2015-12-01

Teacher Participation and Motivation inProfessional Development

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A thesis submitted to the faculty of
Brigham Young University
in partial fulfillment of the requirements for the degree of

Master of Arts

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December 2015

ABSTRACT

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Although professional development is accepted as important for making educational improvements, some have been unsuccessful due to how the teachers choose to participate, and the lack of motivation in teachers to attend or implement the suggested changes. A case study of secondary mathematics teachers in a required professional development is used to look at teachers' motivation and participation during the professional development. This study compared mathematics teachers' motivation to attend with ways of participating in order to determine how these influence a teacher's intent to change. It was found that certain aspects of motivation and participation does influence a teacher's intent to change.

Keywords: Professional development, motivation, intent to change, participation

ACKNOWLEDGEMENTS

I'd like to thank the many people who helped and supported me through this process. First I'd like to thank my advisor, Dawn Teuscher, for all the many hours she spent and the efforts she made to help me with this study. I'd also like to thank my family and friends who supported me, and gave me advice throughout this process.

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CHAPTER 1: INTRODUCTION

While teaching in the same district for five years I was part of Math Cadre and Algebra Task Force, two professional development committees with the goal to gain helpful information about teaching mathematics and to disseminate that information to other mathematics teachers throughout the district. The dissemination was done mostly through professional developments that we planned and provided. I was both a facilitator and a participant in many different professional developments throughout the years. In both capacities I encountered teachers who attended but had no intention to learn from the professional development. I saw teachers sign in, have a snack, and then slip out the door when no one was paying attention. I saw teachers play on their phone or grade papers the entire time without pretending to be interested in what was being presented or discussed. I asked myself, do these teachers not care? Do they realize that the purpose of professional development is to aid them in becoming a better teacher? It was because of these experiences that I want to investigate professional development and how individual mathematics teachers participate in the professional development to determine if participation may influence their teaching practices.

Rationale

I provide a rationale for investigating mathematic teachers' participation in professional development by first discussing the purpose of professional development and why it is important. After that I discuss what makes professional development effective. Lastly, I identify how motivation and participation are missing aspect in professional development research and present my research questions.

Purpose and Importance of Professional Development

Professional development is intended to provide teachers with resources to improve or change their teaching practices in order to improve student learning. There are different approaches to assist teachers in improving their practice so professional development opportunities or activities have different structures. The purpose of a professional development could be for teachers to learn new teaching methods, to broaden their subject matter content knowledge, or to stay informed of changing policies (Scotchmer, McGrath, & Coder, 2005). The most common topics for professional development activities include using effective instructional strategies and increasing academic content area knowledge (U.S. Department of Education, 2011).

There is always something that a teacher can learn to improve their teaching practice. Being a teacher includes a continuous growth and a commitment to learning throughout one's career and professional development is ideal to meet these needs (NCTM, 1991). Professional development provides a structured opportunity for teachers to gain knowledge without having to seek it out on their own.

Professional development is key to accomplishing the current reform changes in mathematics education. These current changes are influenced by the NCTM standards (1991, 2000), and more recently by the Common Core State Standards (2010) and Principles to Actions (NCTM, 2014). Educational policies are putting additional demands on teachers, curriculum developers, schools, and parents to provide quality education to all students. In order to meet the demands on teachers, they need the support provided through appropriate professional development (Sowder, 2007). Research findings have shown that almost no notable improvements in education occur without professional development (Guskey, 2000). Because of

its vital role in education, school districts and schools are heavily invested in the success of professional development activities.

In order to enact improvements, schools funds are used for improving and developing teacher practices through professional development. In a 2010-2011 survey on use of funds under Title II, Part A it was found that schools and districts used 42% of funds for professional development activities where the most common topics included using effective instructional strategies and increasing academic content area knowledge (U.S. Department of Education, 2011). Of the funds used for professional development, 25% were allocated to activities in mathematics. A lot of time and money is used to develop and implement professional development in mathematics education with the intent to improve instruction and teachers' content knowledge with the ultimate goal to improve student learning.

Ineffective Professional Development

Since the purpose of professional development is to promote change, I define ineffective professional development as programs that do not promote teacher change. Although ineffective professional development is not defined in the literature, the definition I provide reflects what researchers have qualified as ineffective programs. For example, Guskey (2000) implies that failing professional development does not impact teacher practice and so improvements in teaching and learning are seldom realized.

Despite the general consensus that professional development is vital to educational improvements, research has pointed out that many professional development programs are ineffective (Corcoran, 1995; Guskey, 2000, 2002). It has been suggested that although the approach to professional development can vary widely, programs that fail usually do so because they do not take into consideration two critical factors: (1) what motivates teachers to engage in

professional development, and (2) the process by which teacher change usually happens (Guskey, 1986, 2002). I expand on these two factors later.

Effective Professional Development

The purpose of professional development is to enact teacher change and. researchers have investigated professional development programs to determine characteristics that make it effective. A professional development is considered effective if it has a majority of these characteristics. The seven characteristics of high quality effective professional development are that it (1) focuses on students and uses student thinking; (2) emphasizes and connects to individual and organizational change by starting with small changes guided by a goal; (3) is continuous, intensive, and ongoing with follow up and support; (4) provides time to collaborate with other teachers to share ideas and develop relationships; (5) focuses on specific content and teacher practices; (6) includes active learning activities; and (7) embodies knowledge of teachers as adult learners (Borko, 2004; Garet, Porter, Desimone, Birman, & Yoon, 2001; Guskey, 2000; Loucks-Horsley, Love, Stiles, Mundry, & Hewson, 2003; Sowder, 2007).

Mathematics education researchers have extended beyond identifying characteristics of professional development by also characterizing the types of professional development. Marra et al. (2011) identified types of high quality professional development for mathematics teachers that promote teacher change. The authors concluded that the most promising types of mathematics professional development are *content-driven* and *balanced-mathematics content and pedagogy*. Content-driven professional development focuses on teachers learning new mathematics content as well as teaching techniques to enhance their understanding of those mathematical concepts (Marra et al., 2011). Balanced-mathematics content and pedagogy

professional development includes the same purpose as content-driven with a second and simultaneous focus of modeling specific instructional strategies for the mathematical concepts.

However promising professional development may seem, the outcome of the same professional development activity can vary from teachers not changing their practice, to teachers who persistently try to take what they learned in the professional development to enact a positive change in the classroom. This is problematic; professional development should always result in enacting teacher change (Corcoran, 1995; Guskey, 2000, 2002). Professional development that has effective characteristics but doesn't yield individual teachers to change are unsuccessful. In fact, nearly half of all teachers in the United States are dissatisfied with their professional development opportunities (Darling-Hammond, Wei, Andree, Richardson, & Orphanos, 2009). Dissatisfaction with the professional development may be why teachers are not willing to change. Why does professional development that has effective characteristics sometimes not enact teacher change? I conjecture that the reason some professional development is unsuccessful in promoting teacher change has to do with individual teacher's motivation and participation. Researchers have investigated the process of teacher change and the characteristics of effective professional development. However, research on teachers' motivation to participate and engage in professional development is not as complete.

Teacher Motivation to Participate

One reason professional development may be unsuccessful is because a teacher's motivation to participate in the professional development is not considered (Guskey, 1986, 2002). When teachers attend professional development they make choices about how they will engage in the information and activities presented. Motivation is why an action is taken (Beck, 1990) and there are two categories of motivation; intrinsic and extrinsic. There is a distinct

difference between intrinsic and extrinsic motivation and with each there are external and internal factors for the behavior or action that is taking place. Identifying and investigating teachers' motivation may explain why some teachers choose to participate in the professional development in a way that will evoke change in their practice.

Teacher Participation in Professional Development

The value of high quality professional development is apparent and because of its importance, some schools and districts require attendance to such meetings; however, attendance does not guarantee teachers are participating in the activities and motivated to learn from the activities to change their teaching practices. When attendance is not required, teachers' attendance varies based on the individual teacher's initiative to attend, the teacher's relationship with administrators, or the willingness of the teacher to pay for the professional development (Corcoran, 1995). Teacher's motivation, or reasons, for attending influences their decision to participate or not in the professional development.

When in attendance, teachers will either choose to actively participate or to just be present. Guskey (2000) states:

> Educators themselves frequently regard professional development as having little impact on their day-to-day responsibilities. Some even consider it a waste of their professional time. They participate in professional development primarily because of contractual obligations but often see it as something they must "get out of the way" so that they can get back to the important work of educationg students. (p. 4)

It is clear that the intention of these teachers was to complete the professional development rather than learn, which will affect their decision to actively participate when in attendance, and they may likely choose not to participate. These teachers seem to be just present and are not

attending the professional development to learn, but to fulfill their obligation, which will likely not result in the teachers changing their teaching practices due to the professional development.

In the literature on professional development, participation is seen as a synonym for attendance. However, the example above demonstrates that participation is different from attendance. Attendance does not guarantee teachers will engage in the opportunity to learn (Guskey, 2000) and start the process of teacher change. To distinguish between attendance and active participation, I will use attendance to define a teacher who is present and active participation to define a teacher who engages with the intent to learn or gain more knowledge. The literature lacks this distinction and researchers have not investigated the difference between teachers who actively participate and those who just attend. I hypothesize that teachers lack of active participation may be why effective professional development is unsuccessful for individual teachers and does not yield teacher change.

When attending a required or non-required professional development, teachers will either choose to actively participate or to just be present. I am interested in the teachers who are active participants in professional development and what causes them to be active participants. How do they participate? Why do they actively participate? Can teacher participation influence their intention to change their practice? Is there a relationship between teachers' motivation and their participation? I hypothesize that teachers actively participate in different ways. I also conjecture that teachers' motivation influences their active participation.

Research Purpose and Questions

There are many groups of mathematics teachers that could be studied; however, based on my own experience with mathematics teachers in professional development, secondary mathematics teachers are less likely to actively participate than elementary teachers. For this

reason, this study will focus on grades 7–12 mathematics teachers. The purpose of this study is to investigate secondary mathematics teachers' motivation and participation in an effective professional development setting. I investigate how teachers' motivation and participation in an effective balanced-mathematics content and pedagogy (Marra et al., 2011) professional development influences their intent to change their teaching practices by answering the following research questions:

1. How do teachers' motivation and participation in an effective professional development influence their intent to change?
    a. How does teachers' motivation relate to their participation in an effective professional development?
    b. What ways of participating in professional development influence teachers' intent to change?

CHAPTER 2: LITERATURE REVIEW AND THEORETICAL FRAMEWORK

Four sections are provided to describe the context for this study in relation to the current literature and explain the theoretical framework. The first section includes a review the literature on professional development to provide the framework of the characteristics of effective professional development and includes the different types of professional development and justification for using one of two specific types in this study. The second section includes a review of the literature on participation and describes how this will be used for mathematics teachers in professional development. The third section reviews the literature on motivation and describes in detail the self-determination theory (SDT) that is part of the theoretical framework for this study. The fourth and last section combines the prior sections to describe how they join and work together for the purposes of this study.

Professional Development

Professional development is defined as any systematic and organized opportunity or activity that is intended to help teachers improve their teaching practice (Guskey, 2002). Some researchers have suggested extending this definition of professional development to include any learning opportunity teachers engage in that provides them with new skills or new ways to think about teaching (e.g., Vaughan and McLaughlin, 2011) such as teachers sharing ideas in the halls of the school. Although professional practices can improve through these types of opportunities, for this study I focus on organized opportunities of professional development. This allows me to utilize the research on professional development, which uses the first and more traditional definition.

Process of Teacher Change

The objective of professional development is to provide teachers with opportunities to develop better understanding of the content they teach and to perturb their beliefs about teaching to enact change in their practices in order to influence student learning. These outcomes are reflected in the process of teacher change, that Guskey (1986) presented as a linear process (see Figure 1). After attending staff development (i.e., professional development) a teacher will change their classroom practice, noting a change in student learning, which may trigger a change in the teacher's beliefs and attitudes. The author provides theoretical support for the model but also encourages more research on the validity of the model. Further development of Guskey's (1986) model of the process of teacher change was done by other researchers suggesting that the process of teacher change is more cyclical than linear (e.g., Clarke, 1988).

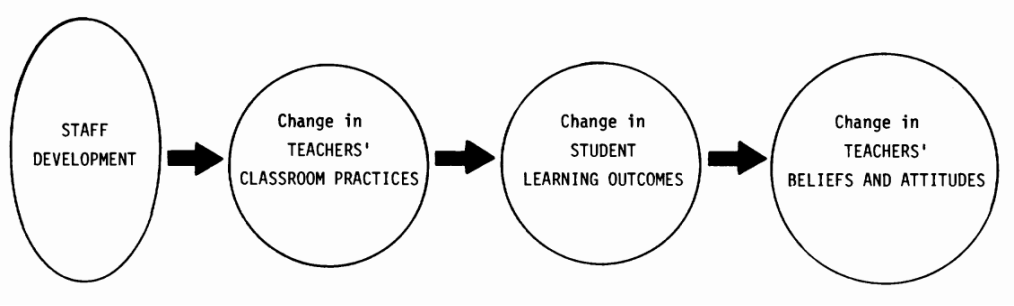


Figure 1. Guskey's model of the process of teacher change (1986, p.7).

Figure 2 displays the interconnected model of teacher professional growth (Clarke & Hollingsworth, 2002) developed to describe the cyclical nature of teacher change. This model suggests that change occurs through reflection and enactment in four distinct domains of teaching. The domains are the *personal* domain which includes teacher knowledge, beliefs, and attitudes; the *practice* domain which consists of professional experimentation; the *consequence* domain which involves the salient outcomes; and the *external* domain which is the source of the stimulus, support, or information (Clarke & Hollingsworth, 2002). The four domains are similar

to the four steps in Guskey's (1986) model with staff development being part of the external domain, classroom practices being part of the practice domain, the student learning outcomes is part of the consequence domain, and teacher's beliefs and attitudes residing in the personal domain. Of the four domains, only the external domain is located outside the teacher's professional world (Clarke & Hollingsworth, 2002). The remaining three, the practice, consequence, and personal domains constitute the professional world of an individual teacher. This professional world encompasses the teacher's professional actions, the inferred consequences of those actions, and the knowledge and beliefs that prompted those actions (Clarke & Hollingsworth, 2002).

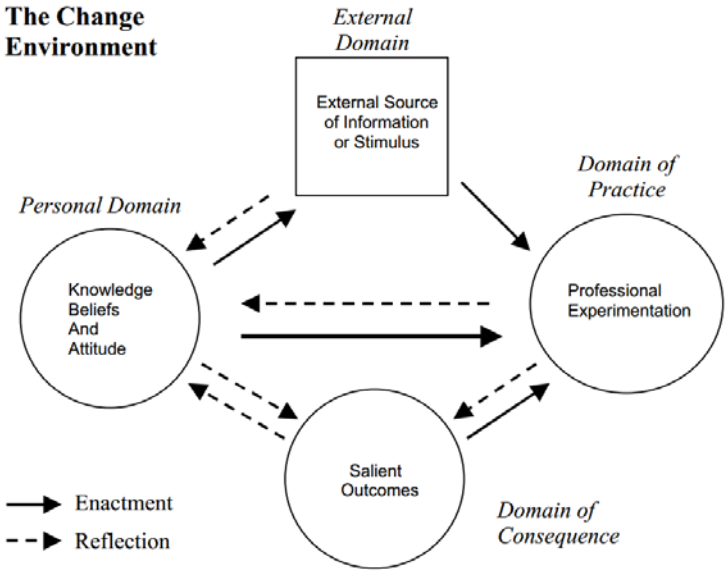


Figure 2. The interconnected model of professional growth (Clarke & Hollingsworth, 2002, p. 951).

The power of the interconnected model of professional growth (Clarke & Hollingsworth, 2002) is that teacher change can result from many different paths through the model. The change environment is the context in which teachers work. This context can impact the professional growth of teachers at every part of the process. For example it can affect access to opportunities of professional growth and encouragement (discouragement) to attempt new teaching techniques

(Clarke & Hollingsworth, 2002). It is also the choice of the teacher whether to engage in reflection or enactment and I would suggest that the decision to do so can be seen in the motivation of the teacher. I would also suggest that a teacher cannot engage in reflection or enactment if they have not actively participated in the professional development (external domain) they attended. Thus even when analyzing teacher change, one must take into account teachers' motivation to participate as well as how they participate in the professional development.

The interconnected model of professional growth has been used in many studies of teacher change, professional growth and professional development (e.g., Justi & Van Driel, 2006; Goldsmith, Doerr, & Lewis, 2014). For example, Witterholt, Goedhart, Suhre, & van Streun, (2012) used the model to assess the development of a mathematics teacher. The aim of the study was to identify the events that contribute to the development of practical knowledge and analyzed one mathematics teacher over two years. This study demonstrated how the interconnected model of professional growth was used to interpret findings on teacher change from research data to describe professional growth. The authors also found that in order to notice teacher change, one must have access to all the domains of consequence. In my study, I will focus on the external domain, professional development, and participation in that domain. Because I will not be looking at the complete process of teacher change, I am limiting my scope to teachers' reported intent to change rather than classroom observation of change or the student outcomes that might result.

While there are varied levels of intent to change, I specifically focus on intent to change that goes beyond the superficial (e.g. using a task provided during the professional development). Rather, I focus on teachers who are intent to change their teaching practices that will affect

themselves or their students in positive ways. This intent to change could be a shift in way that mathematics concepts are taught. For example, if a teacher intends to approach the teaching of a concept or student learning in a different way due to learning from the professional development it would indicate a substantial intent to change. Teachers all start with some view on how teaching and learning should occur and when they show intent to change some teaching practice it can be superficial or more substantive. However, it will usually fit or be adopted to fit into their current view for teaching and learning and substantial change can lead to altering a teacher's view based on their experience with changing something and how they view its effect on the outcome of student learning (Schorr & Koellner-Clark, 2003). This substantial intent to change is more aligned with the purpose of professional development and is what I will focus on in my study.

Characteristics of Effective Professional Development

An abundance of research has been conducted on professional development since it is vital to the process of teacher change and, in turn, improving educational outcomes. The success of professional development in mathematics is usually measured by changes in teachers' mathematical knowledge and beliefs, or by the changes in instructional practices that increased student learning (Sowder, 2007). Researchers have focused on successful professional development in order to determine characteristics that seem to aid teachers in starting the process of teacher change. Different researchers have provided their own list of characteristics of effective professional development either based on reviews of research studies or on the years of success with developing professional development programs (e.g., Sowder, 2007; Borko, 2004). Thus, the literature has multiple lists of effective characteristics by different researchers and so I compiled a list that embodies the common characteristics from the literature.

Guskey (2000) reported four common characteristics across different successful professional development programs: (1) focus on students and student thinking, (2) emphasize individual and organizational change, (3) encourage small changes guided by a larger goal, and (4) include continuous and ongoing with support (Guskey, 2000). I would argue that the second and third characteristics are similar in that the small changes and larger goal are the individual and organizational changes because in both they are focused on the change that is being attempted. The first being the individual teachers and the organization (school, district, etc.) while the second focuses on small changes made incrementally to bring about the individual and/or organizational change. Both focus on the aspect of change in either the smaller or larger scale. Since they are both about change and the characteristics work together to make that change, they can be combined. Table 1 is the initial list of effective characteristics to which I will add with justification from other research.

Table 1

Characteristics of Effective Professional Development from Guskey (2000)

Characteristic	Description
1. Students	Focus on students and student thinking.
2. Change	Emphasize individual and organizational change starting with small changes guided by a goal.
3. Support	Continuous and ongoing with support.

