

**Motivation and Teacher Professional Development:
Review and Knowledge Database**

Laura J. Schieb
&
Stuart A. Karabenick

Math and Science Partnership – Motivation Assessment Program II
(MSP-MAP II)
mspmmap.org

Stuart A. Karabenick
(skaraben@umich.edu)
Combined Program in Education and Psychology
University of Michigan

AnneMarie Conley
(ampm@uci.edu)
Department of Education
University of California – Irvine

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Introduction

Teacher professional development (PD) interventions are designed to increase teacher content knowledge and pedagogical content knowledge. There is considerable consensus (although not necessarily empirical support; see Weiss, 2009) for the features of PD programs that are necessary and sufficient for their success (Darling-Hammond, et al., 2009; Guskey, 2003; Hassel, 1999; Hawley & Valli, 1998; Loucks-Horsley, et al., 2003; National Commission on Teaching and America's Future, 1996; Weiss & Pasley, 2009). In addition to the focus on teacher knowledge and practices, there are urgent calls to examine the role of teacher motivation in PD. Goldsmith and Schifter (1997), for example, suggested that descriptions of teacher development need to add accounts of individual motivational and dispositional factors.

Similarly, in his more contemporary review, Tittle (2006) concluded that while “[t]here are references [in the literature] to motivation and affective (or dispositional) characteristics as important to teacher learning...[f]ew studies address these areas, areas that are likely to be important for assessments of long-term professional learning and development” (p. 976). Boyd et al. (2003) highlighted the critical role of teacher motivation in PD as one of their four key recommendations: “A primary challenge for large-scale PD projects lies in attracting teachers and sustaining their involvement so that they can receive the full dose of PD” (p. 112). And yet, the most recent work on PD in math and science (e.g., Weiss & Pasley, 2009) does not explicitly include motivation. Motivational concerns, while often alluded to in passing (with regard to participation incentives or teacher confidence), remain a critical yet understudied component of teacher PD interventions.

Most obviously, motivation influences the likelihood that teachers will opt to participate in PD. As stated in the study of Local Systemic Change, “You have to make every effort to get the teachers there and once you get them there, you have to make sure you have something of high quality that will encourage them to come back” (Boyd, et al., 2003, p. 47), which is particularly important for higher education faculty (Zhang et al., 2008). Even for teachers who participate, their degree of engagement can moderate whether they profit from that experience. PD can influence motivation for teaching math and science in general (Alexander, 2008; Tittle, 2006) and for attempting new instructional practices (e.g., reform math and problem-based science) that incur costs and risks as well as benefits and challenges (De Corte, et al., 1996; Gregoire, 2003; Hargreaves, 1998; Richardson & Placier, 2001; Smith, 2000)

Effective PD has become more important than ever to ensure that the motivation and goals of teacher participants and those of schools and school districts are in alignment, in order to improve successful implementation of school reform mandates and initiatives into teachers' classroom practices (Yamagata-Lynch, 2009). Fortunately, the recognized importance of teacher motivation in the PD process arises at a time of renewed interest in teacher motivation in general (Watt & Richardson, 2008), which has implications for the more specific domain of teacher PD. The comprehensive application of contemporary motivation theory and research is needed. These approaches include expectancy-value

(Watt & Richardson, 2008), achievement goals (Butler & Shibaz, 2008), interest theories (Hidi, & Renninger, 2006), self-determination theory (Assor, 2009) and new ways to think about emotion and affect (Pekrun, 2007). These conceptual frameworks offer a range of constructs and their assessment, which are particularly relevant for understanding the role of motivation for PD in math and science.

To date, however, there has been no systematic focus on the factors that influence teachers' motivation for participating in PD, their level of engagement during PD activities, and the degree to which teachers' motivation and engagement influences what they learn and apply in their classroom instruction. Such research is essential to clarify the connection between teacher and student learning (Kelleher, 2003) and to identify the necessary components of comprehensive school reform and improved student achievement (Blazer, 2005). Accordingly, the present comprehensive review of motivation and PD is designed to provide that overview in order to inform those planning, conducting and evaluating PD in math and science. The review spans a wide array of sources that in some manner represent the intersection of teacher motivation and PD. Its scope is indicated by a sample of the topics included: teacher education (Wayne, 2008); education policy (Barrett, 2009); mid-career programs (Berl, 2005); components of teacher motivation (Camilia, 2001); content-specific references (Desimone, 2007); outcomes (Blank, 2009; Flecknoe, 2002); effectiveness of programs and enduring change (Guskey, 2002); teacher styles (Kyriakides, 2009); motivation theories (Martin, 2009); and addressing the "whole teacher" with regard to attitudes, skills, knowledge, practices, and proficiency within a wide range of domains (Chen, 2006).

Review Summary

There are several themes discernable in the literature relevant to motivation and PD, including more generally the consensus that PD is key to educational reform and student achievement.

- Teacher self-direction and the key motivational dimensions of teachers self-efficacy (i.e., beliefs they are capable of achieving instructional goals) have been identified as essential factors in the success of PD. Research has recognized positive relationships between teacher levels of self-efficacy with regard to motivation and PD opportunities. A significant number of articles report that teacher self-efficacy is an essential variable in improving student performance, and they stress the importance of PD programs that incorporate teacher self-efficacy as an element of their PD designs.
- The feeling of isolation, and its motivational implications that many teachers experience is well addressed, with suggestions for introducing successful collaboration efforts through PD and other professional learning activities.
- There is considerable emphasis on studies showing that PD programs are most beneficial when teachers maintain input and control over the PD process, for which self-determination theory is relevant. The inclusion of educators in the design, planning process, setting of goals, and implementation of their PD has

often shown to result in an improved ability for participants to translate their experiences more effectively in the classroom.

- There is a strong correlation between positive teacher and administrative relationships and opportunities for PD. Studies show that those in educational leadership positions can support teachers in areas such as motivation, reflection, evaluation, recognition, rewards and improving the work culture. Over time, teachers' practices can be changed through this kind of support, as well as through PD programs and other learning opportunities and materials.
- Studies indicate that the acknowledgment of teachers' existing beliefs and practices is a major factor in their motivation to participate in PD in an engaged way, and that it plays a critical role in facilitating change.
- There is broad coverage of the many ways that PD can be offered to reflect the needs of the individual school environments and contexts in ways that have motivational implications. PD can take many forms, and these articles describe a range of innovative initiatives with the potential to bring together school staff in planning and collective action to create improved learning and positive outcomes for both staff and students.

This review includes determining the range of reasons for teachers to attend PD, ensuring that teachers are offered programs that are of high quality and relevance in order to encourage engaged participation, the degree to which teachers are subsequently motivated to incorporate and apply what they have learned into their classrooms and instructional practices following PD, and how these changes in teacher knowledge and practices affect student academic achievement and outcomes. The purpose is to apply motivation research in developing a new understanding and approach for the integration of motivation theories into the process of teacher participation and PD design. Whether or not they are explicitly stated in specific articles in this literature review, we provide many examples of the application of motivational theories such as expectancy-value theory, achievement goal theory, interest theory, and self-determination theory.

Researchers have suggested several reasons why teachers attend PD. This list includes such ideas as the degree of independence in teachers' decisions to participate, the relevance of the program to the needs of the teachers and their students, the alignment of their professional and personal goals with the purpose of the PD, convenience, costs, and anticipated rewards and skills gained. There are also an increasing number of studies using evidence-based research to measure and evaluate what is working in PD across domains (more specifically with science and mathematics education), and what has been not as effective. Some features of PD programs that research has shown to be effective include teachers having control over the process and content, the existence of a supportive administration, acknowledgement of teachers' existing beliefs, practices and professional identity in the context of rapidly changing school reform efforts and requirements, and follow-up mechanisms which enhance positive outcomes for staff and students. There is considerable consensus that additional research is necessary to inform the design of PD in an educational environment that places an emphasis on education standards, high-stakes testing, and student achievement. This rapidly evolving

educational climate has resulted in school districts having to provide more effective PD for teachers. This literature review has revealed the need and desire for more research that can offer guidance to educators and others involved in PD in identifying the particular features in PD programs that have been shown to be markedly effective in improving teacher educational practices and student achievement.

In recent research regarding school reform, there has been a great deal of attention focused on developing new approaches to educating students, with descriptions of different options for improving student achievement, in order to meet the demands of the federally mandated standards movement. However, research also shows that teacher practices that involve both traditional and newer teaching approaches result in better student outcomes. Teaching is a cultural practice, and educational leaders in the U.S. and around the world are called on to take into account other criteria present in many educational contexts. These include regional differences in our own country as well as across national boundaries.

Yet the goal of higher standards in education is shared globally, with different ways to measure progress towards this objective. PD programs involve teachers from very different backgrounds, experiences and abilities, and some researchers stress reasons why student performance outcomes should not be the sole determinant in designing the optimal models for PD in advancing teachers' abilities to positively affect student learning. Other factors that researchers claim should be given more importance in being integrated into PD programs include the role of intrinsic rewards, such as the impact that a teacher's sense of self-worth and accomplishment have in developing positive attitudes and motivation toward their participation and anticipation of successful implementation; teachers' needs for PD opportunities which address greater understanding of their students' abilities, needs, and motivations, especially in students' science and mathematical thinking and development, with suggestions for creating more positive learning outcomes; and the importance of school leadership and support in assisting teachers in gaining the necessary feeling of empowerment to effectively implement mandatory state and federal standards.

The area of teacher PD continues to be of growing interest nationally and internationally. It is noticeable from the scope of the literature review that during the past decade there has been a vast improvement from the 1990's when educators and researchers expressed opinions about the inadequate attention from state and federal policy makers towards improving the quality of PD programs. Compare this to the significant focus today on PD as the key to school reform and improved student performance and achievement. Additionally, the wide assortment of sources in this literature review explore the factors that contribute most to motivating teachers to engage in PD, the ways that teachers experience their participation, and analyses of how this enhances teacher and student learning. The role of motivational theories mentioned in these articles has been viewed in the context of PD programs and their implications for educational practice and the potential to improve student achievement. The call from teachers for PD opportunities to be offered in a variety of ways is being answered through the creation of alliances between teachers, administrators, and researchers in developing innovative initiatives such as collaborative professional learning communities, teacher support groups and improved traditional PD programs. The future

of research on teacher motivation and PD, and the ability of teachers and schools to successfully bridge the demands of government requirements and students' learning experiences, will be determined by their ability to weave together ideas from a wide array of fields of study and practice that have previously operated separately from each other.

This review supports the conclusion that PD can be improved by focusing directly on teachers' attitudes toward and motivation to engage in PD, the level of enrichment that they gain through their participation, and the relevance of PD programs for their personal and professional lives. The basic tenet is that recognizing the importance of teacher motivation in PD has the potential to not only motivate teachers to greater professional growth and result in higher student academic performance in math and science education, but also to offer evidence of the factors which will contribute to lifelong learning for both teachers and their students.

Review Methodology

Search Process

The following databases were searched: ERIC CSA, Psych Info, EBSCO, Google Scholar and ISI Web of Science. The search was initiated with the broad terms "teacher motivation" and "PD" and then more restricted searches that included terms associated with motivational theories such as teacher efficacy, achievement goals, expectancy-value, interest, self-determination, and cost-benefit analysis. There were significantly fewer results from this more limited search. As we expected, while there was considerable information about the evaluation and assessment of PD programs during and following teacher participation, *few sources were found that addressed teachers' perceptions and motivation prior to their participation in PD.* For example, the search of teacher efficacy and PD in mathematics education yielded extensive information on mathematics education and the assessment of specific PD programs, but little on teachers' perceptions and motivation related to their participation or engagement in these programs. It was difficult to identify articles that assessed PD programs regarding participants' reasons for attending, their level of participation in the program, and how these factors influences student achievement outcomes. Consequently, there is little research examining these relationships.

