (<14 days) after any coaching cycle (Equation 1). Teachers' emotional support ($b$ = 0.06, $SE$ = 0.03, $p < .05$) and classroom organization ($b$ = 0.07, $SE$ = 0.03, $p < .05$) scores were higher immediately following coaching cycles as compared with other times. Given pooled baseline standard deviations of 0.63 and 0.87 for emotional support and classroom organization, respectively, these estimated differences were substantively small (<0.10 $SD$). There were no differences in teachers' instructional support or literacy focus practices after any coaching cycle.

The remaining panels of Table 2 present estimated differences in educator CLASS scores after coaching cycles focused on

**Table 3**
**Estimated Differences in Educator CLASS Scores 7, 14, and 21 Days After the End of Coaching Cycles ($N$ = 2,029)**

| Coaching Cycle | CLASS: ES | CLASS: CO | CLASS: IS | CLASS: LF |
|---|---|---|---|---|
| Post cycle (any focus) | | | | |
| 7 days | –0.02 (0.03) | 0.04 (0.03) | –0.01 (0.04) | –0.04 (0.04) |
| 14 days | 0.06* (0.03) | 0.07* (0.03) | –0.01 (0.05) | –0.02 (0.03) |
| 21 days | 0.07* (0.04) | 0.09* (0.04) | –0.06 (0.05) | –0.04 (0.04) |
| Post ES-focused cycle | | | | |
| 7 days | –0.00 (0.04) | 0.03 (0.04) | –0.01 (0.05) | –0.02 (0.04) |
| 14 days | 0.06 (0.04) | 0.07† (0.04) | –0.03 (0.05) | –0.03 (0.04) |
| 21 days | 0.07† (0.04) | 0.07† (0.04) | –0.07 (0.05) | –0.04 (0.04) |
| Post CO-focused cycle | | | | |
| 7 days | –0.02 (0.04) | 0.07† (0.04) | –0.17** (0.05) | –0.06 (0.05) |
| 14 days | 0.06 (0.04) | 0.06 (0.05) | –0.17** (0.06) | –0.05 (0.05) |
| 21 days | 0.10* (0.05) | 0.10* (0.05) | –0.19** (0.06) | –0.05 (0.05) |
| Post IS-focused cycle | | | | |
| 7 days | 0.00 (0.04) | 0.03 (0.04) | 0.12† (0.06) | –0.12* (0.05) |
| 14 days | 0.09* (0.04) | 0.06 (0.05) | 0.14* (0.07) | –0.04 (0.04) |
| 21 days | 0.11* (0.05) | 0.09 (0.06) | 0.10 (0.07) | –0.09 (0.05) |
| Post LF-focused cycle | | | | |
| 7 days | –0.18† (0.10) | 0.04 (0.08) | –0.16 (0.12) | 0.40** (0.14) |
| 14 days | –0.06 (0.09) | 0.13† (0.08) | –0.19† (0.11) | 0.29* (0.12) |
| 21 days | –0.02 (0.08) | 0.17* (0.08) | –0.27* (0.11) | 0.16 (0.11) |

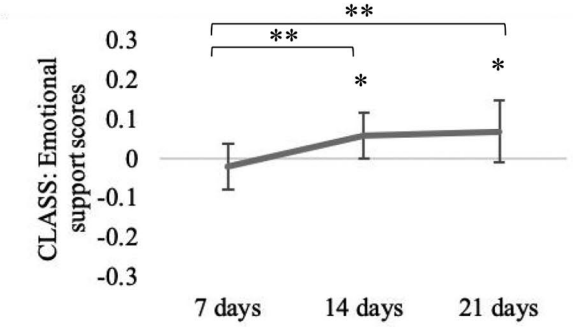
*Note.* Standard errors clustered at the teacher-level in parentheses. Each cell represents a coefficient from a separate regression model with an indicator for whether the video was submitted within 7, 14, or 21 days after a coaching cycle. All models account for number of prior cycles and include quarter fixed effects and teacher fixed effects. Models that focus on domain-specific coaching cycles also include an indicator of whether the video was submitted after a cycle of any other focus. ES = emotional support, CO = classroom organization, IS = instructional support, LF = literacy focus.
†$p < .10$. *$p < .05$. **$p < .01$. ***$p < .001$.