These three characteristics for effective professional development have been expanded and added to by other researchers. For instance Loucks-Horsley, Love, Stiles, Mundry, & Hewson, (2003) suggested that professional development needs to include transformative learning experiences for teachers. Transformative learning is learning that changes ones beliefs, knowledge and habits of practice (Thompson & Zeuli, 1999). Transformative learning also fits in the interconnected model of professional growth (Clarke & Hollingsworth, 2002) under the

personal domain (beliefs, knowledge, etc.) as part of the process of teacher change. Transformative learning requires levels of cognitive dissonance between the teacher's current thinking and what they are experiencing in the professional development (Loucks-Horsley, et al., 2003). Transformative learning is done through professional development that provides sufficient time for teachers to think through the dissonance while using student thinking from the involved teachers' situations as context. This enables teachers to develop new practices to resolve the dissonance, and requires teachers to be involved in a process of continuous improvement (Loucks-Horsley, et al., 2003). This idea of transformative learning only expands upon Guskey's (2000) characteristics. Using student thinking for opportunities of cognitive dissonance is aligned with the first characteristic, focusing on students and student thinking. Also, cognitive dissonance is starting with a small change in a teacher's thinking that will lead the teacher to develop new practices that emphasizes individual change (change) and is an ongoing, continuous process (support). Hence, the suggestion by Louck-Horsley et al., (2003) to include transformative learning is similar to the characteristics offered by Guskey (2000) in a professional development.

Another way to include the initial three characteristics is through professional learning communities. This is the suggestion Borko (2004) makes when discussing the results of research about effective professional development. Professional learning communities provide support while emphasizing collaboration among teachers. Borko (2004) also supports the use of students' learning and work as the context for teacher learning. The author states that professional development that uses records of practice (e.g., videotapes of lessons, student work) as the contexts for teacher learning, allows teachers to examine one another's instructional strategies and student thinking so they can engage in a discussion about improvements. This idea is similar

to transformative learning supporting Loucks-Horsley et al., (2003) emphasis on student thinking (students) while adding again the characteristics of collaboration time. Borko (2004) also adds to the third characteristic of effectiveness by stating that professional development should not only be ongoing but intensive. The author explains that intensive professional development has an explicit focus on subject matter and engages teachers in activities. Borko makes this claim after studying professional developments that focused on a specific subject matter. It was found that this focus helped teachers develop a powerful understanding for the subject matter. The addition of two characteristics to the accumulating list is visible in Table 2.

Table 2

Five Characteristics of Effective Professional Development from Guskey (2000); Loucks-Horsley et al., (2003); Borko (2004)

Characteristic	Description
1. Students	Focus on students and use student thinking.
2. Change	Emphasize individual and organizational change starting with small changes guided by a goal.
3. Support	Continuous and ongoing with support.
4. Collaborate	Provide time to collaborate with teachers.
5. Content	Focus on specific content.

Garet, Porter, Desimone, Birman, and Yoon (2001) conducted a national sample of mathematics and science teachers to empirically compare characteristics of professional development. They looked at the structural features – forms of activities, duration, and collective participation – and core features – content focus, active learning, and coherence – to describe the quality of professional development. When looking at the data for structural features, the forms of activities (e.g., teacher network, conference) were found to only influence the duration of the professional development. Duration was the first characteristic that the authors determined was important for high quality, or effective professional development. High quality professional

development is both sustained over time and has a substantial number of hours which supports the third characteristic (support) of effective professional development. The measures of the core features were all found to have a positive influence on enhancing teachers' knowledge and skill (Garet et al., 2001). This result leads to the conclusion that the core features, (content focus, active learning and coherence) are characteristics of effective professional development. The list being accumulated on characteristics of effective professional development already includes the content characteristic. Active learning includes discussion, planning, and practice (Garet et al., 2001) which is another characteristic of effective professional development and is included in the accumulating list as characteristic 6 (see Table 3). Coherence includes connections to goals and aligns with state and district initiatives (Garet et al., 2001). This is included in the change characteristic because it encourages teachers to change to better align with state and district goals. Also included is communication with others (Garet et al., 2001) which is part of the collaborate characteristic.

Table 3

Six Characteristics of Effective Professional Development from Guskey (2000); Loucks-Horsley et al., (2003); Borko (2004); Garet et al., (2001)

Characteristic	Description
1. Students	Focus on students and use student thinking.
2. Change	Emphasize individual and organizational change starting with small changes guided by a goal.
3. Support	Continuous and ongoing with support.
4. Collaborate	Provide time to collaborate with teachers.
5. Content	Focus on specific content.
6. Activities	Includes active learning activities.

Desimone, Porter, Garet, Yoon, and Birman (2002) used their findings to conduct a three-year national study of mathematics and science teachers participating in the Eisenhower

Professional Development Program. Using the same structure and core features they found that these features were related to increases in teachers' self-reported knowledge, skills, and changes in their practice. They also noted that professional development focused on specific teaching practices increased teachers' use of those practices in the classroom (Desimone, et al., 2002) suggesting that the focus of professional development should not be solely on mathematical content. The authors also suggested that changes in teaching would occur if teachers participated in or attended consistent high quality professional development. This lends support to the importance of professional development and why it is vital to look at why some effective professional development are still not leading to teacher change.

Sowder (2007) reviewed the professional development research and developed a list of characteristics for effect professional development. Sowder (2007) referenced three other studies (Hawley & Valli, 1999; Elmore, 2002; Clarke, 1994) that synthesized the research on professional development that have shown to improve student learning. The first two studies focused on research across education and the last study (Clarke, 1994) was based solely on mathematics professional development. These studies showed overlapping commonalities in characteristics of effective professional development. Indeed the characteristics listed by Sowder (2007) included all six of the characteristics already noted in Table 3. Teacher practices was added to the content characteristic because Sowder (2007) does suggest that the content characteristic should also include the focus of not just the content but the practices of the teacher, which is also supported by Desimone et al. (2002). Another characteristic of effective professional development Sowder (2007) included was that it embodies knowledge of adult learning, an idea also supported by Corcorcan (1995). This last characteristic concludes the list with seven effective characteristics.

This is just a sampling of the research about professional development, but it is sufficient to get a feel for the overall consensus of the requirements for effectiveness. Table 4 is the complete accumulated list of characteristics that have been identified from the research on effective professional development and need to be included. It does not, however, include or consider teachers' motivation to participate in the professional development. I argue that although professional development can meet all the requirements in Table 4, teachers' motivation will affect their learning from the professional development because it influences their choice to actively participate.

Table 4

Seven Characteristics of Effective Professional Development from Guskey(2000); Loucks-Horsley et al., (2003); Borko (2004); Garet et al., (2001); Desimone, et al., (2002); Sowder (2007)

Characteristic	Description
1. Students	Focus on students and use student thinking.
2. Change	Emphasize individual and organizational change starting with small changes guided by a goal.
3. Support	Continuous and ongoing with support.
4. Collaborate	Provide time to collaborate with teachers.
5. Content	Focus on specific content and teacher practices
6. Activities	Includes active learning activities.
7. Learners	Embodies knowledge of teachers as adult learners.

Types of Professional Development

Since teachers have different motivation to attend and participate in professional development, it is beneficial to note that there are different types of professional development that teachers can choose to attend. Ensuring that professional development activities are effective can be difficult but when the requirements are met, the variety of activities can be categorized into orientations. An orientation is the direction of interest that something has. In this case, the

orientation of a professional development is considered the focus and direction of the professional development. Marra et al., (2011) empirically developed six orientations that mathematics professional development are categorized into: (1) activity-driven, (2) content-driven, (3) pedagogy-driven, (4) curriculum materials-driven, (5) needs-driven, and (6) balanced-mathematics content and pedagogy driven orientations. Table 5 provides a description of each of these different orientations. The orientations encompass the specific characteristics of professional development and provide a framework for describing professional development as one whole experience instead of the sum of individual factors (Marra et al., 2011).

Table 5

Orientations of Professional Development created from Marra et al., (2011)

Orientation	Description
Activity-driven	Engage teachers in hands-on activities intended for students. The value of the activity comes from the activity itself. The conceptual or pedagogical value of the activity may not be made explicit.
Content-driven	Help teachers learn new mathematical content and techniques to enhance the teachers' understanding of the concept(s) focused on.
Pedagogy-driven	Model specific instructional strategies and encourage its use to help teachers facilitate student learning.
Curriculum materials-driven	Guide teachers through lessons and units of curriculum materials so teachers learn how to use the materials in a classroom.
Needs-driven	Enlist teachers to determine needs. Then design and implement instruction based on those needs. The major feature is teacher networking.
Balanced-mathematics content and pedagogy	Simultaneously focusing on content and pedagogy knowledge. Incorporates or balances the characteristics of the content-driven and pedagogy-driven orientations.

The authors found that participants in professional development of different orientations expressed different levels of intent to make improvements in their teaching practices. In fact, Marra et al. (2011) found that participants in professional developments that were focused on a

balanced-mathematics content/pedagogy orientation or content-driven orientation showed an intention to make more improvements in their teaching practices than any of the other orientations. Teachers attending professional development with both of these orientations also reported a stronger impact on professional practice than teachers in other professional developments (Marra et al., 2011). Although the authors did not go into the classroom and there is no evidence of improvement, it is a promising aspect. Teachers most likely will not try out a practice or develop a change in practice without the intention to do so.

Research on professional development has identified characteristics of effective professional development. These effective professional development programs can also be categorized based on orientations which provide a framework for categorizing and looking at the different types of professional development available for mathematics teachers. Hence, if a professional development is categorized as having a content-driven or balanced orientation and it has effective characteristics, it should result in teacher change

Participation

This study will identify the ways that mathematics teachers participate in balanced effective professional development, compare their motivation to the ways of participating and examine how teachers' motivation and participation influence their intent to change. In the literature about professional development when participation is considered, it is used as a synonym to attendance. This is the use of participation in the report published by the National Staff Development Council (Wei, Darling-Hammond, & Adamson, 2010) where findings of the Schools and Staffing Survey (SASS) are analyzed among the research literature. One finding was that participation in professional development varies across school context. Participation in this finding is defined as teacher attendance. Although making sure that teachers are attending

professional development is important, it is not the focus of my study. The focus is on how teachers participate once they are in attendance, or how they actively participate. I hypothesize that there will be differences in the extent that individual teachers actively participate in a professional development.

What does active participation look like? Facilitators of professional development attempt to provide teachers with resources to use in the classroom in a similar way that teachers provide students with resources. So in the setting of professional development, the teachers are the students. For this reason, I reviewed the literature about student participation, or engagement, to inform my study about ways in which teachers actively participate.

Student Engagement

Researchers have used different terms such as student involvement, active participation, and student engagement in the past to describe the same construct. To avoid confusion, I will use the term student engagement to describe this construct. Finn (1989) defined student engagement as meeting the minimal conditions in the classroom that is needed for learning to occur. Astin (1984) describe the construct of student engagement as the amount of physical and psychological energy a student uses and also what the individual does and how they behave. Since the construct of student engagement includes an aspect of participation, it is beneficial to explore for this study.

Student engagement depicts effortful learning through interaction with teachers and learning opportunities (Christenson, Reschly, & Wylie, 2012). Although researchers agree that student engagement is multidimensional, there have been different approaches to describing it. Different dimensions researchers have included to describe student engagement are behavior, emotion, cognition, and psychological. Despite the differences, there is agreement that student

engagement includes participatory behavior and an emotional component (Reschly & Christenson, 2012) and most researchers include cognition to make the construct of student engagement three-dimensional. Behavioral engagement includes positive conduct such as following classroom rules, involvement in learning in academic tasks, and being part of school-related activities like sports or leadership. Emotional engagement is the students' affective reactions, such as interest or boredom, to activities or people in the classroom. Cognitive engagement includes students' psychological investment in learning such as their strategies and efforts to learn (Fredricks et al., 2004). I focus on the behavioral and cognitive engagements because these two include aspects similar to how I defined active participation; being engaged in learning with academic tasks. Emotional engagement is not included because it is not an action component (Skinner & Pitzer, 2012).

Behavioral Engagement. The observable actions and behaviors of students' that is the actual interaction with tasks and activities in the classroom is the students' behavioral engagement (Skinner & Pitzer, 2012). Behavioral engagement has different aspects and one of them, student engagement with academic work, aligns with my definition of active participation. Student engagement with academic work (Skinner & Pitzer, 2012) means participating or interacting with tasks or activities with the intent to learn. Student engagement with academic work will have visible indicators and factors that facilitate student engagement. There are two factors that are facilitators of student engagement; personal and social factors (Skinner & Pitzer, 2012). The visible indicators of student engagement are the actions a student takes and is what comprises behavioral engagement.

Measuring student engagement in the classroom through observation methods, McKinney, Mason, Perkerson, and Clifford (1975) depicted 12 categories of behavior that

describe how students could participate. These include behaviors such as "attending" and "task-oriented interaction" which are desired types of participation as well as "distractibility" and "nonconstructive activity" which are non-desired types of participation. Other studies used similar categories of behavioral engagement. Greenwood, Horton, and Utley (2002) put these observable behaviors into three classes based on their correlation to student achievement on standardized tests. Behaviors with a positive correlation (e.g., writing, talking academic) were termed *academic responses*, behaviors with a neutral correlation (e.g., raising hand, manipulating materials) were termed *task management responses*, and behaviors with a negative correlation (e.g., disruption, noncompliance) were termed *competing responses* (Greenwood et al., 2002). These studies and others identified a distinction between desirable behaviors that lead to learning and undesirable behaviors.

Cognitive Engagement. Research on cognitive engagement emphasizes the students' efforts to learn and master the concepts (Fredricks et al., 2004). This aspect of investment in learning and the efforts to learn is cohesive with my definition of active participation. Some researchers note that cognitive engagement is similar to ideas in motivation research (Christenson et al., 2012). There is current debate about how engagement and motivation differentiate and whether there is a relationship between them (Christenson et al., 2012). This study attempts to identify if there is such a relationship between motivation and aspects of engagement related to teachers' active participation.

Cognitive engagement is difficult to identify through visible actions of effort a student takes. Despite this difficulty, measuring cognitive engagement has been done through observational techniques in specific content areas. In mathematics, observable behavioral and linguistic indicators have been empirically shown to indicate cognitive engagement (Helme &

Clarke, 2001). These indicators vary based on the type of classroom situation, and include such behaviors as *self-monitoring*, *exchanging ideas*, *giving information*, and *justifying an argument* (Helme & Clarke, 2001). However, using observation to measure cognitive engagement is problematic because cognition is not directly observable, rather it has to be inferred from the observable behavior (Fredricks et al., 2004). Instead, cognitive engagement can be gauged through self-reporting measures such as interviews.

In the context of professional development, mathematics teachers are the students. The research on student engagement provides a more robust description of active participation. Active participation includes behavioral engagement and cognitive engagement. There are indicators and facilitators of active participation. The seven characteristics of effective professional development (Table 4) as well as the orientations or types of professional development (Table 5) are part of the context of the social factors that facilitate active participation. Other social factors are the interactions and relationships individual teachers have with the others attending the professional development. In this study the focus is on the personal factors that facilitate active participation.

Motivation

Does teachers' motivation facilitate or indicate their active participation? Motivation is associated and used in many studies of student engagement. Motivation provides the underlying reasons someone engages with a task or activity while engagement involves the actions or behaviors of the person (Fredricks & McColskey, 2012). It is the aspect of psychology concerned with explaining variation in behavior (Beck, 1990). That is to say, motivation is the aspect that explains why two people behave differently in the same situation. Motivation is the perceived factor that moves someone to act (Ryan & Deci, 2000b). In his seminal work on personal

causation, deCharms (1968) distinguished between two locus of causalities, or types of factors; internal and external. These are better known as intrinsic and extrinsic motivation. Intrinsic motivation is inherent tendencies people have to seek out challenges, extend one's capacities, and to explore and learn while extrinsic motivation is the performance of an activity due to other reasons besides the inherent satisfaction of the activity itself (Ryan & Deci, 2000a). Most theories of motivation focus on these two types as well as aspects that will affect the internal and/or external factors.

Ford (1992) defined motivation as having three dimensions – goals, emotions, and personal agency beliefs – that serve to direct, energize, and regulate activity. In Ford's definition, goals refer to the individual doing an activity because of external rewards or punishments or because the activity is inherently useful and the individual can learn from the experience. Emotions refer to the interest or curiosity that drives one to learn. Personal agency beliefs, or self-efficacy, is the feeling one has that they are capable of success in the activity (Brahier, 2011). These dimensions are similar to the three innate needs included in the self-determination theory (SDT): autonomy, competence, and relatedness (Ryan & Deci, 2000a) respectively.

Self-Determination Theory (SDT)

Ryan and Deci (2000a) developed the SDT, a framework that illuminates the relationship between extrinsic and intrinsic motivation along a continuum that reflects the level of internalization. The continuum reflects various degrees of self-determination, from less internalized reasons of extrinsic motivation to intrinsic motivation. The more internalized the regulation, the more the motivation level is self-determined. In connection with this continuum, the SDT establishes that people have three fundamental needs that are essential for facilitating the motivation for growth (Ryan & Deci, 2000a). These universally fundamental needs people

have are competence, autonomy, and relatedness. Opportunities to satisfy these three needs facilitate the internalization of regulators whereas opportunities that impede the satisfaction of these needs will have the opposite affect (Baard, Deci, & Ryan, 2004). How fully these three needs are met affects a person's motivation for a behavior as well as where a person's motivation lies along the continuum.

The SDT continuum. According to the SDT, there are five types, or regulatory styles, of motivation that lie along the continuum: *external*, *introjected*, *identified*, *integrated*, and *intrinsic* motivation (see Figure 3). These types of motivation each have consequences for learning, performance, well-being, and personal experience (Ryan & Deci, 2000a). The first four, external, introjected, identified, and integrated, are all types of motivation that fall under extrinsic motivation because there are external reasons for the behavior. External is the least self-determined because the reasons and the decision for doing the behavior are externally regulated. The behavior is performed to satisfy external demand or reward contingency and only continues while those contingencies are present. In the next regulatory style on the continuum, Ryan and Deci (2000a) describe introjected as a behavior that is somewhat externally regulated. The behavior is controlled by wanting to avoid guilt or anxiety or to strive for maintaining feelings of worth. People feel they are acting because they have to and not because they want to. Identified is describe by Ryan and Deci (2000a) as somewhat internally regulated. In the identified regulatory style, the reason for the behavior is because the person accepts value for the activity. The most self-determined extrinsic motivation is integrated where the regulations have been evaluated and are brought into congruence with one's own goals and values. The final regulatory style on the continuum is intrinsic, which is the only regulatory style under intrinsic motivation. This involves engagement in an activity for the inherent enjoyment.

	Non self-determined					Self-determined
Motivation:	**Amotivation**	**Extrinsic Motivation**				**Intrinsic Motivation**
Regulatory Styles:	**Non-Regulation**	**External**	**Introjected**	**Identified**	**Integrated**	**Intrinsic**
Motivation Source:	Impersonal	External	Somewhat external	Somewhat Internal	Internal	Internal
Motivation Regulators:	Nonintentional Incompetence Lack of Control	Compliance External rewards and demands	Self-control Ego-involvement Approval from others	Personal Importance Value the activity Endorsement of goals	Congruence Synthesis with self	Interest Enjoyment Inherent satisfaction

Figure 3. The Self-Determination Theory Continuum created from Ryan and Deci (2000a).

