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Beyond the classroom: a dyadic approach to preschool teacher – coach professional development

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Abstract

Purpose – The paper aims to examine the impact of an 11-month professional development program for a small sample of Head Start preschool teachers who were part of a dyadic coaching relationship.
Design/methodology/approach – The paper implemented a quantitative approach, using data from a pre- and post-surveys.
Findings – Using the results from the surveys, the findings suggest that the participants learning alongside a coach made greater gains in self-efficacy for planning and implementing STEM instruction.
Research limitations/implications – Due to the small sample size, results should be interpreted with caution.
Originality/value – This paper fulfills an identified need by exploring impactful alternatives to traditional professional development models for preschool teachers.

Keywords Self-efficacy, Professional development, Early childhood

Paper type Research article

Introduction

By examining teachers' perceptions and opportunities with coaching during a professional development project, this research aims to contribute to the growing body of literature on STEM in early childhood and inform efforts to strengthen teacher preparation and support systems. From the National Association for School-University Partnerships (NASUP) "Nine Essentials" (NAPDS, 2021) for Professional Development Schools (PDS), those addressed in this study include: # 3: A PDS is a context for continuous professional learning and leading for all participants, guided by need and a spirit and practice of inquiry; and #4: A PDS makes a shared commitment to reflective practice, responsive innovation, and generative knowledge.

The early years of a child's education are critical for developing foundational skills that support lifelong learning. Increasingly, Science, Technology, Engineering, and Mathematics (STEM) is recognized as an essential component of early childhood curricula, offering opportunities for young children to engage in inquiry, exploration, questioning, and problem-solving (Sarama *et al.*, 2018; Tippett & Milford, 2017). Relatedly, benefits of early STEM learning have been linked to improved literacy and mathematics skills (Clements, Vinh, Lim, & Sarama, 2023; Sarama *et al.*, 2018). Despite the growing emphasis on and research supporting early STEM education, many early childhood teachers report low confidence in their ability to plan and implement STEM instruction effectively, often citing limited content

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knowledge, lack of resources, and insufficient training (Amsbary, Yang, Sam, Lim, & Vinh, 2024; Clements *et al.*, 2023; Lange, Brenneman, & Mano, 2019).

Teacher self-efficacy, one's belief in their ability to successfully perform teaching tasks, plays a central role in shaping instructional practices. Higher self-efficacy is associated with greater persistence, creativity, and responsiveness in the classroom, particularly when introducing complex or unfamiliar content (Karwowski, Lebuda, & Beghetto, 2024). For early childhood teachers, fostering self-efficacy in STEM instruction is especially important, as it influences not only their willingness to engage with STEM topics but also the quality and consistency of STEM experiences that are provided for young children.

Professional development (PD) is a key lever for enhancing early childhood teacher self-efficacy (Amsbary *et al.*, 2024; Bandura & Wessels, 1997; Mas, Dunst, & Gomez-Porta, 2025), and among the various models available, instructional coaching has emerged as a promising approach (Schachter, Gerde, & Hatton-Bowers, 2019; Snyder, Hemmeter, & Fox, 2015; U.S. Department of Health and Human Services, Administration for Children and Families, Office of Head Start, 2025; Quality Compendium, 2019). Unlike traditional workshops or one-time training, instructional coaching offers sustained, job-embedded or online support tailored to individual educator needs (Barrett, Jackson, Schachter, Gerde, & Bingham, 2024). Through collaborative goal-setting, modeling, feedback, and reflection, instructional coaching helps teachers build confidence and competence in implementing new instructional strategies (Elek & Page, 2019; Mas *et al.*, 2025). In the context of early STEM education, coaching can provide targeted support for lesson planning, integrating STEM into play-based learning, and navigating challenges, which are often unique to early childhood settings (Amsbary *et al.*, 2024).

This study explores early childhood teachers' self-efficacy in planning and implementing STEM instruction, with a particular focus on the impact of instructional coaching for a small sub-sample of participants. The university site for this project originated as a Teachers' College, and, at the undergraduate level, it has established and maintained a Partner Schools Network (PSN) with strong school-university partnerships. Within the PSN, teacher candidates participate in a clinically rich, scaffolded practicum throughout the program that concludes with a full semester of student teaching. At the graduate level, which is fully online, much of the curriculum and required coursework reflects a clinically centered model, which bridges theory and practice within in-service teachers' own classrooms.

