

Chapter 16

Continuing Professional Development and Middle Years Teachers

What the Literature Tells Us

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Abstract

Continuing Professional Development (CPD) is essential for middle years practitioners to develop their pedagogical skills and content knowledge. The authors used systematic quantitative literature review (SQLR) of CPD journal articles and other important works published from 2000 to June 2018, exploring where the research was conducted; what approaches, methods and technology were used; and the main research findings. This work aims to contribute to knowledge and to identify the types of CPD practices that have the most significant impact on learning outcomes for middle years learners.

The Need for Professional Learning

Schools and, ultimately, teachers are increasingly being held accountable for measurable increases in students' academic achievement. A growing body of research shows that teacher training is critical to student performance and that there is a direct link between teacher and teaching quality and students' academic success (Hanushek & Rivkin, 2006; Hattie, 2012). Thus, the attitudes, skills, competencies, and experience that teachers bring to the classroom are among the factors that determine how well a child learns and performs (Darling-Hammond, 1999; Goe, 2007; Harris & Sass, 2009). For teachers to stay up-to-date with their content knowledge and skills and to keep abreast of pedagogical reform, engaging in continuing professional development (CPD) is essential (Desimone, 2009).

However, as Main and Pendergast (2015) have argued, there is a “conceptual vagueness ... [as well as] disparity and ambiguity” about what effective CPD actually is and what it aims to achieve (p. 4). For the most part, the focus of CPD has been on skills growth, personal development, social control, and learning opportunities to support the development of professional competence (Friedman & Phillips, 2004). In the literature, CPD is also called professional development, professional learning, staff development, and in-service training that tends to include any activities that provide educators with opportunities to acquire or enhance their knowledge, skills, attitudes, and beliefs that necessary for them to create high levels of

learning for all students (National Staff Development Council [NSDC], 2001). Such activities can include participation in workshops, conferences, professional reading, research projects, and courses that may be short or long in duration and formal or informal. The activities can also be regarded as an integral part of the experiential learning acquired through leadership positions (Main & Pendergast, 2015). However, for the purposes of this chapter, CPD is any activity that is undertaken that provides an opportunity for teachers to build their sense of efficacy through enhancing their knowledge and skills to better meet the educational needs of their students and improve their learning outcomes (Coleman & Goldenberg, 2011; National Staff Development Council [NSDC], 2011). Moreover, the effectiveness of CPD can be measured through teachers' increased sense of efficacy with a causal relationship demonstrated between a teacher's sense of efficacy and improved classroom practices (Tschannen-Moran & Woolfolk-Hoy, 2007).

Within the middle years of education, typically applied to learners in the age range 10–15 years (Pendergast, 2017), our understanding of adolescence as a developmental stage continues to broaden and deepen. As such, the middle years have become a focus for educators to understand the unique learning needs of this age group as well as effective pedagogies to support that learning. That is, “the more teachers learn about their students, the more able they are to design experiences that foster learning” (Edwards & Nicoll, 2006, p. 583). For experienced teachers and for those new to the profession, working with this age group presents instructional challenges that may not have been adequately addressed in their initial teacher education training (Flowers, Mertens, & Mulhall, 2002)—regardless of whether that has been a recent or not so recent experience. Thus, the need for targeted and specialised professional development is necessary to provide teachers with opportunities for continual improvements to their pedagogical practice.

While some researchers contend that professional development should focus primarily on teaching and student learning (Guskey, 2000), others suggest that professional development is also about deepening content knowledge for teachers (Antoniou & Kyriakides, 2011; Barber & Mourshed, 2007). However, given that teachers exert a more significant influence on student achievement than any other school factor (Hattie, 2012; Wallace, 2009), instructional leaders face an imperative that teachers are equipped with the knowledge and skills necessary to provide increasingly effective teaching and learning for individual students. We take the view that

understanding what constitutes effective CPD is an important asset to ensure appropriate and high impact CPD is utilised to achieve this aim.