Competence, Autonomy, and Relatedness. The three fundamental needs interact with the internal (or personal) and external factors. The more a person is satisfied by their needs for competence, autonomy, and relatedness, the more the source of motivation is intrinsic. However, satisfying a single need, such as competence, does not indicate intrinsic motivation without the presence of the other needs, such as autonomy (Ryan & Deci, 2000a). The satisfaction of all these needs together will indicate how internal or self-determined the source of motivation is and thus the regulatory style of a person's motivation. Thus, the degree at which a person's needs are satisfied can predict work-related outcomes (Baard et al., 2004).

Much of the research with SDT has focused on environmental factors (or external factors) that can hinder or undermine self-motivation and researchers have found that these factors can be described as thwarting the three basic needs of competence, autonomy, and relatedness (Ryan & Deci, 2000a). Factors that foster competence, autonomy, and relatedness enhance self-determined motivation and factors that impair these basic needs negatively affect self-determined motivation (Grouzet, et al., 2004). I describe related research with teachers that supports the importance of satisfying the needs of competence, autonomy, and relatedness.

Competence is a person's ability to use appropriate means to attain the relevant goal or the desired result (Ford, 1992) and has an effect on a teacher's motivation for professional development. Jesus and Lens (2005) combine multiple theories of motivation in an attempt to develop an integrated model for the study of teacher motivation. In this model, teachers who had high expectancy of success, or efficacy, were found to have higher motivation in teaching or professional engagement. In a study of student teachers, Malmberg (2008) found that student teachers were more intrinsically motivated due to their control-expectancy beliefs, or the beliefs they had about supporting student learning.

A teacher's need for autonomy, the need to make decisions and be the driving force to meet one's goals, is supported in the literature. Pelletier, Seguin-Levesque, and Legault (2002) found that the more teachers perceive pressure from above (e.g., performance standards, complying with curriculum) and below (e.g., students unmotivated to learn), the less they are self-determined to teach. Roth, Assor, Kanat-Maymon, and Kaplan (2007) collaborated these findings by showing that autonomous motivation led to desirable teacher behavior. In a study of reading teachers, Vaughan and McLaughlin (2011) reported that teachers who took ownership over their learning and decision making during professional development activities had a stronger level of change. This idea of taking ownership over one's learning and decision making has both a sense of autonomy and competence.

Relatedness, or the need to feel as if one belongs and connects with others, is important for facilitating internalization (Ryan & Deci, 2000b). Relatedness can include teachers belonging or connections to other school staff as well as the mathematics content they teach. Ishler, Johnson and Johnson (1998) found that teachers' commitment to implementing cooperative learning long-term was related to their involvement in teaching teams and the support from

colleagues and administrators. A significant correlation between school support and teacher motivation to implement project-based learning was empirically found in a study performed in Hong Kong (Lam, Cheng, & Choy, 2010).

Motivation in Education

The focus of motivation in an educational setting has been centered on students' motivation in the classroom. When looking at teacher motivation, many researchers have started with findings in student motivation and applied it to teachers. In mathematics education, motivation has been perceived through either self-efficacy or the goal orientations of a teacher. I outline both of these approaches and explain why they can be encompassed in the SDT.

One approach is to explain teacher motivation through goal orientations. Ames & Ames (1984) attempted to make a qualitative definition of teacher motivation by looking at student motivation. They found that teachers perform under one of three motivational systems that are determined by the teacher's goal(s). Butler (2007) investigated teachers' goals with the focus on the teachers' perception of success. She identified four goal orientations of teacher: (1) mastery, (2) ability approach, (3) ability avoidance, and (4) work avoidance. These goal orientations were influenced by Ames & Ames' (1984) attempt to make a qualitative definition of student and teacher motivation. The orientations described by Butler (2007) can be aligned along the SDT continuum. Mastery orientation is the striving to develop professional understandings and skills. A teacher with this orientation, depending on how internally regulated the behavior, would fall to the right in the continuum. Ability approach orientation is the striving to demonstrate superior teaching ability where ability avoidance orientations is the striving to avoid demonstrating inferior teaching ability. Both of these orientations are externally regulated and fall in the middle of the continuum. The last orientation the author identified was work avoidance which is the

striving to get through the day or activity with little effort. This orientation belongs to the left in the continuum. In her study of teacher orientations, Butler (2007) found that mastery orientation is a significant positive predictor of help seeking. I propose that one form of help seeking is to look at professional development meetings as a means to help learn and develop pedagogical and mathematical understanding.

Another approach to teacher motivation is connected to self-efficacy. Again, much of the research focuses on students and how teachers can develop students' self-efficacy so they are more motivated to do mathematics. Teacher self-efficacy then is the perceived capabilities to help students learn and can influence teachers choice of activities, their interest, and persistence (Schunk & Richardson, 2011). However, self-efficacy or the belief about what one can do and learn (Bandura, 1997) is similar to the innate need of competence that is part of the SDT. Indeed, the concepts of self-efficacy and competence are aligned so one can deem them synonyms. In the SDT, although competency is important, it alone cannot enhance intrinsic motivation (Ryan & Deci, 2000b). For this reason, it is beneficial to use the SDT as a framework for identifying teacher motivation instead of focusing solely on self-efficacy.

The framework for identifying the motivation of teachers that I use in this study is the SDT. It incorporates goal orientations and self-efficacy. Goal orientations can be incorporated into the continuum in SDT. It also incorporates self-efficacy by including competency as well as autonomy and relatedness. There is also support for using SDT in mathematics education. Ross and Bergin (2011) did an examination of the *Principles and Standards for School Mathematics* (NCTM, 2000) through the use of SDT to be applied in classrooms. This examination identified support for developing autonomy, competence, and relatedness in the classroom as well as support for the continuum of extrinsic and intrinsic motivation. The result of this examination is

that the SDT aligned with and supported the vision described in *Principles and Standards* in the mathematics classroom (Ross & Bergin, 2011). Although this study focused on student learning in the classroom, it is applicable for my study because professional development is adult learning.

Motivation and Participation in Professional Development

There is evidence that teachers' motivation for participating in professional development activities can be viewed through SDT. The question becomes: Does a teacher's position on the SDT continuum and the fulfillment of their autonomy, competence, and relatedness influence the ways they participate? Teachers' motivation to actively participate in a professional development is influenced by external and internal factors. The external factors that can influence teachers' motivation that will be identified and analyzed in this study are first, the effective characteristics of professional development and second, the orientation of the professional development. The internal factors that will be identified in this study are the reason for the teacher's attendance, participation, and to make changes to their teaching practices. Through this, I hope to find a relationship between teachers' motivation and their participation.

The internal and external factors work together to facilitate active participation. The characteristics of an effective professional development support competence, autonomy, and relatedness. For example, the need for relatedness is supported in providing time for collaboration and building relationships with other teachers, connecting to teacher initiatives and organizational change, and connecting to teacher practices and a focus on mathematics (see Table 6). Thus these external factors in a professional development can aid in furthering the internalization of teachers' motivation. The studies mentioned prior and the link to the characteristics of an effective professional development indicate that there may be a relationship

between motivation and participation. I hypothesize that the more internal, or intrinsic, a teacher's motivation, the more likely they are to attend and actively participate in professional development.

Table 6

How the Characteristics of Effective Professional Development Support Internalization

Characteristics of effective professional development	Supports Competence	Supports Autonomy	Supports Relatedness
1. Students: Focus on students and use student thinking.	X		
2. Change: Emphasizes and connects to individual and organizational change, starting will small changes guided by a goal.	X		
3. Support: Continuous, intensive, and ongoing with follow up and support.		X	X
4. Collaborate: Provide time to collaborate with other teachers to share ideas and develop relationships.		X	X
5. Content: Focus on specific content and teacher practices.	X	X	
6. Activities: Includes active learning activities.	X	X	X
7. Learners: Embodies knowledge of teachers as adult learners.	X		X

Skinner and Pitzer (2012) provide the motivational model that describes how the indicators and facilitators are connected to the actions (participation) and outcomes of students. The model shows that the context (external factors) leads to the self (internal factors) which both facilitate the actions (active participation or attending) and the actions lead to outcomes (learning and achievement). Figure 4 depicts Skinner and Pitzer's (2012) model, but is modified for teachers attending professional development. The model links together what I am investigating in the context of professional development with motivation and participation. If this model can be shown to indeed have an interaction between motivation, participation, and intent to change,

then findings about student engagement and this motivational model may be applicable to mathematics teachers in context of professional development.

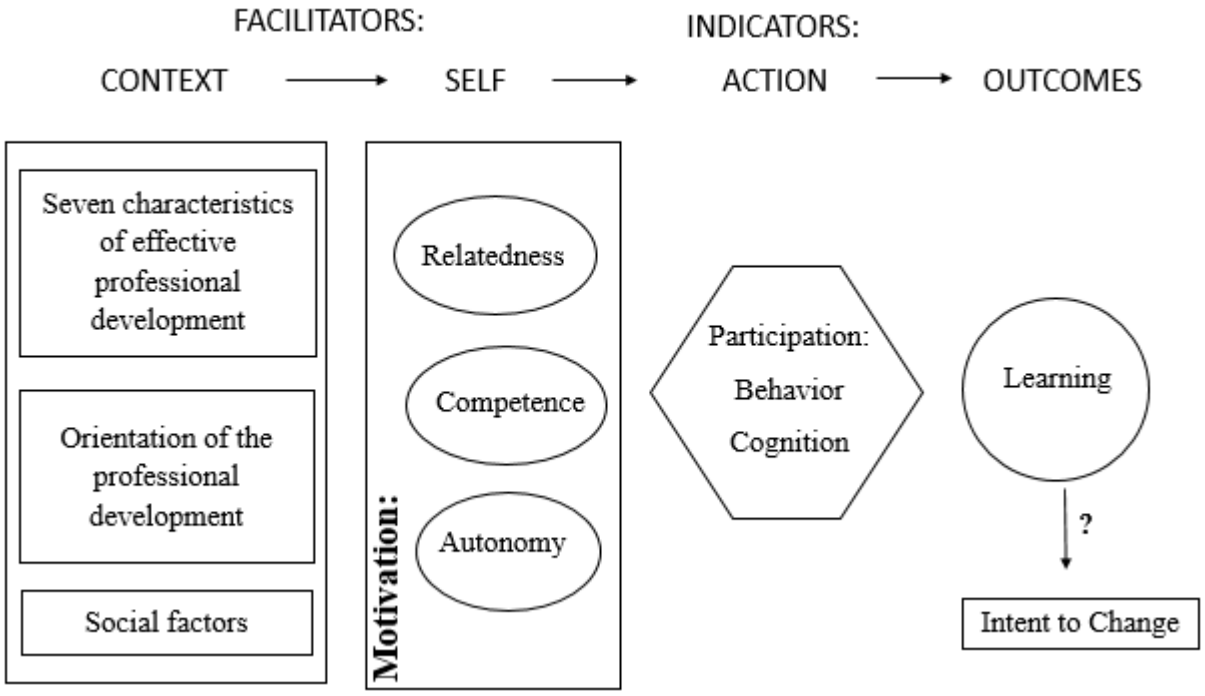


Figure 4. The motivational model of mathematics teachers in professional development adapted from Skinner & Pitzer (2012) that combines the parts of the theoretical framework together.

CHAPTER 3: METHODOLOGY

In this mixed methods study I investigated the relationship between teacher motivation and the ways that they participate in professional development, and how these two aspects influenced teachers' intent to change their teaching practice. Secondary (grades 7-12) mathematics teachers who attended a required two-year professional development in a local school district participated in my study. Data were collected through observations, teacher surveys, video recordings of professional development sessions, and individual interviews to answer my research questions. The overall question of how a teacher's motivation and participation in professional development influences his/her intent to change is answered by looking at the sub questions: How is a teacher's motivation related to his/her participation in an effective professional development? And what ways of participating in an effective professional development influence teacher's intent to change? In the next sections I outline the participants and setting for the study, the instruments that were used, data collection and analyses to answer my research questions.

Setting and Participants

Secondary mathematics teachers, in a local rural school district, who attended a two-year required professional development participated in this study. The district required teachers to attend a bi-weekly professional development about teaching mathematics using task-based instruction.

All teachers attending the professional development completed a pre- and post-survey about their motivation, ways of participating in professional development, and their intent to change teaching practices. From this sample, three teachers were identified to study in-depth and were videotaped during the professional development sessions and interviewed once after the last

videotaped professional development session. I chose two teachers from whom their pre-survey responses showed intent to change their teaching practices beyond a superficial change, and one teacher who did not have an intent to change his teaching practice. This allowed me to make comparisons between teachers who intend to change as well as compare them to the teacher who did not.

Instruments

Surveys

All teachers who agreed to participate in the study completed a pre- and post-survey (see Appendix A). Each survey had two parts. The first part was modified from the Academic Self-Regulation Questionnaire (SRQ-A), that was validated by Ryan and Connell (1989), and the Basic Need Satisfaction at Work Scale (Baard et al., 2004), which allowed for the identification of teachers' motivation and the level at which the three needs were present for teachers' motivation. The original SRQ-A was used to identify the motivation in children to do their school work. The format asked why an action was done and then gave suggested reasons that the children rated on a 4-point scale. The survey for this study used the same format, but the questions and reasons were modified to fit with motivation to attend and participate in professional development. The Basic Need Satisfaction at Work Scale was modified for the context of a professional development setting and not the whole work context. The question format asked teachers to indicate how true the statement was for them based on a 7-point scale. Table 7 displays example survey questions from the SRQ-A and the Basic Need Satisfaction at Work Scale and how they were modified for this study. The second part of the surveys included open-ended questions about how the teachers intended to participate in the professional

development and if they intended to make any changes in their teaching practices due to the professional development.

Table 7

Examples of Survey Questions Modified from SRQ-A and Basic Need Satisfaction at Work Scale

SRQ –A	Survey for Professional Development
Why do I my homework?	Why do I attend Professional Development?
1. Because I want the teacher to think I'm a good student.	1. Because I want my principal to think I'm a good teacher.
2. Because I'll get in trouble if I don't.	2. Because I'll get in trouble if I don't.
3. Because it's fun.	3. Because it's fun.
4. Because I will feel bad about myself if I don't do it.	4. Because I will feel bad about myself if I don't do it.
5. Because I want to understand the subject.	5. Because I want to understand the mathematics I am teaching.
6. Because that's what I'm supposed to do.	6. Because that's what I'm supposed to do.
7. Because I enjoy doing my homework.	7. Because I enjoy attending professional development.
8. Because it's important to me to do my homework.	8. Because it's important to me to attend professional development.
	9. Because it is a requirement from my school.
	10. Because I am interested in knowing more about teaching mathematics.
The Basic Need Satisfaction at Work Scale	
1. I am free to express my ideas and opinions on the job.	1. I am free to express my ideas and opinions at this professional development.
2. People at work tell me I am good at what I do.	2. People at this professional development tell me I am good at what I do.
3. There are not many people at work that I am close to.	3. There are not many people at this professional development that I am close to.

Observation Checklist

During the observation of the first two professional development sessions, I collected data to verify that the professional development was effective. In order to determine if the professional development had effective characteristics, I created a checklist of the seven characteristics accumulated from the literature and identified aspects of the professional development that related to each of these characteristics. This same strategy was used to confirm

the professional development's orientation. Using Marra et al. (2011) descriptions of the orientations, I identified aspects of the professional development that indicated it fit the descriptions of the specific orientation. Appendix B is a checklist that was used to organize my field notes on the characteristics of the professional development during the first observation.

Interview Protocol

I conducted one interview with each of the three focus teachers. I developed an interview protocol and conducted a pilot interview to assess the questions and identify if the data collected provided evidence needed for my research questions. Minor adjustments were made to the interview protocol, including adding specific questions for each focus teachers to verify and clarify my analysis of how they participated in the professional development. The interview protocol used for this study is in Appendix C.

Data Collection

I used three data sources: surveys, observations, and interviews. As discussed previously, all teachers attending the professional development completed a pre- and post-survey. Three teachers were selected from this larger group with the purpose of providing a sampling of teachers who had intent to change and a teacher who did not have an intent to change. These three teachers were the focus of the three observed professional development sessions, with multiple data collected (audio, video, and field-notes) for analysis and triangulation. Following the last observed professional development session the three teachers were interviewed.

Survey Data

Each teacher was given both the pre- and post-survey. The purpose of the pre-survey was to identify: (a) teachers' motivation level (based on the three basic needs); (b) which teachers had intent to change their practice prior to the observed professional development; and (c)

teachers who I would analyze in depth. The goal of the post-survey was to confirm (1) the teachers' motivation levels to attend and participate in the professional development, (2) the ways that the teachers participated while attending the professional development, and (3) how the teachers intended to change his/her teaching practices after the professional development sessions.

Observation Data

I attended and observed six consecutive professional development sessions that occurred every two weeks. The first two sessions were used to identify effective characteristics and to determine the orientation of the professional development. Consent forms and pre-surveys were collected from teachers during the first professional development session. These observations also allowed me to become familiar with the context of the professional development. The following three professional development sessions, I videotaped the three focus teachers to capture their participation. I also took field notes to supplement the videos on how the teachers were participating to aid in the analysis of the videos. The last professional development was video recorded as well and post-surveys were collected from all teachers.

Interview Data

I conducted a 30-45 minute interview with the three focus teachers one month after the last observed professional development session. The interviews were used to collaborate responses from the pre-and post-surveys and observations made during the three professional development sessions to verify how teachers participated and their intent to change. The observation data (i.e., video and field notes) assisted in identifying the behavior engagement of each teacher, but although indicators of cognitive engagement were also noted, cognitive engagement was not as easily observed. Therefore, the interviews were used to further identify

and clarify the cognitive engagement of each teacher. In addition to this, there were interview questions about the professional development and the teacher's motivation to provide additional evidence and confirm the data collected during observations and from the surveys.

Data Analysis

Most of the data were analyzed as it was collected. The open-ended questions from the pre-survey were analyzed to determine the three focus teachers; however, the rest of the pre-survey was not analyzed until I had collected all my data. This was because I did not want to influence the coding of the teacher observation data. Videos were analyzed after each professional development session. The post-survey and individual teacher interviews were analyzed at the end with the pre-survey. The purpose of each analysis was to answer the research questions. The main question was how does teachers' motivation and participation in an effective professional development influence their intent to change? This was answered by answering each of the following questions: How is a teacher's motivation related to their participation in professional development? And what ways of participating in the professional development influenced a teacher's intent to change? To answer these questions I analyzed the surveys, interview, and observation data of each focus teacher, which was the unit of analysis for the study. Once the initial analyses of the observation data were completed, I then compared the two focus teachers who indicated an intent to change for commonalities. This allowed me to notice the ways that their participation were similar or different. I also contrasted those two teachers with the teacher who did not indicate an intent to change for similarities and differences in participation.

Analysis of the Survey

The pre-and post-surveys were self-reported evidence of each teacher's motivation, participation, and intent to change. Data from the surveys were used as evidence to answer all of the research questions. The pre-survey open-ended questions where used to determine the three focus teachers and the responses to the open-ended questions on the post-survey were analyzed to verify the data from the observations and interviews of the three teachers.