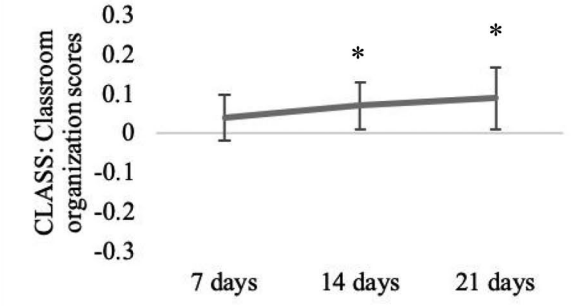
specific CLASS domains (Equation 2). Large differences were observed in certain CLASS domain scores immediately following coaching cycles focused on the same domain. Specifically, immediately after literacy focus cycles, teachers' literacy focus scores were 0.29 points ($SE$ = 0.12, $p < .05$) higher than their scores at other times, representing a substantively large difference (0.39 $SD$). After instructional support cycles, instructional support scores were 0.14 points higher ($SE$ = 0.07, $p < .05$, $\beta = 0.17$). Neither emotional support nor classroom organization cycles were associated with immediate differences in emotional support or classroom organization practices, respectively.

There were also several immediate differences in nontargeted educator practices after coaching cycles focused on certain domains. Emotional support scores were higher after instructional support cycles ($b = 0.09$, $SE = 0.04$, $p < .05$). Classroom organization scores were higher after emotional support cycles ($b = 0.07$, $SE = 0.04$, $p < .10$) and literacy focus cycles ($b = 0.13$, $SE = 0.08$, $p < .10$), although these differences were marginally significant. In two instances, differences in nontargeted domains were negative. Specifically, instructional support scores were 0.17 points ($SE$ = 0.06, $p < .01$) lower after classroom organization cycles and 0.19 points ($SE$ = 0.11, $p < .10$) lower after literacy focus cycles.

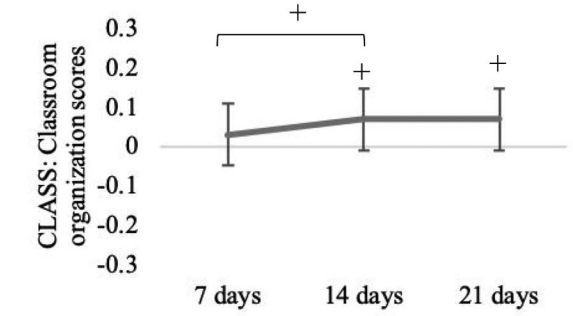
Table 3 presents results of analyses testing whether differences presented in Table 2 endured or faded out over the course of several weeks (i.e., 7, 14, and 21 days). Figure 2 graphically illustrates these results for combinations of coaching cycle focus and CLASS domain scores for which at least two of the postcycle indicators were significant at $p < .10$. The graphs also illustrate the results of post hoc tests comparing estimates across different time bands. First, in terms of differences observed after coaching cycles of any focus, improvements in emotional support and classroom organization were sustained up to 21 days after cycles. In both instances, however, CLASS scores were not significantly higher within seven days of a cycle. Second, in terms of intended domain-specific consequences, the positive difference in instructional support after instructional support cycles was unchanged across 3 weeks. In contrast, the immediate positive difference in literacy focus after literacy focus cycles declined precipitously. Although the estimated difference in classroom organization scores after classroom organization cycles was not statistically significant within 14 days, it was significant within 7 and 21 days and estimated differences in practices across the three specifications were not statistically different from each other. Third, the three positive differences observed in nontargeted practices (i.e., classroom organization after emotional support and literacy focus cycles and emotional support after instructional support cycles) appeared to last for at least 3 weeks, although differences in the first week were not statistically significant. Finally, the unintended negative consequences on instructional support after both classroom organization and literacy focus cycles endured over 3 weeks.

a) Post cycle (any focus)

