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The Facilitator's Role in Elementary Mathematics Professional Development

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This study identified qualities of influential facilitators of elementary mathematics professional development. Extensive research relating to elementary mathematics professional development has emerged over the past three decades. Embedded in this body of research are recommendations for effective practices in professional development and examinations of models that have utilized these effective practices. However, little emphasis has been placed on the role of the facilitator in professional development for elementary mathematics. A phenomenological design was utilized to determine how twenty United States elementary school teachers characterized influential facilitators of professional development. Emerging themes indicate teachers in this sample perceived influential facilitators along five themes: (1) Credibility, (2) Support, (3) Motivation, (4) Management, and (5) Personality. Based on these findings, a multiplicative effect is introduced as a potential framework for increasing teacher motivation during professional development.

A reform movement calling for educators to transform existing instructional practices in mathematics to focus less on developing procedural competency and more on developing conceptual understanding has emerged in the United States over the past thirty years (National Council of Teachers of Mathematics, 2000). In support of this goal, the National Research Council [NRC] (2001) identified five key proficiencies (1) conceptual understanding, or the comprehension of concepts, operations, and relations; (2) procedural fluency, or the ability to carry out procedures with ease; (3) strategic competence, or the ability to formulate, represent, and solve problems; (4) adaptive reasoning, which includes logical thought, reflection, explanation, and justification; and (5) productive disposition, requiring teachers to instil the belief in their students that mathematics is useful and worthwhile (NRC, 2001). When the NRC examined the results of the National Assessment of Educational Progress assessments in 1996 to determine if students in the United States are mathematically proficient in all of these strands, they found that, "they [the students] are most proficient in aspects of procedural fluency and less proficient in conceptual understanding, strategic competence, adaptive reasoning, and productive disposition" (2001, p. 136). This analysis, along with results from international assessments such as the Third International Mathematics and Science Study [TIMSS] indicate that teachers are still using instructional practices that do not align with the goals of the reform movement (Stigler, Fernandez, & Yoshida, 1996; Stigler & Hiebert, 2004; Vincent & Stacey, 2008).

Professional Development for Elementary Mathematics Teachers

Consequently, the need to improve teacher quality through ongoing professional development has been emphasized in research literature relating to elementary mathematics. Lee and Ginsberg (2009) confirm this need for professional development when describing the misconceptions early childhood teachers have about mathematics instruction. In their article, the authors describe teachers of young children as "confused and anxious about the teaching and learning of mathematics, and hesitant to change" (p. 37). Forgasz (2005) also reiterates the importance of professional development when trying to improve teacher quality in mathematics when discussing teacher beliefs related to gender and technology in both an international context and specific to the United States.

However, even with the call for improving teacher quality, many elementary school teachers in the United States do not receive a significant amount of professional development geared towards mathematics. Boyle and Lamprianou's (2006) findings from a three-year longitudinal study of models of professional development indicate that only 10% of mathematics teachers in their sample participated in professional development lasting two days or longer. In 2000, only 12% of fourth grade teachers in the United States received 16-35 hours of professional development in mathematics, while 7% received 36 or more hours during a single school year (Usiskin & Dossey, 2004). With such little time devoted to professional development in mathematics, it is essential that teachers be exposed to high-quality experiences with facilitators who are able to engage and motivate participants, as well as challenge their beliefs and practices.

Challenging Teachers' Beliefs and Practices

The literature related to best practices in professional development recommends creating disequilibrium for teachers by challenging assumptions about the best ways of teaching mathematics (Even, 2005; Leikin & Rota, 2006; Seaman, Szydlik, & Szydlik, 2005). Fennema and colleagues (1993) described five levels of teachers that were encountered in professional development, representing a continuum of beliefs from traditional to reform-minded. This study supported the findings of Carpenter, Fennema, Peterson, Chiang and Loef (1989), which indicated a correlation between teacher beliefs and students' problem solving ability. Hiebert and Stigler (2004) describe results from the TIMSS video study where teachers perceive a change in beliefs; however, these changes were only considered marginal.

When teachers' beliefs about the nature of learning and teaching mathematics shifted to be more reform-minded, their students demonstrated better problem solving abilities (Franke & Kazemi, 2001). Cobb (2000) and Simon (2000) emphasized the need to problematize teachers' instructional practices to facilitate the development of this disequilibrium. Bobis, Clarke, Clarke, Thomas, Wright, Young-Loveridge and Gould (2005) also recommend creating this disequilibrium through the implementation of an early childhood mathematics curriculum and concurrent professional development model. The Count Me in

Too professional development program enabled teachers to examine practice in relation to their students' thinking in early number learning.

In addition, the importance of reflection in professional development as a means of improving mathematics instruction has been cited in the research literature. In an examination of elementary teachers' reflections on instructional practices, Ticha and Hospesova (2006) found that these reflections became more content-focused over time. Gellert (2008) discussed the need to consider social contexts when examining professional development experiences. In this study, Gellert used a phenomenological approach when examining the potential conflict that could arise as a result of these communities of practice. Findings from this study emphasize the need for teachers to be self-reflective while participating in professional development experiences (Gellert, 2008).