The responses to the open-ended questions on the pre-survey were analyzed to identify teachers who indicated intent to: (1) actively participate in the professional development, (2) learn something while attending the professional development, and (3) make changes in their teaching practices. The responses to two questions were the main source of identifying these intentions. These two questions were (1) what are you hoping to gain from attending this professional development; and (2) are you expecting to make any changes in your teaching practices due to this professional development? If yes, explain. From these, three teachers were selected to focus the remaining data collection (observations and interviews).

Another aspect of the pre- and post- surveys analysis was teachers' responses to the motivation questions. These responses determined teachers' motivation based on their three needs (autonomy, competence, and relatedness). This was done by averaging the responses to each of the questions that consist of the subscales using the guidelines from the SRQ – A and the Basic Need Satisfaction at Work Scale. Table 8 contains the subscales and the questions that consist of each subscale. For the questions with (R), their values were first subtracted from eight before including in the averaging of the responses because for these questions, a higher score indicates not having that internal basic need.

Table 8

Subscales on the Pre- and Post-Surveys and the Questions for Each Subscale

Motivational Needs	Pre-Survey Questions	Post-Survey Questions
Autonomy	21, 26(R), 28	24(R), 26(R), 27
Competence	23, 24(R), 29	21, 22(R), 28(R), 29
Relatedness	22(R), 25(R), 27	23, 25
Motivation Regulatory Styles		
External	2, 6, 9, 11, 16	1, 4, 8,14, 18
Introjected	1, 4, 12, 14, 20	2, 9, 11, 12, 19
Identified	5, 8, 13, 18	6, 10, 15, 17, 20
Intrinsic	3, 7, 10, 15, 17, 19	3, 5, 7, 13, 16

Analysis of Observations

Observation data was analyzed after each professional development session. The purpose of analyzing the video data from three consecutive professional development sessions was to identify ways that the three focus teachers participated. This provided evidence for the research question: What ways of participating in professional development influence teachers' intent to change? I used Studiocode (Sportstec, 2013) to identify and code each video for indications of participation, specifically indications of behavior or cognitive engagement. To develop the code window I began by using research on student engagement and then added to or adjusted the coding definitions as needed. The codes represented a combination of the categories of behavioral engagement described by McKinney et al. (1975) and the classes of behavioral engagement developed by Greenwood et al. (2002). The indicators of cognitive engagement were from Helme and Clarke (2001). Table 9 displays the physical indicators with descriptions and how it was visible. The observation data were analyzed to determine each teacher's behavioral and cognitive engagement during the professional development and then was further analyzed to determine how their participation varied. Interview responses where used to verify the observation data analysis.

Table 9

Teacher Engagement Codes, Descriptions and Indicators

	Code	Name	Description	Indicators
Behavioral Engagement	CA	Constructive self-directed activity	Independent work which leads to an accepted product or goal of the PD	Doing assigned work; reading, writing
	AT	Attending	Paying attention during activity	looking at appropriate speaker, raising hand to answer questions
	MM	Manipulate materials	Looking for, using, or handling curriculum materials	Looking for materials, paging through papers, reaching for pencil
	TOI	Task-oriented interaction	Working with others on activity	Discussion with group members, asking questions, directing others
	TA	Talk appropriate	talking on topic or subject	talking about concept, making appropriate comment in discussion, asking on-task question
	DP	Dependency	asking for or accepting help from facilitator or peers	asking facilitator to look at or check work, asking another teacher to compare answers, seeking attention from facilitator
	BEWT	Behavior Engagement at the Wrong Time	Working on something for the professional development but not on the task at hand	Working independently, or having a conversation during times when they should be doing something else.
Competing with Engagement	TI	Talk inappropriate	Conversations about things other than the academic task	talking about an upcoming event, planning a meeting, discussing a non-related student matter
	DST	Distractibility	Being distracted or uninterested in the activity (eye wandering, daydreaming)	Looking out window, staring off into space, looking up when someone walks by, texting or playing on phone
	PR	Passive Responding	Inattention in group activities or passively waiting for directions	sitting in group without attending, passively watching what others are doing

	D	Disrupt	interrupt by producing noise or behavior to attract attention of others, intentionally or accidentally	Yell, phone rings,
	OCE	Other competing with engagement activity	Behavior that distracts from being engaged, not fitting under one of the other categories	Filling out attendance sheet, getting snacks
Cognitive Engagement	CAT	Cognitive Attending	Used to indicated cognitive engagement during behavioral attending	Making comments after listening (aloud or to one's self), raising hand, nodding in agreement.
	SM	Self-monitoring	Checking work and progress	Checking work and checking if they have finished the assignment
	VT	Verbalizing thinking	Speaking aloud your thinking.	Talking while writing or reading.
	EI	Exchanging Ideas	sharing and comparing ideas on a concept or an activity	Sharing idea as part of a discussion, asking another what they think
	JA	Justify an argument	giving reasons for why their argument is correct	sharing answer and reason it is correct, writing down justification
	GI	Giving information	Providing information	Giving directions, explanations or information
	A	Asking Question	Asking a question	Asking a question
	AN	Answering questions	Answering a question posed by someone else	Responding to question, making a comment after a question is asked
	G	Gestures	Movements to help explain or show what the speaker is talking about	Moving hands to show feel of graph, indicating location on a solution.

Analysis of the Interview

The teacher interviews were conducted one month after the last observed session and were transcribed and coded. The unit of analysis was one teacher and the interview data was

used to verify the analysis of the observation data and the survey responses. The interview data provided confirmation for the ways that teachers actively participated in the professional development and how their participation influenced their intent to change. The interviews also provided information to clarify the teachers' motivating reasons for why they participated in the professional development.

I completed a pilot interview and when analyzing that interview developed codes that could be used. From there I modified the codes as needed to fit with the theoretical framework. There were three categories of codes; *motivation*, *participation*, and *intent to change*. The motivation codes come from the SDT continuum as well as the three basic needs. Table 10 includes the motivation codes with descriptions used for analysis. The participation codes were the same ones used for the analysis of the observation data (see Table 9). The last category only had the main code of intent to change. After coding each transcript, I separated the information into the categories of motivation, participation, and intent to change in order to confirm the teacher's motivation to attend and to participate, the ways that the teacher actively participated and if they intended to make changes due to their active participation in the professional development.

Table 10

Motivational Codes and Descriptions of Codes Used to Analyze the Interviews

Code	Description
Relatedness	Mentions relating to or collaborating with others.
Competence	Mentions being able to do or not do the mathematics or tasks included in the professional development.
Autonomy	Talks about having choice or the exclusion of choice.
Intrinsic	Mentions interest, enjoyment, or inherent satisfaction as the reason for doing something.
Integrated	Mentions personal congruence with the reasons listed in identified.
Identified	Mentions personal importance, value of the activity, or endorsement of goals as the reason for doing something.
Introjected	Mentions ego-involvement, or the approval from others as the reason for doing something.
External	Mentions compliance or external rewards and demands as the reason for doing something.

Comparison Analysis

After the initial analysis, I compared and contrasted the two teachers who had intent to change. I also compared and contrasted those two teachers with the third who did not have intent to change. This allowed me to identify similarities and differences in how the focus teachers who indicated having an intent to change in their pre-survey actively participated to the one focus teacher who did not indicated an intent to change in his pre-survey. Table 11 displays the labels used for this comparison. Some of these labels, the last four, come from a study about teacher questions (Boaler & Brodie, 2004). Besides comparing participation I also compared the teachers' motivation and their intent to change.

Table 11

Labels Used to Compare and Find Differences Among the Focus Teachers' Participation

Label	Description
Small Group	Instance happened during a small group activity or task.
Whole Group	Instance happened during the whole group discussions or activity.
Self-instigated	Focus teacher started the instance.
Other-instigated	Instance started by someone besides focus teacher.
Mathematical	The comment or questions was about the mathematics.
Pedagogy	The comment or question was about pedagogy.
Logistics	The comment or questions was logistical, like asking about the direction of a task.
Decision	A question or comment where a decision on how to proceed is made or being asked for.
Instructions	Asking for or giving instructions on how to do something.
Information	A question or comment that is gathering information. Sharing or asking for facts.
Understanding-probe	Asking for or giving an elaboration or clarification of ideas. Explaining their thinking.
Understanding-explore	Points to underlying relationships and meaning. Makes links between ideas and representations.
Generate discussion	Asking for contributions from other members of the professional development.

CHAPTER 4: RESULTS

The professional development sessions I observed were part of a two-year required professional development for secondary teachers in a small rural district. The professional development was held once every two weeks and each session teachers received a homework assignment to be completed before the next session. Although teachers were required to attend the professional development sessions, the homework was not a requirement. Table 12 displays evidence that the professional development had effective characteristics verified through the first observation and the checklist (see Appendix B). The professional development was a balanced-mathematics content and pedagogy because it included activities that focused on the mathematics concepts and pedagogy.

Table 12

Evidence of Effective Characteristics from the Professional Development

Characteristic	Evidence
1. Students	Teachers completed activities to use with students, created representations of possible student work.
2. Change	District requested the professional development, teachers used provided framework and practice lessons.
3. Support	Teachers meet bi-weekly for two years, provided materials to help teachers implement lessons in their classroom.
4. Collaborate	Discussed and shared ideas in whole class and small groups, planned and observed lessons.
5. Content	Focused on new mathematics content each unit.
6. Activities	Worked together to do activities and tasks.
7. Learners	Respectful atmosphere, encouraged to share experiences and reflect on teaching practices.

The three focus teachers taught at the high school and each had taught for at least ten years. Amber has taught for 16 years, Ben for 36 years, and Carl for ten years. Both Amber and Carl taught secondary math courses aligned with the Common Core State Standards (2010). Ben

taught concurrent enrollment courses (i.e., college credit courses) equivalent to College Algebra and Trigonometry. All three teachers attended and participated in the six sessions of professional development observed for data collection. To answer my research questions I investigated similarities and differences among each focus teacher's motivation, the ways in which they participated in the professional development, and their intent to change. I provide a brief description of each teacher's motivation and participation, and then report the influences of their participation on their intent to change their teaching practices. After this, I describe each participant's intent to change and discuss how the differences in their participation may have influenced their intent to change.

Intent to Change

The three focus teachers were chosen based on their initial intent to change, which was determined from their pre-survey responses. Amber and Ben were chosen because their responses indicated they had an intent to change their teaching practices due to the professional development. Carl was chosen because his responses indicated he had only superficial intent to change his teaching practices. In other words, Carl was attending the professional development because he was required to and did not have an intent to change his teaching practices. He is an example of a teacher who is just attending, rather than actively participate.

Examples from the focus teachers' pre-survey responses are used to illustrate the teachers' reported intent to change. Carl, although he stated that "[he] is always looking for ways to improve," he did not state anything he hoped to gain from the professional development (he left the question blank) and he did not expand on this response to indicate that he had more than a superficial intent to change. This is in contrast with the other two focus teachers. Amber stated that she hoped to gain "some positive change/growth in [her] own teaching and that of others"

and that she expected to make changes in her teaching practices by "[trying] techniques after each session, while improving on some of the things [she is] trying already" (Pre-survey). Ben stated that he hoped "to learn more and be a better teacher and learn more about the new teaching methodology" and that he expected to make changes in his teaching practice because "if not, it would have been a waste of time" (Pre-survey). Ben continued by stating that "[he has] been better at asking [himself] why we are doing what we do [and] how best to sequence learning and what pre-requisite knowledge is necessary?" This shows that Ben was committed to trying things out from the professional development and had a non-superficial intent to change.

Motivation

After selecting the focus teachers and following their participation in the three professional development sessions, I analyzed their responses from the pre- and post-surveys for evidence of their motivation. Teachers indicated their level of agreement to specific statements and these responses from both the pre- and post-surveys were combined and averaged to determine their motivation level as well as how their three basic needs (autonomy, competence, and relatedness) where met during the professional development. All three teachers varied in their motivation.

Amber and Ben have more self-determined motivation than Carl. Amber's responses to the surveys showed that although she is more intrinsically motivated to participate, her reasons for attending the professional development fit under identified motivation. Figure 5 shows Amber's scores are both identified and intrinsic, so her motivation to attend and participate in the professional development is a combination of both of these; *integrated motivation*. Ben's responses indicated that his motivation for attending and participating were the same and fell to the right of the SDT continuum at *identified*. Although Carl's motivation to participate was both

somewhat internal and somewhat external, his motivation to attend was completely external and falls farthest to the left at external motivation. Since his motivation for attending was completely external, it pulled his overall motivation for attending and participating in the professional development towards the left of the SDT continuum and kept his overall motivation *external*. Figure 6 shows the focus teachers' motivation and location on the continuum. Further evidence of the teachers' motivation was gathered and used to verify these results through the analysis of each teacher's interview as well as from the open-ended questions on the pre- and post-surveys.

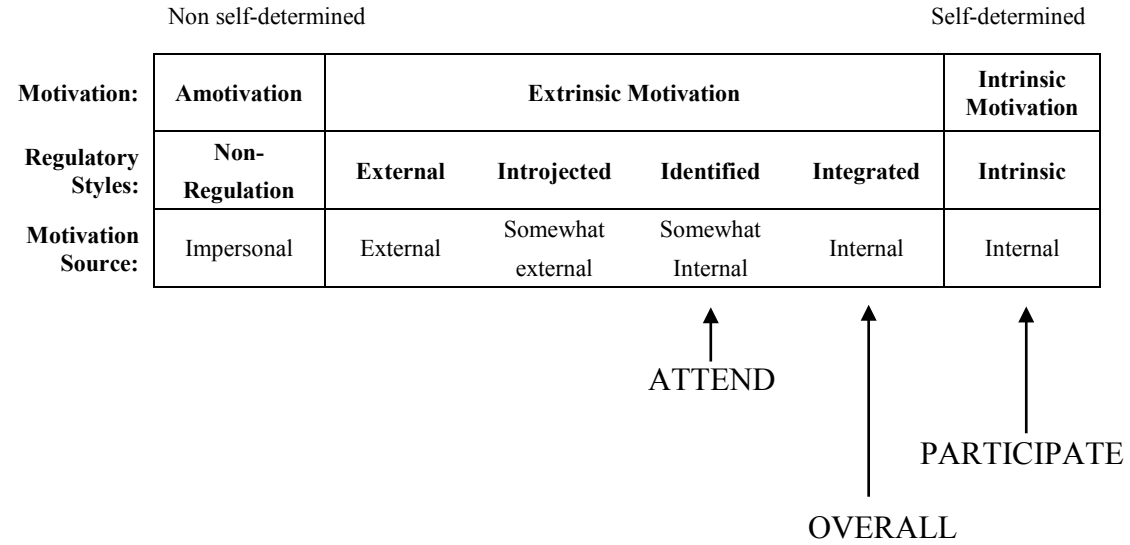


Figure 5. Amber's motivation for attending, participating, and overall motivation along the SDT continuum.

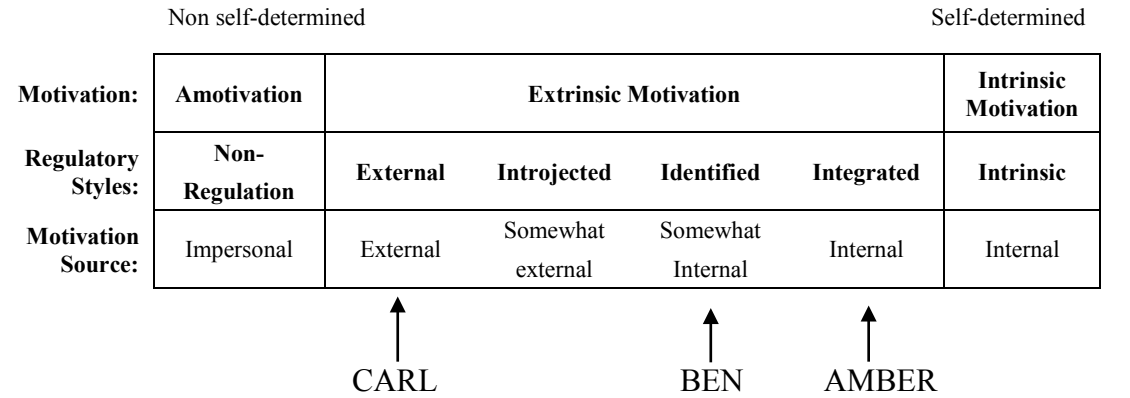


Figure 6. The overall motivation of the three focus teachers along the SDT continuum.

Autonomy, Competence, and Relatedness

Teachers' belief of how their three fundamental needs are met influences their motivation. The feelings of whether their needs across the three dimensions (autonomy, competency and relatedness) were met in the professional development vary among the focus teachers and are shown in Figure 7. The scores range from 1 (low) to 7 (high) and a score of 4 would be average. Based on the self-reported data from the pre- and post-surveys, Amber and Ben both had high to moderately high autonomy, competence and relatedness. However, Amber's levels of the three needs were lower than Ben's. Although Carl also had moderately high relatedness, he had below average autonomy and average competence.

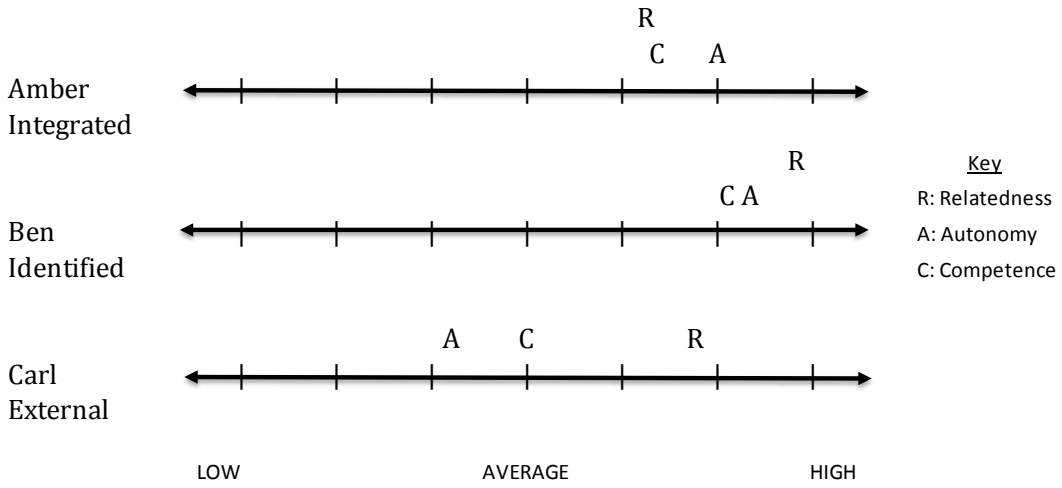


Figure 7. Focus teachers' motivation levels of autonomy, competence, and relatedness during the professional development.

Amber's motivation is influenced by her sense of autonomy, competence, and relatedness to the topics and teachers in the professional development. Her responses from the pre-and post-surveys indicate that these basics needs are being met and correlate with her high motivation level of integrated and self-determined motivation (see Figure 7). She further indicated that meeting these needs influenced her reasons for participating in her interview responses. She demonstrated her sense of autonomy during her interview when she said "part of me believes that

we're going to have some professional development and it's nice to be able to choose." She continues by saying that the type of professional development she likes to attend are those that include mathematics and pedagogy like the one in this study. Her competence also is visible in her responses. She mentions that although the sessions I observed were about probability, which she considers one of her weaker content areas, she had the ability to meet the determined goal of finding expected value. Throughout the professional development sessions she was "trying to build connections" between the different representations and concepts. She felt competent enough in the structure of the lessons because the professional development was focused on "trying to follow the templates" for task development in her department.