There also were few articles that dealt with teacher's own mastery (learning and understanding) or performance (ability, interpersonal comparisons) achievement goals but rather those that focused on students or teacher classroom practices. Instead, there was information on teacher traits as part of motivation for attending PD, and teacher engagement and participation with a particular PD program. For example, the search terms "expectancy value" and "PD" yielded few relevant articles, and fewer still when combined with "motivation." *Google Scholar* resulted in more hits using "motivation theory" and "PD" than did other databases. When using "costs and benefits" and "PD" (and related search terms) if the journal article did not directly focus on math and science, a source was included if it was judged to contribute to an understanding of motivation and PD across content areas. For example, an article on literacy achievement and PD

entitled *Reading Recovery and Evidence-Based Practice* was included since there was information on “evidence of effectiveness, sustained gains, programs evaluation data from a response to intervention perspective” with comments that “*Reading Recovery* has provided an excellent model in demonstrating how to plan, promote, and implement an intervention across an educational system and how to design a PD program” (Schwartz, 2009).

Examples of articles not in math or science were those focused on teachers' attitudes toward the arts in education (Oreck, 2004), professional development initiatives focusing on digital age literacy skills (Richardson, 2007), factors that influence how teachers change (Smith, 2003), improvement of school environments and leadership (Basom, 2004), and positive effects of professional teacher collaboration (Shepard, 2009). Articles in a journal dedicated to PD, *Professional Development in Education*, were only included if deemed relevant to teacher motivation and PD. Finally, articles on math or science were more likely to be included by virtue of the domains themselves. Articles dated no earlier than the 1990's, other than a “classic” or major publication in the field, were included if they had the potential to be of interest for educators who were considering participation in or the study of a PD program and the various perceptions that might contribute to that, including personal interest, content knowledge improvement, cultural background, overlap of subject areas, and school level details. Selection of resources also included PD in international contexts, the connection between PD and student outcomes, and school leadership. Using these criteria yielded approximately 250 relevant resources cited in the accompanying reference section.

Motivation and PD Resource Directory

In addition to the summary of the literature provided above, we categorized resources (journal articles, chapters, technical reports) according to keywords that were used to describe or define teacher motivation related to PD. Representative citations are provided along with comments and examples to capture the scope of the information in each of the categories. It should be recognized that many resources could be assigned to multiple categories. The category descriptions that follow are provided to guide interests in particular topics.

AO Achievement and Other Outcomes

Articles in this category consider the ways that the design and implementation characteristics of PD affect student achievement outcomes (Abell, 2009) and draw comparisons between mathematics teachers from low- and high-performing school districts who participated in PD focusing on their subsequent use of mathematics problem-solving in their classrooms (Zambo, 2008). They also investigate relations between students' interest in mathematics and their mathematics performance during the transition to elementary school (Aunola, 2006) and explore how evidence-based, collaborative PD increases student engagement and learning (Shepard, 2009). This section offers examples of ways that achievement can be motivated by teachers' and students' desire for increased competence.

Included are articles that review the design of PD programs and focus on the central issues of evidence-based practice with regard to their effectiveness in demonstrating sustained gains in student performance, along with cost-benefit considerations (Schwartz, 2009). Others discuss the difficulties and possibilities of providing evidence of the impact of PD programs in schools (Flecknoe, 2002), address concerns about an overreliance on self-report measures and the need to examine alternatives (Fulmer, 2009). There is a clear need for increased empirical evidence about what works in PD for mathematics and science education, and the reasons why this knowledge is so limited (Yager, 2005). Sources also explore the benefits of providing teacher self-assessment tools along with clear standards of teaching as a strategy for improving the effectiveness of PD (Ross, 2007), and others that examine the structural and process features of PD on teachers' practices in Australia and its impact through assessment of follow-up knowledge and student learning outcomes (Ingvarson, 2005). An important feature of these sources consists of indicating most effective approaches to positively influencing student outcomes.

BL Beliefs

This provides a more thorough understanding of the influence of teachers' beliefs, relevant to the design of PD programs in the future, and a necessary consideration for successful educational reform. In trying to resolve hindrances to the implementation of educational reform efforts, educators have examined how to take into account teachers' beliefs about these reforms and how best to support them in adopting changes in their teaching practices. Topics covered in this section include an analysis of how teachers' subject-matter beliefs may create obstacles in the acceptance and implementation of reform practices which conflict with teachers' beliefs (Gregoire, 2003), a survey that explores the characteristics and variables that best describe teachers who integrate computers into their classrooms and those who do not, with teachers' beliefs playing a large role (Mueller, 2008), and an investigation of how teachers' participation in PD activities promotes changes in the participants' beliefs with regard to the implementation of reforms (Meirinka, 2009).

CB Cost-Benefit Analysis

The standards movement has created a sense of urgency to offer more effective PD to achieve higher student performance. Providing sufficient resources for full implementation of these programs raises cost-benefit issues. Topics included in this category provide a cost-benefit analysis along with consideration of the effectiveness of particular educational and PD programs for drawing conclusions and making recommendations. Sources here offer an economic analysis used to improve PD by providing information on the costs and benefits of various approaches to improving the quality of education (Barnett, 2006), an economic comparison of differences between PD and other training opportunities with recommendations in terms of investment and specific features of PD programs (Van Loo, 2006), and an exploration of the purposes of PD and the balance between teachers' desires to pursue their own professional interests and the priorities of the individual schools and school districts, with regard to public

support and increased financial investment (Corcoran, 1995). Additionally, one source describes an analysis of the costs and benefits associated with a particular PD intervention, in terms of achieving specified outcomes and the estimated savings from providing a program, such as literacy achievement in young students, that are not easily quantified in terms of decreased social costs in future housing, health, and employment issues down the road (Schwartz, 2009). This section provides a review of current issues and challenges in PD when considering qualitative and quantitative measures within a cost-benefit analysis, with specific suggestions to improve the quality and effectiveness in PD opportunities for teachers and other educators.

CC Classroom Characteristics

This literature review contains many sources of information about what the main influences are on the day-to-day motivation for teachers in the classroom and with regard to their participation in PD. Articles in this category focus on the factors which may undermine or enhance teacher motivation in these types of situations and experiences. Topics include an examination of the perceptions of teachers' in their lack of knowledge and efficacy in motivating students in the classroom, and the implications of this for PD (Hardre, 2008), the effects of different characteristics of PD on teachers' learning and changes in their classroom practices (Garet, 2001), the consideration of discourse patterns in the mathematics classroom as an essential element in PD in which teachers make instructional decisions according to students' thinking during teaching (Crockett, 2009), and the link between achievement in science and literacy when elementary school teachers are provided the time, instruction, resources and PD to successfully design and implement an inquiry-based science unit in the classroom (Fortino, 2002). This section offers numerous examples of practical solutions for problem solving in the classroom for those educators who have a willingness to engage in new learning and PD opportunities as they become available.

CD Curriculum Domains

The resources that describe research in mathematics education include such concerns as how the policy environment affects teacher participation in PD (Desimone, 2002), teachers' subject-matter beliefs and reform (Gregoire, 2003), the value and design of video-based PD (Koc, 2009; Santagata, 2009), the experience of teachers' experiences in PD as they shift from traditional practices to reform efforts (Smith, 1996; Cohen, 2004), the technique of student-centered learning in math class discussions (Dixon, 2009), and the evaluation of the effects of PD programs on teacher and classroom problem-solving abilities (Zambo, 2008). As for the articles on science education, there were specific resources that examined the instructional practices in PD that show improved effectiveness in the classroom (Lydon, 2009), the range of reasons for science teachers to attend or avoid science-related PD (Schibeci, 2004), and the reform of traditional teachers' practices to refocus science education on the more applied learning needs of the citizen (Ratcliffe, 2009).

Whereas math and science education represent the vast majority of articles, ten other domains are included as well. These focus on the variety of ways that teacher motivation and PD influence student achievement. Articles in these domains include the use of creativity and the arts in general education (Oreck, 2004), similarities in reasons for participating in PD programs for business and general education teachers (Shumack, 2008), cross-disciplinary collaboration and PD projects (Nelson, 2007), the impact of curricular reforms on physical education programs (McCaughtry, 2006), and PD program evaluation and literacy achievement (Schwartz, 2009).

CL Collaboration

Teachers often work in isolation from each other, and this has been seen to be a major impediment to school reform. One of the most innovative approaches to address this has been to develop the ability of schools to function as professional learning communities as an alternative form of PD, allowing teachers to share information, experiences, and valuable classroom practices. The articles in this category strive to determine the perceptions, efforts and progress of those working in educational environments regarding this concept. Topics in this section include an evaluation of a collaborative effort in PD in which several themes emerged as contributing to the success of the program, such as having a shared vision of the goals and maintaining flexibility in planning and implementation (Hanley, 2008), issues related to the development of trust in PD projects that have the aim of building a community of mathematics education teachers and learners (Sztajn, 2007), an examination of a PD program where a networked learning community was chosen as an approach to support technology integration in science education (Duran, 2009), the support of regular teacher engagement and collaboration as an effective means of connecting PD with the daily challenges faced by teachers even in the most rural parts of China when supported by educational institutions, leadership, and teacher initiatives (Sargent, 2009), and the inclusion of educators and other major stakeholders in the planning process and setting of goals for their PD, which often results in an improved ability for participants to translate their experiences more effectively in the classroom (Herner-Patnode, 2009). PD can take many forms, and these articles describe professional learning communities as having the valuable potential to bring together school staff in the planning and collective action to create improved student learning and positive outcomes for both staff and students.

CR Curriculum

The introduction of revised curriculum programs in addressing student motivation and learning involves a complex interaction between curriculum innovation, PD, and the characteristics of the teaching, learning, and leadership environment. There is a diverse collection of sources introducing new approaches to using curriculum in school reform efforts and increasing student achievement. Articles cover such topics as a study showing that mathematical curriculum materials can be effective without PD support but not for all teachers (Collopy, 2003), a report indicating that when teachers' perceptions of their goals and motivations for PD are not aligning with the school district that designed and facilitated the PD activities, this misalignment contributes to obstacles in successful

classroom integration of curricular-based initiatives (Yamagata-Lynch, 2009), and a description of the importance of teachers' perceptions on the value of PD in establishing a deeper understanding of students' needs and offering positive, proactive strategies for classroom management and teaching (Baker-Henningham, 2009). Additionally, several international studies are included. One in England describes recent curriculum changes to increase "scientific literacy" in terms of science in the students' daily lives, as well as science content knowledge, and different forms of PD that might be useful for this (Ratcliffe, 2009). And one in Ireland examines the strong role of PD in providing a mechanism to introduce revised national curriculum to schools and teachers (Loxley, 2007). This section conveys the widespread agreement that teachers' views on the acceptability, feasibility, and usefulness of a particular curriculum program will significantly influence its implementation, sustainability and success in integrating the curriculum and accompanying strategies into their regular classroom practices towards school educational reform efforts.