In this chapter we begin by considering what is already known about CPD, and then we will focus deeply on the literature related to the effectiveness of professional development targeting middle years teachers to identify the types of professional development practices that have the most significant impact on outcomes for middle years learners. For each of the studies reviewed, we explored (a) where the research was conducted; (b) which approaches, methods, and technologies the researchers used in the study; and (c) the main research findings. We begin by providing a general overview of CPD and how it impacts student learning.

General Principles: CPD and How It Impacts Student Learning

Yoon, Duncan, Lee, Scarloss, and Shapley (2007) argued that three specific elements of professional development are necessary if the learning is to positively influence students. First, the professional development must enhance the teacher's knowledge and skills within the focus area. Second, the knowledge and skills must have been shown to improve classroom teaching (i.e., evidenced-based). Third, there must be a transfer from the professional development experience that directly links to improved teaching and thus raises student achievement. If one link is weak or missing, improved student outcomes cannot be expected. For example, Guskey and Sparks (2004) linked student achievement to teacher professional development and noted that if a teacher fails to apply new ideas from professional development into their classroom instruction, students are unlikely to show any academic gains.

To be effective, the content of professional development must promote learning that allows teachers to make classroom connections that have strong value for student learning (Darling-Hammond, 2008). When teachers assume inactive roles in their learning, content remains vague and disconnected from their classroom context. Moreover, when ongoing support wanes, professional development opportunities fall short of maximizing learning for teachers (Pianta, Mashburn, Downer, Hamre, & Justice, 2008). Quite simply, only sustained professional development with ongoing support and dialogue can have positive effects for teachers and students. Researchers have suggested well-structured and organised training that has a clear purpose and focus for all participants as a design for effective professional development (Guskey & Yoon, 2009).

Unfortunately, these well-designed professional development programs do not represent most professional development experienced by teachers (Darling-Hammond, Wei, Andree, Richardson, & Orphanos, 2009). Many teachers find that professional development imposes a model from outside the school or district not related to their specific needs and contexts (Guskey & Yoon, 2009). According to Dana's (2010) model of job-embedded learning as a means of professional development, CPD should be “situated in educational contexts with actual children, actual curriculum, and actual problems of practice” (p. 322). This aligns with Guskey and Yoon's (2009) notion that CPD should be targeted to the context and needs of individual teachers and should include opportunities for ongoing reflection and practice. Job-embedded learning can be implemented through school-university partnerships because “universities can offer schools the tools and personnel to help facilitate job-embedded learning in schools. Schools can offer the universities the rich, ripe context for teacher learning to occur” (Dana, 2010, p. 322), especially if there is informed and voluntary consent by the teachers (Stinson, 2009).

Teachers learn instructional methods in various ways. Although professional learning opportunities are commonly provided by school systems, learning that takes place during these events is not necessarily transferred to or implemented in the classroom. Bandura (1977), author of the self-efficacy theory, addressed this issue by describing the role of self-efficacy in one's belief systems. Bandura (1994) defined self-efficacy as “people's beliefs about their capabilities to produce designated levels of performance that exercise influence over events that affect their lives” (p.1). Self-efficacy levels indicate how one's capabilities to perform acts at specific levels and are based on one's choices of actions and the intensity and persistence that one is willing to endure to complete the task (Bandura, 1977). Teacher efficacy refers to the level of effort teachers are willing to exert in specific teaching situations and the level of persistence teachers are willing to put forth when confronting obstacles. Tschannen-Moran, Hoy, and Hoy (1998) stated that “greater efficacy leads to greater effort and persistence, which leads to better performance, which in turn leads to greater efficacy” (p. 234), and the opposite also is true. Teachers' competence completing tasks can be strengthened by training and positive experiences (Bandura, 1993). Further, teachers must be provided multiple opportunities to participate in high-quality, targeted professional development (MacBeath, 2011). Issues related to preparedness and confidence to teach specific age-groups are especially prominent in middle level school

environments where many teachers continue to hold elementary credentials ([Flowers et al., 2002](#)).

