Building Educator Capacity to Promote Children's Early Math Development

The Count Play Explore (CPE) initiative strives to engage professional learning (PL) facilitators, early childhood educators, families, and children birth to third grade in the joy and wonder of mathematics. Through locally implemented PL and coaching, CPE supports early childhood educators in building positive math mindsets and strengthening their early math knowledge and teaching practices. WestEd serves as the internal evaluator for the CPE initiative. This brief summarizes evaluation data on early educators' self-reported outcomes after participating in local CPE PL and coaching from July 2023 to July 2024.

Educators' attitudes and beliefs toward math can influence how they approach and teach math to children (Gautreau et al., 2016). Some early childhood educators may have had negative math experiences in the past, resulting in math anxiety or lower confidence teaching math relative to other subjects (Ramirez et al., 2018). In addition, many early childhood educators do not have extensive prior math education or training, which can serve as a barrier to teaching math (Wall, 2016). However, educators are one of the most influential factors in improving children's math outcomes (Drake et al., 2025; Saracho, 2013). Therefore, engaging educators in early math training, like CPE local PL and coaching, could offer one avenue for promoting math in early learning settings.

As part of the initiative, CPE implemented a cascade model that offered early math PL to facilitators from 25 agencies across California—including county offices of education, school districts, and nonprofit organizations (see Exhibit 1). Agency facilitators then provided PL and coaching to educators in their local communities. These experiences strive to bolster educators' math mindsets and builds early math teaching capacity, with the ultimate aim of better supporting children's early math development. Most agencies also engaged families in early math experiences.

Exhibit 1. The CPE Cascade Model

This brief summarizes evaluation findings to address the following questions:

- How much CPE PL and coaching did educators report engaging in?
- To what extent did CPE local PL and coaching build educators' early math mindsets, confidence in knowledge of children's early math development, and teaching practices?
- Was there variation in outcomes based on educators' key characteristics (e.g., prior math education and years of teaching experience)?

Method

Educators completed an electronic, retrospective pre/post-survey on a rolling basis using Research Electronic Data Capture (REDCap; Harris et al., 2019) from March to July 2024. Agency facilitators invited the educators they served to complete the survey after each agency concluded their final PL session. Educators received a $5 Amazon gift card as an incentive for their time spent responding to the survey.

The survey assessed educators' self-reported

- negative feelings toward math,
- perceptions of math usefulness,
- confidence in their knowledge of children's math development, and
- perceived impact of participation in CPE on the ability to use math teaching practices (shortened to *perceived impact on teaching* hereafter).

Each of the outcome measures comprised multiple items based on participant self-report. The evaluation team conducted exploratory factor analyses and reliability analyses (i.e., Cronbach's alpha) to determine the composite outcome scales.

The survey asked educators to report on negative feelings toward math, perceptions of math usefulness, and confidence in knowledge of early math development before participating in CPE (e.g., "BEFORE participating in your agency's early math professional learning and coaching, to what extent did you agree with each statement below?") and their current perspective after participation (e.g., "AFTER participating in your agency's early math professional learning and coaching, to what extent do you agree with each statement below?"). The retrospective pre/post design requires educators to recall their perceptions of change, which may introduce recall bias because their current experience may influence their reflection. However, the items related to perceived impact on teaching were only asked from the post-test perspective.

We used multilevel mixed-effect models in R (R Core Team, 2024) to examine the impact of PL and coaching on educators' self-reported outcomes. More specifically, we explored how educators' negative feelings toward math, perceptions of math usefulness, and confidence in knowledge of early math development changed retrospectively from before to after participating in CPE PL and coaching. Because each educator answered these questions multiple times, the analysis accounted for the fact that their responses are related (i.e., time is nested within educators). The analysis also accounted for the possibility that educators within the same agency might have similar responses due to shared experiences like PL sessions and coaching methods (i.e., educators are nested within agencies).