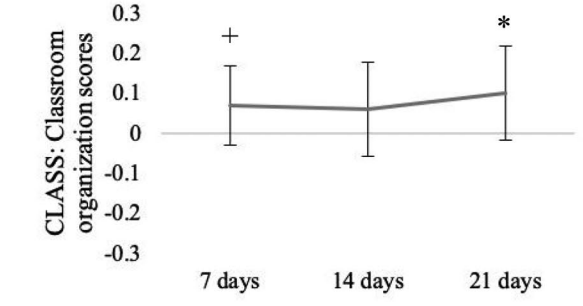


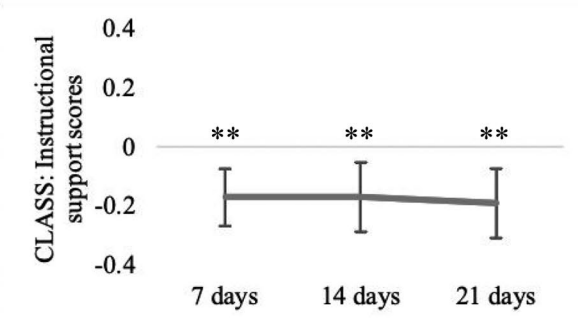




b) Post ES-focused cycle

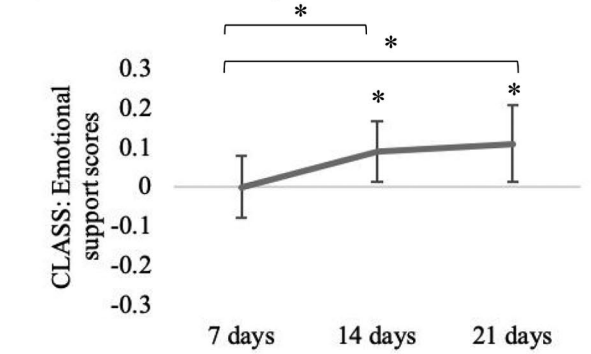



c) Post CO-focused cycle




d) Post IS-focused cycle



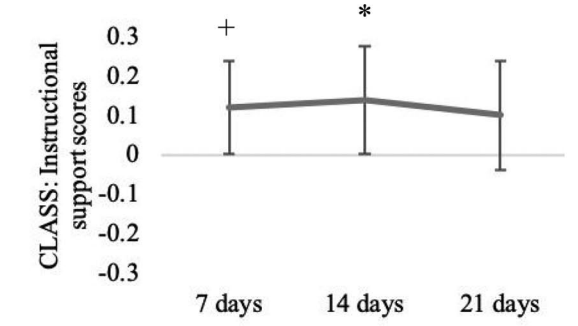




FIGURE 2. (continued)

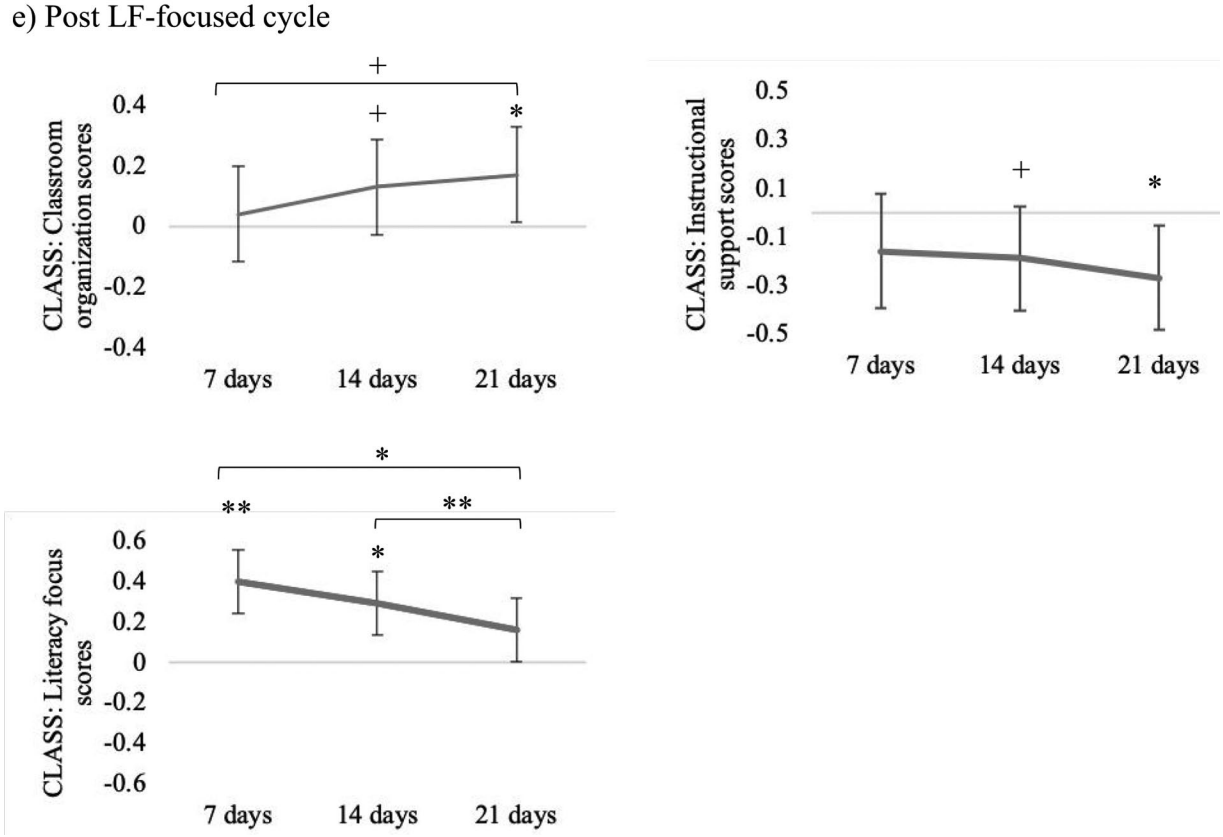



FIGURE 2. *Predicted domain-specific changes in educator CLASS scores 7, 14, and 21 days after coaching cycles.*
*Note.* ES = emotional support, CO = classroom organization, IS = instructional support, LF = literacy focus.