The Role of the Professional Development Facilitator

While the literature relating to effective practices in mathematics professional development is extensive, there is little focus on the role of the facilitator during professional development experiences. When examining a wide-scale implementation of mathematics professional development, Weiss and Pasley (2006) describe the quality of professional development sessions as varying due to the inability of the facilitator to support teacher learning.

> While many sessions were excellent, evaluators also noted many missed opportunities for deepening teacher understanding of content and pedagogical strategies; in general, professional development quality suffered to some degree from ineffective delivery by teacher leaders. (p. 5)

In 2007 Sztajn, Hackenberg, White and Allexsaht-Snider examined the role of the facilitator in a school-based mathematics education community by investigating the development of trust between teachers and facilitators. Teachers in this study identified three components of the professional development experience that were vital to the development of reciprocal trust among colleagues "the professionalism of the mathematics educators, the organization of the project, and the establishment of school-university relations" (p. 983). This study provides empirical evidence regarding the importance of considering the role of the facilitator in mathematics professional development. Nipper and Sztajn (2008) emphasized the necessity to focus on the role of the facilitator when presenting a theoretical framework for mathematics professional development. The framework represented professional development in an instructional triangle with the "teacher developer" or facilitator acting as a vertex, signifying the importance of the facilitator in engaging teachers during professional development experiences. The authors recommended future study on the collaboration and education of facilitators of mathematics professional development.

The role of the facilitator has been a topic of inquiry in areas outside of mathematics education. The use of school-based coaching has become an increasingly prevalent method of ongoing professional development in literacy (Costa & Garmston, 2002; Knight, 2009). In this model, coaches are hired within

schools or districts to work with teachers as they implement lessons. Gibson (2005) analyzed the role of a literacy coach as perceived by two school-based literacy coaches at the elementary level. Participants in the study described a level of resistance existing between coaches and teachers and a lack of engagement or motivation from teachers during professional development experiences. These participants also described the need for coaches to listen and take teachers' needs into consideration when developing sessions. Gibson (2005) indicated the necessity for coaches to not be chosen based solely on experience or knowledge, but also based on the coaches' ability to critically examine their own practice. McGatha (2008) also studied the role of a facilitator in professional development through coaching by examining the interactions of two coaches with teachers. Results indicated the importance of defining the role of the coach and the coaching experience by providing a clear focus for teachers. While both of these studies provide insight about the role of the facilitator in professional development, they each utilize a small sample size of only two participants to determine results.

In the field of vocational education, Santoro (2005) argues for the need to investigate the facilitators' role in professional development, in particular, how the role changes in response to socio-cultural differences. Results from a qualitative case study investigating how the social and cultural backgrounds of four trainers intersect with discourse occurring in vocational education and training indicate the need for reflective practice and the examination of facilitator beliefs regarding the implementation of professional development experiences.

In early childhood education, Riley and Roach (2006) describe the need for facilitators to use a constructivist approach when working with day care providers in ongoing professional development, however it was necessary for these facilitators to be flexible when dealing with certain situations, "In particular instances, Training Specialists adopted a directive role by pointing out unhealthy conditions or unsafe practices" (p. 369). In this study, researchers found that facilitators who were trusted by participants proved to be more effective in terms of creating change. However, it is unclear what qualities these facilitators possessed to develop reciprocal trust with participants.

Examples of research focusing on the facilitator of professional development are prevalent in areas outside of mathematics education. Although few studies in mathematics education exist focusing on the facilitator, there are recommendations embedded in the literature relating to effective models of professional development that suggest qualities necessary for facilitators to be influential. Carpenter and his colleagues stressed the need for the facilitator to have a high level of content knowledge in mathematics to support the learning of participants when examining the effects of Cognitively Guided Instruction (Carpenter, Fennema, Franke, Levi, & Empson, 1999, 2000). Cobb (2000) and Simon (2000) identify the need for facilitators to problematize participants' current instructional practices to induce critical reflection. Methods such as Lesson Study (Fernandez & Cannon, 2005; Hiebert & Stigler, 2000) and Teaching Experiments (Gellert, 2008; Norton & McCloskey, 2008) emphasize the need for facilitators to modify professional development experiences to fit the context of participants.

These essential characteristics of facilitators: (1) a high level of content knowledge, (2) the ability to problematize instructional practices, and (3) the ability to modify experiences to fit participants' contexts are identified in the literature relating to effective models of professional development. While it is necessary for a facilitator to possess these three qualities, that facilitator could still be unsuccessful in motivating teachers in professional development experiences. While examined in other content areas, the specific characteristics for influential facilitators of professional development have not been examined in the literature relating to elementary mathematics. The purpose of the current study was to determine the qualities that United States elementary school teachers in eight South Carolina counties perceived as essential when describing influential facilitators of elementary mathematics professional development.

Research question and theoretical framework

A phenomenological approach was utilized to investigate the central research question:

> What do South Carolina teachers experiencing two separate models of elementary mathematics professional development identify as influential characteristics of the facilitators of professional development?