EI Ethnicity and Other Identities

Teaching is a cultural practice that differs across countries, between regions in the U.S., and within local communities. In addition to an individual's or group's identity as being defined by race, ethnicity or gender, other criteria factor in as well such as economic status, age, religion, and professional self-understanding and perception. In this context, articles in this category ask why diverse teachers with differing knowledge and experiences in science exist, and discuss the various ways that PD can address the intersection of these multiple identities, which result in different perceptions of the world as science teachers (Moore, 2008), explore methods which could be included in PD programs to increase teacher effectiveness when working with low-income and culturally diverse students (Tucker, 2005), consider the No Child Left Behind legislation in the U.S. as a shift towards a "performance" pedagogical model which has altered the professional practices and identities of teachers differently depending on whether they are early or late in their careers, with implications for the design of PD opportunities (Barrett, 2009), and offer insights into the potential of "transformational" PD by examining the relation of self to others for urban public school leaders (Jurow, 2009). A significant number of articles acknowledge that teacher emotions have to be better understood with regard to their sense of identity when dealing with the challenges posed by educational reform directives (Kelchtermans, 2005), examine the need to include teachers' emotions during critical periods of educational reform in order to reconstruct professional self-understanding which lead to improvements in instructional practices and student achievement (Darby, 2008), and address the changing identities of teachers amidst education reform, and the role of PD in enhancing teacher competence and personal growth during the upheaval of educational reform (Pattie, 2009). Implications which result from the existence of multiple identities are highlighted in this section, with recommendations for the design of PD programs which incorporate the identity of teachers and other educational leaders, in furthering their personal and professional growth as well as contributing to more effective learning environments for their students.

EM Empowerment

Interest in the concept of empowerment has triggered a number of PD initiatives to study the influences of such things as teacher self-efficacy, opportunities for professional growth, and leadership support on teachers' sense of empowerment. Articles covering this issue include an examination of a collaborative model of PD showing results indicating greater teaching efficacy but no relationship between empowerment and efficacy (Henson, 2001), and highlighting a micro/macro approach to PD in Malta, which takes into account the personal initiative of the teachers along with the educational system through practice with additional ongoing PD opportunities (Bezzina, 2001). In addition, a study in Israel focused on the relationship between teacher empowerment and organizational and professional commitment, with findings showing that teachers' sense of empowerment is significantly related to their feelings of commitment to the organization (e.g., school and school district) and their profession (Bogler, 2004), and a PD program was evaluated to better assist teachers in implementing state content standards, which found that the keys to empowerment and completion of the program were the teachers' active engagement and their gaining the support of the school principal (Edwards, 1999). The sources in this category will provide a current view of PD as a framework within which educators develop greater efficacy and empowerment through active engagement, in collaboration with colleagues, and involving an ongoing continuum of professional learning networks, with implications for teachers, principals, education leaders, and policy makers.

EO Emotions

The most recent efforts at school reform, encompassing the standards movement with high-stakes testing and accountability, has made PD more crucial than ever, with unprecedented numbers of educators involved in professional learning activities (Williams, 2005; Kelleher, 2003). In studies of emotion in educational contexts, sources in this category have shown that school reform has involved a reconstruction of teachers' professional understanding of themselves and their beliefs, and support given through school administration and PD opportunities can lead to improvements in teacher practices and student achievement (Darby, 2008). Additionally, reform agendas also present challenges by creating emotions which may lead to intense feelings that cause teacher resistance or support in changing the working conditions in schools and in teachers' classroom practices (Kelchtermans, 2005). Further, other emotional factors involved with teachers' engagement with school reform and PD stem from teachers' perceptions that their motivation and goals are not in alignment with their school district, causing obstacles to the implementation of improved teachers' classroom practices (Yamagata-Lynch, 2009). School reform in the U.S. has exacerbated teacher burnout, affecting teachers in different ways. Articles included here (e.g., Dworkin, 2001) report on teacher burnout as a predictor of teaching efficacy, with PD improving teacher efficacy, and its implications for educational quality (Madden-Szeszko, 2000). There are suggestions for a variety of approaches to PD, and comparisons and evaluations of PD characteristics such as scope, stakeholders and economic perspectives that affect the return on investments when designing PD programs (Van Loo, 2006), and which address the connection between teacher emotions, PD, and student learning.

EP Educational Innovations and Programs

The current educational reform environment places an emphasis on the importance of PD as a means to improve student achievement. The sources in this category highlight some specific reform programs that seem to be effective and that discuss which factors may be responsible for this progress. Included are articles which describe a promising preschool classroom intervention that promotes math interest and skills in young children, with successful results for both teachers and students (Arnold, 2002), review *Reading Recovery* as a positive model for demonstrating how to implement an intervention across a large educational system (Schwartz, 2009), report a meta-analysis at the state and local level about the effects of teacher PD on improving student learning, with the goal of widely disseminating the scientifically-based evidence of the study's findings (Blank, 2009), discuss effective PD programs that are in partnership with universities with the goal of enhancing teacher leadership practices (Crawford, 2008), and outline some variables that could be used by school districts to determine whether or not students could benefit from a particular innovation in their schools, such as a sufficient willingness on educators' parts and organizational capacity (Fixsen, 2009). Also mentioned were projects in Head Start classrooms to improve early literacy development and promote book reading, language and vocabulary for young children (Dickinson, 2007; Wasik, 2006), and the impact of the *Local Systematic Change Initiative*, a National Science Foundation program on student achievement in science, mathematics and technology, and the importance of PD as a means of improving student outcomes in these subject areas (Banilower, 2002; Supovitz, 2000). In sum, this category provides information that describes how PD continues to address a variety of challenges that arise through evolving research, innovation, policies, and educational philosophies.

ER Educational Change and Reform

Studies show that PD is key to educational reform efforts. The articles in this section evaluate the different combinations in which PD programs are being designed in order to most effectively direct educational reform towards improving student performance in the areas most needed. The topics covered in this category include how learning to use technology in Rwanda through PD can serve as a model for teachers in creating change in other ways in the learning environment (Mukama, 2008), science education reform through PD that focuses on concrete tasks which connect teacher's subject-matter knowledge with standards for student performance (Supovitz, 2000), the connection between the meanings that teachers in South Africa attach to a new curriculum and the success of educational reform (Bantwini, 2010), an investigation of how adult education teachers changed after being presented with different models of PD (Smith, 2003), and an explanation of the factors that contribute to how teachers implement new knowledge and skills gained from PD into their classrooms (Watson, 2008). The studies in this section suggest that teachers' practices can be changed over time and with considerable support from PD programs and other learning opportunities and materials, and offers potential solutions to this ongoing challenge for teachers, administrators, designers of PD, and policy makers.

GL Grade Level

Grade levels range from early childcare and education through adult education programs, along with different international perspectives. Regarding early childhood education settings, articles considered such concerns as alternatives available to enhance early childhood PD opportunities (Barnett, 2006) and the role of the state in Kenya's long history of early childhood education (Adams, 2000). For the elementary grade levels, articles provided information that include PD efforts to support and retain experienced teachers (Holloway, 2003), success of PD programs in New Zealand in integrating classroom pedagogical tools to improve student achievement (Higgins, 2009), inadequate attention of state policy makers to improve the quality of PD programs (Corcoran, 1995), teachers' motivation and instructional style with regard to their progress in PD programs (Campoy, 1998), and the expectancy of success and perceived value of the use of technology in the classroom (Wozney, 2006).

Despite a relative lack of articles specific to middle school education, several were aimed at these grades that included reports about the relationship between teachers' feelings of isolation and the development of a professional learning community (Grider, 2008), and looking at teacher efficacy, learning styles and beliefs, and how these factors influence behavior to motivate and change (Kitchens, 2007). There were also a significant number of resources that focus on high school and secondary education. These articles addressed educational issues such as teachers' attitudes regarding integrating technological tools in teaching and learning (Govender, 2009), the lack of occupational motivation among teachers and professional engagement and development (Neves de Jesus, 2005), and in Holland the way in which workplace activities such as PD contribute to changes in teachers' beliefs over time (Meirinka, 2009), and teachers' perceptions in Botswana of the quality of their work life and their undertaking innovative educational practices (Perry, 2005). For higher and adult education, several articles which examined the relationship between positive teacher and administrative dynamics and opportunities for PD (Ellet, 1997) and the comparison between different models of PD and identifying the most important factors influencing teacher change (Smith, 2003). Generally, there were sources that inquired into the absence of PD programs which include the major factors that research has shown to be effective, such as school-wide efforts that include follow-up involvement and a supportive administration (Richardson, 2003). The articles in this category provide information on teaching concerns belonging to a particular grade level, or those that are shared across grade levels.

IC International Comparisons

The articles in this category highlight the importance of taking into account the role of educational research in PD in many different contexts. There are 31 countries represented in this resource review. Research in Australia, for example, has focused on stability, change and the global impact on school principals, leadership and PD (Gamage, 2006), as well as on a new curriculum that offers an engineering course in secondary schools (Williams, 2008). The success in China of teacher professional learning communities in resource-constrained schools has also been documented (Sargent, 2009), along with the

use of PD in providing a mechanism to introduce a national primary curriculum in Ireland (Loxley, 2007). In Jamaica, one study focused on a school-based intervention through PD to prevent student misbehavior (Baker-Henningham, 2009) and in Hong Kong, researchers looked at educational reform and stress on teachers as a main component of PD programs (Pattie, 2009). A collection of articles on PD from different regions of the world is available (Day, 2005), and researchers have made international comparisons in mathematics education and its impact on PD (Blomeke, 2009). This international category includes articles about Israeli research efforts to ascertain which processes in PD are necessary to develop teacher expertise in a specific aspect of science education (Harrison, 2008), researchers in Japan who have made comparisons between teachers' professional status and student achievement in mathematics (Schoenfeld, 1999), and a study in Tanzania of discourse patterns as an essential feature of PD programs (Crockett, 2009).

IM Improvement

In the context of educational improvement, there has been a call from teachers, principals, and policy makers for PD to be offered through a range of innovative initiatives, such as collaborative school communities, teacher support groups, and professional learning networks, to develop more successful classroom practices (Kraayenoord, 2003). Articles in this category describe PD models that support shifts in teaching practice based on collaborative inquiry in a learning environment (Butler, 2004), and examine the effectiveness of specific PD models in predicting teachers' subsequent practices and responses based on observed motivation and instructional styles (Campoy, 1998). Sources in this section explore a variety of perspectives on the factors that influence the PD of teachers and contributes to understanding the situational challenges that become obstacles for teachers in PD programs, with potential solutions in improving professional opportunities and teaching practices in the classroom.

IS Institution/School Features

Resources in this category suggest the many ways that PD can be offered to reflect the needs of the individual school environments and contexts. The types of schools represented range from elementary through high school, and encompass urban, rural, public and private school systems, and schools with different levels of student achievement. Factors affecting schools such as organizational aspects, policy implications, and institutional development are also considered. Topics include investigation of the characteristics of PD in high- and low-performing schools (Henry-Bell, 2007), teachers' views about instructional reform through PD (Nielsen, 2008), analysis of scientifically-based evidence of the effects of PD on improving student achievement (Blank, 2009), engaging teachers in research experiences to enrich their classroom teaching (Klein, 2009), and how the policy environment affects teachers' choices of PD (Desimone, 2007). Additionally, regarding math and science education, specific articles explore teacher perception before and after PD in increasing their understanding of mathematical content (Feuerborn, 2009), study the effect of PD on science teaching and achieving scientific literacy for all students (Khourey-Bowers,

2004), and describe scientists' views that PD should offer science teachers ways to make science fun and exciting for students (Taylor, 2008). Further, articles considered the integrative nature of school routine and PD as complementary processes in school reform (Gorodetsky, 2009) and PD programs as transformative in offering new ways for teachers to see themselves personally and professionally in becoming more effective and successful teachers (Jurow, 2009). In sum, this category reveals the intricacies of the work environment in schools and suggests to the reader some PD programs that have the potential to motivate and satisfy teachers, and lead to increased effectiveness and improvement in student achievement.