Amber shares the most in her interview about relatedness. She said, "having the high school and the junior high school teachers together was a good motivation" for attending the professional development. One of the biggest benefits she saw to this professional development was learning how to "debrief after a lesson study so that it is very much focused on the lesson, not at all on the people involved" because being "able to have that kind of conversation without being offended or offending anyone…would really help [her] department." These comments Amber shared show how her need for relatedness was met and that she has moderately high relatedness, autonomy, and competence.

Ben's responses in the interview also corroborate how his three basic needs were met during the professional development. Ben indicates his autonomy needs were being met because it was his choice to participate the way he did and that he did so because he wanted to learn. Ben's struggle for whether to use what he learned in his classroom also indicates his autonomy. He stated that the professional development has "made [him] ask [himself], which would be better to do." He also makes comments that demonstrate his competence. "[Ben] found [he] was

usually the one who was stepping in saying 'Let's do this, let's do that' because [he's] dealt with [the content] a lot and others have not." Sometimes this competence led him to ignore his groupmates during small group tasks for a moment. "There are some activities that [he] just got an idea and [wanted] to pursue it." However, sometimes Ben was not confident in his knowledge and he would "[look] for what others are doing." His relatedness is very high and indicated in the fact that he often mentions his appreciation for being able to work with his peers. In fact, Ben told me his favorite part of the professional development was "…working with the other math teachers and figuring things out and just working together. Usually I am on my own… and I just enjoyed working with the others, and the challenges we faced." He also commented that he "… enjoyed interacting with the others and seeing different ways of approaching problems." These responses verify Ben's high relatedness and moderately high competence and autonomy.

Carl's external motivation is influenced by his feelings about how his basic needs were met. Carl has a below average sense of autonomy and this is verified through his interview as he indicated that he only attended the professional development because it was a requirement and that it was not "near the top of [his] priority list." Carl further corroborated that he would only attend this type of professional development again "if [his] district told [him] to." Carl has an average competence, which he paints a mixed picture of in his interview. He indicated that he did not comment often because he "[tries] to figure out what [he's] doing before [saying] too much," possibly showing his lack of competence. He also shared that he meets often with other teachers who have more experience because it is his first year teaching this type of course and so he is "asking how much in-depth [he's] got to go and… kind of getting a few of the details" of what he needs to teach. Although these comments may indicate his lack of competence, Carl did state that he knew the content that was covered in the observed professional development sessions. He

told me that he knew "most of the probability and … most of the theory and everything else." His competence is high in some aspects and low in others, fitting with his indicated average competence. Carl's need for relatedness is also present in his interview responses. He stated that what he liked best about the professional development was working together "with the teachers [he] worked with." He enjoys working with his colleagues and mentions many times that he works with them outside the professional development during prep periods and weekly department meetings. Carl's responses collaborate that he has moderately high relatedness, average competence, and below average autonomy.

Participation

The three focus teachers where videotaped for three concurrent professional development sessions to determine the ways that they participated. From the analysis of the observation data, I describe how each focus teacher actively participated in the professional development, and how their participation differed. I describe Amber as an *attentive, inquisitive*, and *involved explorer*. During the professional development sessions she paid attention, asked questions, involved herself in the small and large group discussions and tasks, and explored connections. These connections were either between mathematical ideas or between her prior knowledge and the content of the professional development. Ben can be described as an *attentive* and *involved conversationalist*. During the professional development he paid attention, and was involved in doing the tasks and in the small and whole group discussions. When lulls in the discussion occur, he moved the discussion along by asking questions, prompting others to share, or sharing himself. I describe Carl as a *passive, distractible*, yet *cooperative team player*. In the professional development he listened but was not always paying attention. He got distracted easily but, cooperated and worked well in his small groups. He did not actively seek out new

learning, but participated because he was required to attend. I discuss more in depth how these ways of participation differed among the focus teachers after briefly expanding on their participation.

Amber

Amber was highly engaged and actively participated during the professional development sessions. Amber responded to pre- and post-survey questions about how she participated in the professional development by stating that she intended to "actively engage in activities and discussion" (Pre-survey), do her homework, prepare for the lesson study, and try new things in her classroom. When asked in her interview to describe how she participated in the professional development, she stated:

> I feel like I come prepared and so I am able to respond in discussions. I read what I am supposed to read thoughtfully so I can give feedback in the conversation. In the tasks I feel like I am engaged mathematically. I think just participating in the discussions as well.

From Amber's description, she described her participation as paying attention during discussions, sharing comments during those discussions, engaging cognitively with the tasks and independent work, and was all around engaged in learning at the professional development sessions. She also invested time outside of the professional development to think about and do the homework. These interview responses verify the evidence of her participation seen in the video observations during the professional development sessions. From the ways that Amber participated, it is clear that she is an *attentive, inquisitive, and involved explorer* of the professional development.

Amber is *attentive*. During small and whole group discussions Amber attended to the speakers by looking at the speakers, often nodding her head and making comments to herself about what is said (e.g., "Okay, that makes sense") or writing down notes, which Amber clarified during the interview. Amber also involved herself in discussion by making many comments. These comments were usually to share ideas or to give information on what was discussed. For example, during a task in Session 2 about representing probability with area models, one of her small group members suggested that their new area model will be similar to the last one they completed stating "Same set up except the blue is just going to be (points to her paper) four points, done. No second draw. So we can just put a four in there, right?" Amber then gave information to the group and then extended the response to include another idea on how to make the new area model. Amber asked many questions during both the small and whole group discussions. She was also attentive during individual tasks. During independent work, Amber was observed reading, underlining passages, and writing on readings and handouts. She described her reading as thoughtful so she could provide feedback and this was evident in the ways she responded during the small and whole group discussions that followed. Amber often initiated the small group discussions or responded with her thoughts from the reading during whole group discussions. She also continued to reference the reading or the handout as she discussed her responses she had written independently during the small group discussions. Thus, Amber was attentive in her participation during the professional development sessions.

Amber is *involved*. In whole group discussions Amber usually shared her ideas, often presenting work done during the small group tasks. She also answered questions posed by other group members and the facilitators as well as asked clarifying questions of her fellow teachers and the facilitators. There were 19 activities that the teachers were involved in during the three

observed professional developments: seven whole group discussions (37%), seven small group tasks/discussions (37%), and five independent activities (26%). Amber participated in all the small group tasks and independent activities. She also presented her group's work or shared comments that stemmed from her small group working in every whole group discussion. This is significant because although most of the professional development sessions were spent in small group discussions, these always lead to whole group discussions about what was learned in the small groups. Thus, she participated in every activity or task in the professional development. In the small group discussions Amber usually exchanged ideas, asked about other's thinking and ideas, asked for clarification on understanding the mathematics, and justified her mathematical thinking to others. She also often verbalized her thinking as she worked on completing the tasks. During her interview I asked if her behavior was typical of her and she replied "I think it's pretty typical. For me it's better to be as involved as possible. It makes it more enjoyable." Amber involved herself in every aspect of the professional development.

Amber is *inquisitive*. She asked nearly three times as many questions as the other two focus teachers in the study. A more detailed look at the questions each teacher asks will be reported later. When asked about the number of questions she asked during the professional development during the post-interview, she stated that the unit on probability and statistics is one of her weaker content areas so she "was asking a lot of questions to clarify and really trying to get a good understanding of the meaning of, for instance, expected value." She continued to explain that she asked questions "to try to figure out what they were doing. Trying to make connections." This is evident in the number and types of questions that Amber asked during the three observed professional development sessions. Her questions showed her intent to learn because she was asking questions to gain understanding of the probability concepts and how

other teachers where approaching the content. Amber's purpose in asking questions was typically to gather information (46%) and to explore mathematical understanding (24%). Amber asked more explore understanding type of questions than the other two focus teachers.

An example of a question Amber asks to explore the mathematics comes during a small group discussion during Session 2 where they are building area models to represent different strategies to playing a game where points are given for different color cubes pulled out of a bag. After making area models for two different strategies and determining the expected value for each strategy, Amber's group determines that the expected value for both the strategies are the same. This led Amber to ask "So why doesn't that matter?" This question goes unanswered as the group tries to account for why it doesn't matter which strategy you use in the game, but it does show how Amber uses questions to explore her and her groupmates understanding of the mathematics.

Throughout the observed professional development sessions, Amber was seen trying to explore understanding, or to explore the kinds of connections that can be made to further her understanding. Sometimes she did this by making connections between the things being discussed like different representations and sometimes between what was being discussed and what she has done outside the professional development. An example of exploring connections between two representations can be seen in the following discussion Amber had in her small group during a probability task that required area models during session 2 of the professional development. In this task, the goal was to use an area model to represent the different possibilities in a game of drawing colored cubes each with different point values out of a bag. The teachers had just completed an area model showing the possibilities for drawing out two cubes and were trying to figure out the area model for drawing out three cubes. Amber initiated

the conversation by relating a tree diagram to the area model. She determined all the possibilities using her fingers and gestures to indicate making a tree diagram. Amber said "We kind of have to do like branching... Let's say I roll a red, or I pick a red. Then my second I've got red, blue, yellow. And then off of that..." and then one of the group members asked Amber how this could be done with the area model. Her response is "Well before didn't we do it like squares within squares?" What Amber says here is in reference to the last area model they made, where they had shown the first draw as the columns and the second as the rows, making smaller squares within the whole square. Amber then proceeds to discuss with her group how to create the area model, using the information from the tree diagram. Amber comments in the discussion "But then we need to branch again from this one square, so if we made a tree diagram..." and then continues until the groups agrees with how to create the area model. Amber explored how these representations where connected throughout the professional development sessions.

Amber explores connections not just between different representations but also between what is discussed at the professional development session with things she has learned outside of the professional development. She indicated in the interview that these area models discussed in the example above "could be used for other standards within the core" verifying that Amber sees how things she learned in the professional development connect to her teaching. Another example that shows the connections she made between the professional development and her own experiences was an activity in the session 1 of the professional development where the teachers were given a reading that included a couple of classroom scenarios and asked to come up with questions that could have made the scenario better. During the small group discussion that followed a task where the teachers read an article independently, Amber makes a connection between her prior reading and the reading they did in the professional development. "Those five,

did you read that? I think the book is called five practices to promote mathematical discourse. Have you read that? It's this (pointing to the paper)." Amber explored how different readings where connected. Amber is an explorer and did this exploring through her participation of being attentive, involved, and inquisitive.

Ben

Ben was actively engaged and participated well in the professional development. In Ben's response to the pre-survey question about how he participated he stated he would "fully participate during the classes but find[s] it difficult to make time for the homework." He further expanded on what his participation looked like for this professional development in his post-survey response: "I share my ideas and listen to those of others to obtain a more complete understanding of concepts. But I have not been doing most of the outside reading and homework. I just don't have the time free for it." During the interview, Ben described that during the professional development he "tried to be an active participant both in group work and as, the body as a whole...to speak out and give [his] views and opinions on things." Ben stated that he participated by sharing ideas, and listening to others in order to get a better understanding of the topic. These descriptions Ben provided verify evidence of his participation seen in the observations. From the observations, it seems as though Ben paid attention during the discussions, listened to others comments including his own comments regularly. Ben was engaged in learning the information presented in the professional development; however, he rarely did the required homework. Because of the ways that he participated, I describe Ben as an *attentive and involved conversationalist.*

Ben is *attentive*. During small and whole group discussions Ben attends to the speaker and listens to their words. This is evident in the fact that he looked at the speaker, often nodding

his head, making comments to himself about what is said (e.g., yeah, okay), and taking notes. It was also evident that he was listening to the speakers because he often answered their posed questions or made comments connected to what others had shared. For instance, during session 1 of a whole group discussion where they were talking about a game where a dart was dropped randomly from the ceiling to a checkered rug, a teacher asked why they have to make sure the dart will land in every spot and they discussed this for a bit. Later on in that same discussion Ben commented, "Just on what (teacher's name) was saying, it said in the directions that we were to assume it was equally likely to hit every spot." Often Ben asked questions to further the discussion or encourage other teachers to share their thinking. In the interview, Ben corroborates this stating "I just pay attention to what goes on around me and just [am] trying to learn from others." During independent work, Ben was observed reading and writing on the handouts. After doing the independent work, he shared his ideas and responses from the readings or handout in the small group discussions. These ways of participation show that Ben was attentive to who was speaking and to the tasks in the professional development.

Ben is *involved*. In both the small and whole group discussions, he shared a lot of comments. This included sharing and exchanging ideas, and justifying his work. A more detailed look at the types of comments each focus teacher made will be given later. During small groups Ben often made comments while monitoring his progress or he tried to clarify his understanding of other teachers' work or thinking. Ben also asked questions in these small group discussions but, often these questions were to clarify directions or to encourage other teachers to take part in the discussion. After these small group discussions, he often volunteered to present his group's work in whole group discussions. In fact, out of the seven whole group discussions, Ben presented work or shared ideas in most of them (5). This means that Ben was involved and

commented in nearly every activity (89%). In the two whole group discussions in which he did not share comments, he was still attentive to the speakers. Ben verified that this participation was typical when he said “I’m outspoken and I like to share my ideas” (Interview). Sometimes Ben would be so involved in his work that he would not hear a group member’s question or comment and so it appeared as if he ignored the group members and continued the task independently. Even during whole group discussion, sometimes Ben seemed distracted because he seems to be momentarily not attending to the speakers; however, he clarified during the interview that this was because sometimes he was finishing an activity that he wanted to “pursue further” (Interview) and sometimes he was writing notes on what was said or thoughts he had that he wanted to remember. Ben was usually involved during discussions as he listened to the speakers and responded with comments.

Ben is a *conversationalist*, often trying to bring other people or ideas into discussions. He did this by asking questions such as “Did we get all the ones you had there too” (Session 1)? or "What were you saying" (Session 2)? His involvement and attentiveness also indicate his interest in the conversations. Ben expressed during the interview that “it’s good for everyone else to get an extra viewpoint” and that he does not like it “when people just sit and stare at [you].” He knows that there are different types of people and to keep the ideas coming sometimes “you have to pull [the ideas] out of them.” These interview statements corroborate Ben’s observed participation in the professional development sessions. Ben showed himself to be an attentive and involved conversationalist.

Carl

Carl was moderately engaged most of the time but wasn’t a fully active participant in the professional development sessions. He seemed to be a teacher that was just present but happened

to actively participate sometimes throughout the professional development. In Carl's pre-survey responses about how he participates he replied "If I am going to be here I may as well get something out of it." He further expanded in the post-survey that he did "try to participate while here but [he didn't] do much of the homework." Specific evidence of Carl's participation comes through the observations, and then is confirmed through the responses in the interview questions. The ways that Carl engaged in the activities during the professional development sessions varied depending on the type of activity (mathematical or pedagogy) and whether it was done independently, in small groups or whole group. The ways that Carl participated led me to conclude that he is a *passive, distractible, but cooperative team player*.

Carl is a *passive participant*. During whole group discussions, Carl was a less active participant than during the small groups. His attention didn't always seem to be on the speaker. Instead of looking at the speaker, often he was just looking down at his desk. For example, during one of the professional development sessions, Carl is seen looking down and then closing his eyes. It is only for a moment, but later a group member makes a remark that indicated she noticed he was tired and sleepy. Once a task was completed, Carl rarely volunteered comments in the following whole group discussion (only in two out of the seven whole group discussions), and only presented his work when prompted by the facilitator. Therefore, there is evidence that Carl was more passive in his participation during whole group discussions. Although this behavior seemed to indicate that Carl was not engaged in the discussion, when asked about this in the interview Carl stated that he was usually listening when he was looking down. "I listen but when I'm tired I tend to look at a desk or whatever." However typical this behavior is for Carl, he admitted that during this professional development, "there might be a time or two where I dozed off but most of the time I know what's going on." These interview comments verify the

coding that Carl participated as a passive participant. Even during small groups, where he was more attentive, he was sometimes passive. He would often just sit and wait instead of working on the task. Carl was a passive participant.

Carl was easily *distracted* while participating in the professional development. He was often involved in off-task conversations, usually initiated by himself. Of the 17 off-task conversations Carl was involved in, 65% of them were initiated by him. He talked about off-task topics regardless of the activity type (independent work, small group, whole group). Along with these off-task conversations, Carl was often distracted by other things. These distractions happened more often during whole group discussions or independent work than in the small groups. During the whole group discussion, Carl was sometimes playing with candy wrappers or pens while he was listening to the speakers. He even left one of the professional development sessions for a few minutes to answer a phone call. He also would sometimes look off in other directions than where the speaker was, or look through windows or open doors instead of being involved with the task.

Carl is a *cooperative team player* because he was a more active participant during small groups than during independent work or whole group discussions. When Carl did a task in the small groups, he was attentive to the speakers, made comments, and worked on the task. When asked about this during his interview he indicated that he is more comfortable in small groups and that he "[doesn't] usually get too outspoken in big groups." He also seemed to be more interested in the mathematically related activities compared to the pedagogical activities. Carl told me in the interview that what he liked most about the professional development was working with other teachers because it "just deepened some of the understanding of the mathematics." Although he cooperated with his group and worked well with them, sometimes he

completed his work independently from the others before sharing his ideas on the task even though they were to work together in small groups to complete the task. Carl confirmed in his interview that this was because he wanted to "process the information on paper or in my head before I start opening my mouth too much." Although he likes to be confident of what he says before he speaks in the small group discussions, Carl did make comments and cooperated with members of his group. He exchanged ideas, monitored his group's progress on the task, and provided information during the conversation, particularly when other group members asked him questions. Carl also asked questions, usually these questions were to clarify directions or clarify other group member work, such as "so what is the two point strategy" (Session 2) or "Didn't they tell us to skip 2 and go to 3" (Session 1)? Carl was more involved when it came to small groups and cooperated with the other teachers showing that he was a cooperative team player.

Differing Ways of Participation

There are a few distinct ways that Amber, Ben, and Carl's participation varied. First, Amber and Ben were attentive and involved; whereas, Carl was passive. Another way their participation differed was that Carl spent more time in off-task behaviors than either Amber or Ben. Although the types of comments during small group discussions varied only slightly, the types of comments made during whole group discussions differed among the focus teachers. The types of statements Amber and Ben made to questions differed from Carl. Carl's responses were giving the bare facts; whereas, Amber and Ben were more apt to share their thinking. The last way that their participation varied was in the types of questions that the teachers asked during the professional development sessions. Amber was an explorer in her types of questions, looking for connections; Ben and Carl asked questions to gather information.

Attentiveness versus Passiveness

In the whole group discussions, there was a distinct difference between how Amber and Ben paid attention compared to Carl. This difference is related to how they attended to the speakers during the discussion. Amber and Ben were attentive and involved and Carl was not. His attention was more passive and often divided.

Amber and Ben were attentive and involved in discussions. They were attentive listeners. They nodded their heads in agreement, leaned and/or looked toward the speaker, and made comments to themselves about what was said (e.g., yeah, uh huh). Amber shared comments in every whole group discussion and Ben in most of them. They willingly volunteered those comments the majority of the time, sharing their work from the small group tasks and thoughts about other teachers' work that was presented. They were often seen writing during discussions and when asked about this during the interviews, both commented that they were taking notes. Amber clarified although she was taking notes, sometimes she was following-up with or continuing ideas from the task. Ben clarified that sometimes he was only "half listening, half writing" (Interview) but that he was writing either notes, thoughts about what was said, or if he didn't get completely through the task, he was completing the activity. Overall, both focus teachers with an intent to change were attentive to the speakers during whole group discussions.