For the purpose of this study, professional development was operationally defined as any teacher learning, district mandated or not, that is dedicated to improving teacher quality. Influential was operationally defined in two parts. First, influential was defined as having the ability to engage or motivate teachers to participate in learning experiences. Second, influential indicated the ability to increase teacher learning during professional development. Thus, this study focused on what teachers perceive are the characteristics that are necessary for facilitators to both motivate and support the learning of participants during professional development experiences.

The operational definition of a facilitator of professional development was limited in this study to someone who has moved away from the traditional, or additive, approach to professional development where trainers transmit or tell information and teachers are passive recipients. Lambert (2003) draws a parallel between the roles of a teacher in constructivist teaching to the role of a facilitator in constructivist leading. According to Lambert (2003), constructivist teachers seek and value students' points of view, structure lessons to challenge students' suppositions, recognize that tasks must be meaningful, structure lessons around big ideas, and utilize formative assessment in making instructional decisions. In comparison, a constructivist leader or a facilitator seeks out and values teachers' point of view, structures leadership to challenge teacher beliefs, constructs meaning through reflection and dialogue, and assesses teacher learning in context. Schools or districts will sometimes hire a facilitator of professional development from outside organizations. However, a facilitator of professional development can also be a teacher leader from within the school confines, an administrator dedicated to improving teacher quality, or it can be the teachers

themselves. For the purposes of this study, a facilitator was defined as someone who supports the learning of teachers.

The theoretical framework guiding this study was grounded in motivation theory. In order for a facilitator of professional development to be influential, they must engage teachers or motivate them to learn from professional development experiences. This study primarily centred on Bandura's social cognitive theory (1986). In this theory, Bandura identified three constructs: (1) environment, (2) self, and (3) behaviours, which act in a symbiotic manner to influence motivation. Embedded in this theory is the notion of self-regulation, or peoples' ability to control learning through the necessary combination of academic learning skills and self-control, or what is commonly known as the skill and the will to complete a task. Self-regulation focuses on the need for a person to recognize their own ability to learn, however, this recognition is heavily dependent upon perceptions of the world around them. Bandura's social cognitive theory (1986) identifies perceptions as integral to influencing motivation. Participants must first be engaged in the experience before they can learn from the experience.

A wealth of research has been conducted on the roles people can play in influencing motivation (Groth & Bergner, 2007; Könings, Brand-Gruwel, & van Merriënboer, 2007; Vogt, Hoecevar, & Hagedoren, 2007; Watt & Richardson, 2007). Role models have been shown to increase motivation through such qualities as perceived competence, perceived prestige, or perceived connections (Bandura, 1986). If the goal is to motivate teachers to be engaged in professional development, then examinations of their perceptions as they relate to the role of the facilitator are necessary to identify specific factors that may influence teacher engagement.

Research Design

This study explored teacher perceptions of influential facilitators, a topic that had not been examined in the research literature relating to mathematics professional development. Because these perceptions relate to the experience of professional development, a phenomenological design was appropriate. According to Schram (2006), a phenomenology investigates, "the meaning of a lived experience of a small group of people from the standpoint of a concept or phenomenon" (p. 98). The phenomenon investigated in this study was elementary mathematics professional development with an influential facilitator. In attempting to identify and extract the qualities of an influential facilitator it was necessary to ascertain the meaning of the experience from teachers.

An assumption of this type of research is that perceptions provide evidence of a lived reality (Moustakas, 1994; Schram, 2006). This assumption is grounded in the work of Husserl who first proposed the notion that perceived truths could be discovered through analysis of objects or events as experienced through the self or through one's consciousness (Moustakas, 1994). Schram (2006) identifies language as the primary medium for meaning to be discovered. Therefore, this approach called for the use of in-depth interview techniques and descriptive analysis to provide insight to the essence of the experience of having an influential facilitator. Polkinghorne (1989) recommends the inclusion of

approximately 10 participants to complete a phenomenological study. The two samples of elementary teachers identified for this study were each comprised of 10 participants.

Sampling Techniques

Participants in this study were K-5 elementary school teachers from eight counties in South Carolina who had experienced transformative mathematics professional development. Two subgroups of teachers were identified. The first subgroup (labelled Group I in Table 1) was comprised of teachers who had experienced ongoing, content-focused models of professional development.

Table 1
Demographics of Group I and Group II participants

Demographic Criteria	Sample Demographics	Group I (*N*)	Group II (*N*)	% of Total Participants
County Employed	Florence	4	0	20%
	Lexington	0	1	5%
	Anderson	0	2	10%
	Greenville	1	3	20%
	Greenwood	4	0	20%
	York	1	0	5%
	Pickens	0	2	10%
	Oconee	0	2	10%
Grade Level	Kindergarten	0	1	5%
	1st Grade	0	1	5%
	2nd Grade	2	1	15%
	3rd Grade	3	1	20%
	4th Grade	1	3	20%
	5th Grade	3	2	25%
	Special Education	1	1	10%
Ethnicity	Caucasian	9	9	90%
	African American	1	1	10%
Gender	Male	1	0	5%
	Female	9	10	95%
Years of Experience	1-3	0	1	5%
	4-10	4	5	45%
	11-15	2	1	15%
	16-20	1	2	15%
	Above 20	3	1	20%

The second subgroup of teachers (labelled Group II) was comprised of those who had experienced content-focused models of professional development that were isolated into a one or two day experience. By controlling for the type of experience (transformative rather than additive) the researcher was able to extract meaning relating to the person providing the experience, not the experience itself. In this study, the researcher was attempting to examine the "who" not the "what" in professional development, therefore a consistent approach to professional development was necessary in participant selection.