Early childhood teachers' self-efficacy

Bandura (1977) defined self-efficacy as a person's belief in their ability to achieve a specific outcome. Relatedly, Zee and Koomen (2016) determined that individuals with positive attitudes were more likely to develop and apply innovative teaching methods. Regrettably, many in the field of early childhood have reported lower self-efficacy and lower levels of confidence for teaching science and math concepts (Lange *et al.*, 2019). When early childhood teachers lack self-efficacy, they are less likely to integrate impactful learning experiences for the children they serve (Gerde, Pierce, Lee, & Van Egeren, 2018). On the other hand, a correlation exists between teachers with high levels of self-efficacy and their efforts to implement innovative instructional approaches. Prioritizing early childhood self-efficacy may have a profound impact on young children's learning. According to the research, integrating purposeful, ongoing PD opportunities may increase early childhood teachers' self-efficacy.

Professional development in early childhood

PD opportunities should aim to increase teachers' self-efficacy relative to the implementation of innovative instructional approaches. To do so, Darling-Hammond and Richardson (2009) determined that job-embedded PD maximized the learning outcomes for teachers and impact for students. Similarly, Callingham, Carmichael, and Watson (2015) noted that long-term work-embedded PD, even if offered online, was more impactful than workshops that were disconnected from teachers' classrooms. Relatedly, Desimone (2009) established a conceptual framework that prioritized coherence, collaboration, and active learning as the three non-negotiable components of PD. Utilizing this style of PD, groups of teachers within the same grade level engaged in active learning practices such as analyzing student work and/or practicing giving feedback. This coherence ensured alignment among teachers' goals, curriculum standards, and school policies. Furthermore, when teachers engaged in self-reflection and used formative feedback, the benefits of PD were often compounded (Desimone, 2009; Melton, Mallory, & Green, 2019; Miller, Latham, & Cahill, 2019; NAPDS, 2021).

More specifically, and for early childhood teachers, Sarama *et al.* (2018) suggested that PD opportunities be ongoing, aligned to teachers' needs, and connected to actual teaching. In addition, Sarama *et al.* (2018) recommended that PD for early childhood teachers should emphasize at least one of the following: collaborative and ongoing professional cohorts or learning communities, opportunities to examine, practice, and reflect on instructional methods, and the establishment of goals. Essential #3 (NAPDS, 2021) also promotes continuous, purposeful learning and leadership that is sustained through a practice of inquiry. Likewise, the *What Matters framework* for effective PD (Darling-Hammond & Richardson, 2009) emphasizes coaching as a central component of PD, extending beyond traditional approaches to promote deeper, sustained instructional change.

Instructional coaching

When implementing new instructional practices, PD opportunities should be intentionally designed to support and change teacher practice (Fox, Hemmeter, Snyder, Binder, & Clarke, 2011). For instance, rather than exclusively providing PD workshops, studies show that PD opportunities involving instructional coaching, modeling, application, and self-reflection are more effective and likely to influence or change teacher practice (Alexander, 2018; Fox *et al.*, 2011). These studies infer that PD, which integrates a partnership in the form of instructional coaching (e.g., coach/teacher), may support the teacher in applying new instructional practices. This partnership or relationship between coach(es) and teacher(s) is referred to as "dyadic" (Knight, 2011) and is often used in early childhood settings.

Dyadic relationships in instructional coaching represent various partnership dynamics between coaches and teachers. In early childhood, dyadic instructional coaching has emerged as a preferred PD strategy for supporting teachers in acquiring new knowledge and skills necessary for improving early childhood outcomes (Kemp & Turnbull, 2014; McCollum, Hemmeter, & Hsieh, 2011; Thompson, Marvin, & Knoche, 2021). A meta-analysis of 124 studies reported positive effects of dyadic instructional coaching for teachers and children, with teachers maintaining higher levels of implementation even after coaching support was withdrawn (Schachter *et al.*, 2025). Other studies indicated that using dyadic instructional coaching supported teachers' effectiveness across various content areas, including emergent literacy instruction (McCollum *et al.*, 2011), social-emotional supports (Fox *et al.*, 2011), and classroom management (Bullock, Coplan, & Bosacki, 2015). Similarly, Sarama *et al.* (2018) recommended using a one-on-one, mentor-teacher design (e.g., dyads) for teaching STEM in early childhood settings. Recent studies in early childhood education suggest that dyadic and collaborative coaching models may strengthen teacher self-efficacy by promoting reflective dialogue, shared problem solving, and supportive professional relationships (Täschner *et al.*, 2024). Relationship-centered coaching structures are known to provide opportunities for feedback, co-construction of knowledge, and mastery experiences, all of which are associated with increased instructional confidence and professional growth (Vasseleu, Neilsen-Hewett, & Howard, 2024).