MV Motivation

This category highlights the increased focus on teacher motivation in recent educational research and literature. From the perspective of teachers, articles include such topics as teachers' resistance to change in educational reform (Assor, 2009), an examination of teachers' motivation and styles in relationship to their progress in PD (Campoy, 1998) and with regard to their ability to implement reform in areas such as mathematics (Manouchehri, 2004). In addition, studies focus on the educational environment, such as research examining a strong correlation between positive teacher and administrative relationships and opportunities for PD (Ellett, 1997), descriptions of professional learning communities and the results of collective action taken by school staff on behalf of increased learning for students (Hord, 1997), and the effect of Pakistani teachers' feelings of being undervalued by society and working in the least sought after profession (Javaid, 2009). From the position of those involved in designing PD programs, several articles have explored the factors that contribute most to motivating teachers to engage in PD, the ways that teachers experience their participation, and how this enhances their learning (Scribner, 1999). Others provide an overview of PD since the 1980s, with a comparison between the US and Japan and an analysis of their similarities and differences (Collinson, 2001). With the current emphasis on accountability, several articles stress the need for an integrated approach that involves teachers, administrators, policy makers, those in leadership positions, and the designers of PD programs (Leithwood, 2002).

Teacher self-direction and efficacy have been identified as essential factors in the success of PD in many sources in this literature review. A surprising number of articles on efficacy and research have shown that teacher efficacy is also an important variable in improving student performance, and stress the importance of PD programs that incorporate this element into their designs. Among these studies, articles explore the potential relationship between teachers' self-efficacy beliefs and the integration of computer technology in teaching and learning through PD (Govender, 2009), examine how the level of teaching self-efficacy of highly regarded teachers influences their experiences in PD (Scribner, 1998), research the connection between quality PD and teacher self-efficacy and its effect on student performance (Kuskovski, 2008), consider science teaching self-efficacy as a major component in improving science teaching in elementary schools (Ramey-Gassert, 1996), address the isolation of teachers by increasing teacher efficacy and successful collaboration efforts through PD (Shepard, 2009), and analyze the shift between teacher efficacy in traditional mathematics education and mathematics reform efforts (Smith, 1996). As the demand increases

regarding accountability issues for educators, high quality PD will be essential to the success of reform initiatives. This category includes resources that offer information about PD programs that focus on teacher self-efficacy as a key factor in increasing teacher competence and student achievement.

There also has been a focus on the ways in which teacher attitudes affect teaching skills, knowledge, and practices. The sources in this section cover such issues as the attitudes, motivations, and rewards of English teachers in Malaysia with regard to their use of computers in teaching English in their classrooms (Abdullah, 2006), differences between those K-12 teacher participants in a three-year PD program who persist and who drop out, through assessments of such factors as personal empowerment, satisfaction with teaching, and teacher efficacy (Edwards, 1999), and the relationship between the school professional learning environment and opportunities, and the level of dedication and motivation among teachers (Ellett, 1997). Additional topics include studies showing that PD programs are most beneficial when teachers maintain input and control in the PD process and are linked to the participants' teaching culture, curricula, and classrooms (Nir, 2008). Furthermore, research emphasized the consideration of K-12 teachers' beliefs in the importance of arts in education has resulted in missed opportunities for improved awareness of student diversity, and increased motivation, effectiveness and enjoyment in teaching and learning that the inclusion of the arts can offer (Oreck, 2004). The research in this category assists in identifying teacher attitudes towards PD and how the level of enrichment gained through this participation can be determined by individual attitudes and other more complex factors such as access, relevance and variety of PD programs.

PC PD Program Comparisons

The area of PD is of growing interest nationally and globally. This category offers articles that address the spectrum of PD models in a comparative manner, relating to characteristics of individual PD programs, and also from an international perspective. Comparative analyses included here evaluate the most significant characteristics of PD suggested by members of professional educational organizations as part of effective PD programs, with wide variation and inconsistent research findings, and emphasize the need to seek more consensus among educators (Guskey, 2003), investigate mathematics PD programs which focus on either content knowledge or pedagogical issues, along with perceived relevance and teacher enthusiasm regarding participation, offering examples of the incorporation of these two approaches in PD models (White, 2004), and identify the different attitudes of those participating towards their engagement in PD and offer insights about possible ways to adequately support this variety of attitudes for more effective outcomes (Varga-Atkins, 2009). With increasingly diverse educational environments and rapidly changing demands, the comparative analyses of PD opportunities in this section suggests ways that PD can improve both teacher and student learning.

PL Policies

PD has a key role in contributing to effective teaching that leads to positive student outcomes. The Obama administration has put forth policies that have placed developing talent within the teacher force as essential to opening up educational opportunities for all students. Additionally, with the No Child Left Behind (NCLB) legislation established by the Bush administration, content standards have come to define education in the U.S. with the theory that this will improve teacher practices and student learning. These reforms have changed the way education is being discussed in America and throughout the world, and the articles in this category reflect this. Sources included here look at ways to improve the connections between PD and early childhood policies, practices and school readiness (Zaslow, 2005), examine teacher burnout and the ways that school reform policies have contributed to this (Dworkin, 2001), and discuss recent educational policy initiatives that emphasize retaining only the best teachers and rewarding them for outstanding performance, as essential to narrowing achievement gaps, with significant implications for PD (Whitcomb, 2009). With the policy of NCLB incorporating content standards into federal law, researchers have analyzed PD programs integrating these policies and the influence of standards in teaching and learning (Snow-Renner, 2005), reported on the results of recent nationwide math tests showing that student achievement grew faster during the years before the NCLB law when states were more dominant in education policy than later when federal law became a stronger force (Dillon, 2009), and evaluated PD initiatives funded by government policymakers to address the need for improved mathematics knowledge for teaching (Hill, 2004). Authors describe how the U.S. Department of Education has established the “What Works Clearinghouse” to determine which education and PD initiatives have scientific research-based evidence of effectiveness, to make this information available to educators and policymakers (Schwartz, 2009). With the continuing demands of NCLB and the recent Obama education policies, the importance of finding the PD models most likely to improve teacher practice and student performance has become essential (Desimone, 2007). The articles found in this section offers a variety of useful resources to help understand some of the best opportunities and suggestions available for responding effectively and successfully to challenging educational reform policies.

PR Perceptions

The purpose of this section is to include articles which explore educators’ perceptions of their needs, abilities, knowledge, workplace support, values, and beliefs, and the factors of PD which have the most potential to influence what participants take from it and how it is implemented in the classroom. Topics covered in this category include the role that intrinsic rewards, such as a sense of self-worth and accomplishment, have in developing positive attitudes and motivation enhanced through PD programs that assist in the integration of technology in Malaysian schools (Abdullah, 2006), the effects of different characteristics of PD on mathematics and science teachers’ perceptions of learning, which focus on content learning and opportunities for active collective participation of teachers from the same school (Garet, 2001), and a study of science teachers’ perceptions which indicates that science content knowledge dominates over current science applications in their teaching, reflecting the need for PD that continues over time and offers considerable support through access to teaching materials and school leadership, in

order to use relevant and meaningful science applications more effectively in the classroom (Ratcliffe, 2009). Several articles highlighted the importance of teachers' perceptions of their students in creating more positive learning outcomes, such as investigating the relationship between teachers' perceptions of student motivation before and after PD and the effects of this participation on student motivation (Turner, 2008), evaluating teachers' perceptions about a PD intervention designed to increase skills in understanding students' needs and abilities with positive and proactive strategies in improving student behavior and achievement (Baker-Henningham, 2009), and analyzing the influence of high school teachers' perceptions on their use of motivation strategies in the classroom, and their need for more PD opportunities which address knowledge and skills for greater teacher effectiveness in motivating students (Hardre, 2008). The articles in this section provide information on the ways that teachers' perceptions of their own needs interact with creating the quality of learning opportunities available to their students, and the degree and types of support that are necessary to sustain successful pedagogical implementation of new practices through the educational system and PD programs.

QE Quality of Education

Striving for higher standards in education is a goal that is shared around the world, yet different criteria are used to measure progress towards this objective. In this section, a variety of topics are covered that report differing paths taken to increase the quality of education. Examples of this are articles that document efforts which attempt to demonstrate the effectiveness of PD programs that involve science teachers with very different backgrounds, experiences and abilities, and which claim that student outcomes cannot tell the whole story when discussing the best model to advance science teacher quality (Abell, 2009), report on teacher quality being dependent upon improving teaching skills through PD which addresses deeper content knowledge, ability to motivate students, communication skills, flexibility, and general knowledge about many areas of life (Keisa, 2009), and describe an example of video-based mathematics PD designed to raise the quality of mathematics education in low-performing schools (Santagata, 2009). Additionally, there are a significant number of sources concerned with the greater expectations being placed on teachers for higher student outcomes. For example, one study in Sweden reported that PD was a way to help teachers cope more effectively to maintain quality amidst higher demands in a rapidly changing educational environment and considered the support structures that are necessary for successful PD to take place (Drakenberg, 2001). A second article discussed efforts to use PD to help teachers better manage the negative aspects of their practices by identifying their strengths and how to use these more effectively (Bisplinghoff, 2005). A third focused on the motivation of school administrators and teachers to take greater ownership of their PD programs to encourage and support lifelong learning opportunities for both teachers and students (European Commission, 2005).

RS Research

Articles in this category acknowledge that a strong base of research is needed to guide the design and investment in PD for present applications. They offer evidence regarding the specific features in PD that could contribute to more effective educational practices, improved student achievement, and provide possible directions for future studies. Articles in this section highlight a variety of valued characteristics of PD, according to several professional organizations, with the need to seek consensus on criteria for the effectiveness of PD programs (Guskey, 2003) and address possible reasons as to why there is little known about what teachers learn through their PD opportunities and why knowledge about PD is limited, especially in math and science (Yager, 2005). Additionally, there are sources which examine the relationship between scientists' views of teachers as professionals and suggestions for alternatives to current practices regarding the practical role that research scientists can play in the PD of science teachers (Schuster, 2009), as well as describing a PD program which engages high school teachers in meaningful research experiences to encourage them to take these experiences back to their science classrooms (Klein, 2009). According to several authors, there has been a lack of analysis regarding the kinds of professional knowledge that are actually acquired in PD. These authors express a need for more research on the interrelationship between teacher learning, PD, teacher knowledge, and student learning (Wilson, 2009). This section provides a review of the most methodologically sound research on PD, delineating the relationship of teacher attitudes and behaviors to PD and the need to discern whether or not specific PD practices are improving student achievement.

SB Student Behavior

There are a few sources in this literature review written specifically about student behavior, and the growing interest in PD that addresses this issue. Articles in this category explore teachers' perceptions of PD interventions which deepen teachers' knowledge and understanding of students' needs and abilities, offer practical strategies to improve student conduct, and find that teachers' views of the usefulness and feasibility of these types of programs significantly influence successful implementation into their regular practice (Baker-Henningham, 2009). Additionally, these articles examine the role of interpersonal relationships in students' academic behavior and motivation, establishing a framework that guides specific actions at the student, teacher, classroom, and school levels, with implications for the design of PD (Martin, 2009). Sources provide information about the benefits that teachers have experienced from participating in PD and curriculum programs explicitly teaching improved social and emotional skills and enhancing the use of these strategies in classrooms and schools.