Participants for Group I included teachers that experienced ongoing transformative professional development in the context of their own schools with a state-hired mathematics coach. These coaches, or facilitators, work with teachers at the elementary level to improve instruction through reflection and collaboration (Dempsey, 2007; Harwell-Lee, 1999). Participants were identified through convenience sampling techniques by working with mathematics supervisors and coaches in a variety of school districts who acted as gatekeepers by providing contact with potential teachers. The possibility of bias on the part of these participants could have been introduced because the facilitators provided the connection for the researcher; however, all efforts were made during interviews to triangulate data by having participants provide specific examples of if and when the facilitator was influential.

Participants in Group II were selected based on their involvement with isolated transformative professional development experiences prior to implementing a reform-based elementary mathematics curriculum. Participants were selected for Group II by working with the same gatekeepers from Group I to identify teachers who met the necessary criteria. After finding a pool of teachers in both groups who fit the inclusion criteria, the researcher used maximal variation sampling techniques to ensure representation of groups in terms of age, years of experience, and type of position (Creswell & Plano Clark, 2007). To clarify, it is unclear if the facilitators who worked with these participants were actually influential in terms of transforming teacher practice. This study only examines teacher perceptions of facilitators in an attempt to develop a framework for identifying influential facilitators in the future. Table 1 provides an overview of the demographics for each subgroup of participants (all participants were state employed).

Procedures for Data Collection and Analysis

Semi-structured interviews were conducted for each subgroup concurrently during the fall of 2008. A sample of these questions is outlined in Table 2. The use of a semi-structured protocol instead of a formal protocol allowed each participant to speak openly about their experiences (Moustakas, 1994). The use of semi-structured questions also enabled the researcher to guide the interview and keep participants focused on the data needed to understand this phenomenon (Flick, 2005). Subjects in this phase were each interviewed separately and the interviews occurred at a time and place chosen by participants. Each interview was digitally recorded and lasted for approximately

45 minutes to one hour. The researcher transcribed interviews within a week following each interview. In an effort to increase trustworthiness, the researcher provided participants with an electronic copy of the transcript and asked them to confirm their responses.

Table 2
Example questions from interviews

1. Describe some of your experiences with professional development in mathematics. What tasks were you asked to do? Describe the structure of the experience Describe th e environment in which this PD occurred.
2. Was there a time when you really got a lot out of a professional development experience? Describe this experience What made it rewarding? Did the facilitator do anything to support this experience? What?
3. Was there a time when you did not get a lot out of a professional development experience? Describe this experience Why wasn't it rewarding? Did the facilitator do anything to hinder the experience? What?
4. What do you think of when I say the word facilitator?
5. Has a facilitator ever motivated you to be engaged in a professional development experience? What did they do to motivate you? Were there characteristics about the facilitator that you liked? What? Were there characteristics about the facilitator that you disliked? What? Did they do anything to make you unmotivated?
6. Has there been a time when a facilitator turned you off to a professional development experience? Describe this encounter. What qualities did this person display that led you to be disengaged? How could they have been better? Describe your feelings toward this facilitator.
7. What does the word influential mean to you?

The researcher utilized Moustakas' (1994) framework of data analysis for a transcendental phenomenological design. This framework begins with repetitive readings of each interview transcription to ascertain an overall impression of the data and to identify overarching patterns in data (Creswell, 2003). During this process, it was necessary for the researcher to distance, or bracket, herself from the data to avoid preconceptions about the experience. This process, which Schram (2006) identifies as "Epochè", enables researchers to suspend their own beliefs in an effort to immerse them in the meaning of the experience as described by the participants.

Isolating and extracting significant statements from interview transcripts within subgroups enabled a primary analysis of the data. These statements were then used to create meaning units, which were clustered into common themes (Moustakas, 1994). The clustering process was completed twice before final themes were established for each subgroup of participants. One trained doctoral student acted as an independent rater during this process to establish inter-rater agreement. This student was presented with the common themes and asked to analyse an excerpt of twenty statements from the data that were identified as significant. This analysis resulted in 85% agreement between the researcher and additional coder. The three statements that were coded differently were examined and discussed, which resulted in 100% agreement between coders.

Following the primary analysis of data, the researcher conducted a secondary review by identifying common themes between groups. Once themes were established, a data reduction phase occurred where all repetitive meaning units were eliminated. A table outlining the derived themes was developed following the secondary data analysis and data reduction process. This table was sent electronically to participants for a second member check. Fifty percent of all participants responded to this member check and all agreed with the findings as displayed in the table. There was no consensus among participants regarding the theme that should be classified as most important, indicating that participants view the qualities categorized under all themes as necessary to be an influential facilitator.

