SELF-DETERMINATION THEORY AND MIDDLE SCHOOL MATHEMATICS TEACHERS: UNDERSTANDING THE MOTIVATION TO ATTAIN PROFESSIONAL DEVELOPMENT

A dissertation submitted to the
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The purpose of this phenomenological research study was to use Self-Determination Theory as a framework to analyze middle school mathematics teachers’ motivation to attain effective professional development concerning Ohio’s Learning Standards as well as other instructional aspects that affect the classroom. Teachers are exceptionally busy meeting the daily demands that exist in the realm of education. They often take it upon themselves to further their education by pursuing graduate degrees and participating in required professional development involving all aspects of education. Furthermore, the Ohio school systems have adopted the Common Core Standards as well as the American Institute for Research’s Ohio Computer-Based Assessments which has compelled mathematics teachers to not only change the order in which they instruct the mathematics standards, but how they instruct. This study will utilize the Self-Determination Theory (Ryan & Deci, 2000) as a framework to research the motivation behind teachers’ will to pursue professional development to satisfy internal needs of self-improvement involving instructional methods in order to ensure success in the classroom involving both instruction and assessment.
The results of the findings of the study indicated the three basic psychological needs of autonomy, competency and relatedness must be met to foster intrinsic motivation in middle school mathematics teachers that participated in this study. Those teachers that were intrinsically motivated were more likely to engage in effective professional development and exceed expectations conveyed by their districts. Effective professional development incorporates a learning environment that acknowledges the research regarding adult learning contexts, including aspects of situated learning.
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CHAPTER I

INTRODUCTION

“The fullest representations of humanity show people to be curious, vital, and self-motivated.”

~ Edward Deci & Richard Ryan, 2000

It is Monday morning. A seventh-grade mathematics teacher (Angie) has just walked into her classroom and assembled herself at her desk. There are bright colored sticky notes plastered everywhere, notes left from Friday, with tasks Angie was to have completed by the end of the day—with the end of the day on Friday! Angie is exhausted, feeling as if she has never left and the weekend was non-existent. She places her carrying case and totes stuffed with her laptop, graded homework and quizzes, handouts, lesson plans, and other paperwork beside her desk, reaching over to pick up a few documents that have plummeted out. She sets her coffee on an unsteady stack of ungraded tests that she gave last Wednesday.

At this time of day, the classroom is serene and quiet; tables are empty, floors are swept. Angie begins to feel the stress and anxiety of another hectic, overscheduled week. All weekend was spent preparing lessons, assembling instructional materials, and updating her class website. Today there are six different math periods to teach, meetings with a few parents (unfortunately, none of the parents Angie really needs to meet with), a teacher-based team (TBT) meeting during her precious prep period, and headache
inducing lunch duty. In addition, Angie needs to remember to contribute data to the Individual Education Plan (IEP) goals of two students for the intervention specialist, continue planning an upcoming Family Math Night, deal with interruptions from staff and administrators throughout each class, manage behavioral issues in three of her classes, and finish grading last Wednesday’s tests because quarter grades are due in three days.

Angie sits and worries if the lessons that she spent all weekend preparing are going to meet the needs of her students. She worked very hard to make sure they met the Standards, but she wonders if she is capable of providing the differentiated instruction, as well as helping students develop the knowledge, her middle school mathematics students need to succeed on the standardized tests. Angie wonders if she should ask one of her peers for help, or if that would portray her as incompetent in the eyes of others in her department. All of the sudden she feels very isolated, as if she is alone in meeting the demands of her day.

On top of all of this, Angie’s principal has adamantly requested she take part in professional development at the end of the day regarding their state’s transition to new learning standards in mathematics (again!!). Angie closes her eyes, sighs, and thinks: This professional development better be worth my time because when I get home I need to finish grading Wednesday’s tests, make sure I’m ready for tomorrow’s classes, and maybe, if I’m lucky, say ‘hi’ to my family on the way to locking myself in my home office.
The Role of Professional Development in the Life of a Teacher

As exemplified above, a typical day in the life of a middle school mathematics teacher generates numerous challenges and responsibilities. Although the vast majority of teachers are exceptionally adept at meeting these daily demands, some may seem passive and submissive to the burdens of an educator. There is often a misunderstanding that teaching only involves standing in front of a classroom and conveying information. In actuality, there is an immense amount of research, paperwork, data collection and analysis, meetings and deadlines that face teachers every day.