Attributes of effective instructional coaching

In Cornett and Knight's study (2009), the combination of training and instructional coaching was shown to increase teachers' implementation of learned content and transfer of new knowledge within their instructional setting. Additional research further outlined attributes of effective instructional coaching. These attributes included: *structured observation*, *data-based feedback*, *modeling of strategies*, and *collaborative action planning between coach and teacher* (Hemmeter, Snyder, Kinder, & Artman, 2011; Snyder *et al.*, 2015). Relatedly, Fox *et al.*'s (2011) study identified *goal setting, classroom observations*, and *performance feedback* as attributes of instructional coaching, which resulted in improvements in teachers' implementation of new practices. While applying new instructional approaches, formative and data-based feedback and reflection were found to impact teacher discourse and student reasoning (Sedova, Sedlacek, & Svaricek, 2016). Developing specific and measurable goals along with sustainable action plans may promote and expedite implementations of PD as well as build self-confidence as teachers learn new instructional techniques and habits (Clear, 2018). Collectively, the aforementioned studies suggested that teachers should receive feedback and be provided opportunities to reflect and set personal goals accordingly.

Dyadic relationships in instructional coaching

Dyadic relationships in instructional coaching represent various partnership dynamics between coaches and teachers. Each type serves distinct purposes in PD. Three types of dyadic coaching relationships have been identified in educational settings: reciprocal relationships, administrative coaching, and expert coaching (Knight, 2011). *Reciprocal coaching* relationships emphasize mutual learning and shared expertise between coach and teacher. This approach creates a collaborative environment where both parties contribute equally to professional growth (Kraft, Blazar, & Hogan, 2018). This format allows both parties to serve in the role of leader and learner as they innovate and reflect, generating new knowledge about teaching and learning (NAPDS, Essential #4, 2021). Conversely, *administrative coaching* involves more of a supervisory relationship, typically implementing specific organizational goals or standards (Desimone & Pak, 2017). The third approach, *expert coaching*, incorporates specialized knowledge transfer, where coaches with specific expertise guide teachers in implementing evidence-based practices. Regardless of the type of dyadic coaching, studies revealed potential benefits.

Benefits of effective instructional coaching

Instructional coaching offers several benefits to early childhood teachers. Research showed two benefits – improved classroom quality scores and enhanced teacher-child interactions (Pianta *et al.*, 2014). Teachers engaged in dyadic coaching relationships were shown to sustain implementation of PD through individualized support, feedback techniques, and reflective practices (Rush & Shelden, 2020). Teachers in these studies reported that coaching support was essential for successful implementation, stating they would not have implemented practices as effectively without their coach's guidance. Similarly, instructional coaches highlighted effective coaching to include the following essentials: *relationship building, individualized goal-setting, in-class demonstration, timely feedback*, and *data-informed planning* (Thompson *et al.*, 2021).

While there is research on early childhood teacher self-efficacy and coaching as a beneficial form of PD, there is limited research that explores the interplay among early childhood teachers' self-efficacy, coaching, and the implementation of STEM instruction. This study explored whether a difference in self-efficacy for planning and implementing STEM instruction, if any, exists for early childhood teachers who were in a dyadic coaching relationship in comparison to teachers who were without an instructional coach during the same STEM PD project.

Methods

Participants

This study used a subsample of Head Start preschool teachers; all were enrolled in the same online graduate-level courses at a midwestern university as part of an ongoing, collaborative early childhood STEM project. Over time, the project delivered four online graduate courses in a cohort model of instruction for the participants, all of whom were working in a Head Start setting in the same midwestern state. The focus for two of the online courses was on STEM instruction in early childhood. In addition to the STEM courses, one of the graduate-level courses emphasized current research-based teaching strategies for early childhood educators, and the other focused on the improvement of instruction in early mathematics.