Carl was passive during the whole group discussions, passively listening to the speakers. He was sometimes looking at the speaker, but rarely leaned toward them or made comments to himself about what was said. Most often Carl was looking at the desk or distracted by things around him (e.g., candy wrappers, pens) and his full attention was not on the speaker. His listening was not only passive but rarely led to him sharing a comment during discussions. In the three observed professional development sessions he only made four comments during whole

group discussions, two of which were prompted by the facilitator. This is in contrast to Amber who made 49 comments and Ben who made 35 comments in those same professional development sessions. Carl in this sense was more passive in his participation during whole group discussions.

Off-Task Behavior

There were times in the professional development sessions where each of the focus teachers were not engaged in the task or discussion. However, Carl was much more distracted than the other two focus teachers and spent more time engaged in off-task behavior. Carl displayed off-task behavior 8% (24 minutes) of the total time in attendance during the three observed professional development sessions. Amber and Ben were off-task about 2% (5.5 minutes) and 5% (14.5 minutes) of the total time in attendance. It is expected that most off-task behavior is self-instigated but there was a difference among the three focus teachers. Carl self-instigated most of his off-task behavior (83%) compared with Amber (48%) and Ben (67%). For all teachers this off-task behavior is seen most commonly in off-task conversations. Table 13 displays the focus teachers' total time spent off-task, the percent of off-task behavior in relation to the total time across the three professional development sessions, the number of off-task conversations, the total time spent in those conversations, and the percent of self-instigated conversations. Carl was more likely to initiate the off-task conversation than the other two teachers. Overall, Carl spent more time in each of these off-task behaviors than the other two focus teachers.

Table 13

Time Engaged in All Off-Task Behavior and in Off-Task Conversations

	Off-Task Behavior		Off-Task Conversations		
Teacher	Total Time	%	#	Time	Self - Instigated
Amber	5.5 min.	1.86%	14	3.5 min.	42.86%
Ben	14.5 min.	5.03%	16	5.5 min.	50.00%
Carl	24 min.	8.33%	17	7.5 min.	64.71%

Other off-task behavior displayed by the teachers were distractibility, passively responding, disrupting, and other competing activity (see Table 9 for descriptions). For these, only Carl had behavior labeled as disruptive due to his phone ringing three times in one of the professional development sessions. Twice Carl silencing the phone quickly and once he took the call and left the room. Carl was easily distracted, spending about 29% (7 minutes) of off-task behavior time on distracted behavior. Neither Amber nor Ben were as distracted as Carl and their off-task behaviors usually happened during the small group task while they were waiting for the other teachers in their group. Ben was typically distracted by the provided snacks. He got up four times in two professional development sessions where snacks were provided after the beginning of the professional development session, resulting in about 38% (5.5 minutes) of Ben's off-task behavior. Passively waiting usually occurred during small group discussions. Carl spent about 21% (5 minutes) of his time off-task sitting without interacting with others or working on the task. This is in contrast to Amber and Ben who spent less than two minutes combined in this behavior. Of the many off-task behaviors that were observed during the professional development sessions, Carl carried out most of them.

Types of Comments

One of the main ways of participating was talking which gives evidence of teachers' cognitive engagement in the task or activity. These moments of talking included types of comments where a teacher shares or exchanges an idea, gives information, justifies an argument, asks or answers a question, or monitors their progress. When working individually, cognitive engagement is evident if the teacher verbalizes their thinking. Each focus teacher had moments of talking in the observed professional development sessions. Most of the moments when they verbalized their thinking came during small group discussions (82%), and the rest happened during independent tasks. In small group discussions, the three focus teachers commented similarly. They exchanged ideas, gave information, asked and answered questions, and justified arguments. However, in whole group discussions, the three focus teachers comments differed.

In whole group discussions, 88 comments were made by the three focus teachers. Figure 8 shows the number of comments made by each of the focus teachers. Amber and Ben made most of those comments. When Amber and Ben made comments in whole group discussions, they were mostly volunteered (both above 80%) but Carl's comments were half volunteered and half prompted by a facilitator or other teachers. This corresponds with the fact that Amber and Ben were more *attentive* and *involved* during whole group discussions and Carl was more *passive*. Figure 9 is a breakdown of the different types of comments made during the professional development sessions by each of the focus teachers. Carl made comments that only gave information and asked or answered questions. This differs from Amber and Ben whose comments included justification of arguments or sharing and exchanging ideas. This is an important difference when considering which types of comments indicate a high level of cognitive engagement.

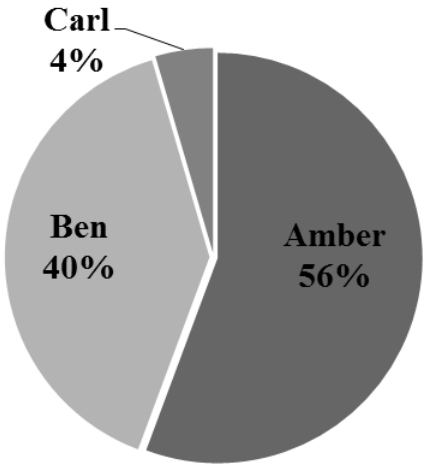
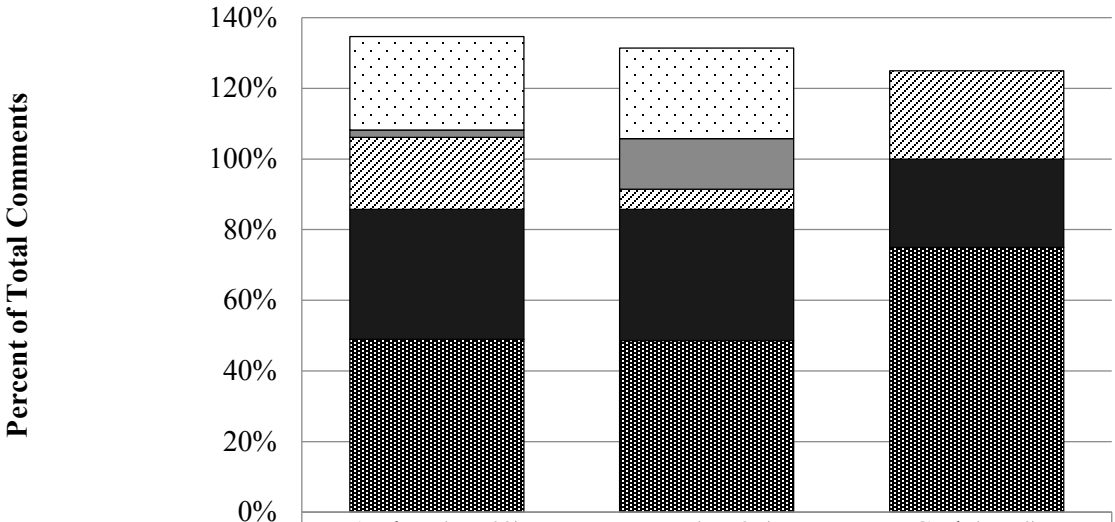


Figure 8. Percent of comments made by the three focus teachers.



	Amber (N=49)	Ben (N=35)	Carl (N=4)
Exchange Ideas	27%	26%	0%
Justify Argument	2%	14%	0%
Asking Questions	20%	6%	25%
Answering Questions	37%	37%	25%
Giving Information	49%	49%	75%

Figure 9. The types of comments each focus teacher made during whole group discussions.

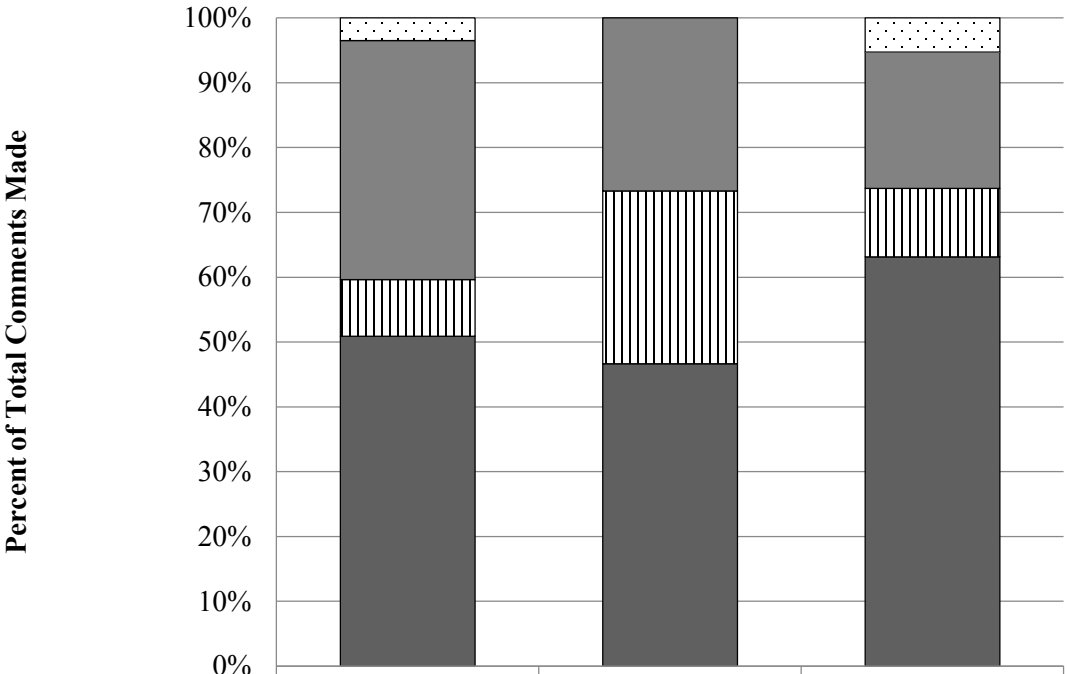
Comments where ideas are exchanged or an argument is justified demonstrates that teachers are more cognitively engaged than teacher comments that provide information. For

instance, during a whole group discussion teachers were sharing questions they developed in small groups to improve the mathematical discourse of scenarios in a reading. During Session 1, Ben shared an idea that his group came up with to direct the students to notice patterns. He then shared the idea that "and if they didn't see that, we could always just put the methods up say how do these methods compare to each other? Can you see similarities?" During this same discussion, Amber connected the ideas and said "yeah, like you said, how do you see this strategy in this one?" Both comments demonstrate that sharing ideas involves thinking about what others have already said in the discussion and connecting their thinking with others. An example of a giving information comment comes from another discussion during Session 2 about the area models the teachers made in small groups for the probability of pulling out colored cubes from a bag. They were asked what the numbers in the area model represented and the response was the "points for a red-red-red-red." Giving information comments requires less cognitive effort and thus other types of comments show more cognitive engagement in the discussions.

Responses to Questions

Through the analysis of the types of comments that the focus teachers made in the professional development sessions I found differences in the ways that they answered questions. Of all the comments made by the focus teachers, 109 of them were responses to questions. Amber responded to 57 questions (54%), Ben responded to 30 questions (28%), and Carl responded to 19 questions (18%). Besides the quantity, there are also differences in the type of responses the focus teachers provided. Figure 10 displays the types of comments made in response to questions for the three teachers. The majority of responses to questions were just giving information (about 53%), however the focus teachers varied across the other types of responses they provided. Amber responded to many questions by sharing or exchanging ideas

(37%). Ben responded to many questions by justifying his argument (27%).The majority of Carl's responses to questions were to provide information or exchange ideas (84%). This is significant because justifying arguments or sharing ideas indicate more cognitive engagement than just giving information.



	Amber (N=57)	Ben (N=30)	Carl (N=19)
Self-monitoring	4%	0%	5%
Exchange Ideas	37%	27%	21%
Justify Argument	9%	27%	11%
Giving Information	51%	47%	63%

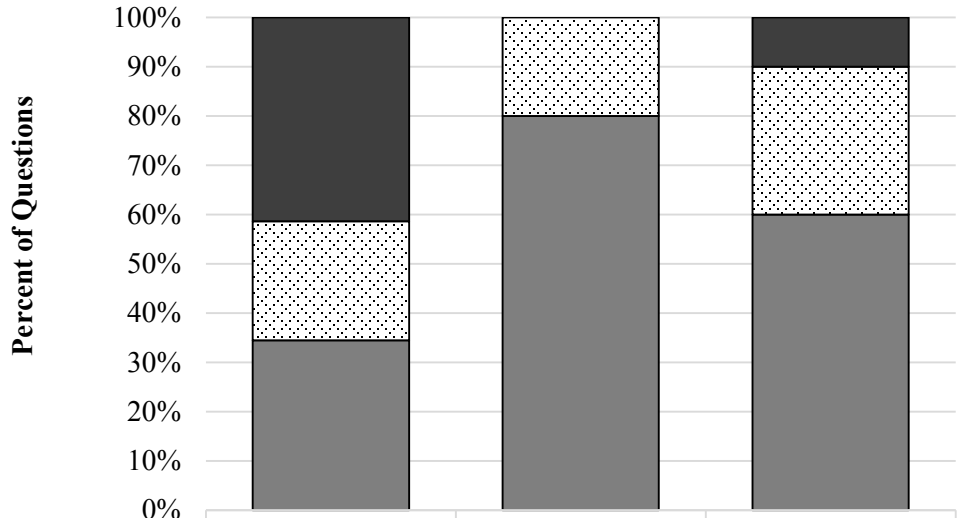
Figure 10. Types of comments made by the three focus teachers when responding to a question.

Asking Questions

The types of questions asked by the focus teachers also indicates a difference in how they participated in the professional development. Table 11 displays the six categories of question types found amongst the three focus teachers: *decision-making*, *informational*, *instructions*, *probing understanding*, *exploring understanding*, and *generating discussion*. Each category was coded with the subcategories of mathematical, pedagogy, or logistics. Amber asked the most

questions, more than twice as many as Ben and Carl. However, there are some differences in the types of questions each focus teacher asked. Ben asked seven generate discussion questions (23% of the questions he asked) while Amber did not ask any and Carl asked one. Another difference is that Carl asked one understanding question (4% of the questions he asked) while Amber asked 24 (35%) and Ben asked four (14%) of this same question type. This corresponds with Ben being more of a conversationalist and Amber exploring connections.

When comparing the types of questions with the subcategories (mathematical, pedagogy, and logistics), there are some differences – specifically with the mathematical questions. Figure 11 displays the different types of mathematical questions the focus teachers asked during the professional development. Ben and Carl asked mostly information mathematical questions while Amber asked mostly exploring understanding mathematical questions. Although both types of questions are good, this difference is important. Information mathematical questions such as "So what's the two point strategy?" (Session 2, Carl) or "What would be your expected value for one term?" (Session 2, Ben) are good questions but are just asked to clarify or gather information. Exploring understanding questions such as "So why doesn't that matter" (Session 2, Amber)? Require others to think before responding. These type of questions indicate that the inquirer is looking for connections, which may indicate that the teacher is more cognitively engaged in the activity than when asking other types of questions such as information questions.



	Amber (N=29)	Ben (N=5)	Carl (N=10)
Understanding-explore	41%	0%	10%
Understanding-probe	24%	20%	30%
Information	34%	80%	60%

Figure 11. The type of mathematical questions each focus teacher asked.

Although independently these differences may seem insignificant, collectively they show a difference in the focus teachers. Amber was mostly on-task, did not get distracted, shared a lot of ideas in both small and whole group discussions, and asked many exploring understanding questions. These differences were visible and are described by saying that Amber is an attentive, involved, and inquisitive explorer. Ben, who was also on-task and not usually distracted also shared ideas but did much more justifying arguments and questioning to extend the discussion. This can be described as an attentive, involved conversationalist. And then Carl, who was often distracted and the cause of those distractions limited his comments and answers to giving information is described as a passive, distractible yet cooperative team player.

Influences on Participation

When analyzing the ways that the three focus teachers participated in the professional development, there were factors that influenced their participation. One factor was the focus

teacher's motivation which was used to answer the research question: How does teachers' motivation relate to their participation in professional development? Both Amber and Ben have internal motivational sources which included high or moderately high autonomy, competence, and relatedness. Both were attentive and involved. Both regularly shared comments in the whole group discussions. This is in contrast to Carl who had external motivational sources that included moderately high relatedness, average competence and below average autonomy. This difference in motivation influenced Carl's participation. Carl spent more time off-task, rarely shared comments during the whole group discussion, typically only gave information in response to questions and most of the questions he asked were information ones.

A closer look at the motivation of the three shows a correspondence between their fundamental needs being met and their participation. Table 14 displays this relationship because it puts the focus teachers' information about motivation and participation together. The feeling of one's autonomy, competence, and relatedness influences the motivation of that person and this in turn has an influence on the way the person participates. All three have high or extremely high relatedness and all seem to do very well in small groups and interacting with the other teachers. . The common need for relatedness that was met for these teachers and influenced their participation (which was similar) in the small groups. Thus they all can be characterized as involved. However, since Carl was typically only involved during the small groups, he was characterized as a cooperative team player.

Table 14

Relating Motivation to the Ways Teachers Participate in Professional Development

	Motivation				Participation		
Teacher	Regulatory style	Autonomy	Competence	Relatedness	Whole Group	Small Group	Independent Activity
Amber	Integrated	High	Moderately High	Moderately High	Attentive, Involved	Attentive, Involved	Attentive, Involved
Ben	Identified	High	High	High	Attentive, Involved	Attentive, Involved	Attentive, Involved
Carl	External	Below Average	Average	Moderately High	Passive, Distracted	Involved	Passive, Distracted

Differences in the focus teachers' autonomy and competence correspond with differences in their participation. It is Carl who has lower autonomy and competence than the other two focus teachers, so how did Carl participate differently? Carl resented the fact that he had to go to this required professional development indicating in both surveys and the interview that he only attended because it was a district requirement. This may be why his need for autonomy is low, or he feels it is not being met. Carl indicated that his participation decreased throughout the two-year professional development because he had no choice in attending. The influence of Carl's lack of autonomy maybe seen in his distractedness. Overall, Carl's lack of autonomy affected how he participated. This also may account for the differences in the types of questions and comments that Carl shared. He tends to only share when prompted too, which corresponds with his autonomy and his competence. As for his competence, it affects Carl's participation as well. Carl does not comment in discussions where he has to do more than just give information unless it is in the small group setting. This may be due to his feeling of average competence. This is in stark contrast to Amber and Ben who both have higher levels of autonomy and competence and regularly make comments in both large and small groups.

Motivation is not the only thing that influences the focus teachers' participation in the professional development. The focus teachers' intent to change also influenced their participation. Amber states that she participated the way she did because she was hoping "to see some positive change/growth in [her] own teaching" (Pre-survey). She also confirmed in the interview that her participation was due to her desire to try things, or to change and provides evidence for her more self-determined motivation. The ways she participated is linked to her motivation and her intent to change. Ben stated that he participated "to learn more and be a better teacher and learn more about the new teaching methodology" (Pre-survey) showing that his intent to change influenced his participation. Carl did not have an intent to change, yet participated anyway because he had to attend. Recall that Carl participated as a *passive, distractible* but *cooperative team player*. He worked well with the small groups but easily got distracted and was passive during other activities besides the small group tasks. This participation is different from the other two focus teachers and Carl's lack of intent to change seemed to influence his decision to participate in these ways.