## Discussion

Although coaching is increasingly seen as a key quality improvement strategy, little is known about the mechanisms through which it changes teacher practices *during* interventions as most research has focused on changes in teacher practices observed at the *end* of coaching interventions. In response to this gap, this study examined whether teachers immediately and incrementally improve their practices as hypothesized after individual coaching cycles. Findings support the notion that teachers do implement certain practices immediately after certain coaching experiences. Although, whether and which practices teachers deliberately rehearse depends on the focus of the preceding coaching cycle, lending support to the hypothesis that content focus in an important factor in explaining coaching effects (Desimone, 2009; Garet et al., 2001). There was also evidence that deliberate rehearsal in one area could have unintended positive and negative consequences for practices in other areas. Finally, several of the immediate changes in teacher practices after coaching cycles endured over the course of several weeks, whereas others dissipated quickly. The implications of these findings are discussed below.

Results indicated teachers immediately improved certain practices after coaching cycles of any focus, whereas other practices improved only after specific, targeted supports. Specifically, educators' emotional support and classroom organization practices tended to be slightly higher (<0.10 *SD*) immediately after any coaching cycle than they were at other times. It could be that meeting with a coach, rather than induce deliberate practice in these areas, served as a reminder to implement the impactful but relatively basic aspects of high-quality teaching captured by these domains (e.g., showing enthusiasm, matching students' affect, making eye contact, acknowledging children's emotions). In contrast, instructional support or literacy focus, domains that generally have low scores across the early education field (Bassok et al., 2021; Hamre et al., 2013), improved only after coaching cycles focused on those particular areas. It could be that coaching interactions help distill these relatively complex skills into manageable action steps that facilitate deliberate practice and experiential learning in ways that teachers can not readily do independently (Hamre et al., 2012; Kolb et al., 2000). The magnitude of the immediate changes in both of these practices was also substantively large (0.17 to 0.39 *SD*), in line with Blazar and Kraft (2015) and Pianta et al.'s (2014) finding that instructional-focused coaching is linked to larger improvements in educator practices at the end of coaching interventions than coaching focused on other areas. Specifically, Blazar and Kraft (2015) found that each additional week of coaching focused on instructional delivery was associated with improvements of roughly 0.30 to 0.50 *SD* in various teacher practices observed after a year of coaching.

Consistent with holistic perspectives on the interrelated nature of teaching and learning (Clarke & Hollingsworth, 2002; Leinhardt et al., 1995), coaching cycles focused on one area of practice also resulted in immediate improvements and declines

in other areas. Whereas emotional support scores were higher after instructional support cycles, instructional support scores were lower after classroom organization and literacy focus cycles. It is possible that instructional support coaching ignited a so-called "change sequence" in which teachers deliberately practicing instructional support may, for example, have then been able to make more space for children to express their opinions and ideas, strong emotional support practices (Clarke & Hollingsworth, 2002). At the same time, the inverse association between classroom organization coaching and instructional support practices suggest that deliberately rehearsing classroom organization by focusing on clear expectations and establishing consistent routines may have come at the sacrifice of instructional time.

The potential trade-offs between the two instructionally oriented domains—literacy focus and instructional support—are less apparent. It could be that teachers coached on literacy focus prioritized low-rigor code-based activities, such as those related to rhyming and letter identification, more than the types of content-neutral, cognitively intensive activities associated with higher instructional support scores (e.g., asking opened-ended questions). As Blazar and Kraft (2017) point out, it is unlikely that these types of trade-offs in practices are inevitable. For example, skilled educators are likely to be able to successfully integrate multiple dimensions of high-quality practices simultaneously (Leinhardt et al., 1995), whereas teachers just learning to manage student behaviors and routines (core classroom organization practices) may not yet be able to accommodate both types of practices. This highlights that practice integration, not just domain-specific improvements, should be an explicit focus of professional development.