Method

We used a systematic quantitative literature review (SQLR) methodology ([Pickering & Byrne, 2014](#); [Pickering, Grignon, Steven, Guitart, & Byrne, 2015](#)) to explore contemporary literature that focuses on effective professional development targeting middle years teachers. We restricted the search to peer-reviewed journal papers published in English language journals between the years 2000 to June 2018. We set these parameters to ensure studies were of a high caliber and were recent and relevant to the purpose. The search strategy encompassed systematically reviewing peer-reviewed published papers with an initial database search of PsycINFO, Proquest, Educational Resources Information Center (ERIC), Science Direct, Active learning, and Education Research Complete, Teacher Reference Center, EBSCOhost, SAGE, Emerald, JSTOR and the Internet search engines Google and Google Scholar. We undertook this search for papers that explored professional development and professional learning strategies adopted by middle level school teachers in education settings with the aim of maximizing relevant findings for papers published within the last decade. The key terms we used are shown in [Table 16.1](#). This search was performed in June 2018.

Table 16.1 *Inclusion Search Terms*

Search terms	AND	AND
1. middle school teachers	10. network	20. learning
2. middle years	11. professional	21. knowledge sharing
3. professional learning	12. professional development	22. teacher community
4. teacher	13. upskill*	23. student diversity
5. continuing professional development	14. upskilling	24. pedagogy
6. middle school experts	15. student outcome	25. learning styles
7. professional education and training	16. learning pathways	26. multiple intelligences
8. learning communities	17. profession*	27. Bloom
9. or/1–9	18. professionalism	28. Bandura

Search terms	AND	AND
	19. or/10–19	29. social networks
		30. peer learning
		31. self-efficacy
		32. teacher efficacy
		33. in-service, and teacher education
		34. teacher knowledge
		35. or/20–35

Inclusion and Exclusion Criteria

Along with the 35 key inclusion search terms listed in [Table 16.1](#), studies had to target the middle years and examine the application of professional development or professional learning strategies by teachers in which the outcome variable was based on “what works”; that is, “why certain professional development or professional learning practices work and don’t work” and “student outcomes.” Studies with in-service teachers who participated in self-organized and non-institutional situations of informal professional interchange were included in this review. Participant gender, race, age, type of course being undertaken and other demographic information were not subject to limitation. Studies in which participants were not classified as middle years teachers were excluded. [Figure 16.1](#) provides a schematic of the search we conducted.

Figure 16.1 Schematic of the systematic quantitative literature review.

Stage I: Description of Included Papers

As indicated in [Figure 16.1](#), the initial database search strategy using the descriptors middle school teachers, professional development, or professional learning resulted in 610 articles, of which 230 had been peer-reviewed and were published in academic journals. These findings were further screened using the descriptors student outcome*, upskilling, student diversity and continuing professional development. This further screening resulted in 110 peer-reviewed articles that could

not be clearly excluded based on the above criteria. Duplicates from other databases were then excluded, resulting in a sample of 55 articles at the end of stage I.

Stage II: Secondary Searches

In the secondary searches, additional articles were identified through reference sections, theoretical discussion papers, and bibliographic references in order to ensure completeness. An additional five studies were identified, resulting in a total of 60 articles. Sixty full-text articles were assessed for eligibility and ultimately nine papers remained which were considered relevant for this SQLR. That is, they meet all of the inclusion criteria. A full list of included articles (n = 9) is presented in Table 16.2.