A comparison of these three focus teachers establishes that a teacher's intent to make changes from learning at a professional development does indicate how they will participate. Both Amber and Ben had this intent and participated in similar ways. They were both attentive and involved. They shared comments, ideas, and the work they did on the task during both the small group and whole group discussions. This is directly opposite to Carl, who did not have more than a superficial intent to change. While Amber and Ben were attentive and involved, Carl was passive and only involved during small groups. His comments were not usually ideas or his work, but instead just giving information. Thus, teachers with intent to change will be more actively engaged during the professional development.

Resulting Intent to Change

One cannot determine if a teacher will follow their reported intent to change without analyzing all domains of the teacher's teaching environment (Clarke & Hollingsworth, 2002). Thus, for this study I focused on only the intent to make changes from the things that the teachers learned or were presented in the professional development. Teachers were chosen to participate based on their pre-survey questions. However, each teacher was given a post-survey to provide more evidence of their intent to change and interviewed after the last videotaped professional development observation to further corroborate the data. From these data, it was confirmed that Amber had a strong intent to change. She started with an intent to change and ended the study with a similar resulting intent to change. The resulting intent to change is the focus teacher's intent to change at the end of the study. Through Amber's participation in the professional development she developed or maintained her intent change. On the other hand, both Ben and Carl had a resulting intent to change different from their intent to change at the beginning of the study. Ben started with an intent to change and by the end of six professional development session reported having little to no intent to change his practice. Carl had a superficial intent to change, yet by the end of the study his resulting intent to change was different because he expressed a desire to incorporate some ideas from the professional development in his classroom.

There is evidence in the focus teachers' interview responses of how likely their intent to change will result in actual change. Amber's responses in the interview as well as comments made during the professional development indicate she has already implemented some changes into her teaching practices. This is promising as it shows Amber's resulting intent to change will most likely result in actually trying different teaching practices in her classroom. Not only did

Amber show this initial intent to change in her responses to the pre-survey, she showed it again in her responses to the post-survey questions. In the post-survey, Amber wrote that she intended to use the task format taught in the professional development and to focus on the standards of mathematical practices with her students. To implement these ideas from the professional development into her classroom she will "grade [and] discuss the practice standards with students [and] select or write appropriate tasks" (Post-survey). Amber also stated that she attended the professional development not only because it was a requirement but because she wanted the math department to "get better at teaching practices" (Interview) and lesson development. Hence, she came into the study with an intent to change and left the study with a resulting intent to change that seemed to affect her teaching practice as she reported.

Amber had a strong intent to change at the beginning of the study that continued to strengthen as she participated in the professional development and tried things out in her classroom. Amber specifically stated three things that she has tried implementing that resulted from attending and participating in this professional development: (1) "being clear about the purpose or goal and having students respond and recognize and discuss the purpose each day", (2) "making sure students are comfortable with multiple representations and concepts and connections between those representations", and (3) "having conversations where you can disconnect from having taught it or observed it and just being able to focus on the lesson design and the lesson implementation" (Interview). When asked if she will continue implementing these changes, she responded affirmatively for all three. Other evidence of her willingness to try out teaching practices from the professional development come from a conversation she had during a task in the first professional development. During one small group task, Amber and another teacher were discussing an element of pedagogy and started discussing things they have

tried in their classroom. From the conversation, it was clear that Amber had tried things in her classroom that were discussed during a prior professional development session. All of these examples provide evidence to conclude that Amber has a strong resulting intent to change, and that it is highly likely that her intent to change will actually yield changes in Amber's teaching practices.

If I label Amber's resulting intent to change as strong, this is not the case for Ben or Carl. Although Ben had an intent to change, it is evident from his interview responses that by the end of the study, his resulting intent to change was altered. Carl, who had a superficial intent to change at the beginning of the study, ended the study with a resulting intent to change that was driving him to change some of his practices.

Although Ben attended the professional development with an intent to learn and change his teaching practice, his responses during the interview indicate that he has not changed his teaching practice due to his participation in the professional development. Ben stated that during the observed professional development sessions, there were no new mathematical concepts for him but that it did emphasize "the idea of modeling and how important that can be in understanding." The professional development also helped him reflect and identify better ways to teach concepts. Ben informed me that "the discussions we've had, the ideas presented, have given [him] extra ways that [he] can present things to people and help them learn." He also learned more about the teaching methods, or the pedagogy that was a focus or the professional development. With this learning, Ben did try to use it in his teaching but indicated that based on his experience and student feedback, he did not see an advantage in using the teaching strategies. When asked if he will continue with these changes he tried, Ben stated that he plans to "incorporate it into [his] lessons where it's appropriate but [he's] not going to switch over to it

being [his] primary method of teaching." He plans to "just take bits and parts and implement it into what [he's] doing to help with what [he's] doing." Although Ben had an intent to change, after trying some things out in his classroom, he determined not to continue them and so his resulting intent to change is weak which probably will not result in a change of his teaching practices.

Carl's superficial intent to change at the beginning of the study is also different than his resulting intent to change at the end of the study. He indicated on his post-survey that he will use "productive struggle task based lessons" to "get the students thinking." Although this shows his resulting intent to use something from the professional development in his classroom, he admitted in the interview that he only attended the professional development because it was a requirement. Thus, to begin with, Carl had no intentions coming into the professional development to make changes; however, by the end of the study, his resulting intent to change was different. His response on the post-survey provides information about his opinion toward the professional development that "it sometimes feels like [they] are just filling time." However, Carl also indicated in the interview that he tried a few things he learned from the professional development in his classroom and will continue to do those things. He told me that "The learning cycle just kind of deepened my understanding of that and I tried to put a little bit more of that in some of my lessons... I've tried a little bit harder this year…to let the kids have more productive struggle." Carl recalled that this helped students remember things better so he will continue using this in his teaching. Thus, although a teacher may attend and participate in professional development with no intent to change, it is key to get them to try something out in their classroom so they can experience differences in what students learn. Even though Carl had a

superficial intent to change at the beginning of the study, he has a resulting non-superficial intent to change because of what he learned in the professional development and tried in his classroom.

Influences on Intent to Change

The three focus teachers participated in different ways most of the time during the professional development and have different resulting intents to change. The three focus teachers participated in similar ways during the professional development during small group tasks; however, these ways of participating do not seem to be the reason that the focus teachers end with their resulting intent to change. All three teachers commented that their experience with trying something new in their classroom and how they saw the success of that experience was the reason for their resulting intent to change. Hence, this way of participated is an influence on a teacher's intent to change.

After trying something out in their classroom from the professional development, the teachers determined if they would continue implementing what they had tried based on how they viewed the success of the experience. After trying some things out, both Amber and Carl indicated that they would continue to use these things in their teaching practices. Amber stated in her interview that she will continue to use multiple representations in her classes (something that was a focus in the professional development) because she feels "it's been wonderful for ninth graders and pretty powerful for them, and they have a more solid understanding." Carl stated in his interview that he would continue to use productive struggle with his students because "when [students] come up with the answer on their own, they remember it better a little more so it's best to have the productive struggle." Ben tried a few things but stopped trying things because he did not see any advantage for his students or himself. Ben stated in his interview that he will not continue using the inquiry-based structure because he has had students say "you know, I actually

came out of that confused because I've done so many things…What is the correct way?" and as a teacher he did not want the students to question themselves. Ben also indicated that there were pressures outside of the classroom that influenced his view of the success of implementing things from the professional development in his classroom. He stated that part of the reason he chose not to continue with what he had tried was because "every time we turn around the state's taking away more time from our schedule… The state has always said how much you teach is more important." Ben felt that what he tried was not worth the time it took and the students seems to be more confused. Even though Ben does not plan on continuing to use the things he tried, and Carl only indicated a few things that he will continue, all three tried something. Because of the professional development, two of the focus teachers showed some resulting intent to change at various levels, including Carl who had a superficial intent to change at the beginning of the study.

This aspect of trying something out in their classroom seems to be an application of the professional development and stems from the teachers' participation during the sessions and the way that the professional development was structured. Although all the focus teachers participated similarly in small group tasks, there was not enough evidence to conclude that this type of participation is what caused the teachers to decide to try something out in their classrooms. Another possibility is that the homework discussion at the end of each session influenced the teachers' decision to try something out. These discussions encouraged teachers to try something in their classroom from what they learned that session in the professional development. In session one teachers were asked to implement cards that had questions about discourse in their classroom with their students and to audio record one of their classrooms and do the same activity with that recording as they did during the professional development session

to determine the types of questions they asked in their classroom. Even though Ben and Carl said that they did not do the homework perhaps the consistent reminder to try things out in the classroom prompted the teachers to make the decision to try something out.

Discussion

The purpose of this study was to determine how teachers' motivation and participation in professional development influenced their intent to change. In order to determine this, the study focused on two research questions; (1) how does teachers' motivation relate to their participation in professional development; and (2) what ways of participating in professional development influence teachers' intent to change. I have identified ways that motivation, participation, and intent to change are related.

Just as indicated in the research on motivation, sometimes the context or environmental factors can foster these needs and enhance self-determined motivation and sometimes they can impart or negatively affect self-determined motivation (Grouzet, et al., 2004). In the sessions I observed, the focus of the mathematical content was probability. The teachers' competence for this mathematical content influenced their overall motivation differently. Amber stated that this was a weak area of content for her yet, her lack of competence compelled her to ask questions and gain understanding. Ben indicated in his interview that he knew the content but he still enjoyed "seeing different ways to approach the problems." Both of these responses demonstrate how the structure of the professional development (content characteristic) met their need for competence and enhanced the teachers' self-determined motivation. However, Carl suggested in his interview that because he knew probability very well "it was almost a little frustrating at times because they [facilitators] wanted you to think back too far where you didn't understand it but [he] understood it so well for so long. It's not easy to do that." In this example, Carl's

competence hindered his self-determined motivation and it demonstrates that all three needs are necessary for intrinsic motivation (Ryan & Deci, 2000a).

The three basic needs (autonomy, competence, and relatedness) seem to also influence the teachers' participation. This influence indicates that the characteristics of an effective professional development should provide support for the teachers' needs in autonomy, competence, and relatedness to be met. For example, all three teachers indicated that one of the things they enjoyed most about the professional development was the interactions with fellow teachers. This enjoyment is part of the reason the three focus teachers had high relatedness. These interactions were possible due to the structure of the professional development. It was structured with collaboration (collaborate characteristic) in mind throughout each unit of the professional development, ended with a lesson study where teachers worked together to plan, implement, and improve upon a lesson. The professional development also was structured so that each session had a variety of activities, most of which were done in small groups. Indeed both the context of the professional development and the teachers' motivation facilitate their participation, again supporting the motivational model used in this study.

It was found that all three teachers were actively and similarly engaged in small group tasks. This similarity in the teachers' participation was due to the high or moderately high relatedness of all the focus teachers and may correspond with all the teachers trying out things they learned or did in the professional development in their classroom. This relationship may indicate that teachers' sense of relatedness needs to be satisfied in order for them to try new things in their classroom. It also indicates that small group tasks are important to include in professional development. Researchers have stated that professional learning communities are effective because it provides support and time to collaborate (Borko, 2004). Considering this

study, perhaps the reason that professional developments that include small group tasks are effective is because they satisfy the teachers' need for relatedness.

Motivation does indeed influence teachers' participation in a professional development setting. In particular, the feeling of relatedness influences the ways in which teachers participate particularly in small group tasks and activities. The correspondence of these motivational needs being met and the ways that the focus teachers' participated support the claim that the degree at which a person's needs are satisfied can predict work-related outcomes (Baard et al., 2004). It was also found that teachers' initial intent to change influenced their participation. Both Amber and Ben had an intent to change and participated in similar ways. This is directly opposite to Carl who had a superficial intent to change and was passive and only involved during small groups. The influences found through this study also supports part of the motivation model (Skinner & Pitzer, 2012) that combined the SDT with participation and intent to change. Figure 12 shows how the results of this study fit into and adds to the motivation model. The teachers' initial intent to change influences their participation in the professional development so this was added as a facilitator. The figure displays that the teacher's motivation and initial intent to change both influence how teachers will participate in the professional development. A direct influence of motivation on participation was also determined from the study. It was also found that relatedness and small group participation are directly related and influence each other. This is visible in the double arrow between relatedness as a facilitator to participation and small group as an indicator of participation.

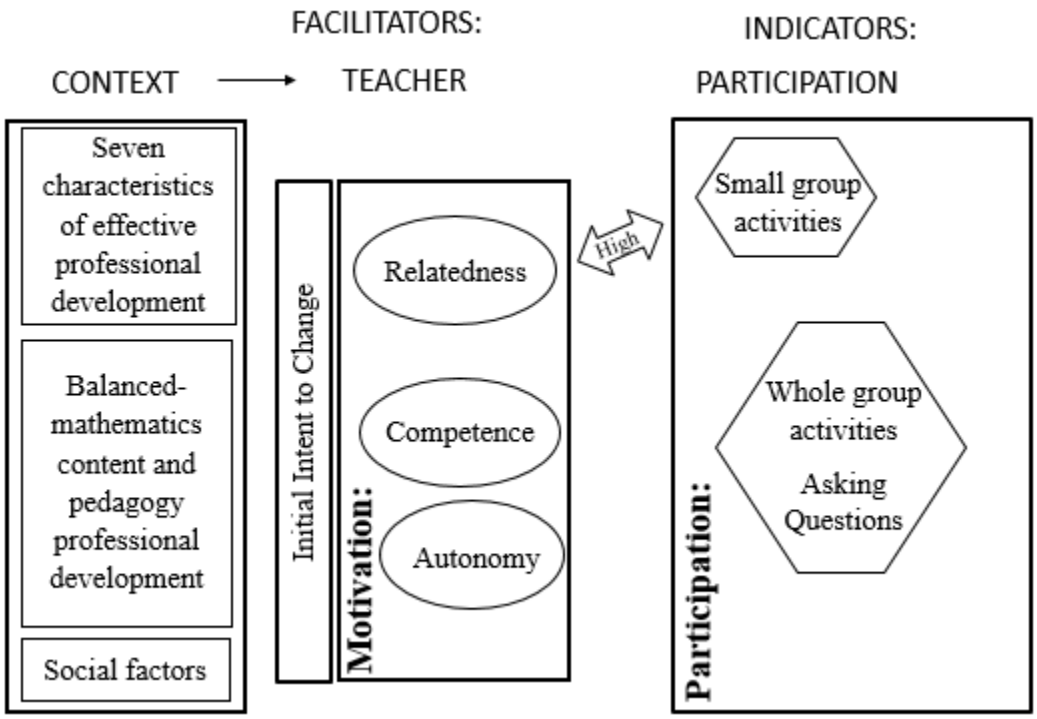


Figure 12. The modified motivation model showing influences on participation.

There is some influence of teachers' participation on their resulting intent to change. All three teachers ended up trying something in their classrooms from what they learned or did at the professional development. The three focus teachers participated similarly in the small group tasks and this supports research on student engagement that states that small group activities increase engagement as well as enhance students' learning (Schunk & Richardson, 2011). However, no evidence was found to indicate that the teachers' resulting intent to change was strengthened based on the small group activities. Even though the three teachers participated similarity in small groups, only Amber's resulting intent to change was strengthened. Both Ben and Carl changed their intent to change at the end of the study. It seems to be the case that the influence on the resulting intent to change comes from the teachers implementing something in their classroom and how successful the teacher viewed that experience.

There is a difference between the initial intent to change and the resulting intent to change for the focus teachers. Overall, Amber's resulting intent to change was strengthened while Ben and Carl's resulting intent to change was changed due to their classroom experience. Although teachers most likely will not try out a practice or develop a change in practice without the intention to do so, Carl is a counterexample of this. Carl did not attend the professional development with an intent to change but did end up trying a few things out in his classroom. Amber indicates more of a willingness to continue using what she tried in her classroom from the professional development. This indication is closely aligned with the purpose of professional development - to change teaching practices to improve student learning. Amber's responses during the interview show how she adopted what she learned in the professional development and how her experience of implementing different practices in her classroom led her to decide to continue with what she changed about her teaching. Amber's responses closely agree with the definition of intent to change (Schorr & Koellner-Clark, 2003) used in this study. The other two focus teachers either indicated that based on their experience with trying something in their classroom, they will not continue with it (Ben) or that they will continue to use something they tried in their classroom (Carl).

These findings fit with the research on teacher change that teacher change occurs as teachers try things and then reflect on what they have tried based on the perceived outcomes of their efforts (see Clarke & Hollingsworth, 2002; Guskey, 1986). It seems that once the teacher tries something in their classroom that experience either strengthens or changes their resulting intent, which will influence their motivation and participation in the professional development. There are also outside pressures that sometimes influence how the teacher views the success of such experiences, like in Ben's case. I suggest that the relationship and influences between

motivation, participation, and resulting intent to change, is more cyclical than first thought and the original motivation model used as the theoretical framework for this study should reflect this. Figure 13 shows the alterations made to the motivational model to account for the findings in this study. Participation and the emphasis on trying out things in the classroom between professional development sessions lead teachers to apply things in their classroom. This classroom experience is viewed by the teacher as either successful and worth it or unsuccessful, which influences teachers' resulting intent to change, which will then influence the teachers' motivation and participation in the next professional development session.

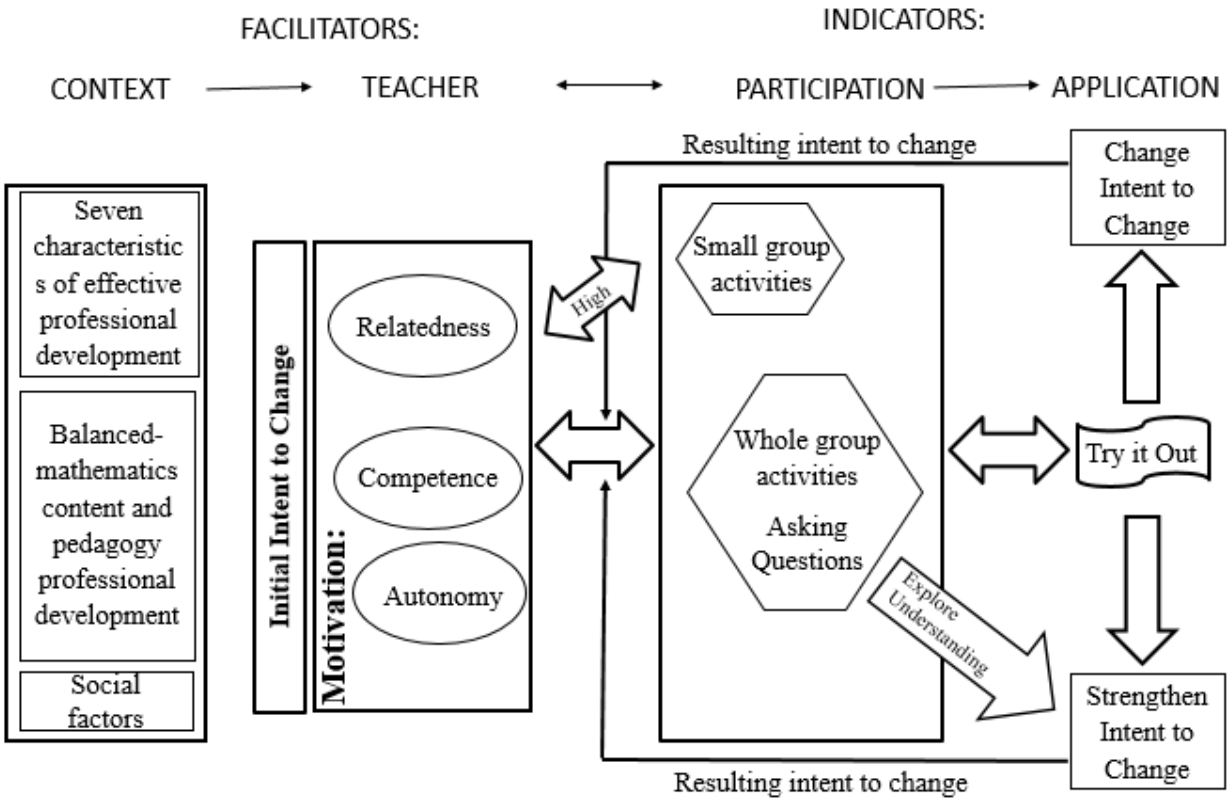


Figure 13. The modified motivation model with all findings present.