During the first semester of the project, participants took two online courses as a cohort. The course on early childhood teaching practices was taught asynchronously, whereas the early STEM course had monthly Zoom discussions led by the university instructor. In the second semester of the project (summer), each participant developed a STEM lab lesson for early childhood children to be used in their respective educational settings for the upcoming fall semester. During the final semester of the project, an asynchronous online course on improving mathematics instruction in the early grades was the focus. As a capstone event for the project, the participants presented their STEM lab lessons during an annual regional conference held on the university campus.

Thirteen educators with varying roles in Head Start (i.e., coaches, teachers, managerial positions) consented to participate and complete the 11-month grant-funded project; two participants withdrew before the program concluded. To explore the dyadic impact of PD, a subsample consisting of the five preschool teachers was used for this exploratory study. Two of the participants were preschool teachers whose coaches were also involved in the PD, while the other three teachers did not have an instructional coach participating. This dyadic versus non-dyadic distinction provided the researchers with an opportunity to further explore the quantitative data for possible patterns and/or trends. A summary of the five participants' demographics is displayed in Table 1.

Measures

Demographic information was gathered and pertained to the participants' age, gender, race, primary language, years of experience, type of classroom (e.g., full year), employment (e.g. job role, work schedule), additional/outside employment (e.g. summer employment),

Table 1. Participant demographics

Characteristics	Participants ($n = 5$)
Employment role/title	
Classroom Teacher	5
Experience in early childhood	
7 years	1
8 years	2
9 years	2
Teachers in a dyadic relationship	2
Gender	
Female	5
Race	
White, non-Hispanic	5
Language preference	
English	5
Highest Level of Education	
Bachelor's Degree (Early Childhood)	4
Bachelor's Degree (Other)	1

experience working with young children, highest education level achieved, and licensure/certifications (see Appendix A).

To gain information about the teachers' self-efficacies associated with planning and implementing STEM instruction for preschool-age children, this study used the same measure as a pre-survey and post-survey. To collect self-efficacy data, the pre-survey was administered after participants consented to participate and before beginning the first online graduate cohort course for the project. Near the completion of the study and approximately 11 months after the pre-survey, a post-survey was used to collect self-efficacy data. The post-survey used the same self-efficacy questions as the pre-survey.

For the current project, the Early Childhood Educator Self-Efficacy Scale (ECESES) for Supporting Preschoolers' STEM Development was created by examining two existing self-efficacy scales. One of the existing surveys, the Science Teaching Efficacy Belief Instrument (Riggs & Enochs, 1990), used a 25-item scale to measure elementary teacher self-efficacy for teaching science. Additionally, items from the Coaching Efficacy Scale (Feltz, Chase, Moritz, & Sullivan, 1999) were considered to determine the scale format and question wording, leading to the development of the ECESES-STEM. The ECESES-STEM consists of 40 items, with 10 items in each of the STEM disciplines. Wording was consistent across each of the four STEM disciplines, and each subset of questions focused on one STEM discipline. For example, the first question for the science discipline stated, "I believe I can effectively use observation/documentation to find out if a preschooler is in need of individualized support in science," whereas for the technology discipline, the question replaced the word "science" with "technology." A 5-point Likert scale was used, prompting participants to identify the confidence with which they felt each statement was true, ranging from one, "not confident," to five, "extremely confident."

The ECESES-STEM has not been validated for use with early childhood teachers; however, the Primary Investigator (PI) conducted a pilot study of the ECESES-STEM survey with a small set of experienced early childhood teachers who were not affiliated with the current study. The pilot group completed the scale via Qualtrics and provided written feedback via email to the PI. Following the pilot study, feedback on the survey wording, ease of use, length of scale, completion time, and general feedback was utilized to improve the survey. A copy of the ECESES-STEM is shown in Appendix B.

Procedures

To obtain informed consent, the potential participants were contacted via email by the study's PI. Once informed consent was obtained, participants were prompted to complete an online Qualtrics survey to gather demographic information and assess the teachers' self-efficacy in planning and implementing STEM content for preschool-age children. Within the prescribed two-week period, participants accessed and completed the surveys using personal devices and internet connections.