Table 16.2 Summary of Papers Included for Review

No	Reference	Aim(s) of the study	Participants, method, design, course & duration	Findings/Outcome
1	Flowers, N. Mertens, S.B. & Mulhall, P. F. (2002). Research on Middle School Renewal Four Important Lessons About Teacher Professional Development. <i>Middle School Journal</i> , 33:5,57–61.	To provide data to support and guide middle grades schools through reform and restructuring using the best educational, organizational, and technological resources and practices available in order to improve student achievement and related student outcomes.	85 middle grades schools (5–8, 6–8, 6–7 grade configurations) though a self-study teacher (n=1551) and administrator (n=75) survey exploring teacher participation in professional development activities as well as the areas where teachers need additional training. Data were collected in the USA states of Arkansas, Louisiana, and Mississippi in 1998.	<ul style="list-style-type: none"> • Most middle grades teachers do not have middle grades certification; • Professional development must be ongoing, outcome-based, and foster continuous improvement; • There is a mismatch between the availability of professional development activities and teacher participation; • Teachers and administrators offer differing opinions about teacher needs for professional development because they each serve very different roles within the school.
2	Hilton, A. & Hilton, G. & Dole, S. & Goos, M. (2016). Promoting middle school students’ proportional reasoning skills through an ongoing professional development programme for teachers. <i>Education Studies Math</i> 92,193–219.	To investigate the efficacy of ongoing teacher professional development for promoting middle years students’ proportional reasoning.	Participants included 90 teachers and 1303 students (years 5–9) in Queensland, Australia. Data were gathered through pre- and post-survey using a 12 item, two-tiered diagnostic instrument. Teachers participated in a series of four workshops on proportional reasoning skills.	<ul style="list-style-type: none"> • Teachers are not well prepared to teach mathematical content and many make the same mistakes and experience the same conceptual difficulties as their students; • Professional development that promotes teachers’ conceptual knowledge and classroom strategies can impact on students’ learning outcomes.
3	Monet, J.A & Etkina, E. (2008). Fostering Self-Reflection and Meaningful Learning:	An analysis of teachers’ journal reflections during an inquiry-based	Participants were 10 middle grade science teachers from K-8 elementary schools in Colorado, USA.	<ul style="list-style-type: none"> • Teachers felt that an inquiry-based approach to teaching science was important but struggled to implement inquiry into their day-to-day practice;

No	Reference	Aim(s) of the study	Participants, method, design, course & duration	Findings/Outcome
	Earth Science Professional Development for Middle School Science Teachers. <i>Journal of Science Teacher Education</i> 19,455–475.	professional development program.	Data were collected during a professional development program in 2004 that included nine two-hour and 15 minute workshops, two six-hour Saturday workshops, and approximately 18 hours of independent study. Data instruments included a survey, pre- and post-tests on teachers' pedagogical knowledge, and structured reflective journals.	<ul style="list-style-type: none"> • Teachers' perceptions of what inquiry-based teaching meant were challenged through the professional development program; • The mode of professional development delivery is important to enable change in teachers' conceptualisation of strategies; • Meaningful reflection on learning supports learning.
4.	Lakin, J. M. & Wallace, C. S. (2015). Assessing Dimensions of Inquiry Practice by Middle School Science Teachers Engaged in a Professional Development Program. <i>Journal of Science Teacher Education</i> 26,139–162.	The current study focuses on the validity of assessments developed for evaluating teachers' use of inquiry strategies and classroom orientations.	Participants were 90 middle school science teachers Alabama, USA and 1085 students. Teachers participated in professional development workshops during the year. Data collected: Teachers: Survey—either Inquiry Strategies Scale or the 5Es Inquiry Scale. Students: Pre- and post-tests.	<ul style="list-style-type: none"> • Teachers tended to self-report higher levels of inquiry strategy use than their students perceived; • Teachers' understanding of inquiry-based teaching varied; • The 5Es scale is more valid for measuring frequency of use than the Inquiry Scale (IS); • Professional development programs need to challenge pre-conceived notions and be designed to challenge and support knowledge and understanding of inquiry-based strategies.
5.	Green, J. D., Gonzalez, E. M., López-Velásquez, A.M., & Howard, E.R. (2013). Hands-on professional development: middle school teachers' experiences with a curriculum intervention research project:	This study explores the benefits of an eight-week curriculum intervention study that served as a form of Professional	The study involved 26 teachers from the New England region of USA. Middle years teachers undertook a 12-hour training session and were coached for eight weeks throughout the	<ul style="list-style-type: none"> • Teachers' knowledge of academic vocabulary teaching increased through their participation in the professional development; • Teachers' acquired new instructional strategies for teaching vocabulary and reading;