Educator Demographics and Professional Background

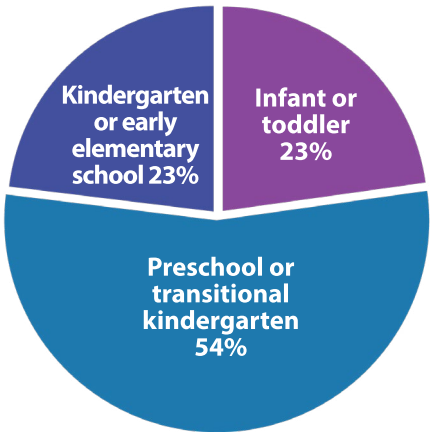
The final sample included 329 educators from 23 of 25 agencies participating in CPE in 2023–24 (2 agencies declined to invite their educators to participate in the survey). Response rates from individual agencies ranged from 5 to 86 percent. Across all agencies who reported their total number of participating educators ($n = 22$), the overall response rate was approximately 27 percent.

Participating educators were predominantly women (94%) who were monolingual English-speakers (56%). However, over a third reported being fluent in both English and Spanish (34%; see Exhibit 2).

Exhibit 2. Educator Demographics

American Indian or Alaska Native	2%
Asian	8%
Black or African American	3%
Hispanic/Latina/o/e	46%
Native Hawaiian or Pacific Islander	<1%
White	46%
Other Race or Ethnicity	2%
English Monolingual	56%
Spanish Monolingual	10%
Spanish-English Bilingual	34%

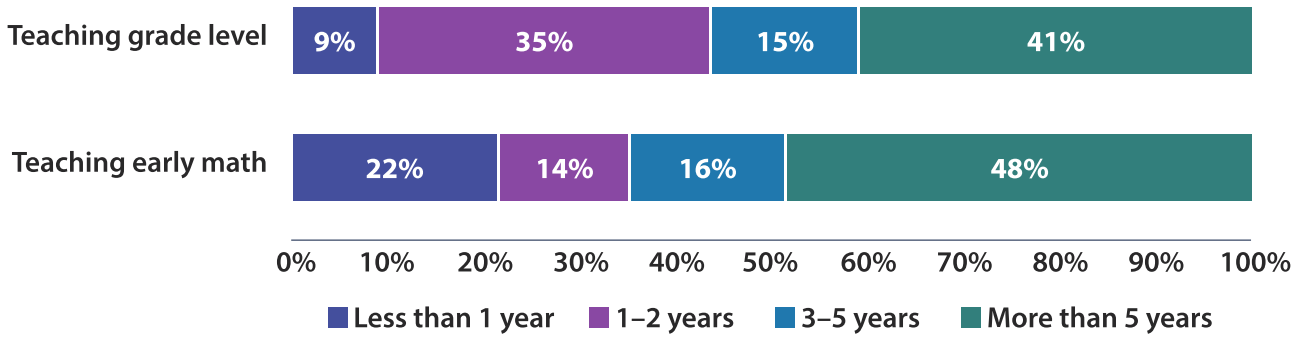
Exhibit 3. Primary Age Group Taught by Educators



Educators varied in their highest level of education. Over half of the educators (57%) reported holding a bachelor's or higher degree; 28 percent held an associate's degree, certificate, or trade school degree; 12 percent held a high school diploma or GED; and 3 percent had less than a high school diploma. Over half of the participating educators taught preschool-aged children (see Exhibit 3).

Exhibit 4 displays the frequency of the years of experience educators reported teaching their primary grade level and teaching math. While there was some variation, over half of educators had at least a few years of teaching experience. Specifically, 56 percent of educators reported teaching their grade level for more than 3 years, and 64 percent reported teaching early math for more than 3 years.

Exhibit 4. Years of Educator Teaching Experience



Note. For grade-level experience, 9% had less than 1 year, 35% had 1–2 years, 15% had 3–5 years, and 41% had more than 5 years. For early math teaching experience, 22% had less than 1 year, 14% had 1–2 years, 16% had 3–5 years, and 48% had more than 5 years.