The pre and post-survey mean scores were computed separately by group - the group of teachers whose instructional coach was involved in the project, and the group of teachers without an instructional coach involved in the project. Additionally, item-level means were calculated for all 40 survey items, as well as aggregated means by group for each of the four STEM domains. Mean ratings between 4 and 5 suggested participants had higher perceived confidence for planning and implementing content for preschool-age children. Mean ratings of 3 to 3.9 indicated moderate perceived confidence, and the mean ratings of 1 to 2.9 suggested lower perceived confidence.

Analysis

Quantitative data from the self-efficacy scale were collected at two points - before and after participation -and subsequently summarized. These data captured all participants' perceived confidence in planning and implementing STEM content for preschool-age children.

Specifically, responses on the ECESES-STEM scale, completed at both the pre- and post-surveys, were analyzed to examine changes in self-efficacy over time. The pre- and post-survey results reflected participants' perceptions of their ability to design and deliver STEM learning experiences for preschool-aged children.

An overall mean score was calculated for both the pre- and post-surveys, and additional mean ratings were generated for the STEM domains. A visual inspection of the mean scores was conducted to explore patterns and/or trends, as well as whether any difference existed between the two groups of participants, those with an instructional coach during the project and those without an instructional coach.

Results

Table 2 presents descriptive statistics for self-efficacy in the four STEM disciplines, showing the means and change scores from pre-to post-survey. Group A was used to identify the participants with coaches involved in the study, whereas Group B denotes the participants without coaches. Across each of the four STEM areas, both groups increased from pre-to post-survey, suggesting that participation in the PD may be associated with increased perceived confidence regardless of coaching.

At the beginning of the project, most of Group A's self-efficacy mean scores varied, yet indicated moderate confidence in planning/implementing STEM instruction, with low confidence in engineering. Similarly, Group B's pre-survey scores range from 3.39 to 4.01 suggesting moderate confidence and the least confidence with engineering. At the time of the pre-survey, both groups of teachers' mean scores were highest for math and over the 4.0 threshold.

As reported in Table 2, the largest change from pre-to post-survey occurs in the area of engineering. The self-efficacy outcomes for participants with instructional coaches represented the largest gain ($\Delta M = 1.55$) relative to those with no instructional coach ($\Delta M = 0.91$). Instructional coaching appears to be particularly beneficial for engineering self-efficacy, with coached participants demonstrating greater growth than the non-coached participants. Relatedly, the mean scores for technology self-efficacy changed for both groups, although the growth for Group A was nearly twice that of Group B. The participants with an instructional coach gained from $M = 3.00$ (pre-survey) to $M = 4.25$ at post-survey, representing a pre–post change of $\Delta M = 1.25$, whereas Group B's mean scores showed less change, $\Delta M = 0.67$. Group A moved from moderate confidence (3.0–3.9) to high confidence (≥4.0). This supports the value of coaching as part of PD for increasing confidence in technology integration.

For math and science, the change in mean scores follows a different pattern in that Group B made the greater gains ($\Delta M = 0.71$). For science, the change from pre-to post-survey was

Table 2. Mean of means, pre–post change, and difference-in-differences by STEM discipline

Subject area	M (Pre-AG)	M (Post-AG)	ΔM (AG)	M (Pre-BG)	M (Post-BG)	ΔM (BG)	ΔΔM
Science	3.88	4.75	0.87	3.69	4.62	0.93	−0.06
Technology	3.00	4.25	1.25	3.72	4.39	0.67	0.58
Engineering	2.90	4.45	1.55	3.39	4.30	0.91	0.64
Math	4.15	4.65	0.50	4.01	4.72	0.71	−0.21
Grand Mean	3.48	4.53	1.05	3.70	4.51	0.81	0.24

Note(s): AG = group of teachers with coaches; BG = group of teachers without coaches; M = mean of means; ΔM = post-test minus pre-test mean; ΔΔM = difference-in-differences (ΔM A Group of teachers (those with coaches) − ΔM B Group of teachers (those without coaches) nearly identical, with a slight difference of 0.06 between the two groups. This supports the conclusion that coaching effects may be discipline-specific, not universal.

Additionally, the grand mean scores were examined. For the group of teachers with an instructional coach (Group A), the overall mean increased from $M = 3.48$ at pre-survey to $M = 4.53$ at post-survey. By comparison, the participants without an instructional coach showed a smaller increase, from $M = 3.70$ at pre-survey to $M = 4.51$ at post-survey. Group A's pre-survey grand mean ($M = 3.48$) reflected moderate perceived confidence, whereas the post-survey mean ($M = 4.53$) exceeded the threshold for high perceived confidence, indicating meaningful growth over the study period. This resulting difference-in-differences estimate ($\Delta\Delta M = 0.24$) indicates a greater magnitude of improvement for the two participants in a dyadic coaching relationship relative to the participants without an instructional coach over the study period.