In order to meet what seem like ever-changing demands and keep informed of new instructional ideas, teachers are frequently required by their school district or state, to participate in professional development. Such professional development is delivered during the school year or through summer workshops or institutes. Professional development can occur during school hours, before or after school, on weekends, or on district ‘waiver days’ when students are not at school. Professional development can be delivered in person, online, by district or state personnel, school colleagues, university faculty, or professional development consultants.

While some teachers view professional development as effective and a positive influence to their practice, others frequently see it is an imposition on their limited planning time. Furthermore, professional development experiences might result in teachers being assigned additional responsibilities. For example, teachers might be asked to spend additional time each week developing daily rather than weekly lesson plans, more detailed lesson plans, or engage in meetings and implement ideas that focus on
areas like writing across the curriculum or state testing.

Many teachers not only engage in school-embedded professional development as described above, but take it upon themselves to increase and enhance their subject matter or pedagogical knowledge. Teachers may seek out professional development experiences on their own, pursue graduate degrees, or participate in service to their profession by creating online resources, mentoring other teachers, submitting articles or lessons to practitioner journals (e.g., NCTM’s *Mathematics Teaching in the Middle School*), or other professional-based endeavors. Exploring the factors that motivate teachers to actively engage in such professional learning opportunities is an important endeavor, because instructional improvements in the classroom will directly benefit students, school buildings, and districts as a whole. Teachers that are motivated to attend these learning opportunities, fully engaging in the learning process, are more likely to gain insights and skills they can implement in their classrooms.

**Motivation and Professional Development**

Teacher professional development is an essential piece in the enhancement of a teacher’s skills and resources. The main idea is, that teachers will take what they learned from professional development and implement it into their classrooms, therefore benefiting their students. Karabenick and Conley (2011) acknowledge in their National Science Foundation Report, “Teacher motivation in professional development is directly linked with classroom enactment of professional development approaches, content and skills, and it is indirectly related to increasing the likelihood of desirable student outcomes” (p.7). In other words, if teachers are motivated to not only participate, but
engage in professional development, it increases the likelihood that students will benefit from teachers’ learning. Alternatively, if a teacher just ‘shows up,’ does not feel there is value to the professional development, and does not actively engage in the professional development, it is likely neither the teacher nor their students will benefit from the training.

**Why Professional Development is Essential**

Professional development often refers to the many learning opportunities teachers have related to their work. These learning opportunities include, but are not limited to: content specific professional development, instructional strategies, curriculum, educational laws, classroom management, state testing, standards, and district specific professional development (e.g., policies and procedures). Teachers are often required to participate in ongoing learning that is required to keep their licenses through state specific requirements. Many states (e.g., Florida, Ohio) require teachers to accumulate a certain number of Continued Education Units (CEUs) before they can renew their professional license.

Most professional development experiences in the field of education offer a number of CEUs based on the hours involved in the professional development. Mizell (2010) states, “Professional development is also the only way educators can learn so that they are able to better their performance and raise student achievement” (p. 3). Professional development, however, is an ongoing learning opportunity most often situated in the context in which it will be used. For example, learning experiences for
middle school (grades 4-9) mathematics teachers can be as broad as middle school instructional strategies or as specific as strategies in numeracy that benefit middle school mathematics students with specific learning disabilities. Many professional development opportunities are situated in a collaborative learning environment with colleagues. Such environments may not only provide ideas and support, but opportunities to form new professional relationships.