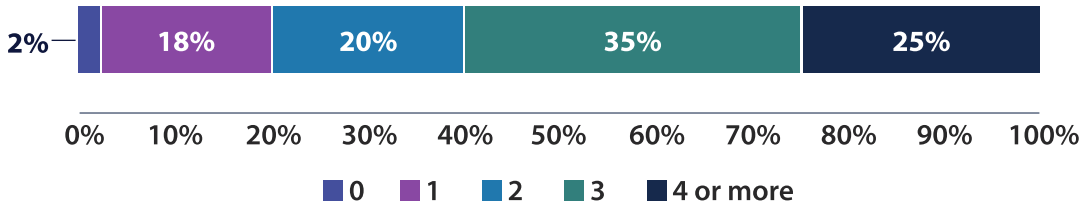
How much CPE professional learning and coaching did educators report engaging in?

CPE allows agencies to tailor their PL and coaching to their local context, which resulted in educators receiving varying amounts of PL and coaching. This evaluation brief uses an estimate of dosage based on educators' self-reported participation in PL and coaching. Some educators reported participating in a single PL session (18%), whereas most reported participating in multiple PL sessions (80%; see Exhibit 5). On average, educators reported attending about three PL sessions, which equated to an average of about 11 hours of PL.

Most educators (64%) reported receiving coaching, though some (36%) reported not receiving any coaching. Educators who received coaching reported participating in an average of between three and four coaching sessions, which equated to an average of about 8 hours of coaching.

PLs covered a range of early math topics, most commonly number and counting, geometry and spatial thinking, and measurement and data, with the goals of strengthening early math teaching practices and providing educators with opportunities to participate in hands-on learning. For more about how agencies implemented CPE, see the *CPE Evaluation Brief: CPE Professional Learning and Coaching in Local Communities*).

Exhibit 5. Number of PL Sessions Educators Attended



Note. A small percentage of educators (2%) attended 0 PL sessions and only received coaching, 18% attended one PL session, 20% attended two PL sessions, 35% attended three PL sessions, and 25% attended four or more PL sessions.

Educator Perceptions of Professional Learning and Coaching

Overall, educators had favorable perceptions of the PL and coaching offered by their agency. The survey asked educators to reflect on their agency's early math PL and coaching sessions and rate eight aspects of high-quality PL and coaching. For example, items included "help you learn something new that you tried out in your teaching" and "deepen your understanding of children's development across the preschool–Grade 3 (P–3) continuum." Educators responded on a 5-point Likert scale, which ranged from 1 for *strongly disagree* to 5 for *strongly agree*, with 3 representing *neutral*. Average ratings for each item ranged from 4.04 to 4.44, or between *agree* and *strongly agree*.

The item with the highest average was "include active hands-on learning," while the lowest average item was "model effective practices for engaging families."

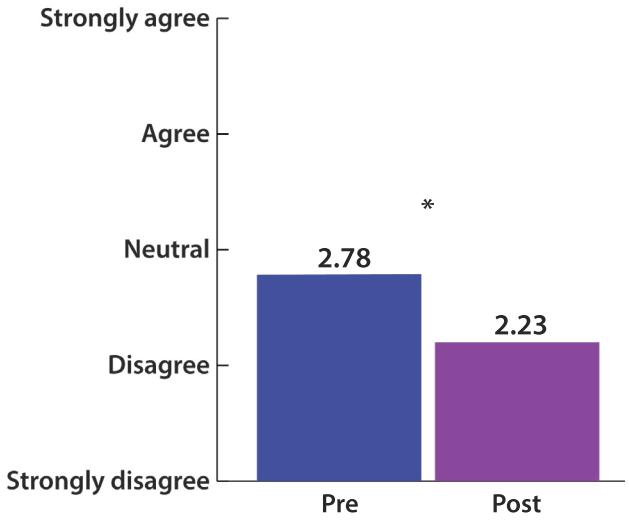
Educators' open-ended responses indicated that they appreciated the interactive hands-on learning experiences. In addition, educators expressed gratitude for having an opportunity to collaborate with their peers as they learned.

How did educators' math mindsets change after participating in CPE local professional learning and coaching?