SC Student Characteristics

Many educators and teachers are finding that they have to develop new understandings and reconsider how students with a variety of abilities might best be taught, and are recognizing the necessity to change their practices in curriculum, pedagogy and assessment in order to address the needs of their students in all of their diversity. Consequently, educators recognize that in order to make the necessary changes, there is a new demand for PD opportunities in a wide range of areas. This category includes

articles which investigate the characteristics of PD programs in high-performing and low-performing schools as possibly contributing to the persistence of the achievement gap between underserved students and their higher performing peers in different schools (Henry-Bell, 2007), document how teachers who participated in PD programs which focused on understanding the development of students' mathematical thinking continue to implement the program long afterwards, signifying meaningful and sustained changes in their teaching practices through this kind of PD (Franke, 2001), report on an early childhood curriculum which sees children and adults as active and equal participants in the learning process, involves children in making choices, carrying out their ideas, and their reflections, with longitudinal studies showing benefits for the students which carry into adulthood, with implications for PD (Epstein, 2009), study the teaching practices within the context of gifted students and the role of PD with regard to improving teachers' abilities to differentiate curriculum and instruction for gifted students (Sharfman, 2007), and acknowledge that when teachers and administrators discuss issues of inclusion, it often leads to rethinking and restructuring school programs to improve the education of all students (Kraayenoord, 2003). In sum, this section presents conceptual, organizational and planning ideas needed to create PD opportunities with the objective of increased inclusion of all students' diverse needs, with the concurrent goals of greater teacher efficacy and improved student achievement outcomes.

SL School Administration/Leadership

School principals and leaders are at the forefront to provide stability during periods of educational reform while at the same time, being held accountable as agents of change. They are key to ensuring school effectiveness in the midst of rapidly changing educational challenges and demands. The articles in this category reflect the desires of those in educational leadership positions for PD training to better assist them in meeting continually evolving government mandates in measuring student achievement levels and performance. These sources include research that investigates the perceptions of the PD needs of public school principals to meet the required state and federal accountability measures (Keith, 2008), evaluates the consequences of poorly planned PD for teachers with little or no input or support from school leadership, which may perpetuate ineffective teaching practices (Berl, 2005), and explore the responses of teachers and school administrators to government accountability initiatives, and assess which leadership practices influence those responses, implying that some forms of PD could serve as antidotes to negative teacher and administrative responses (Leithwood, 2002). Studies show that those in educational leadership roles can support teachers in areas such as motivation, reflection, evaluation, recognition, rewards and improving the work culture (Berl, 2005), and the increasing call for the design of PD that can actively engage and prepare teachers for assuming leadership roles in their present and future positions in schools.

ST Standards

School reform efforts have recognized teacher PD as an important link between the standards movement and student achievement. Many initiatives have been put forth so

that teachers are able to have opportunities to learn new ways to teach that will develop higher order thinking in their students, so that they may gain more complex and analytical skills in order to be prepared to live, study and work in a globalized and technological world. Among the topics covered in this section is a study in which teachers in experimental preschool classrooms use math relevant activities in their daily routines resulting in these students scoring significantly higher on standardized tests of math ability than students in regular classrooms (Arnold, 2002), acknowledgement that the emphasis being placed on high-stakes testing, with its rewards and punishments, can be informative but also come with unintended negative consequences with implications for PD programs (Ryan, 2009), and a thorough examination of formal PD and other professional learning opportunities that may increase teachers' knowledge and change classroom practices to better meet federal requirements regarding student performance in the U.S. (Wei, 2009). The practice of using standardized tests to compare student achievement between teachers, schools, states, and nations has become a basis for educational reform around the world. This movement has resulted in school districts being compelled to provide more effective PD for teachers (Kelleher, 2003). This has also led to interest in developing sources such as the National Science Education Standards (NSES), which is an attempt to provide a listing of the best professional opportunities for science teachers in staff development programs (Coskie, 2008).

TC Teacher Characteristics

The category on teachers focuses on contexts, perceptions and motivations that contribute to their participation in PD, along with the level and outcomes with regard to their continuing application of what was learned and gained through this engagement. Topics include teacher persistence in PD (Edwards, 1999), entrance and exit motivations in the teaching profession (Watt, 2007), self-reported positive effects of PD (Garet, 2001), teachers' inclusion of information technology in the classroom (Wu, 2008; Mushayikwa, 2009), teachers' strengths as a positive force to counteract negatives in the teaching climate (Bisplinghoff, 2005), organizational and professional commitment and the feeling of empowerment (Bogler, 2004), best and worst incentives for PD (Chaney, 2004), and teacher reform (Boyd, 2003). In general, the articles are relevant for a wide variety of issues that affect teachers, administrators, policy makers, and designers of teacher PD programs.

TN Technology

The rapid development of technology has changed and challenged the way that education is being delivered. The power of technology has also presented unprecedented opportunities that encourage and offer educators help in solving disparities in educational resources and experiences available to students so that higher quality education is accessible for all. Many articles in this category illustrate the growing wealth of information which provides guidance in facilitating the integration of technology into the educational process. Studies have explored the perceptions of teachers' abilities with regard to their level of competence with computers and their corresponding attitudes toward technology application in the classroom, with implications for how PD can best

address these learning and teaching challenges (Govender, 2009), surveyed variables that may distinguish between high and low computer integration in the classroom, such as positive expectations, comfort level, beliefs, training and support (Mueller, 2008), and examined the factors which have influenced teachers' decisions to participate in a PD initiative focused on digital age literacy skills and the subsequent level of implementation of the ideas gained through their participation (Richardson, 2007). Additional articles have focused on the need for alternative PD models that offer teachers opportunities to share and communicate with each other and have access to quality resources, with an example of an online mathematics support network (Delgarno, 2007), and researched the participation of mathematics teachers in an online content-based mentoring program and the value of this type of active engagement for professional growth and development (McAleer, 2009). Sources in this category offer innovative approaches to adapting technological advances into positive educational initiatives, the research findings from the articles in this section may be used to assist in designing PD that promotes good teaching, learning and creative thinking practices. These articles also provide recommendations for further research.

TR Theories

In this category, I have reviewed the role of motivational theories in teachers' and other educators' motivation, engagement and implementation regarding their participation in PD, and how this has had the potential to improve student achievement. The theories mentioned in these articles, such as achievement goal theory, expectancy-value theory and self-determination theory, have been looked at in the context of PD programs and their implications for educational practice in light of these theoretical perspectives. Topics covered by articles regarding achievement goal theory include exploring the ways in which achievement goal theory affects factors such as mastery ability, ability-approach, ability-avoidance and work avoidance goals for students (Butler, 2007), examining how well achievement goal theory predicts student achievement and the relationship between teachers' and students' goals in leading to a higher level of student achievement (Robustelli, 2007), and analyzing achievement motivation and the concept of competence as an organizing framework, and the relevance of this for future PD programs (Elliot, 2005). Regarding expectancy-value theory, examples of sources in this category describe how the expectancy-value framework provides greater understanding for teachers' motivation in choosing teaching as a career, with implications for PD, academic institutions, and policy decisions (Watt, 2007), and a study of the extent to which the expectancy-value model could explain different teacher beliefs and practices related to computer technology (Wozney, 2006). For self-determination theory, articles discuss such topics as the usefulness of self-determination theory as a component in promoting educational reform (Assor, 2009), an investigation of the utilization of self-determination theory as a framework to better understand why teachers attend PD and how school administration can contribute to greater implementation of what teachers gain from their participation (Grove, 2009), and the role of self-determination theory in supplying an explanation of unintended negative consequences from high-stakes testing such as the potential for undermining both students and teachers (Ryan, 2009).

Incorporating sources that address possible theoretical approaches to teacher motivation and PD could be useful as guides to the design of PD programs and interventions.

Additional Comments

Several themes that are briefly mentioned in the literature review deserve further comment. For example, some authors acknowledge that the current emphasis on high-stakes testing, with its rewards and punishments, can be informative but also may come with unintended negative consequences, such as teaching to the test, a narrowing of the curriculum, too much uniformity resulting in fewer optimally challenged students, and crowding out enriching teaching and learning activities, with implications for PD programs. Additionally, school reform in the U.S., with its increased government mandates and requirements, has contributed to teacher burnout, affecting teachers in different ways. Further, school reform has involved a reconsideration of teachers' professional understanding of themselves, their beliefs and practices, which calls for more attention to creating PD opportunities that address the connection between teacher emotions, PD, and student learning. Finally, studies indicate at times a lack of alignment between the motivation and goals of teachers and the schools and school districts they work for, which generally facilitate PD programs and opportunities for their staff, resulting in less than satisfactory implementation of improved teacher practices in the classroom. There is a need for continued research in the design of PD programs to highlight these issues in order to offer a more thorough understanding of the influence of teachers' motivation, beliefs and abilities, reduce obstacles impeding improved teacher practices and student achievement, and result in more successful educational reform outcomes.

For future research, there are additional areas of inquiry that might be considered as contributing to a more nuanced understanding of the factors that affect teacher motivation and PD. By comparing the role, frequency, and type of PD made available to educators in a variety of contexts (e.g., public, private, and charter schools), along with evaluations of teachers' experiences and student outcomes, policy makers and other stakeholders in educational reform may be informed more thoroughly of the relationship between teacher motivation and PD. Comparative studies such as these could offer valuable insights when considering cost-benefit analyses not only in economic terms, but also with regard to reduced course offerings available for students in subjects such as the arts, history, literature, physical education, civics, and foreign languages. More research is needed to determine the causes of teacher resistance to reforms which conflict with deeply held beliefs regarding what constitutes quality educational practices. Studies with an increased focus on the assessment of factors such as personal empowerment and teacher efficacy would better enable researchers to identify the differences in participants who continue with or drop out of PD programs. This would also inform educators about the ways that shifting governmental requirements have altered the professional identities and practices of teachers. There is an urgent role for designers of PD to explore how to enhance teachers' perception of competence in the midst of educational reform, and to address

teachers' motivation with regard to their participation and subsequent ability to implement reform in a wide variety of educational contexts and environments. Educators have suggested that more in-depth analysis should be done regarding the kinds of professional knowledge that is actually acquired in PD, how this affects the relationship of teacher attitudes and behaviors towards their participation in PD, and whether or not specific PD practices are measurably improving student achievement.