The goal of this study was to determine if a teacher's intent to change is influenced by their motivation and participation in a professional development. Findings indicate that there are influences between motivation, participation, and intent to change. The findings are summed up

in Figure 13 and show that initial intent to change and motivation influence a teacher's participation. This participation and emphasis on trying things out influences the teacher applying things in their classroom but it is the experience and how the teachers view the success of that experience that influence the teacher's resulting intent to change.

CHAPTER 5: CONCLUSION

In this study, I used research on student engagement to investigate how teachers' participation was influenced by their motivation and their initial intent to change their teaching practice in an effective professional development setting. Findings indicate that there are influences between motivation, participation, and intent to change (see Figure 13). Although the study did have its limitations, the results contribute to different areas of research and suggest areas of further research.

Contributions

This study contributes to three areas of research: professional development, teacher change, and engagement. These contributions include adding to the body of research on effective characteristics of professional development; adding to the research on engagement, specifically its relationship with motivation; and relating teacher change to teacher motivation and participation.

This study adds to the research on effective professional developments because it used research on effective professional developments and suggests certain characteristics that seem to encourage teacher change. Analysis of teachers' motivation and interview responses indicated that these characteristics of the professional development attended helped meet teachers' need for competence, autonomy, and relatedness. Indications that certain characteristics of a professional development support the three fundamental needs and internal motivation sources are beneficial for research on professional development. For example, the teachers all discussed that their knowledge about probability affecting how they participated, showing that their competence was satisfied by the content characteristic. Findings point towards small group tasks and activities (combining the characteristics collaborate and activities) influencing teachers'

participation because those small groups satisfy the teachers' need for relatedness. Findings also indicate that teachers who ask exploring understanding questions may indicate a stronger intent to change for that teacher.

This study contributes to the research on teacher engagement and the relationship to motivation. The research on teacher engagement is lacking so this study used research on student engagement. The results of this study indicate that research on student engagement can be used with mathematics teachers in a professional development setting. This study used a modified version of the motivation model to show that motivation and participation do influence a teacher's intent to change. Keeping in mind that the study included only three focus teachers, results indicated that a relationship does exist between motivation and participation, influencing each other, and that teachers' participation can indicate their intent to change, however it is more cyclical than the original model indicated. Thus findings seem to confirm and extend the motivation model and illustration that teachers' motivation influences their participation. From the results, the motivation model was modified to include the influences between motivation and participation that were found (see Figure 13). These changes in the motivation model also add to the ongoing discussion of research on engagement about the distinction between motivation and engagement and how these two constructs are related (Christenson et al., 2012). The changes also indicate that motivation is not the only influence of teacher participation in professional development.

The research on teacher change shows that there are many aspects of teachers' work that can influence their practice and lead to changed practices. This study provides more evidence for how some aspects of the change environment (Clark & Hollingsworth, 2002) relate, in particular motivation in the *personal domain* and teacher participation in the *external domain*. The

influences between teachers' motivation and participation adds to the interconnected model of professional growth (Clarke & Hollingsworth, 2002) and provides evidence of how something in the *personal domain* (motivation) enacts change or effort (participation) in the *external domain* (professional development) and emphasizes the cyclical nature of teacher change. These findings suggest that a major influence on a teacher's continued efforts to change is how they view their success of implementing something different in their classroom.

Implications

The mentioned contributions have implications for research. This study distinguishes between attending and participating in professional development, which adds to the literature about professional development. Although all three focus teachers attended the professional development, they participated differently, implying that attending is different from participation. In order to determine if teachers' resulting intent to change their practice, one must not just look at attendance but at teachers' participation. Researchers should be aware of this difference and account for it when analyzing professional developments. Another implication for research is the motivational model (Skinner & Pitzer, 2012) and its usefulness for teachers. Additions made to the motivation model (see Figure 13) build on the research related to motivation, participation, and intent to change. Researchers should account for the indicated influences in the motivation model when conducting research on professional development. This along with the interconnected model of professional growth (Clarke & Hollingsworth, 2002) could be combined to provide researchers with a framework for teacher change that includes the influences of motivation and initial intent to change on participation and also the influences of these on resulting intent to change.

There are also implications for teaching practices, in particular for professional development facilitators. It is beneficial for professional development facilitators to include opportunities for teachers to work with each other in small group tasks. These small group tasks aid in meeting the teachers' need for relatedness and can help in engaging teacher in learning during the professional development. Professional development facilitators need to be aware of the influence of teachers' motivation on their participation so they can structure the professional development to obtain more participation. In order to encourage more teacher participation, facilitators should structure the professional development to meet the three fundamental needs (autonomy, competence, relatedness), which will help internalize teachers' motivation to participate. Findings from this study also imply that research on student engagement is related to teacher engagement. Professional development facilitators should use the research on student engagement to better facilitate and engage teachers in learning during professional development sessions. The study also shows that a teacher's view on the success of trying something out in their classroom greatly influences their resulting intent to change. This means the professional development should focus on encouraging teachers to try things out. This can be done similar to how it was done in this study with the discussion on homework. Along with this, facilitators should also give opportunities for teachers to discuss what did and did not work, and why. This may help avoid teachers like Ben who started with an intent to change but did not see the value of his classroom experience so he did not continue with his intent to change.

Limitations and Future Research

This study used volunteers from among the attending mathematics teachers. It was difficult to get many of the teachers to volunteer and less than half of teachers attending volunteered to participate in the study. The number of participants is a limitation to this study,

giving only preliminary results that should be verified through a larger study. Although this is a limitation to the generalizability of the findings from this study, I did account for this limitation in other ways. The study focused on three teachers chosen from the volunteers that met the requirements in regards to their intent to change. I also obtained permission to videotape those who were not part of the study so that the facilitators would not have to alter their grouping of teachers to accommodate for the lack of volunteers.

Another limitation to this study was that I only collected data from observations of the professional development sessions and self-reported information from the teachers (interview and surveys). I did not collect any data from the classroom when teachers were teaching; therefore, I could only investigate teachers' reported intent to change. To further assess the influences between motivation, participation, and intent to change, researchers need access to all of the teacher's domains of consequence (Witterholt et al., 2012) including the classroom (*domain of practice*). This limitation could be addressed in future research by replicating this study and extending it to include observing teachers' classrooms to ascertain that the reported intent to change results in a change of teaching practice.

Future research needs to be conducted to better understand the relationships in the motivational model (see Figure 13). There is a distinct influence between high relatedness and small group participation, but it is unclear whether autonomy or competence were related with whole group participation because both Amber and Ben had high autonomy and competence and participated in similar ways. Thus, more research should be conducted to investigate the relationship among autonomy, competence, and teacher participation. Another aspect that future research could follow is the direct influence of motivation on teacher change instead of how motivation influences teachers' participation. In this study I investigated teachers' motivation to

attend and to participate; however, there was some indications that there could be other motivating factors that affect teachers' willingness to change besides their motivation to attend and participate in the professional development. For instance, Ben who had high relatedness, competence, and autonomy shared in his interview that he did not use the lesson he and two other teachers prepared in his class and hinted that the main motivating reason for his decision was administrative pressures that he felt indicating that "how much you teach is more important" than "helping kids learn how to learn." Hence, outside pressures influenced his overall motivation and his resulting intent to change. A further and more in-depth investigation of teacher's motivation across other aspects of their teaching profession could help to further define the influence of motivation on teacher change.

Conclusion

Professional development is important for the improvement of teachers' content knowledge and their teaching practices. However, there are many times that teachers do not use what they learn in the professional development or make changes in their teaching practices even after attending professional development. Because of this, research on effective professional development has been conducted with a focus on the characteristics of the professional development itself rather than the effect on teachers' practice. The goal of this study was to determine (1) how motivation influences a teacher's participation in a professional development setting and (2) how the teacher's participation influences their intent to change. I found that motivation does influence teachers' participation. For the three focus teachers, their participation differed because of their varying internalized motivation and levels of autonomy, competence, and relatedness. The more internal their motivation, the more engaged they were in participating in the professional development. It also appears that relatedness was the easiest fundamental

need to satisfy in a professional development, as long as the professional development is designed to include small group activities. These small group tasks can get teachers (even ones with external motivation) to participate, which may influence their resulting intent to change. Another finding is that if teachers ask exploring understanding questions, they may have a strong intent to change. I hypothesized that teacher's lack of active participation would be why effective professional development was unsuccessful for an individual teacher and would not yield teacher change. However, the results of this study indicate that the reason that an effective professional development is unsuccessful for individual teachers is due to their perspective on classroom experiences when they have tried things learned in the professional development. It was found that the viewed success of trying out something from the professional development in the teacher's classroom influenced the teacher's resulting intent to change.

These findings contribute to the fields of research on professional development, engagement, and teacher change. Professional development facilitators should use the research on student engagement to better aid teachers in learning during professional development. Researchers need to consider the distinction between attending and participating when researching professional developments. They also should connect research on motivation and engagement alongside teacher change to further develop and investigate ways to improve understanding in both areas. Future research can be done to further develop this relationship. It would be beneficial to replicate this study while including the investigation of what the teacher does in their classroom to further determine the relationship among teachers' motivation, participation, and their intent to change.

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Appendix A: Pre- and Post-Surveys

Pre-Survey

Name:_____ Years Teaching Mathematics:___ Teaching Assignment:_____

Why I am attending this Professional Development.	Very True	Sort of True	Not Very True	Not True at All
1. Because I want my principal to think I'm a good teacher.	4	3	2	1
2. Because I'll get in trouble if I don't.	4	3	2	1
3. Because it's fun.	4	3	2	1
4. Because I will feel bad about myself if I don't do it.	4	3	2	1
5. Because I want to understand teaching mathematics.	4	3	2	1
6. Because that's what I'm supposed to do.	4	3	2	1
7. Because I enjoy attending professional development.	4	3	2	1
8. Because it's important to me to attend professional development.	4	3	2	1
9. Because it is a requirement from my school.	4	3	2	1
10. Because I am interested in knowing more about teaching mathematics.	4	3	2	1
Why am I participating in Professional Development.				
11. So that my principal can assess my work and performance.	4	3	2	1
12. Because I want the principal to think I'm a good teacher.	4	3	2	1
13. Because I want to learn new things.	4	3	2	1
14. Because I'll be ashamed of myself if I didn't actively participate.	4	3	2	1
15. Because it's fun.	4	3	2	1
16. Because that's what I am supposed to do.	4	3	2	1
17. Because I enjoy actively participating.	4	3	2	1
18. Because it's important to me to actively participate.	4	3	2	1
19. Because learning new teaching approaches is enjoyable.	4	3	2	1
20. Because I would feel uncomfortable if I refused to get involved.	4	3	2	1

The following questions concern your feelings about this professional development since it began. Please indicate how true each of the following statement is for you given your experience in this professional development. Please use the following scale in responding to the items.

1	2	3	4	5	6	7
not at all true			**somewhat true**			**very true**

21. ____I am free to express my ideas and opinions at this professional development.
22. ____I pretty much keep to myself when I am at this professional development.
23. ____I have been able to learn interesting new skills for my job at this professional development.
24. ____At this professional development, I do not get much of a chance to show how capable I am.
25. ____There are not many people at this professional development that I am close to.
26. ____There is not much opportunity for me to decide for myself how to go about my work at this professional development.
27. ____People at this professional development are pretty friendly towards me.
28. ____I feel like I can pretty much be myself at this professional development.
29. ____People at this professional development tell me I am good at what I do.

30. Why are you attending this professional development?

31. What expectations do you have for this professional development?

32. What are you hoping to gain from attending this professional development?

33. How do you intend to participate while attending this professional development?

34. Are you expecting to make any changes in your teaching practices due to this professional development? If yes, explain.

Post-Survey

Name:_____ Years Teaching Mathematics:___ Teaching Assignment:_____

Why did I attend this Professional Development.	Very True	Sort of True	Not Very True	Not True at All
1. Because that's what I'm supposed to do.	4	3	2	1
2. So my principal will think I'm a good teacher.	4	3	2	1
3. Because I enjoy attending professional development.	4	3	2	1
4. Because I will get in trouble if I don't attend.	4	3	2	1
5. Because I am interested in this professional development.	4	3	2	1
6. Because it is important to me to keep up with innovations of teaching.	4	3	2	1
7. Because I am interested in this professional development.	4	3	2	1
8. Because I might get a reward if I do.	4	3	2	1
9. Because I would be embarrassed to explain to others my absence.	4	3	2	1
10. Because it involves important things that I should learn.	4	3	2	1
Why did I participate in this professional development?				
11. Because I want the other teachers to think I'm smart.	4	3	2	1
12. Because I feel ashamed of myself when I don't try.	4	3	2	1
13. Because I enjoy being an active participant.	4	3	2	1
14. Because that is what I'm supposed to do.	4	3	2	1
15. To find out if I'm right or wrong.	4	3	2	1
16. Because it is fun to learn new ways of teaching.	4	3	2	1
17. Because it is important for me to try.	4	3	2	1
18. Because I want the presenter to say nice things about me.	4	3	2	1
19. Because I don't want others to think I am incapable.	4	3	2	1
20. Because mastering the information involved can enhance my teaching.	4	3	2	1

The following questions concern your feelings about this professional development since it began. Please indicate how true each of the following statement is for you given your experience in this professional development. Please use the following scale in responding to the items.

1	**2**	**3**	**4**	**5**	**6**	**7**
not at all true			**somewhat true**			**very true**

21. ____Most days I feel a sense of accomplishment from the work done at this professional development.
22. ____I do not feel very competent when I am at this professional development.

23. ____People at this professional development care about me.
24. ____When I am at this professional development, I have to do what I am told.
25. ____I get along with the people at this professional development.
26. ____I feel pressured at this professional development.
27. ____I feel like I can make a lot of inputs on deciding how to do the work at this professional development.
28. ____When I am at this professional development I often do not feel very capable.
29. ____I have been able to learn new interesting skills for my job at this professional development.

30. What were your expectations for the professional development you attended? Did it meet those expectations?

31. What did you like best about the professional development? Why?

32. How did you participate in this professional development?

33. Why did you choose to participate in this way?

34. What ideas or strategies presented in the professional development do you intend to use in your classroom?

35. How will you implement the ideas or strategies in your classroom?

36. In your opinion, was participating worth your professional time? Why, or why not?

37. Would you attend and participate in another professional development with the same purpose? Why or why not?

38. What types of professional development are you most interested or motivated to attend and participate in?

Appendix B: Observation Checklist

		Noticed	Evidence
1	**Students:** Focus on students and use student thinking.		
2	**Change:** Emphasizes and connects to individual and organizational change, starting will small changes guided by a goal.		
3	**Support:** Continuous, intensive, and ongoing with follow up and support.		
4	**Collaborate:** Provide time to collaborate with other teachers to share ideas and develop relationships.		
5	**Content:** Focus on specific content and teacher practices.		
6	**Activities:** Includes active learning activities.		
7	**Learners:** Embodies knowledge of teachers as adult learners.		
C	Help teachers learn new mathematical content and techniques to enhance the teachers' understanding of the concept(s) focused on.		
B	Simultaneously focusing on content and pedagogy knowledge. Incorporates or balances the characteristics of the content-driven and pedagogy-driven orientations.		

Appendix C: Interview Protocol

- Introduction:
  - My name is Krystal Hill and I am a graduate student in the Mathematics Education department at BYU. Thank you for your time and willingness to participate in this interview. Just so you know, this interview is being recorded so I can transcribe and analyze it later.
  - Remember that this interview is completely confidential. I will be the only one to read it and if your responses are used in my thesis, they will be attributed to a pseudonym. You won't be identified in any way. Please feel free to choose not to answer any question or to ask for clarification.
  - Do you have any questions for me before we get started?
- Questions:
  - This was a required professional development by your district; however, was there anything else that motivated you to attend this professional development?
    - Any other motivating reasons to attend this professional development?
  - What did you like the most about the professional development?
    - Why?
  - What are you doing (interactions, activities, etc.) in the professional development that are helping you improve as a teacher?
    - Please give me examples. Why is that example helping you improve as a teacher?
    - Any other examples?
  - How are you interacting with the information that is provided in the professional development? Describe how you participate during the professional development on a typical Monday.
    - What motivated you to participate in this way?
  - I have been watching the videos from the professional developments and I'd like to ask you a few questions to check and clarify what I've noticed about your participation with you.
  - Amber's Questions:
    - I've noticed that you often write during the whole group discussions. What are you writing?
    - I've also noticed that you ask a lot of questions during the small groups. Is there a reason for that?
    - One last thing, I've noticed that you present your work a lot, and you even were the teacher for the lesson study. Is this typical or did I just happen to observe the pd's that you did this?
      - Why is that?
  - Ben's Questions:
    - I've noticed that you often write during the whole group discussions. What are you writing?
    - Another thing I've noticed is that you present your work a lot. Is this typical or did I just happen to observe the pd's that you did this?
      - Why is that?
    - I've noticed that in the small groups, sometimes you behave different towards the other teachers in your group. Why is that?

        - Do you prefer working with some people over others?
    - So I have a few questions about the lesson study. In the professional development when you were planning it, it seemed like you guys might have agreed to meet later to finish. Is that right?
        - Did you end up using that same lesson in your class?
- Carl' Questions:
    - I've noticed that you tend to talk and share ideas more during small groups than during the whole group discussions. Is there a reason for that?
    - I've also noticed that while others are talking during discussions sometimes you are looking at them and sometimes you are looking down. Why is that?
        - Are you listening or are not interested in what others might be saying.
    - One more thing I've noticed is that sometimes you do individual work during small groups. Why is this? Do you prefer to work alone?
    - So I have a few questions about the lesson study. In the professional development when you were planning it, it seemed like you guys might have agreed to meet later to finish. Is that right?
        - Did you end up using that same lesson in your class?
- What are you doing outside the professional development (homework, lesson study, etc.) that is not attached to the professional development but is related to it, that is helping you improve as a teacher?
    - Please give me examples. How are they related to the professional development?
    - What motivated you to participate in this way?
    - Any other examples?
- Throughout the 2 year professional development, how has your participation, or your interactions with the materials in the professional development changed?
    - Can you give me an example?
    - Any other ways?
- What did you learned during the professional development sessions about probability?
    - How will you use what you learned in your teaching?
    - Anything else?
- What is something that you have learned over the year PD that you have tried in your teaching/classroom?
    - Will you continue to use this?
    - Why or why not?
- In your opinion, was attending/participating in this professional development worth your professional time?
    - Why, or why not?
- Would you attend and participate in another professional development like this one?
    - Why or why not?
- What types of professional development are you most interested or motivated to attend and participate in?
    - Why?

❖ Conclusion:

- Thank you for your time. I appreciate your honesty and your responses.
- Do you have any questions for me before we part?