Negative Feelings Toward Math

Educators rated their agreement with two items: "I'm not a math person" and "Just the word *math* can make me feel nervous" (using a scale from 1 for *strongly disagree* to 5 for *strongly agree*, with 3 representing *neutral*). Educators' negative feelings about math significantly decreased from before ($M = 2.78$, $SD = 1.19$) to after participating in CPE PL and coaching ($M = 2.23$, $SD = 1.02$; $b = -0.55$, $SE = 0.06$, $p < .001$; see Exhibit 6). In addition, in the pre and post items, educators with less than 1 year of experience teaching math reported more negative feelings toward math than educators with more than 5 years of experience ($b = -0.38$, $SE = 0.15$, $p < .05$).

Exhibit 6. Change in Educators' Negative Feelings Toward Math

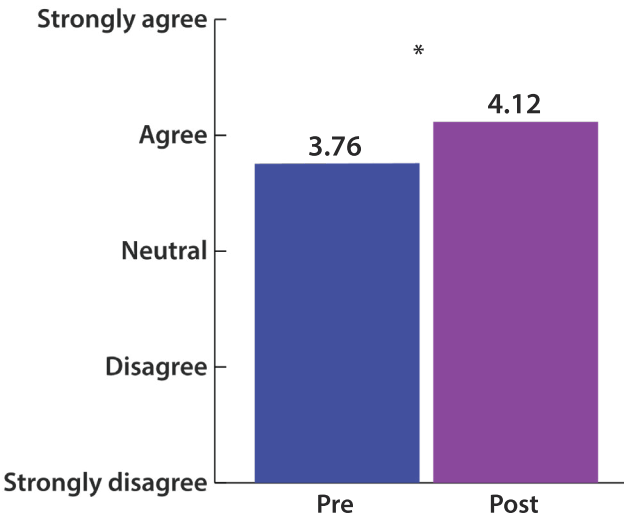


* $p < .001$.

Perceptions of Math Usefulness

Educators rated their agreement with two items: "I like coming up with creative ways to solve math problems" and "Math is a subject I use often throughout my life" (using a scale of 1 for *strongly disagree* to 5 for *strongly agree*, with 3 representing *neutral*). Educators' perceptions of math usefulness significantly increased from before ($M = 3.76$, $SD = 0.92$) to after participating in CPE PL and coaching ($M = 4.12$, $SD = 0.81$; $b = 0.35$, $SE = 0.05$, $p < .001$; see Exhibit 7).

Exhibit 7. Change in Educators' Perceptions of Math Usefulness



* $p < .001$.

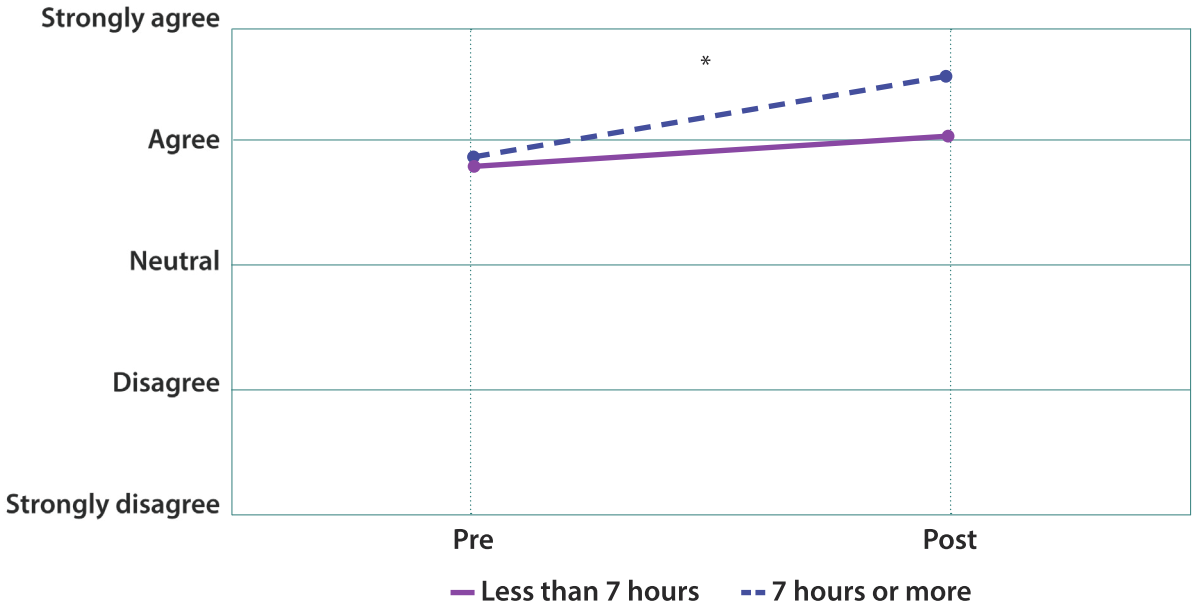
How did educators' confidence in their knowledge of children's math development change after participating in CPE local professional learning and coaching?