Discussion

While research exists on self-efficacy, early childhood STEM professional development (PD), and instructional coaching, limited literature discusses the interplay among these areas. This study examined the effect of a dyadic coaching relationship within a grant-funded STEM PD project on early childhood teachers' self-efficacy for planning and implementing STEM instruction. Specifically, the study investigated whether differences in self-efficacy existed between teachers who participated in a dyadic coaching relationship and those who engaged in the same STEM PD without an instructional coach.

The subsample of Head Start teachers who participated in dyad coaching demonstrated increases in self-efficacy scores, indicating that the collaborative nature of the dyad model may have supported professional growth as well as improved confidence. These improvements expand on prior studies on coaching within PD opportunities (Cornett & Knight, 2009; Rush & Shelden, 2020; Thompson *et al.*, 2021). The potential practical value of dyad coaching as a professional development strategy highlights that benefits to teacher confidence and instructional self-belief may occur when coaches and teachers share STEM knowledge or coursework, with both the teacher and the coach receiving training simultaneously.

For this exploratory study, coaching with training appears to have had a positive impact on the self-efficacy for teaching STEM outcomes, particularly in engineering and technology. PD programs should consider joint training and coaching as a core component to maximize impact for early childhood STEM. Relatedly, school leaders and administrators may prioritize coaching initiatives when allocating resources for teacher support and providing opportunities to develop educators' leadership capacity (NASUP's Essential #3, 2021).

While not measured as part of this study, participant feedback for the larger grant-funded project suggested that the teachers who were learning in dyadic partnerships were impacted. One preschool teacher wrote, "*We are working to plan a family STEM night at our next parent meeting. We are hoping to set up some fun and engaging STEM activities for parents to engage in with their preschoolers,*" and another stated that, "*We're learning together as a team to break lessons and topics down more and spread it out so we can really dive into it.*"

Research indicates that coaching is an effective model for supporting teacher competence and self-efficacy. While the present study demonstrates promise in enhancing teacher self-efficacy related to STEM implementation and planning, further research is needed to identify the specific coaching practices and dispositions that most effectively support STEM instruction, as well as other academic domains. With the small sample size and lack of qualitative data, the findings are intended to be exploratory and are not generalizable beyond the participants in this study. Further research with larger sample sizes and participant interviews could strengthen the evidence base and guide policy decisions. Monitoring and evaluation of coaching programs, in particular dyadic coaching, should continue to ensure sustained effectiveness and scalability.

Ethical statement

This study was reviewed and approved by the Institutional Review Board at the authors' campus (Protocol #111521–1). All procedures involving human participants were conducted in accordance with institutional and national ethical standards. Informed consent was obtained from all participants before participation.

Supplementary material

The supplementary material for this article can be found online.

References

Alexander, R. (2018). Developing dialogic teaching: Process, trial, outcomes. *Research Papers in Education*, *33*(5), 561-598. doi: 10.1080/02671522.2018.1481140.

Amsbary, J., Yang, H. W., Sam, A., Lim, C. I., & Vinh, M. (2024). Practitioner and director perceptions, beliefs, and practices related to STEM and inclusion in early childhood. *Early Childhood Education Journal*, *52*(4), 705-723. doi: 10.1007/s10643-023-01476-w.

Bandura, A. (1977). Self-efficacy: Toward a unifying theory of behavioral change. *Psychological Review*, *84*(2), 191-215. doi: 10.1037/0033-295x.84.2.191.

Bandura, A., & Wessels, S. (1997). *Self-efficacy* (Vol. 10). Cambridge: Cambridge University Press.

Barrett, J. S., Jackson, H., Schachter, R. E., Gerde, H. K., & Bingham, G. E. (2024). Understanding the nature of coaching interactions and teacher engagement in an online coaching intervention. *Journal of Early Childhood Teacher Education*, *45*(4), 397–420. doi: 10.1080/10901027.2024.2356594.

Bullock, A., Coplan, R. J., & Bosacki, S. (2015). Exploring links between early childhood teachers' psychological characteristics and classroom management self-efficacy beliefs. *Canadian Journal of Behavioural Science*, *47*(2), 175-183. doi: 10.1037/a0038547.