No	Reference	Aim(s) of the study	Participants, method, design, course & duration	Findings/Outcome
	<i>Middle School Journal, 45: 2 Unique Contexts for Learning and Teaching, 27–32.</i>	Development (PD) for teachers.	implementation of the curriculum in their classrooms. Data were collected through small focus groups using a semi-structured interview methodology.	<ul style="list-style-type: none"> Teachers understood how to better engage students in language teaching; Teachers were provided with opportunities to apply their new knowledge with sustained support.
6	Yost, D.S. and Vogel, R (2007) Urban Professional Development Working to Create Successful Teachers and Achieving Students. <i>Middle School Journal, 38: 3,34–40.</i>	The study reviewed the development and implementation of a professional development program.	Participants included 15 fifth and eighth grade teachers in Grover Washington, USA. These teachers were not volunteers as all members of the learning community were expected to participate in the professional development and the study. Teachers participated in a two-day workshop that used pre- and post-testing of their research-based teaching strategies; teacher observations and focus group discussions.	<ul style="list-style-type: none"> Intervention through targeted professional development at the school level can enhance their instruction in a short period of time; There is a direct connection between growth in teaching expertise and student academic outcomes; Professional development needs to be targeted and needs-based; Teachers need to understand and evaluate the extent to which their instructional strategies and attitudes are research-based.
7	Bryant, D. P., Linan-Thompson, S., Ugel, N. Hamff, A. and Hougen, M. (2001). The Effects of Professional Development for Middle School General and Special Education Teachers on Implementation of Reading Strategies in Inclusive Content Area Classes. <i>Learning Disability Quarterly, 24: 4,251–264.</i>	The study aimed to examine teachers' personal knowledge about their struggling readers and reading strategies.	Ten sixth-grade middle school teachers, including general and special education teachers, participated in a four-month professional development and intervention program. Data were collected through pre- and post-interviews; in-service evaluation forms, support meeting notes, IVCs,	<ul style="list-style-type: none"> Teachers were overwhelmed with the many challenges when working in schools with large and varied student populations; Teaming is an effective model for promoting collaboration and planning; Time must be allocated for teachers to share their personal knowledge about their students and teaching and to receive guidance from experts;

No	Reference	Aim(s) of the study	Participants, method, design, course & duration	Findings/Outcome
			and ‘promoters of’ and ‘barriers to checklists.’	<ul style="list-style-type: none"> Teachers perceived middle school as the ‘last chance’ for struggling readers; Teachers need more and ongoing support to improve practice.
8	Blanchard, M.R., LePrevost, C.E., Tolin, A.D. and Gutierrez, K.S. (2016). Investigating Technology-Enhanced Teacher Professional Development in Rural, High-Poverty Middle Schools. <i>Educational Researcher</i> , 45:3,207–220.	An investigation of teachers’ beliefs, practices, and reflections before and throughout a professional development program.	<p>This study included 20 middle school teachers and 2,320 students in a south-eastern state in the United States.</p> <p>This was a longitudinal study over three years with teachers having</p> <ol style="list-style-type: none"> a week-long face-to-face inquiry-based PD within their own classroom each year supported by monthly online Blackboard Collaborate sessions. <p>Data were collected through</p> <ul style="list-style-type: none"> Teacher reflections that were used to guide ongoing PD Survey data around teachers’ beliefs, efficacy, and Reformed Teaching Observations Video data 	<ul style="list-style-type: none"> Professional development showed improved student outcomes where the PD was conducted schoolwide and over an extended period of time; Students benefitted more from more experienced teachers (those that had more PD); Long-term, schoolwide teacher PD supports the development of teachers’ sense of efficacy.