An eight-item composite measured educators' confidence in their knowledge of children's math development (using a scale of 1 for *strongly disagree* to 5 for *strongly agree*, with 3 representing *neutral*). The composite included the following math content areas: number and counting, classification and patterning, measurement and data, geometry, spatial thinking, addition and subtraction, multiplication and division, and fractions.

Participation in CPE Professional Learning Enhanced Educators' Knowledge of Math Development

Overall, educators' reported confidence in knowledge of children's math development significantly increased from before ($M = 3.70$, $SD = 0.81$) to after participating in CPE PL and coaching ($M = 4.34$, $SD = 0.74$; $b = 0.63$, $SE = 0.05$, $p < .001$). Further, educators who received 7 or more hours of PL reported significantly greater change in their confidence in knowledge compared to educators receiving fewer than 7 hours ($b = -0.03$, $SE = 0.01$, $p < .05$; see Exhibit 8). However, educators with less than 1 year of experience teaching their age/grade level reported significantly lower confidence in their knowledge of children's math development compared to those with more experience, including those with 1–2 years ($b = 0.46$, $SE = 0.21$, $p < .05$), 3–5 years ($b = 0.64$, $SE = 0.21$, $p < .01$), and more than 5 years ($b = 0.59$, $SE = 0.19$, $p < .01$).

Exhibit 8. Change in Educators' Confidence in Knowledge by PL Hours



* Statistically significant difference between the rate of change between the two groups.

How did educators perceive that CPE local professional learning and coaching impacted their math teaching abilities?

Educators rated the perceived impact of their agency's early math PL and coaching on their teaching abilities. The survey asked, "To what extent did your agency's early math professional learning and coaching impact your ability to …" followed by nine early math teaching practices. Example teaching practices included "making connections to math while children play," "using math language as part of daily routines," and "supporting mathematical thinking to solve everyday problems." Educators responded on a 4-point scale, from 1 for *not at all* to 4 for *a lot*. A composite score was created by averaging ratings across all nine teaching practices.

On average, educators reported a high degree of perceived impact of agency early math PL and coaching on their teaching abilities ($M = 3.66$, $SD = 0.41$). In addition, years of experience teaching math positively predicted perceived impact on teaching ($b = 0.04$, $SE = 0.02$, $p < .05$), such that more experienced math teachers indicated greater perceived impact on teaching.

Participation in Coaching Bolstered Perceived Impact on Teaching

Educators' participation in CPE coaching was positively associated with their perception that CPE impacted their math teaching. Educators who received coaching ($M = 3.74$, $SD = 0.36$) perceived that CPE impacted math teaching to a significantly greater extent than did educators who did not receive coaching ($M = 3.54$, $SD = 0.44$; $b = 0.19$, $SE = 0.05$, $p < .001$; see Exhibit 9).