Category Keyword Dictionary

Key	Description
AO	<p>Achievement and Other Outcomes</p> <p>Articles in this category consider the ways in which the design and implementation of PD programs affect student achievement outcomes, offer examples in which achievement can be motivated by the desire to experience competence by both teachers and students, and gives a foundation for future research and PD opportunities.</p>
BL	<p>Beliefs</p> <p>This section offers information which contributes to a more thorough understanding of the influence of teachers' beliefs, relevant to the design of PD programs and educational reform. In trying to resolve hindrances to the implementation of educational reform efforts, educators have examined how to take into account teachers' beliefs about these reforms and how best to support them in adopting changes in their teaching practices.</p>
CB	<p>Cost-Benefit Analysis</p> <p>This category offers a review of current issues and challenges in PD when considering qualitative and quantitative measures within a cost-benefit analysis, with specific suggestions to improve the quality and effectiveness of PD opportunities for teachers and other educators.</p>
CC	<p>Classroom Characteristics</p> <p>This section contains sources describing the main influences on the day-to-day motivation for teachers in the classroom and with regard to their participation in PD. Articles focus on the factors which may undermine or enhance teacher motivation in these types of situations and experiences, and offer examples of practical solutions for problem-solving in the classroom for those educators who have a willingness to engage in new learning and PD opportunities as they become available.</p>
CD	<p>Curriculum Domains</p> <p>Math and science education represent the vast majority of articles in this category, however ten other domains are included as well which focus on the variety of ways that teacher motivation and PD influence student achievement.</p>
CL	<p>Collaboration</p> <p>Topics in this section consider teacher collaboration as an effective means of connecting PD with the daily challenges faced by teachers. Research has shown that the inclusion of educators and other major stakeholders in the planning process and setting of goals for their PD often results in an</p>

	improved ability for participants to translate their experiences more effectively in the classroom.
CR	<p>Curriculum</p> <p>This is a diverse collection of articles describing new PD approaches to using curriculum in school reform efforts to increase student achievement. These sources convey a widespread agreement that teachers' views on the acceptability and usefulness of a particular curriculum program will significantly influence its implementation and success in integrating the curriculum into regular classroom practices towards school educational reform efforts. Several international studies are included.</p>
EI	<p>Ethnicity and Other Identities</p> <p>An individual's or group's identity may be defined by race, ethnicity or gender, along with other criteria factors such as economic status, age, religion, and professional self-understanding and perception. Implications which result from the existence of multiple identities are highlighted in this section, with recommendations for the design of PD programs which incorporate the identity of teachers and other educational leaders in furthering their personal and professional growth as well as contributing to more effective learning environments for their students.</p>
EM	<p>Empowerment</p> <p>The sources in this category provide a current view of PD as a framework within which educators can develop greater efficacy and empowerment through active engagement, in collaboration with colleagues, and involving an ongoing continuum of professional learning networks, with implications for teachers, principals, education leaders, and policy makers.</p>
EO	<p>Emotions</p> <p>In studies of emotion in educational contexts, sources in this category have shown that school reform has involved a reconstruction of teachers' professional understanding of themselves and their beliefs. School reform may lead to intense feelings that cause teacher resistance or support in changing working conditions in schools and in teachers' classroom practices, and articles in this section address the connection between teacher emotions, PD and student learning.</p>
EP	<p>Educational Innovations and Programs</p> <p>The current educational reform environment places an emphasis on the importance of PD as a means to improve student achievement. The sources in this section highlight some specific reform programs that seem to be effective and discuss which factors may be responsible for this progress.</p>
ER	<p>Educational Change and Reform</p> <p>The articles in this section evaluate the different combinations in which PD programs are being designed in order to most effectively direct educational</p>

	reform towards improving student performance in the areas most needed. Several international studies are included.
GL	<p>Grade Level</p> <p>The sources in this category cover grade levels that range from early childhood education through adult education programs, along with different international perspectives. These articles provide information on teaching concerns belonging to a particular grade level, as well as those that are shared across grade levels.</p>
IC	<p>International Comparisons</p> <p>There are 31 countries represented in this literature review. The articles in this section highlight the importance of taking into account the role of educational research in PD in many different contexts. A collection of articles from different regions of the world is available.</p>
IM	<p>Improvement</p> <p>Sources in this section explore a variety of perspectives on the factors which influence the PD of teachers and contribute to an understanding of the various situational challenges that may become obstacles for teachers in PD programs, with potential solutions in improving professional opportunities and teaching practices in the classroom.</p>
IS	<p>Institution/School Features</p> <p>Resources in this category suggest the many ways that PD can be offered to reflect the needs of the individual school environments and contexts. The types of schools represented range from elementary through high school, and encompass urban, rural, public and private school systems, and schools with different levels of student achievement.</p>
MV	<p>Motivation</p> <p>Articles are included from the perspective of teachers, as well as from those involved in designing PD programs, which explore the factors that contribute most to motivating teachers to engage in PD, the ways that teachers experience their participation, and how this enhances teacher and student learning.</p>
PC	<p>PD Program Comparisons</p> <p>This category offers articles that address the spectrum of PD models in a comparative manner, relating to characteristics of individual PD programs, and also from an international perspective. Comparative analyses included here evaluate the most significant characteristics of PD suggested by members of professional educational organizations as part of effective PD programs.</p>
PL	<p>Policies</p> <p>The No Child Left Behind (NCLB) legislation established by the previous</p>

	<p>Bush administration, and the policies of the Obama administration have changed the way education is being discussed in the U.S. and throughout the world, and the articles in this category reflect this, highlighting the importance of finding the PD models most likely to improve teacher practice and student performance.</p>
PR	<p>Perceptions</p> <p>The sources in this section offer information regarding the ways that teachers' perceptions of their own needs interact with the types of support that are necessary to sustain successful pedagogical implementation of new practices through the educational system and PD programs. Articles in this category address the roles that intrinsic rewards, such as a sense of self-worth and accomplishment, have in developing positive attitudes and motivation to engage in PD programs.</p>
QE	<p>Quality of Education</p> <p>In this section, a variety of topics are covered that report differing paths taken to increase the quality of education. Additionally, there are a significant number of sources concerned with greater expectations being placed on teachers for higher student outcomes and potential solutions which demonstrate effectiveness in advancing educational quality and increasing student achievement.</p>
RS	<p>Research</p> <p>The articles in this category acknowledge that a strong base of research is needed to guide the design and investment in PD for present applications, and offer evidence regarding the specific features in PD that could contribute to more effective educational practices, improved student achievement, and possible directions for future studies.</p>
SB	<p>Student Behavior</p> <p>Sources in this section explore teachers' perceptions of PD interventions which deepen teachers' knowledge and understanding of students' needs and abilities, offer practical strategies to improve student conduct, and suggest that teachers' views of the usefulness and feasibility of these types of PD programs significantly influence successful implementation into their regular classroom practice.</p>
SC	<p>Student Characteristics</p> <p>This category includes articles which investigate the characteristics of PD programs in high-performing and low-performing schools, and document how teachers who participated in PD programs which focused on understanding the development of students' thinking continue to implement the programs long afterwards, signifying meaningful and sustained changes in their teaching practices through this kind of PD.</p>
SL	<p>School Administration/Leadership</p>

	<p>The articles in this section reflect the desires of those in educational leadership positions for PD training to better assist them in meeting continually evolving government mandates in measuring student achievement levels and performance. Studies show an increasing call for the design of PD that can actively engage and prepare teachers for assuming leadership roles in their present and future positions in schools.</p>
ST	<p>Standards</p> <p>New standards require new approaches to educating students, and sources in this section evaluate several different options for improving student achievement by enhancing the capacity of teachers and schools through PD to more successfully bridge the demands of students' learning experiences and the demands of the federally mandated standards movement.</p>
TC	<p>Teacher Characteristics</p> <p>This category focuses on contexts, perceptions and motivations that contribute to teachers' participation in PD, along with the outcomes resulting from their application of what was learned and gained through this engagement. The articles are relevant for a wide variety of issues that affect teachers, administrators, policy makers and designers of teacher PD programs.</p>
TN	<p>Technology</p> <p>Sources in this category illustrate the growing wealth of information which provides guidance in facilitating the integration of technology into the educational process. For educators who seek innovative approaches to adapting technological advances into positive educational initiatives, the research findings from the articles in this section may be used to assist in designing PD that promotes good teaching, learning and creative thinking practices.</p>
TR	<p>Theories</p> <p>The motivational theories mentioned in these articles, such as achievement goal theory, expectancy-value theory and self-determination theory, have been looked at in the context of PD programs and their implications for educational practice in light of these theoretical perspectives. Sources that suggest possible theoretical approaches to teacher motivation and PD could be useful to educators in guiding the design of PD programs and interventions.</p>

Key	Resource
CD IS MV PR TN	Abdullah, N. A., Abidin, M. J. Z., Luan, W. S., Majid, O., & Atan, H. (2006). The attitude and motivation of English language teachers towards the use of computers. <i>Malaysian Online Journal of Instructional Technology (MOJIT) Theory and Research in Education</i> , 3(1), 57-67.
AO CD QE	Abell, S. (2009). <i>A model for evaluating science teacher professional development projects</i> . Paper presented at the European Science Education Research Association (ESERA) conference. Retrieved from http://www.pdeval.missouri.edu/docs/products/esera%2009%20abell%20paper%208509.pdf
CL EP MV	Abrami, P. C., Poulsen, C., & Chambers, B. (2004). Teacher motivation to implement an educational innovation: Factors differentiating users and non-users of cooperative learning. <i>Educational Psychology</i> , 24(2), 201-216.
EP GL IC PL	Adams, D., & Swadener, B. B. (2000). Early childhood education and teacher development in Kenya: Lessons learned. <i>Child and Youth Care Forum</i> , 29(6), 18.
MV TC	Arbaugh, F. (2003). Study groups as a form of professional development for secondary mathematics teachers. <i>Journal of Mathematics Teacher Education</i> , 6(2), 139-163.
EP GL SC ST	Arnold, D. H., Fisher, P. H., Doctoroff, G. L., & Dobb, J. (2002). Accelerating math development in head start classrooms. <i>Journal of Educational Psychology</i> , 94(4), 762-770.
ER	Assor, A., Kaplan, H., Feinberg, O., & Tal, K. (2009). Combining

MV PL PR TR	vision with voice: A learning and implementation structure promoting teachers' internalization of practices based on self-determination theory. <i>Theory and Research in Education</i> , 7(2), 234-243.
AO RS	Au, W. (2007). High-stakes testing and curricular control: A qualitative metasynthesis. <i>Educational Researcher</i> , 36(5), 258–267.
AO IS MV	Aunola, K., Leskinen, E., & Nurmi, J.-E. (2006). Developmental dynamics between mathematical performance, task motivation, and teachers' goals during the transition to primary school. <i>British Journal of Educational Psychology</i> , 76(1), 21-40.
CD GL MV	Backhaus, K. (2009). Desire for professional development among adjunct business faculty. <i>Journal of Faculty Development</i> , 23(1), 40-47.
CR EP IC MV PR SB TC	Baker-Henningham, H., & Walker, S. (2009). A qualitative study of teacher's perceptions of an intervention to prevent conduct problems in Jamaican pre-schools. <i>Child Care Health and Development</i> , 35(5), 632-642.
AO EP	Banilower, E. R. (2002). <i>Results of the 2001-2002 study of the impact of the local systemic change initiative on student achievement in science</i> . Chapel Hill, NC: Horizon Research.
CR ER GL IC	Bantwini, B. D. (2010). How teachers perceive the new curriculum reform: Lessons from a school district in the Eastern Cape Province, South Africa. <i>International Journal of Educational Development</i> , 30(1), 83-90.