Callingham, R., Carmichael, C., & Watson, J. M. (2015). Explaining student achievement: The influence of ' pedagogical content knowledge in statistics. *International Journal of Science and Mathematics Education*, *14*(7), 1339-1357. doi: 10.1007/s10763-015-9653-2.

Clear, J. (2018). *Atomic habits: An easy and proven way to build good habits and break bad ones*. Penguin Random House.

Clements, D. H., Vinh, M., Lim, C. I., & Sarama, J. (2023). STEM for inclusive excellence and equity. In *Developing culturally and developmentally appropriate early STEM learning experiences* (pp. 148-171). Routledge.

Cornett, J., & Knight, J. (2009). Research on coaching. In *Coaching: Approaches and Perspectives*, 192-216.

Darling-Hammond, L., & Richardson, N. (2009). Research review/teacher learning: What matters?. *Educational Leadership*, *66*(5), 46-53.

Desimone, L. M. (2009). Improving impact studies of teachers' professional development: Toward better conceptualizations and measures. *Educational Researcher*, *38*(3), 181-199. doi: 10.3102/0013189x08331140.

Desimone, L. M., & Pak, K. (2017). Instructional coaching as high-quality professional development. *Theory Into Practice*, *56*(1), 3-12. doi: 10.1080/00405841.2016.1241947.

Elek, C., & Page, J. (2019). Critical features of effective coaching for early childhood educators: A review of empirical research literature. *Professional Development in Education*, *45*(4), 567-585. doi: 10.1080/19415257.2018.1452781.

Feltz, D. L., Chase, M. A., Moritz, S. E., & Sullivan, P. J. (1999). A conceptual model of coaching efficacy: Preliminary investigation and instrument development. *Journal of Educational Psychology*, *91*(4), 765, 776. doi: 10.1037/0022-0663.91.4.765.

Fox, L., Hemmeter, M. L., Snyder, P., Binder, D. P., & Clarke, S. (2011). Coaching early childhood special educators to implement a comprehensive model for promoting young children's social competence. *Topics in Early Childhood Special Education*, *31*(2), 178-192. DOI:10.1177/0271121411404440.

Gerde, H. K., Pierce, S. J., Lee, K., & Van Egeren, L. A. (2018). Early childhood educators' self-efficacy in science, math, and literacy instruction and science practice in the classroom. *Early Education & Development*, *29*(1), 70-90. doi: 10.1080/10409289.2017.1360127.

Hemmeter, M. L., Snyder, P., Kinder, K., & Artman, K. (2011). Impact of performance feedback delivered via electronic mail on preschool teachers' use of descriptive praise. *Early Childhood Research Quarterly*, *26*(1), 96-109. doi: 10.1016/j.ecresq.2010.05.004.

Karwowski, M., Lebuda, I., & Beghetto, R. A. (2024). Teachers as creative agents: How self-beliefs and self-regulation drive teachers' creative activity. *Contemporary Educational Psychology*, *77*, 102267.

Kemp, P., & Turnbull, A. P. (2014). Coaching with parents in early intervention: An interdisciplinary research synthesis. *Infants & Young Children*, *27*(4), 305-324. doi: 10.1097/iyc.0000000000000018.

Knight, J. (2011). *Unmistakable impact: A partnership approach for dramatically improving instruction*. Corwin Press.

Kraft, M. A., Blazar, D., & Hogan, D. (2018). The effect of teacher coaching on instruction and achievement: A meta-analysis of the causal evidence. *Review of Educational Research*, *88*(4), 547-588. doi: 10.3102/0034654318759268.

Lange, A. A., Brenneman, K., & Mano, H. (2019). *Teaching STEM in the preschool classroom: Exploring big ideas with 3- to 5-year-olds*. College Press.

Mas, J. M., Dunst, C. J., & Gomez-Porta, C. (2025). A systematic analysis of core features of coaching in early childhood intervention. *International Journal of Early Childhood Special Education*, *17*(1), 1227-1241.

McCollum, J. A., Hemmeter, M. L., & Hsieh, W. Y. (2011). Coaching for emergent literacy instruction using performance-based feedback. *Topics in Early Childhood Special Education*, *30*(4), 248-259.