No	Reference	Aim(s) of the study	Participants, method, design, course & duration	Findings/Outcome
9	Telese, J. A. (2012). Middle School Mathematics Teachers' Professional Development and Student Achievement. <i>The Journal of Educational Research</i> , 105:2, 102–111.	The purposes of the study were to determine the impact of middle school mathematics teachers' content knowledge and teachers' mathematics pedagogical knowledge on student achievement and (b) compare the effect of the degree to which teachers received reform-oriented professional development activities on student achievement.	Data were compiled using the 2005 National Association of Education Progress (NAEP) mathematics scale database and a multistage sampling design. The data set included 100,000 students and their teachers resulting in a stratified national probability sample. Students' results from National Center of Educational Statistics were merged with teacher survey results from NAEP. The teacher survey provided information on teacher characteristics including educational background, preparation to teach specific content, participation in professional development activities, and use of teaching strategies.	<ul style="list-style-type: none"> • Teachers' mathematics content knowledge was a better predictor of student achievement than mathematics pedagogical knowledge; • Teachers who reported participating in fewer professional development activities had students with higher scores than those students whose teachers reported participating in more professional development; • Certain topics for professional development activities were more effective than others in raising student achievement—training in content standards, the available curriculum materials, instructional methods for teaching mathematics, and effective use of calculators in mathematics instruction where found to be positively related to student achievement; • Teachers who received a small extent of professional development in methods for assessing students performed at the same level as teachers receiving no training at all, whereas students whose teachers received more than a small extent of training were found to have lower achievement; • Professional development in strategies for teaching mathematics to students from diverse backgrounds produced student achievement levels lower than if teachers received no training at all, regardless of the extent of the training they received.

Deepening Our Understanding: What the SQLR Tells Us

We used SQLR to focus deeply on the literature related to the effectiveness of CPD for middle years teachers so we could identify the types of professional development practices that have the most significant impact on outcomes for middle years learners. Here we consider the findings and explore where the research was conducted; what approaches, methods, and technology were used; and the main research findings in each of the identified studies.

Research Generators: Where the Research Was Conducted

Of the nine studies that met the inclusion criteria for this study, one was conducted in Australia and the remainder were conducted in the United States of America.

Nature of the Research: Approaches, Methods, and Technologies

Table 16.2 provides a description of the methodology and the participant numbers involved in each of the studies we included. The nine studies varied in size and focus, ranging from small-scale studies with 10 teachers to large-scale studies with more than 100,000 participants. The studies covered a range of topics including specific teacher pedagogic skills (n = 2), mathematics teaching (n = 2); science teaching (n = 2); English teaching (n = 2); and technology-enhanced learning (n = 1). Seven of the nine studies reported the results of specific CPD programs. Of those seven studies, three examined the impact of the CPD through pre- and post-surveys or tests of students with all three studies reporting improved academic outcomes for students in the post-test results. Within the studies that focused on specific CPD programs, most found that teachers reported themselves as either “unprepared or underprepared,” “overwhelmed,” or having “struggled to implement” or “lacking a clear understanding” of practices within the middle years. However, after the targeted CPD program, all seven studies found teachers reported an increased sense of efficacy in relation to the particular CPD focus. Of the other two studies we reviewed, one study (Flowers et al., 2002) explored the perceived gap in teachers’ initial training to teach in the middle years and highlighted the need for CPD, and one large-scale study (Telese, 2012) linked self-reported training background and participation in CPD activities with student outcomes on a standardized test. The

study by Telese (2012) was the only study to report that higher levels of CPD potentially had a negative effect on student outcomes. However, the authors of this study cautioned that more research was needed to find the reasons underpinning this outcome.

Findings from the Research Studies

The studies confirmed what the general CPD research has said about the effectiveness of sustained, contextually embedded CPD, stressing the importance of the classroom as the context of the professional development. Lakin and Wallace (2015) and Yost and Vogel (2007) stressed that professional development should involve teachers in identifying what they need to learn and in developing learning experiences in which they will be involved. Professional development must be regarded as a lifelong process, and it should be primarily school-based and built into the day-to-day work of teaching that ultimately helps all students achieve at high levels.

Nevertheless, little is known about how the most effective PD influences teachers' learning and how teachers perceive PD that goes beyond the typical PD session. The study of literature suggests that there is awareness that middle level students have the capacity to learn, grow, and achieve to their highest potentials if they have competent and caring teachers to foster this growth. Well-articulated and authentic professional development is thus required to move teachers to higher performance levels and boost student achievement. However, one-size-fits-all solutions often fail to distinguish between the needs of different teachers and their teaching styles, between different schools' or classrooms' contexts, or between the needs of novice and experienced teachers.