> "After participating in these coaching sessions, I learned that shapes and math are in everything we do. We can so easily teach children about geometry, addition, subtraction without the need of a paper and pencil. I am able to speak about math with families confidently and show them ways to implement activities at home as well as provide them good online resources."
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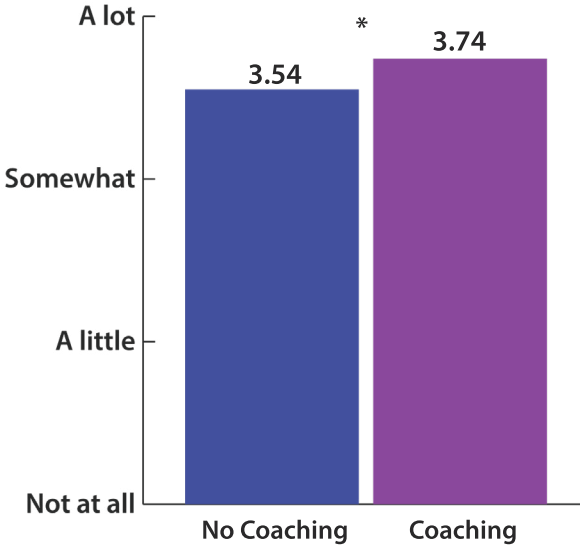
> *—Infant/Toddler Educator, June 2024*

Exhibit 9. Change in Educators' Negative Feelings Toward Math



* $p < .001$.

Educators' Experiences Integrating CPE With Their Curriculum

Educators were asked which curriculum they used in their classroom (e.g., Building Blocks, Creative Curriculum). Educators who reported using a curriculum (70%) then responded to the item, "Which of the following best describes the process of integrating what you learned about early math in the professional learning and coaching sessions with your existing curriculum?" Many educators (74%) reported that CPE enhanced or complemented their existing curriculum, whereas others had not yet integrated CPE with their curriculum (21%), and a small number of educators (5%) reported that it was challenging to integrate CPE with their curriculum. A logistic regression showed that educators who attended more hours of PL were significantly more likely to report integrating what they learned in CPE with their curriculum (OR = 1.02, 95% CI [1.01, 1.04], $p < .01$).

"I added some of the new strategies to my routine like 'Which One Does Not Belong?' to my math talks. I added more time with math toys to allow times to explore and ask questions to help the students stretch their knowledge or ask questions to help guide their observations and how they related to math."

—PreK/TK Educator, April 2024

Is there variation in outcomes based on educator's prior math education?

Most CPE educators (80%) reported not having any prior math-specific education. Those who reported prior math education predominantly reported taking college courses in math subjects (49% of those reporting prior math education) or math-specific training courses (e.g., Cognitively Guided Instruction, Creative Mathematics [29%]). A smaller group (14%) reported prior math education in the form of past participation in CPE. We examined whether outcomes differed based on prior math education because prior research shows that math education or training can reduce barriers to teaching math (Wall, 2016).

Impact of Prior Math Education on Negative Feelings Toward Math

Educators without prior math education reported significantly more negative feelings toward math before participating in CPE than did educators with prior math education (b = -0.75, SE = 0.17, $p < .001$; see Exhibit 10). However, after participating in CPE PL and coaching, educators reported a significantly greater decrease in negative feelings toward math compared to educators with prior

math education ($b = 0.44$, $SE = 0.16$, $p < .01$). In addition, educators without prior math education reported significantly lower perceptions of math usefulness before and after participating in CPE PL and coaching compared to educators with prior math education ($b = 0.24$, $SE = 0.12$, $p < .05$).

Impact of Prior Math Education on Confidence in Knowledge of Children's Math Development

Before participating in CPE PL, educators without prior math education rated their confidence in their knowledge of children's math development significantly lower than did educators with prior math education ($b = 0.34$, $SE = 0.12$, $p < .01$). However, after participating in CPE PL and coaching, educators without prior math education reported significantly increased confidence in their knowledge of children's math development ($b = -0.28$, $SE = 0.12$, $p < .05$), resulting in similar post-test confidence levels between educators regardless of prior math education (see Exhibit 10).