Results

Individual textural descriptions were developed for each of the 20 participants. The researcher used these individual textural descriptions to form composite textural descriptions for each theme emerging from the data (Moustakas, 1994). These composite textural descriptions provide the meaning or essence for participants as a whole when experiencing an influential facilitator of elementary mathematics professional development. Five themes emerged from the data analysis of both groups: (1) Credibility, (2) Support, (3) Motivation, (4) Management, and (5) Personality. What follows is a composite textural description for each of these five themes with evidence from interview transcripts for each of the five themes and their corresponding meaning units. Based on the data, it is insufficient for a facilitator to display evidence of only one or two themes; all must be present for that facilitator to be influential in motivating teachers to transform instructional practice.

Credibility

Credibility, as perceived by participants, encompasses the characteristics that demonstrate the facilitator's qualifications and capability to conduct professional development for teachers of elementary mathematics. Facilitators demonstrating these characteristics increase participant confidence by enabling them to feel secure that the information presented or discussed during professional development is coming from a trustworthy source. This confidence is critical if facilitators want to influence instructional practice. If participants are not confident that a facilitator is credible, they are less likely to accept what the facilitator is recommending during professional development. Participants identified this lack of confidence as common in their professional development experiences. Four central characteristics emerged as meaning units for the theme of credibility: (1) knowledge, (2) experience, (3) proof, and (4) professionalism (see Table 3). Participants categorized facilitators as non-credible if one of these qualities was missing.

Table 3:
Excerpts from transcripts for the meaning units of the credibility theme

Meaning Unit	Excerpt from Transcript
Knowledge	I just feel like she is so knowledgeable on the content of each grade level, because there are so many grade levels sometimes in professional development and she makes it meaningful to a Kindergarten teacher, just as meaningful to me as a fifth grade teacher (Participant 9).
Experience	Well, I would think someone who was going to do elementary mathematics, they should have taught math at the elementary level. Maybe two or three different grades (Participant 20).
Proof/Evidence	When you see statistics, however accurate the testing is, when you see that compared to either in district, in state, nationally or internationally you see sort of where you're falling in that. I think that is incentive enough to make you want to know how to do something more effectively (Participant 13).
Professionalism	I just think if a professional development is a professional thing, you should dress and act the part (Participant 8).

Participants identified knowledge in three different ways, (1) knowledge of content, (2) knowledge of pedagogy, and (3) knowledge of new practices in education. An influential facilitator of elementary mathematics professional development must have a thorough understanding of mathematical content at

both the elementary level and beyond. They must be able to answer questions related to mathematical content or provide a way for participants to find answers. It is also necessary for a facilitator to understand the best ways to teach the content at the elementary level. This understanding of pedagogy should encompass the continuum between early childhood and upper elementary grade levels. In addition to knowledge of content and pedagogy, an influential facilitator will demonstrate knowledge of new practices related to education. Participants often cited a lack of new information as a non-influential characteristic of a facilitator.

Participants across both samples stressed the need for facilitators to have two main types of experience in order to be influential. They need current classroom experience at the elementary level and experience with the topic about which they are facilitating. Participants identified facilitators with elementary classroom experience as understanding of the issues that teachers currently face and realistic of the expectations that are demanded of teachers. Participants valued empathy over sympathy from facilitators. If a facilitator had classroom experience, but it was at a level above elementary school, teachers were less likely to categorize that experience as influential. Many participants felt it was necessary for facilitators to have experience at the specific grade level they were working with in professional development. If a facilitator was working with teachers from kindergarten through fifth grade, that facilitator should have experience at kindergarten, first, second, third, fourth, and fifth grade in order to exude a high level of credibility. Experience in one grade at the early childhood level (kindergarten through second grade) and one grade at the upper elementary level (third through fifth grade) was also considered highly credible.

The facilitator must also demonstrate experience with their topic, in this case, with elementary mathematics. Facilitators should be able to describe specific instances where they have used the recommended methods in their own instructional practices. Participants cited this type of experience as valuable because facilitators then have the ability to provide hints or answer questions teachers may have about implementing these practices in their own instruction.

Participants stressed the need for facilitators to provide proof or evidence that their topic was beneficial to classroom instruction. It was not enough for a facilitator to possess the belief that their topic would improve student achievement in mathematics; evidence of this increase in student achievement should be presented through standardized test scores or student work in order for a facilitator to increase their level of credibility. There was no mention of evidence for increasing student motivation or dispositions towards mathematics when participants were asked to define evidence or proof. This definition was not surprising considering the amount of emphasis placed on standardized testing in the United States. These findings could indicate that teachers do not place value on issues of motivation or dispositions in mathematics, but rather on performance measures of student achievement.

The last piece categorized under the theme of credibility was the need for facilitators to act, speak, and dress in a professional manner. Participants described

experiences where facilitators used curse words, dressed inappropriately, or behaved in a disrespectful manner. When these experiences occurred, teachers identified these facilitators as being non-influential due to a lack of integrity.

Support

The second theme emerging from the data, Support, indicated the need for facilitators to provide encouragement to participants before, during, and after professional development. According to participants, facilitators should demonstrate the ability and, perhaps more importantly, the desire to provide support in two ways: (1) by providing assistance to participants and (2) by reacting to participants in an appropriate manner (see Table 4). The qualities categorized under Support enable participants to develop trust in the facilitator, a feeling that is essential to transformative professional development.