Most statistically significant differences in educator practices after coaching cycles endured over a 3-week period, confirming coaching likely has lasting impacts through accumulating, incremental changes evoked by individual coaching cycles. After coaching cycles of any focus, educators' emotional support and classroom organization scores remained elevated. Similarly, educators' emotional support and instructional support scores remained higher after instructional support cycles. A few changes in teacher practices did dissipate quickly, however, like those in literacy focus, indicating certain practices likely need additional ongoing supports to sustain improvements. It could be that these literacy-specific practices were particularly challenging to integrate into educators' existing routines, and were quickly challenged by competing demands (e.g., subsequent coaching cycles, administrative pressures). Future research should examine whether these rapid declines in improved practices may be remedied with simple reminders or whether more intensive ongoing supports like coaching cycles are required.

In quantifying the marginal changes in teacher practices immediately after coaching cycles, this work sheds additional light on prior research findings on the average impacts of coaching on teacher practices at the *end* of interventions. Given the randomized nature of the coaching intervention, main impacts represent average changes in practices attributable to the intervention. As noted in the introduction, the NCRECE-PDS MTP intervention, the focus of the present study, had large positive and statistically significant average impacts on instructional support practices at the end of the intervention (0.69 *SD*; Downer et al., 2018), which is consistent with the large and enduring immediate changes in instructional support practices after instructional support cycles. There were no significant main impacts on emotional support or classroom organization practices, which may suggest the small immediate improvements observed here after any coaching cycles may not be large or enduring enough to appear in teacher practices at the end of the intervention. Finally, there were large negative main impacts on literacy focus practices (–0.32 *SD*), which may have been the product of rapid fade out in literacy focus practices after literacy focus cycles and the apparent trade-off between instructional support and literacy focus practices. Overall, examining average impact findings in relation to this article's acute impact findings underscore that focusing exclusively on teacher practices at the end of interventions overlooks the complex ebbs and flows of teacher practices throughout coaching interventions.

### *Limitations*

Although this study offers initial insight into the contribution of coaching cycles to teacher practices, estimates presented in this article cannot be interpreted as causal for reasons discussed in the methods section (e.g., models account for some but not all time-varying factors). To estimate the causal effect of individual coaching cycles, the timing of coaching cycles and video collection would need to be completely random. To estimate the causal effect of individual coaching cycles with particular content foci, the timing of cycles with a particular content focus would also need to be random. However, as noted in the violent crimes literature from which this analytic approach is derived (Sharkey et al., 2012), this approach, if anything, represents a conservative estimate of the acute impacts of coaching cycles, as cycles are likely to have enduring impacts on educator practice that downward bias estimates. In sum, the results of this study motivate the design of future studies allowing for more rigorous testing of the contribution of specific program features, like coaching cycles, to outcomes. A potentially promising avenue for future study is considering whether different combinations and sequences of coaching cycles best promote deliberate rehearsal and sustained improvements. Does focusing on the same domain over time or getting exposure to many different domains of practice result in larger improvements? Unfortunately, exploring this question in the present data is limited by small sample sizes across any given sequence of coaching, as nearly every teacher followed their own path during the intervention (as illustrated in online Appendix Figure A2, available on the journal website).

There are several additional limitations that could affect the interpretation of the results. First, Type I error could account for some of the observed results. As numerous hypotheses were tested in answering the three research questions, it is possible that some of the significant results were observed by chance. However, in testing whether practices differed immediately after domain-specific coaching cycles (Research Question 2), 16 hypotheses were tested and of these hypotheses, four (25%) were at least statistically significant at $p < .05$ and eight (50%) were at least marginally significant at $p < .10$, suggesting results

were unlikely due entirely to random chance. Second, the coaching cycles were directly aligned to the outcome measure, the CLASS. As Pianta et al. (2014) note, this means that any observed results may reflect "teaching to the test," rather than true changes in teacher practices. Future work should replicate these analyses in studies using less directly aligned coaching and outcome measures. Finally, although this work includes a relatively large and diverse sample of educators working across multiple early education auspices, coaching cycles may have unique consequences among other samples of educators.

### *Conclusions*

This study suggests educator practices can immediately change after coaching cycles, but that these changes vary based on the content focus of coaching cycles. For those tasked with designing coaching programs to improve teacher practices, deliberate practice may be most likely to occur when focused on areas of practice that educators need support breaking down and figuring out how to implement in their settings, like instructional support. Moreover, decision makers should be aware that coaching may result in unintended trade-offs between practices (e.g., between literacy focus and instructional support). Anticipating these trade-offs and actively supporting teachers in integrating multiple areas of practice are likely central to designing effective coaching. Taken together, these results underscore the importance of moving beyond a singular focus on the average impacts of coaching on teacher practices at the *end* of interventions to considering ongoing changes in teacher practices *during* interventions.

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