Flowers and colleagues (2002) noted that most middle grades teachers do not have middle grades credentials or receive specialized training as part of their pre-service education. They further highlighted that in a typical professional development session, most teachers would attend a two-hour session on some aspect of instruction during which the presenter described a variety of teaching strategies to be implemented. Teachers' level of engagement within the session was limited and not active, and the usefulness of the session in terms of sustained effect on practice was not reviewed as, in general, there was no reporting post the professional development session on how teachers implemented what they learned. They reported that some teachers tried one or two activities that were suggested, but on the whole, in the day-to-day

pressures of the classroom, teachers tended to revert back to their familiar practice. However, Flowers and colleagues (2002) stressed that the importance of CPD was clearly understood by teachers and the common scenario described above did not lead to the expansion of teaching capacity, increased discernment, escalating enthusiasm, or more complex wisdom.

However, Hilton et al. (2016) pointed out that that if teachers are not well prepared to teach the content in appropriate ways, they may make the same mistakes and experience the same conceptual difficulties as their students. Their research addressed the effect of teacher professional development on mathematics students' learning and outcomes revealing that teachers' participation in professional development and subsequent targeted teaching could accelerate students' development of proportional reasoning.

The studies by Monet and Etkina (2008) and Lakin and Wallace (2015) suggested that inquiry-based teaching promotes students' engagement in problem-solving and investigation as they learn science concepts. Lakin and Wallace (2015) argued that given the prominence of inquiry in professional development experiences, educational evaluators need strong tools to detect its intended use in the classroom. Current practice in science teacher education promotes the use of inquiry in the teaching of science. However, the literature suggests that many science teachers hold incomplete or incorrect conceptions of inquiry. Teachers, therefore, may believe they are providing more inquiry experiences than they are, reducing the positive impact of inquiry on science interest and skills. Monet and Etkina (2008) found that teachers have difficulties reflecting on their learning and posing meaningful questions. The teachers who could describe how they reasoned from evidence to understand a concept had the highest learning gains. In contrast, those teachers who seldom or never described learning a concept by reasoning from evidence showed the smallest learning gains.

Green, Gonzalez, López-Velásquez, and Howard (2013) and Bryant, Linan-Thompson, Ugel, Hamff, and Hougen (2001) argued that some teachers in their study reported being exposed to teaching strategies and skills for academic reading and vocabulary teaching for the first time through the PD intervention. The teachers in the study expressed that their participation in the vocabulary curriculum intervention expanded their knowledge and that participating in such CPD provided them with an example of how his new knowledge of morphology transferred into some teachers' lessons and helped his students unlock the meaning of scientific words. This

analysis suggests that learning to reflect on one's learning should be an integral part of teachers' professional development experiences.

Bryant et al.'s (2001) study involved extensive staff development in the Direct Instruction Reading Program, with follow-up training, practice sessions, coaching, observations, and immediate feedback. This study was conducted to determine whether teachers implemented the reading program appropriately, teachers' instructional practices changed during the school year, and students' reading achievement improved. Results indicated that the participants did implement the program as instructed, the teachers' use of instructional practices improved over the school year in which the study was conducted, and all of the participating classes showed significant increases in student achievement on the post-test.

Furthermore, Yost and Vogel (2007) pointed out a direct connection between growth in teaching expertise, as measured by Marzano's Dimensions of Learning, and student academic achievement. Their study argued that personalized and needs-based CPD that focused on participants' teaching skills based on Marzano's Dimensions of Learning positively influenced their teaching behaviors and self-reported use of standards-based practices. The findings from their study clearly showed that intervention at the school level with teachers enhanced the instruction of participating teachers in a short period of time. Class scores of the participating teachers on the benchmark assessments were higher compared to non-participants' class scores, with the exception of fifth grade reading.