Table 4:
Excerpts from transcripts for the meaning units of the support theme

Meaning Unit	Excerpt from Transcript
Providing Assistance	We emailed her one day and said 'When you get a chance can you come and talk to us' well, she rearranged her schedule so that she could meet with us that next morning because that was important. If it was important to us, then it was important to her (Participant 18).
Reactions to Participants	It was as if we were learning together, so they knew that we were all in the same boat and that attitude always helps too because it makes you feel like, 'Well, I can give input and it's important and they are giving me input' and it builds the relationship or the rapport (Participant 3).

The need for facilitators to provide assistance to teachers is the only area emerging in the data that differed between samples of participants. This need was evident in both samples; however it was described differently depending on the model of professional development that was experienced by participants. Those experiencing a model of isolated transformative professional development often described the feeling that they were exposed to professional development and then were expected to immediately implement changes in classroom practice regardless of how confident or capable they felt about the techniques. They identified the need for facilitators of professional development to be available following a professional development experience and believed that this need was not currently being fulfilled in their isolated professional development experiences. Many participants described the feeling that facilitators could not fully meet teacher needs because they were not present long enough to develop an understanding of the context.

In contrast, those who had experienced a model of ongoing professional development categorized the support received from facilitators as an influential or positive characteristic. These participants recognized the importance of this type of support and often cited experiences where changes in instructional practices were evident because they felt confidence and trusted that their facilitator would provide support or assistance if necessary.

While the need for support through ongoing assistance was described differently between samples, both samples identified the ability to provide assistance during a professional development session as essential in building trust. A facilitator should provide assistance during a session by affording enough time for participants to complete and discuss activities, by offering a variety of resources for teachers to use during or following sessions, and by providing incentives such as food or prizes during professional development. If a facilitator supplied these types of support during a session, participants were more likely to be engaged in the experience.

The way a facilitator reacts to teachers during sessions can either build or deteriorate the amount of trust teachers feel. Many participants describe the feeling that facilitators do not view them as equals. This feeling was intensified when facilitators' reactions toward questions or comments made by teachers were considered condescending or dismissive. Facilitators must instil the feeling that they are 'on the same level' as teachers and that any comments or questions are valid and will be treated as such. Participants value facilitators who listen to what they have to say and who are open to criticism or differing opinions during professional development. An influential facilitator is someone who establishes personal connections with teachers and makes an effort to get to know more about the lives of teachers in the session. This facilitator will establish a community of learners within a session where teachers learn from each other and the facilitator participates in the learning process. This facilitator will also present material in a way that 'makes sense' to participants and will not introduce mathematical content that is 'too far over the participants' heads'. They will exhibit a sense of caring or understanding towards participants and will continuously encourage them during sessions. Finally, an influential facilitator will alter a professional development session to meet the needs of the teachers they are serving. They will react to these needs by tailoring a professional development session for the context of participants.

Motivation

The third theme emerging from the data is Motivation. Participants suggested that the motivation of a facilitator to approach their job in a meaningful or effective manner was important. Participants discussed two areas in which motivation can be seen: (1) the rationale for being a facilitator and (2) demonstrating belief or excitement about the topic (see Table 5). A motivated facilitator is not conducting professional development for a 'pay cheque'. Their goal is to influence change in instructional practice by helping teachers and supporting

students. According to participants, a facilitator's main goal is to improve student achievement. However, participants did not mention the need for facilitators to focus on improving student motivation or dispositions towards mathematics. Participants describe instances in which facilitators tell participants that they don't want to be there in an effort to make a personal connection, a characteristic that could be categorized under Support; however, this effort backfires on the facilitator because teachers view the facilitator as having a lack of proper motivation for their position. Motivated facilitators demonstrate a love of mathematics and for seeing people achieve in mathematics by exuding enthusiasm during professional development experiences.

Table 5:
Excerpts from transcripts for the meaning units of the motivation theme

Meaning Unit	Excerpt from Transcript
Rationale	Her love for, not just math, but truly wanted to see the kids succeed. That is her one goal. All the kids. Not just the high group or not just bringing the low kids from the bottom up, she really and truly wants to see all the kids succeed (Participant 5).
Belief or Excitement About Their Topic	She was wholeheartedly, she wasn't only talking it, she was walking it too. She was telling us what she truly believed (Participant 2).

Management

The fourth theme emerging from the data, Management, encompasses the methods for presenting content in a professional development session. This theme does not pertain to the actual content that is presented. Three meaning units are clustered under this theme: (1) session management, (2) making the material meaningful, and (3) organization (see Table 6). The facilitator's actions when presenting material to teachers can be categorized under session management. Influential facilitators will manage a session by moving around rather than standing in one place at the front of the room. They will use group activities rather than lecture to present the content and they will engage participants in reflective discussions.

Table 6:
Excerpts from transcripts for the meaning units of the management theme

Meaning Unit	Excerpt from Transcript
Physically What They Do	I love the interaction, the not so much lecture, but here is a task, go work on that for a little while and let's come back, group work, I enjoy that as an adult. I learn from my peers and when I have the opportunity to sit with a group of other teachers in a professional development situation and the facilitator lets us work together, that is so powerful for me (Participant 9).
Making it Meaningful	When we left, we were like, 'Wow, what a new idea', you know seeing something new that you know would be beneficial for you and your students. More so for the students (Participant 2).
Managing Materials and Session	If they are not organized in their speech and the way they present the material, they may be all over the place and you are lost, you are still trying to figure out what exactly are they trying to tie together. So their ability to organize the material and present it (Participant 7).