Melton, K., Mallory, S., & Green, J. (2019). Examining the relationship between teacher self-efficacy and student outcomes: A systematic review. *Journal of Research in Education*, *29*(2), 30-60.

Miller, R., Latham, B., & Cahill, B. (2019). *Humanizing the education machine: How to create schools that turn disengaged kids into inspired learners*. John Wiley & Sons.

National Association for Professional Development Schools (2021). *What it means to be a professional development school: The nine essentials* (2nd ed.) [Policy statement]. Author.

Pianta, R. C., DeCoster, J., Cabell, S., Burchinal, M., Hamre, B. K., Downer, J., . . . Williford, A. (2014). Dose–response relations between preschool teachers' exposure to components of professional development and increases in quality of their interactions with children. *Early Childhood Research Quarterly*, *29*(4), 499–508. doi: 10.1016/j.ecresq.2014.06.001.

Quality Compendium (2019). *Build initiative strong foundations for our youngest children*. Build Initiative. Available from: https://qualitycompendium.org/view-state-profiles

Riggs, I. M., & Enochs, L. G. (1990). Toward the development of an elementary teacher's science teaching efficacy belief instrument. *Science Education*, *74*(6), 625-637. doi: 10.1002/sce.3730740605.

Rush, D. D., & Shelden, M. L. (2020). *The early childhood coaching handbook* (2nd ed.). Brookes Publishing.

Sarama, J., Clements, D. H., Nielsen, N., Blanton, M., Romance, N., Hoover, M., & McCulloch, C. (2018). *Considerations for STEM education from PreK through grade 3*. Education Development Center.

Schachter R. E., Gerde H. K., Hatton-Bowers H. (2019). Guidelines for selecting professional development for early childhood teachers. *Early Childhood Education Journal*, *47*(4), 395–408. doi: 10.1007/s10643-019-00942-8.

Schachter, R. E., Knoche, L. L., Lu, J., Goldberg, M. J., Wernick, P. D., Piasta, S. B., & Lancaster, H. S. (2025). A meta-analysis of the effectiveness of coaching and the contribution of coaching processes to learning outcomes for early childhood and children. *Early Childhood Research Quarterly*, *72*, 156–169. doi: 10.1016/j.ecresq.2025.02.014.

Sedova, K., Sedlacek, M., & Svaricek, R. (2016). Teacher professional development as a means of transforming student classroom talk. *Teaching and Teacher Education*, *57*, 14-25. doi: 10.1016/j.tate.2016.03.005.

Snyder, P., Hemmeter, M. L., & Fox, L. (2015). Supporting implementation of evidence-based practices through practice-based coaching. *Topics in Early Childhood Special Education*, *35*(3), 133-143. doi: 10.1177/0271121415594925.

Täschner, J., Dicke, T., Reinhold, S., & Holzberger, D. (2024). 'Yes, I can!' a systematic review and meta-analysis of intervention studies promoting teacher self-efficacy. *Review of Educational Research*, *95*(1), 3–52. doi:10.3102/00346543231221499.

Thompson, P. J., Marvin, C. A., & Knoche, L. L. (2021). Practices and reflections of experienced, expert early childhood coaches. *Infants & Young Children*, *34*(4), 337-355. doi: 10.1097/iyc.0000000000000200.

Tippett, C. D., & Milford, T. M. (2017). Findings from a pre-kindergarten classroom: Making the case for STEM in early childhood education. *International Journal of Science and Mathematics Education*, *15*(Supp. 1), 67–86. doi: 10.1007/s10763-017-9812-8.

U.S. Department of Health and Human Services, Administration for Children and Families, Office of Head Start (2025). Practice-based coaching (PBC). Head Start. Available from: https://headstart.gov/professional-development/article/practice-based-coaching-pbc

Vasseleu, E., Neilsen-Hewett, C., & Howard, S. (2024). An early start to self-regulation: Evaluating the effects of an early childhood self-regulation intervention on educator beliefs, knowledge, and practice. *Journal of Research in Childhood Education*, (39), 1–21. doi: 10.1080/02568543.2024.2396907.

Zee, M., & Koomen, H. M. (2016). Teacher self-efficacy and its effects on classroom processes, student academic adjustment, and teacher well-being: A synthesis of 40 years of research. *Review of Educational Research*, *86*(4), 981-1015. doi: 10.3102/0034654315626801.

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