Exhibit 10. Educators' Reported Change in Outcomes by Prior Math Education

Educator outcome	No prior math education		Prior math education	
	Pre *Mean (SD)*	Post *Mean (SD)*	Pre *Mean (SD)*	Post *Mean (SD)*
Negative feelings toward math	2.98 (1.19)	2.33 (1.03)*	1.95 (0.94)	1.75 (0.92)*
Perceptions of math usefulness	3.73 (0.90)	4.09 (0.81)*	3.88 (1.05)	4.28 (0.77)*
Confidence in knowledge of children's math development	3.62 (0.81)	4.31 (0.76)*	4.00 (0.76)	4.41 (0.68)*

* *Indicates that the post score is significantly different from the pre score.*

Key Insights and Implications

POSITIVE PERCEPTIONS OF CPE LOCAL PROFESSIONAL LEARNING AND COACHING

Educators generally rated CPE PL and coaching positively, particularly for its hands-on and interactive approach. These data reflect CPE's emphasis on playful, active learning and suggests that educators found the sessions engaging and useful. In contrast, an item related to engaging families received the lowest average rating. These data points align with the fact that family and community engagement became a primary focus later in this phase of CPE (after the timing of this retrospective educator pre/post-survey). For more information on how CPE engaged families, see the *CPE Evaluation Brief: Engaging Families to Support Children in Early STEAM* summarizing the findings from a subsequent substudy.

IMPROVEMENTS IN MATH MINDSETS AND CONFIDENCE

Educators reported positive changes in their math mindsets (i.e., negative feelings toward math and perceptions of math usefulness) and confidence in knowledge of children's early math development after participating in CPE PL and coaching. They also perceived a positive impact on their math teaching ability. These findings suggest that local CPE PL and coaching supported educators in feeling more capable and confident in early math, which may contribute to improved math learning experiences for young children. Given that prior research links educator's math attitudes and beliefs with children's math outcomes (Drake et al., 2025; Saracho, 2013), these findings highlight the importance of high-quality PL and coaching opportunities that address mindsets, knowledge, and practices to build early childhood and elementary educators' capacity to teach math.

IMPACT OF PRIOR MATH-SPECIFIC EDUCATION AND TEACHING EXPERIENCE

Across multiple outcomes of interest, educators' prior math education emerged as an important predictor. Educators without prior math education reported a greater reduction in negative feelings toward math compared to those with prior math education. Furthermore, educators without prior math education showed gains in confidence in knowledge of children's math development, such that they even caught up in confidence to those who did report prior math-specific education. These data suggest that CPE may help address some math barriers for educators who previously had limited or no exposure to math-specific education. However, educators with prior math education continued to report higher overall perceptions of math usefulness and confidence in knowledge of children's math development compared to educators without prior math education. Similarly, educators with more teaching experience reported higher initial confidence in knowledge of children's math development and perceived a greater impact of PL and coaching on teaching. These patterns suggest tailoring PL and coaching opportunities to educators' prior experiences—for example, by offering differentiated supports for new versus experienced educators—could maximize the impact of CPE PL and coaching for each educator.

ROLE OF PROFESSIONAL LEARNING AND COACHING INTENSITY

Educators who participated in more hours of PL reported a greater increase in their confidence in knowledge of children's math development and were more likely to report that they integrated what they learned in CPE with their curriculum. In addition, educators who participated in coaching perceived a greater impact on their teaching abilities than did educators who did not participate in coaching.

Together, these findings underscore existing research that ongoing professional learning coupled with individualized coaching supports educators in building their knowledge and strengthening their teaching practices (Schachter et al., 2025). However, the relationship between PL and coaching dosage to educator outcomes may also reflect that educators who were already more confident sought out more CPE PL and coaching. In the future, educators may benefit from CPE agencies ensuring access to meaningful learning experiences that meet the needs of educators with varying levels of prior experience.

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WestEd is a nonpartisan, nonprofit organization that aims to improve the lives of children and adults at all ages of learning and development. We do this by addressing challenges in education and human development, reducing opportunity gaps, and helping build communities where all can thrive. WestEd staff conduct and apply research, provide technical assistance, and support professional learning. We work with early learning educators, classroom teachers, local and state leaders, and policymakers at all levels of government. For more information, visit WestEd.org.