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CB GL IM QE	Barnett, W. S., & Kelley, P. J. (2006). A framework for cost-benefit analysis of professional development in early care and education. In M. E. Zaslow & I. E. Martinez-Beck (Eds.), <i>Critical issues in early childhood professional development</i> (pp. 313-337): Baltimore, MD, US: Paul H Brookes Publishing.
EI PL	Barrett, B. D. (2009). No child left behind and the assault on teachers' professional practices and identities. <i>Teaching and Teacher Education, 25</i> (8), 1018–1025.
AO GL MV	Barsby, C. E. (2008). Reading calibration: Quantitative study exploring the extent calibration affects teachers' motivation to pursue professional development. <i>Dissertation Abstracts International Section A: Humanities and Social Sciences, 68</i> (9-A).
IS MV	Basom, M. R., & Frase, L. (2004). Creating optimal work environments: Exploring teacher flow experiences. <i>Mentoring & Tutoring: Partnership in Learning, 12</i> (2), 241-258.
GL TC	Beard, G. V. (2008). The adult learner, professional development, and the literacy coach: An effective professional development model proposal. <i>Dissertation Abstracts International Section A: Humanities and Social Sciences, 68</i> (8-A), 96.
CD IS MV SL	Berl, P. S. (2005). Developing early to mid career teachers. <i>Exchange: The Early Childhood Leaders' Magazine Since 1978, NA</i> (162), 6-10.
EM IC	Bezzina, C., & Camilleri, A. (2001). The professional development of teachers in Malta. <i>European Journal of Teacher Education, 24</i> (2), 14.
CC	Bikner-Ahsbahs, A. (2003). <i>A social extension of a psychological</i>

CD TR	<i>interest theory</i> . Honolulu, HI: International Group for the Psychology of Mathematics Education.
IM MV QE TC	Bisplinghoff, B. (2005). Taking time to tend to the "good". <i>Educational Horizons</i> , 48(1), 35-38.
CD EP IS	Blank, R. K., & de las Alas, N. (2009). <i>Effects of teacher professional development on gains in student achievement: How meta analysis provides scientific evidence useful to education leaders</i> . Washington, D.C.: Council of Chief State School Officers.
AO ER TC	Blazer, C. (2005). <i>Literature review on professional development for teachers</i> . Miami, FL: Miami-Dade County Public Schools.
AO MV	Blazevski, J. L. (2007). Teacher efficacy for supporting student motivation. <i>Dissertation Abstracts International Section A: Humanities and Social Sciences</i> , 67(7-A), 2460.
EI IC PC TC	Blömeke, S., & Paine, L. (2008). Getting the fish out of the water: Considering benefits and problems of doing research on teacher education at an international level. <i>Teaching and Teacher Education</i> , 24(8), 2027-2037.
IC IS MV TC	Bogler, R., & Somech, A. (2004). Influence of teacher empowerment on teachers' organizational commitment, professional commitment and organizational citizenship behavior in schools. <i>Teaching and Teacher Education</i> , 20(3), 277-289.
AO ER	Borko, H. (2004). Professional development and teacher learning: Mapping the terrain. <i>Educational Researcher</i> , 33(8), 3-15.
EM	Boyd, S. E., Banilower, E. R., Pasley, J. D., & Weiss, I. R. (2003).

EP IS TC	<i>Progress and pitfalls: A cross-site look at local systemic change through teacher enhancement.</i> Chapel Hill, NC: Horizon Research Inc.
CC GL IS MV TC	Bozack, A. R. (2008). Growing new teachers: The relationship among professional development, efficacy beliefs, and classroom practices. <i>Dissertation Abstracts International Section A: Humanities and Social Sciences</i> , 69(2-A).
AO MV	Bray-Clark, N., & Bates, R. (2003). Self-efficacy beliefs and teacher effectiveness: Implications for professional development. <i>Professional Educator</i> , 26(1), 13-22.
CB IM	Brett, K., & Mathews, C. (1996). Building an evaluative climate in continuing professional development--The NPDP: SA experience. <i>Australian Journal of Adult and Community Education</i> , 36(3), 181-192.
IC QE TC	Brighouse, T. (2008). Putting professional development centre stage. <i>Oxford Review of Education</i> , 34(3), 313-323.
CC CL MV	Bruce, C. D., & Ross, J. A. (2008). A model for increasing reform implementation and teacher efficacy: Teacher peer coaching in grades 3 and 6 mathematics. <i>Canadian Journal of Education</i> , 31(2), 346-370.
CL IM TC	Butler, D. L., Lauscher, H. N., Jarvis-Selinger, S., & Beckingham, B. (2004). Collaboration and self-regulation in teachers' professional development. <i>Teaching and Teacher Education</i> , 20(6), 435-455.
AO IS	Butler, R. (2007). Teachers' achievement goal orientations and associations with teachers' help seeking: Examination of a novel approach to teacher motivation. <i>Journal of Educational Psychology</i> ,

MV TC	99(2), 241-252.
CC IC MV	Buumlmen, N. T. (2009). Possible effects of professional development on Turkish teachers' self-efficacy and classroom practice. <i>Professional Development in Education</i> , 35(2), 261-278.
AO CL IS TR	Cabrera, A., & Cabrera, E. (2002). Knowledge-sharing dilemmas. <i>Organization Studies</i> , 23(5), 687-710.
GL MV QE	Camilia, A. (2001). Maintaining teacher motivation. <i>Suite101.com</i> , from http://www.suite101.com/article.cfm/effective_teacher/62074/1
BL GL IM MV	Campoy, R. W., & Hoewisch, A. (1998). Moral and instructional influences of teachers in professional development schools. <i>Professional Educator</i> , 20(3), 7-23.
MV TC	Chaney, S. (2004). Six best and worst incentives for professional development. <i>The Delta Kappa Gamma Bulletin</i> , 70(2), 10-14.
GL MV TC	Chen, J.-Q., & Chang, C. (2006). Testing the whole teacher approach to professional development: A study of enhancing early childhood teachers' technology proficiency. <i>Early Childhood Research & Practice (ECRP)</i> , 8(1).
IS	Clement, M., & Vandenberghe, R. (2000). Teachers' professional development: A solitary or collegial (ad)venture? <i>Teaching and Teacher Education</i> , 16(1), 81-101.
CD IS	Cohen, S. (2004). <i>Teachers' professional development and the elementary mathematics classroom: Bringing understandings to</i>

	<i>light</i> . Mahwah, New Jersey: Lawrence Erlbaum Associates.
MV PC QE	Collinson, V., & Ono, Y. (2001). The professional development of teachers in the United States and Japan. <i>European Journal of Teacher Education</i> , 24(2), 26.
CR GL TC	Collopy, R. (2003). Curriculum materials as a professional development tool: How a mathematics textbook affected two teachers' learning. <i>The Elementary School Journal</i> , 103(3), 287-311.
CB ER GL IS	Corcoran, T. C. (1995). <i>Transforming professional development for teachers: A guide for state policymakers</i> . Washington, DC: National Governors' Association.
CC CD IS MV ST	Coskie, T. L., & Place, N. A. (2008). The National Board certification process as professional development: The potential for changed literacy practice. <i>Teaching and Teacher Education</i> , 24(7), 1893-1906.
CD GL IC	Courtney, J. (2007). What are effective components of in-service teacher training? A study examining teacher trainers' perceptions of the components of a training programme in mathematics education in Cambodia. <i>Journal of In-service Education</i> , 33(3), 19.
EP SL	Crawford, P. A., Roberts, S. K., & Hickmann, R. (2008). All together now: Authentic university-school partnerships for professional development. <i>Childhood Education</i> , 85(2), 6.
AO CC CD EI	Crockett, M. D., Chen, C.-H., Namikawa, T., & Zilimu, J. (2009). Exploring discourse-based assessment practice and its role in mathematics professional development. <i>Professional Development in Education</i> , 35(4), 677-680.

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CD GL TN	Dalgarno, N., & Colgan, L. (2007). Supporting novice elementary mathematics teachers' induction in professional communities and providing innovative forms of pedagogical content knowledge development through information and communication technology. <i>Teaching and Teacher Education</i> , 23(7), 1051-1065.
EI EO ER TC	Darby, A. (2008). Teachers' emotions in the reconstruction of professional self-understanding. <i>Teaching and Teacher Education</i> , 24(5), 1160-1172.
IC IM TR	Day, C., & Sachs, J. (2005). <i>International handbook on the continuing professional development of teachers</i> . United Kingdom: Open University Press, McGraw-Hill companies.
CD IS MV	Desimone, L., Smith, T. M., & Phillips, K. J. R. (2007). Does policy influence mathematics and science teachers' participation in professional development? <i>Teachers College Record</i> , 109(5), 1086-1122.
AO ER	Desimone, L. M., Porter, A. C., Garet, M. S., Yoon, K. S., & Birman, B. F. (2002). Effects of professional development on teachers' instruction: Results from a three-year longitudinal study. <i>Educational Evaluation and Policy Analysis</i> , 24(2), 81-112.
CC CD EP GL	Dickinson, D., & Caswell, L. (2007). Building support for language and early literacy in preschool classrooms through in-service professional development: Effects of the Literacy Environment Enrichment Program (LEEP). <i>Early Childhood Research Quarterly</i> , 22, 243-260.
AO PL	Dillon, S. (2009, October 14, 2009). Sluggish results seen in math scores. <i>New York Times online</i> . Retrieved from

	http://www.nytimes.com/2009/10/15/education/15math.html?_r=1&scp=1&sq=sluggish%20results%20seen%20in%20math%20scores&st=cse
CC CD GL	Dixon, J. K., Egendoerfer, L. A., & Clements, T. (2009). Do they really need to raise their hands? Challenging a traditional social norm in a second grade mathematics classroom. <i>Teaching and Teacher Education</i> , 25(8), 1067–1076.
IC QE	Drakenberg, M. (2001). The professional development of teachers in Sweden. <i>European Journal of Teacher Education</i> , 24(2), 10.
CD CL GL MV TN	Duran, M., Brunvand, S., & Fossum, P. R. (2009). Preparing science teachers to teach with technology: Exploring a K-16 networked learning community approach. <i>Turkish Online Journal of Educational Technology</i> , 8(4), 21-42.
ER PL	Dworkin, A. G. (2001). Perspectives on teacher burnout and school reform. <i>International Education Journal</i> , 2(2), 69-78.
EP TR	Eccles, J. S. (1994). Understanding women’s educational and occupational choices. <i>Psychology of Women Quarterly</i> , 18(4), 585-609.
EM GL MV	Edwards, J. L., & Green, K. E. (1999). <i>Persisters versus nonpersisters: Characteristics of teachers who stay in a professional development program</i> . Paper presented at the Annual Meeting of the American Educational Research Association.
GL MV TC	Ellett, C. D., Hill, F. H., Liu, X., Loup, K. S., & Lakshmanan, A. (1997). <i>Professional learning environment and human caring correlates of teacher efficacy</i> . (No. Report: ED411206. 30pp. Mar 1997): Paper presented at the Annual Meeting of the American Educational Research Association (Chicago, IL, March 24-28,

	1997).
AO MV SC TR	Elliot, A. J., & Dweck, C. S. (2005). <i>Handbook of competence and motivation</i> . New York: Guilford Press.
CR SC	Epstein, A. S. (2009). The HighScope preschool curriculum and dimensions of preschool curriculum decision-making. <i>Early Childhood Services: An Interdisciplinary Journal of Effectiveness</i> , 3(3), 193-208.
IC IS PL QE	European Commission, & Culture, D.-G. f. E. a. (2005). <i>CPD for teachers and trainers</i> . Dublin, Ireland.
IC PC	Fernandez, C. (2002). Learning from Japanese approaches to professional development. <i>Journal of Teacher Education</i> , 53(5), 393-405.
CD IS	Feuerborn, L. L., Chinn, D., & Morlan, G. (2009). Improving mathematics teachers' content knowledge via brief in-service: a US case study. <i>Professional Development in Education</i> , 35(4), 531-545.
ER	Fishman, B. J., Marx, R. W., Besta, S., & Talb, R. T. (2003). Linking teacher and student learning to improve professional development in systemic reform. <i>Teaching and Teacher Education</i> , 19(6), 643-658.
EP ER	Fixsen, D. L., Blase, K. A., Horner, R., & Sugai, G. (2009). Readiness for change. In S. I. S.-u. o. E.-b. Practices, F. C. D. Institute & T. U. o. N. C. a. C. Hill (Eds.) (Vol. 3).
AO SB	Flecknoe, M. (2002). Measuring the impact of teacher professional development: can it be done. <i>European Journal of Teacher</i>