Influential facilitators will present meaningful information to participants because they have anticipated their needs and wants prior to a professional development session. Participants described facilitators who have met their needs during sessions by connecting the information to current practices or by making it useful to them by making the information immediately applicable to their current situations. They also valued facilitators who presented challenging experiences. Activities that are done during a professional development session should connect explicitly to classroom practice. A facilitator conducting an experience devoted primarily to improve teacher content knowledge in mathematics must show how improving content knowledge connects to classroom practice in order to influence or motivate teachers. In addition to making the information meaningful, an influential facilitator will have the professional development experience organized effectively. They will have all materials prepared prior to the session and have these materials easily accessible by participants during the session. They will not waste time by 'getting off track' and they will dismiss participants on time.

Personality

The fifth and final theme emerging from the data is Personality. Personality represents the facilitator's demeanour or the way they act, not their reactions towards participants. Reactions towards participants were categorized under Support. Participants describe the characteristics clustered under Personality as

setting the tone for an entire professional development experience. Participants identified both positive and negative personality characteristics of facilitators that were present in their experiences (see Table 7).

Table 7:
Excerpts from transcripts for the meaning units of the personality theme

Meaning Unit	Excerpt from Transcript
Positive Qualities	It is almost like you have to entertain teachers just like we are expected to entertain students in the classroom. They say there is a little bit of drama and acting in what you do to keep them motivated (Participant 18).
Negative Qualities	Arrogant, very arrogant. 'I am not in the classroom anymore, you are, aw poor baby'. I have heard that before. I'm like, 'There's the door, don't let it hit you on the way out' (Participant 17).

According to participants, influential facilitators are friendly and outgoing; they have a sense of humour and have the ability to laugh at themselves. They are energetic yet relaxed. They display a sense of confidence and calm. They are entertaining and include jokes or tell stories when presenting. Non-influential facilitators are boring and monotone. They are opinionated, arrogant, and can be rude toward participants. When they speak, they are not animated and seem sad. They are standoffish or unapproachable. Participants identified a facilitator's personality as essential to building a positive rapport within the professional development session. Without a positive personality, a facilitator cannot make the connections necessary to build a community of learners among teachers.

The phenomenology conducted in this study resulted in the emergence of five themes outlining the essence of how teachers perceive an influential facilitator of elementary mathematics professional development: (1) Credibility, (2) Support, (3) Motivation, (4) Management, and (5) Personality. Teachers labelled the meaning units clustered under each of these themes as influential across both samples. There was no hierarchy of themes identified in this study. Participants emphasize that all five themes must be present for a facilitator to be influential. Facilitators must be credible, ensuring teacher confidence. They must display a desire to support teachers, enabling teachers to build a sense of trust. Facilitators must be motivated, showing the same passion for facilitating that their participants do for teaching. They must demonstrate management capability, providing teachers with organized experiences that are meaningful because they are connected to practice. Finally, they must have a positive personality, building rapport with teachers and enabling them to enjoy the overall experience.

Discussion

Results from this study can inform the practice of current facilitators of elementary mathematics professional development as to what they can do to influence teachers and support their learning during professional development experiences. Facilitators should be mindful of how teachers perceive their actions and demeanour during professional development experiences. Based on the study findings, teacher perceptions and facilitator intentions may differ drastically. All participants in this study remembered facilitators that were arrogant or that looked down upon teachers. Although this attitude was obvious to teachers, it is improbable that the facilitators who worked with participants were aware of their perceived arrogance.

The five themes identified by participants provide a framework for facilitators to assess their own practice. Findings indicate that facilitators should use group work and discussion during professional development sessions to support teacher learning. Facilitators should also attempt to connect to teachers by showing an understanding of their professional context and by demonstrating a genuine interest in the opinions of participants. Facilitators should use reflection after professional development experiences to determine if the characteristics identified through this study are apparent in their own professional practice. While many of these individual practices are currently evident in professional development for elementary mathematics, it is the combined effect that is significant to participants when identifying influential facilitators.

In this study, a multiplicative effect was found to potentially increase motivation, meaning that all themes must be present for a facilitator to be perceived as influential by participants. If one category is not represented, the facilitator will not be influential. An influential facilitator must possess perceived competence, prestige, and connections, which can all be categorized under the theme of Credibility. In addition, influential facilitators must possess perceived personality, management ability, motivation, and support in order to motivate participants. Figure 1 (see page 62) provides a conceptual framework of the multiplicative effect for influential facilitators.

Future investigations of this multiplicative effect are necessary to determine if facilitators who are perceived as influential increase teacher motivation during professional development and to determine the implications that increased motivation holds for instructional practice.