Similar findings were observed in the study conducted by Blanchard, LePrevost, Tolin, and Gutierrez (2016) that focused on a teacher technology enhanced CPD project. They reported that teachers' beliefs about teaching and comfort with using technologies changed significantly over the course of their participation in the CPD program, addressing calls in the literature for assisting teachers with their technology integration (Gerard, Varma, Corliss, & Linn, 2011; Sancho, 2010). However, there were no statistically significant findings overall for changes in teachers' practices, for their pedagogical discontentment, or for their subject-specific self-efficacy. Indeed, the findings indicated that teachers were self-efficacious in their subject matter teaching and had teaching that was predominantly teacher centered, rather than having a focus on the learner, both before and during the CPD. Despite sustained teacher professional development that modeled and promoted reform-based teaching, the teachers in this rural, high-poverty setting were resistant to major changes in their instructional methods, in concert with findings by

Goodpaster, Adedokun, and Weaver (2009) and consistent with, on average, their lack of pedagogical discontentment (Southerland, Sowell, Blanchard, & Granger, 2011). Interestingly, despite a lack of evidence for teachers' adoption of more reform-based practices, students who were in the teachers' classrooms benefited from the added technology resources, as evidenced by higher assessment scores in mathematics and science compared to students who were not in classrooms of teachers who undertook the CPD.

This was further supported by the results of the study by Telese (2012) that indicated the mathematics content knowledge of teacher participants had a larger role in predicting student achievement than mathematics pedagogical knowledge. Also, teachers who reported participating in fewer professional development activities had students with higher scores than those students whose teachers reported participating in more professional development. The findings show that although content knowledge is important for teachers to possess, any more than a small extent of professional development in this area was associated with lower achievement when compared to teachers not receiving any training. However, a surprising result was students of teachers who received a small extent of professional development in methods for assessing students performed at the same level as teachers receiving no training at all, whereas students whose teachers received more than a small extent of training were found to have lower achievement. The authors raised questions regarding these reasons and potential validity of these findings and recommended further investigation into teachers' beliefs and attitudes that were not part of the study.

Conclusion

Through the rigorous search strategy, nine articles exploring the effectiveness of professional development targeting middle years teachers were reviewed to identify the types of professional development practices that have the most significant impact on outcomes for middle years learners. Within the reviewed studies, only three (33%) included student achievement data as a measure of the CPD's effectiveness. With CPD accounting for a significant amount of time and money from a school's yearly budget, measuring the effectiveness of CPD programs through changes in teachers' attitudes and beliefs (sense of efficacy) or students' improved outcomes (academic or affective) should be a key component of the CPD delivery. Where teachers report an increased sense of efficacy or improved student outcomes as a direct result of CPD, more effective CPD

approaches can be designed and future programs will potentially lead to greater teacher efficacy and improved student outcomes. To determine what makes professional development effective in bringing about change in teacher learning and teacher practice, educational researchers should focus on measurable factors that can be taken into account while designing professional development to meet the needs of teachers delivering instruction.

Many of the teachers currently working in middle years classrooms have not had specific training to prepare them to work with this age group and report being underprepared and overwhelmed by the day-to-day challenges of the classroom. Targeted CPD is key for teachers to continue to develop and enhance their pedagogical and content knowledge to meet the demands of the classroom and to improve student outcomes. However, the professional development activities offered must meet the current needs of teachers and be structured; focused on academic content, curriculum and skills; and have a culture of inquiry to support teachers' skill development. Moreover, Coleman and Goldenberg (2011) asserted that "professional development cannot be of the one-shot workshop variety" but "must be embedded in the work lives of teachers and the routines of teaching" (p. 161). The studies included in this review that reported positive outcomes all described professional development programs that linked into the daily lives of teachers' practice. It is concerning that with most teacher registration authorities mandating that teachers participate in at least 20 hours of CPD annually, so few studies have been reported specifically on CPD in the middle years. A key recommendation of this review is that research measuring the effectiveness of CPD becomes a rule rather than the exception in middle years education, and that this research informs and guides effective CPD for teachers working within the middle years of schooling.

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