	<i>Education, 25(2/3), 16.</i>
AO CC GL TC	Fortino, C., Gerretson, H., Button, L. J., & Johnson, S. (2002). <i>Using literacy integration for communicating scientifically: Research results on teacher efficacy and student achievement.</i> University of Northern Colorado. Adams Twelve Five Star School District.
TC TN	Fowler, E. L. (2008). Teacher use and integration of technology in Alabama K--12 public school classrooms: Influences and barriers. <i>Dissertation Abstracts International Section A: Humanities and Social Sciences, 68(7-A), 109.</i>
CC CD SC	Franke, M. L. (2001). Capturing teachers' generative change: A follow-up study of professional development in mathematics. <i>American Educational Research Journal, 38(3), 653-689.</i>
IC	Fraser, C., Kennedy, A., Reid, L., & Mckinney, S. (2007). Teachers' continuing professional development: contested concepts, understandings and models. <i>Journal of In-service Education, 33(2), 17.</i>
RS TC	Fukkink, R. G., & Lont, A. (2007). Does training matter? A meta-analysis and review of caregiver training studies. <i>Early Childhood Research Quarterly, 22, 294-311.</i>
AO GL MV RS SC	Fulmer, S. M., & Frijters, J. C. (2009). A review of self-report and alternative approaches in the measurement of student motivation. [Journal]. <i>Educational Psychology Review, 21(3), 219-246.</i>
EP IC IS	Gamage, D., & Hansson, P. (2006). A comparative study of profiles and perspectives on professional development of school leaders in Australia and Sweden. <i>Education and Society, 24(3), 61-81.</i>

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CC PR TC	Garet, M. S., Porter, A. C., Desimone, L., Birman, B. F., & Yoon, K. S. (2001). What makes professional development effective? Results from a national sample of teachers. <i>American Educational Research Journal</i> , 38(4), 915-945.
CD GL	Goebel, C. A., Umoja, A., & DeHaan, R. L. (2009). Providing undergraduate science partners for elementary teachers: Benefits and challenges. <i>CBE - Life Sciences Education</i> , 8(3), 239-251.
CD IS MV TC	Goos, M., Brown, R., & Makar, K. (2008, June 28-July 1, 2008). <i>Navigating currents and charting directions. Proceedings of the annual conference of the Mathematics Education Research Group of Australasia (31st, Brisbane, Queensland, Australia, June 28-July 1, 2008). Volumes 1 and 2.</i> Paper presented at the Annual Conference of the Mathematics Education Research Group of Australasia, Queensland, Australia.
ER IS	Gorodetsky, M., & Barak, J. (2009). Back to schooling: Challenging implicit routines and change. <i>Professional Development in Education</i> , 35(4), 585-600.
GL MV PR TN	Govender, D., & Govender, I. (2009). The relationship between Information and Communications Technology (ICT) integration and teachers' self-efficacy beliefs about ICT. <i>Education as Change</i> , 13(1), 153-165.
BL CC CD ER	Gregoire, M. (2003). Is it a challenge or a threat? A dual-process model of teachers' cognition and appraisal processes during conceptual change. <i>Educational Psychology Review</i> , 15(2), 147-179.
CL GL	Grider, A. T. (2008). Elementary, middle, and high school teachers' perceptions of professional learning community and sense of

MV PR	efficacy. <i>Dissertation Abstracts International Section A: Humanities and Social Sciences</i> , 69(4-A).
CC ER TC	Grierson, A. L., & Gallagher, T. L. (2009). Seeing is believing: Creating a catalyst for teacher change through a demonstration classroom professional development initiative. <i>Professional Development in Education</i> , 35(4), 567-584.
MV TR	Grove, C. M. (2009). The importance of values-alignment within a role-hierarchy to foster teachers' motivation for implementing professional development. <i>Dissertation Abstracts International Section A: Humanities and Social Sciences</i> , 69(7A).
CC CD EP GL RS	Grove, C. M., Dixon, P. J., & Pop, M. M. (2009). Research experiences for teachers: Influences related to expectancy and value of changes to practice in the American classroom. <i>Professional Development in Education</i> , 35(2), 247-260.
CD TC	Guskey, T. R. (2000). <i>Evaluating professional development</i> . Thousand Oaks, Calif.: Corwin Press.
MV	Guskey, T. R. (2002). Professional development and teacher change. <i>Teachers and Teaching: Theory and Practice</i> , 8(3/4), 381-391.
ER PC RS	Guskey, T. R. (2003). What makes professional development effective? <i>Phi Delta Kappan</i> , 84(10).
CD CL ER QE	Hanley, P., Maringe, F., & Ratcliffe, M. (2008). Evaluation of professional development: Deploying a process-focused model. <i>International Journal of Science Education</i> , 30(5), 711-725.

IC	Hansen, A., & Simonsen, B. (2001). Mentor, master and mother: the professional development of teachers in Norway. <i>European Journal of Teacher Education</i> , 24(2), 12.
CC IS MV PR SC	Hardre, P. L., & Sullivan, D. W. (2008). Teacher perceptions and individual differences: How they influence rural teachers' motivating strategies. <i>Teaching and Teacher Education</i> , 24(8), 2059-2075.
AO MV TC TR	Hardre, P. L. B. (2003). The effects of instructional design professional development on teaching performance, perceived competence, self-efficacy, and effectiveness. <i>Dissertation Abstracts International Section A: Humanities and Social Sciences</i> , 63(12-A).
CD GL IC MV	Harrison, C., Hofstein, A., Eylon, B.-S., & Simon, S. (2008). Evidence-based professional development of science teachers in two countries. <i>International Journal of Science Education</i> , 30(5), 577-591.
IS MV TC	Harvey, P., Sinclair, C., & Dowson, M. (2005). Teacher motivations for postgraduate study: Development of a psychometric scale for Christian higher education. <i>Christian Higher Education</i> , 4(4), 241-264.
EI IS MV SC	Henry-Bell, M. R. (2007). Professional development in high- and low-performing elementary schools serving large numbers of African American, Latino, and low-socioeconomic students. <i>Dissertation Abstracts International Section A: Humanities and Social Sciences</i> , 68(3-A).
EM IS	Henson, R. K. (2000). The effects of participation in teacher research on teacher efficacy and empowerment. <i>Dissertation Abstracts International Section A: Humanities and Social Sciences</i> ,

	<i>Vol 61(1-A), Jul, 2000. pp. 82., 61(1-A).</i>
EM MV	Henson, R. K. (2001). The effects of participation in teacher research on teacher efficacy. <i>Teaching and Teacher Education, 17(7)</i> , 819-836.
CL EP SC	Herner-Patnode, L. (2009). Educator study groups: A professional development tool to enhance inclusion. <i>Intervention in School and Clinic, 45(1)</i> , 24-30.
CD ER GL IC	Higgins, J., & Parsons, R. (2009). A successful professional development model in mathematics: A system-wide New Zealand case. <i>Journal of Teacher Education, 60(3)</i> , 231-242 .
GL PL TC	Hill, H. C., & Ball, D. L. (2004). Learning mathematics for teaching: Results from California's Mathematics Professional Development Institutes. <i>Journal for Research in Mathematics Education. Washington: Nov 2004. Vol. 35, Iss. 5; pg. 330, 35(5).</i>
GL IS MV TC	Holloway, J. H. (2003). Sustaining experienced teachers. <i>Educational Leadership, 60(8)</i> , 87-89.
CL GL IM MV SL	Hord, S. M. (1997). <i>Professional learning communities: Communities of continuous inquiry and improvement</i> . Austin, TX: Southwest Educational Development Laboratory.
CD EP	Horizon Research, I. (2001). <i>What have we learned? Local systemic change initiatives share lessons from the field</i> . Retrieved from
IS	Hoy, A. W., & Spero, R. B. (2005). Changes in teacher efficacy

MV PR	during the early years of teaching: A comparison of four measures. <i>Teaching and Teacher Education</i> , 21(4), 343-356.
AO ER PL	Hursh, D. (2007). Assessing No child left behind and the rise of neoliberal education policies. <i>American Educational Research Journal</i> , 44(3), 493-518.
AO TC	Ingvarson, L., Meiers, M., & Beavis, A. (2005). Factors affecting the impact of professional development programs on teachers' knowledge, practice, student outcomes & efficacy. <i>Education Policy Analysis Archives</i> , 13(10), 1-28.
CD MV	Jansen, D. J. (2008). Validation of an instrument for mathematics enhancement teaching efficacy of Pacific Northwest agricultural educators. <i>Dissertation Abstracts International Section A: Humanities and Social Sciences</i> , 69(1-A), 71.
IC MV	Javaid, N. (2009). Teacher motivation – an area of neglect. Canadian International Development Program (CIDA) Pakistan Programme.
GL MV TC TR	Jesus, S. N. d., & Lens, W. (2005). An integrated model for the study of teacher motivation. <i>Applied Psychology: An International Review</i> , 54(1), 1 - 147.
IC TC	Joldoshalieva, R. (2007). Continuing teacher professional development in post-Soviet Kyrgyzstan. <i>Journal of In-service Education</i> , 33(3), 14.
CD GL IS	Jones, E., Hampton, E. M., Brown, E. M., & Leinenbach, M. T. (2009). Impacting teacher mathematical knowledge and attitudes with grade-appropriate methods. <i>Professional Development in Education</i> , 35(2), 279-283.
EI ER	Jurow, S. (2009). Cultivating self in the context of transformative professional development. <i>Journal of Teacher Education</i> , 60(3),

IS SL	277-290.
MV RS	Kaplan, A., Karabenick, S. A., & de Groot, E. (2009). <i>Culture, self, and motivation: Essays in honor of Martin L. Maehr</i> . Information Age Publisher.
IC TN	Karagiorgi, Y., & Lymbouridou, C. (2009). The story of an online teacher community in Cyprus. <i>Professional Development in Education, 35</i> (1), 119-138.
EP IC QE TC	Keisa, V. (2009). <i>Analysis of teacher's professional development</i> . Paper presented at the International Scientific Conference on Society, Integration, Education. Rezekne, Latvia, Feb 27-28, 2009.
SL	Keith, D. L. (2008). Principal desirability for professional development. <i>Dissertation Abstracts International Section A: Humanities and Social Sciences, 69</i> (4-A).
EI EO ER IS	Kelchtermans, G. (2005). Teachers' emotions in educational reforms: Self-understanding, vulnerable commitment and micropolitical literacy. <i>Teaching and Teacher Education, 21</i> (8), 995-1006.
CB CC SC ST	Kelleher, J. (2003). A model for assessment-driven professional develop. <i>Phi Delta Kappan. Bloomington, 84</i> (10).
IC PC	Kennedy, A. (2005). Models of continuing professional development: A framework for analysis. <i>Journal of In-service Education, 31</i> (2), 16.
AO	Khourey-Bowers, C., & Simonis, D. G. (2004). Longitudinal study

CD IS MV	of middle grades chemistry professional development: Enhancement of personal science teaching self-efficacy and outcome expectancy. <i>Journal of Science Teacher Education</i> , 15(3), 175-195.
IC TC	Killeavy, M. (2001). Teacher education in Ireland: the induction and continuing professional development of primary teachers. <i>European Journal of Teacher Education</i> , 24(2), 18.
CD GL MV	Kitchens, A. N., & Wenta, R. G. (2007). Merging invitational theory with mathematics education: A workshop for teachers. <i>Journal of Invitational Theory and Practice</i> , 13, 34-46.
EI GL IC MV RS	Klassen, R. M., Chong, W. H., Huan, V. S., Wong, I., Kates, A., & Hannok, W. (2008). Motivation beliefs of secondary school teachers in Canada and Singapore: A mixed methods study. <i>Teaching and Teacher Education</i> , 24(7), 1919-1934.
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