Findings from this study also suggest implications for those people who hire or evaluate facilitators of professional development. By identifying what teachers perceive are the characteristics of influential facilitators of professional development, they will be better equipped to find educators that will be influential facilitators. Those people who hire or train facilitators of professional development should consider the possibility of using more than one person during professional development experiences because finding one facilitator to meet the multiple needs indicated by participants in this study may be a difficult

task to achieve. Perhaps a facilitator possesses the knowledge and personality necessary to be influential, but does not have any classroom experience. The addition of a second facilitator who has classroom experience may potentially increase participants' motivation during a professional development session. Future research is necessary to assess whether co-facilitation can increase teacher motivation during professional development.

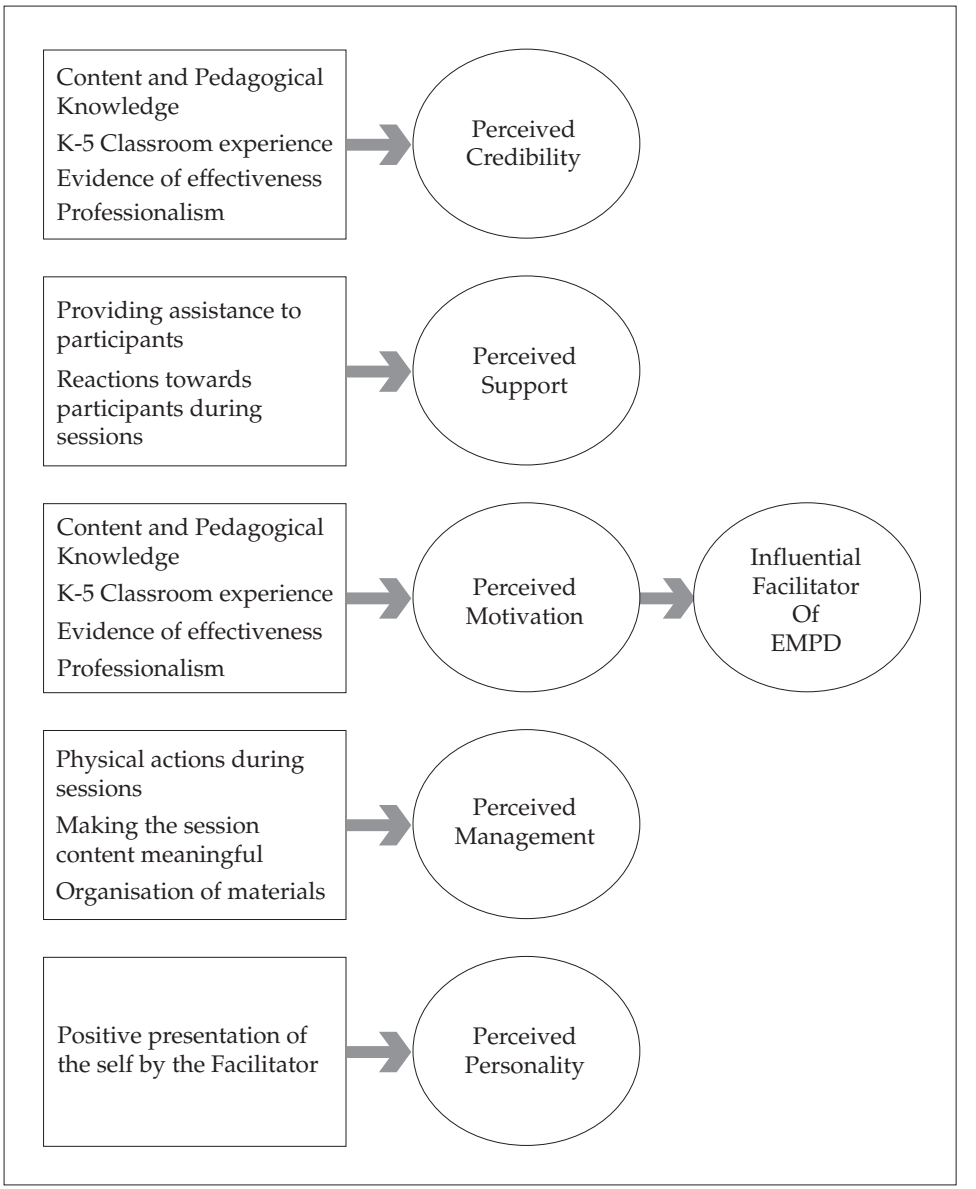

Figure 1. Multiplicative effect for teacher motivation.

Conclusion

For the past three decades, a reform movement has existed for the teaching and learning of elementary mathematics. A call for research examining the effects of professional development on teacher quality and student achievement has occurred concurrently with this reform movement (Borko, 2004; Darling-Hammond, & Hammerness, 2005). Although extensive research has been conducted on professional development in mathematics, a review of the literature revealed a lack of research related to the role of the facilitator in elementary mathematics professional development. This study was conducted in response to the gap identified in the research to examine how teachers perceive influential facilitators of elementary mathematics professional development. While it lays a foundation for understanding the role of the facilitator, it also represents a call for action for future research on how facilitators can influence teachers to be motivated during professional development. More research is required to determine if these characteristics of influential facilitators can be generalized across different samples of teachers. Research is also required to determine what implications the use of influential facilitators can hold for instructional practice and student achievement in elementary mathematics.

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