**Diverse Teacher Educational Backgrounds**

Teachers approach their careers with a wide array of knowledge, understandings, beliefs, and experiences. They bring with them personal beliefs about education, lived experiences in the field, diverse educational backgrounds, and unique levels of content knowledge, just to name a few. Assembling an effective teaching force, while attempting to provide professional development to meet the needs of such a diverse population (of teachers), is an enormous and often daunting task. For example, many districts have a variety of middle school mathematics teachers, ranging from first year to veteran teachers. These teachers are at different places in both their careers and lives and bring to the table different levels of understanding of instructional learning strategies and mandated mathematical content and practice standards.

All teachers have unique methods and ways of instructing mathematics. Teachers use a variety of instructional methods that include, but are not limited to: methods learned from their teacher preparation program, methods that mirror the way they learn themselves, research-based methods, and methods they have gained from experience or
professional development. Throughout everyone’s educational career, each person has encountered teachers who instructed in unique ways, some more productive than others. Teachers are at varying levels of content knowledge, instructional competency, and self-efficacy; they also create unique learning environments as well as utilize a variety of resources (e.g., curriculum and technology).

**Importance of the Study**

Middle school mathematics teachers are held to high levels of accountability concerning the Common Core State Standards for Mathematics and other standards promoting college and career readiness of K-12 students. In addition, middle school is the important bridge between elementary and high school, where the foundations are made for basic mathematical knowledge and skills and the scaffolds of pre-algebraic thinking are built for successful navigation of high school mathematics courses. In order to understand the Common Core State Standards (or aligned standards) and instruct them effectively and with fidelity, teachers need to continually up their game by participating in rigorous professional development that pulls them out of their comfort zone and self-reflect on their instructional methods.

School districts bombard teachers with professional development opportunities that are not always effective. If school districts and professional development agencies had a better understanding about what motivates teachers to attend professional development opportunities and to take what they learn and apply it in their classrooms, they could create a social context in which such opportunities were more effective and valuable. In addition, school districts and professional development agencies need a
better understanding of the roles adults play as learners and how the environments in which teachers work impacts their motivation to fully engage and participate in professional development activities.

All too often, school districts offer external compensation (e.g., monetary compensation, compensatory time, gift cards, etc.) to teachers who attend and participate in professional development in the context of education. This can affect a teacher’s feelings of autonomy, competency and relatedness, making them feel controlled, in turn, limiting their positive engagement in the learning process (Niemic & Ryan, 2009). Self-Determination Theory is a manifestation of the work completed by Deci and Ryan (2000) and is concerned with the idea of motivation and how it affects everyday decisions. Self-Determination Theory often focuses on intrinsic motivation and how it affects human growth tendencies (Deci & Ryan, 2000).

Many studies in the field of education, regarding Self-Determination Theory, have focused on the application of motivation concerning students in the classrooms and their motivation to engage in mathematics instruction. The idea is that if students have the innate motivation to participate in class, and seek out opportunities to grow both academically and behaviorally they will have positive outcomes. A thorough literature review was conducted and very limited research was found that focused on adult learners in professional development opportunities in the field of mathematics education.

Teacher motivation affects all aspects of the classroom involving instruction and overall environment. This study will examine whether Self-Determination Theory can be applied to adult learners, in this case middle school mathematics teachers in professional
development educational opportunities. In addition, the study will examine the supposition that if teachers are intrinsically motivated to attend professional development that incorporates aspects that are beneficial to an adult learning social context, the outcomes will be: (1) an effective and engaging professional development, and (2) teachers will take what they learn and apply it into their classrooms. Professional development opportunities will evolve around the Common Core’s Standards for Mathematical Content and Standards for Mathematical Practice.

Statement of the Problem

In the United States, adoption of the Common Core State Standards for Mathematics [CCSSM] (National Governors Association Center for Best Practices [NGA Center] & Council of Chief State School Officers [CCSSO], 2010) in 2010 by 45 of 50 states—representing 84.9% of pre-university age students—provided mathematics teacher educators and professional developers expanded opportunities to engage with in-service mathematics teachers. Although persistent implementation of CCSSM has fallen to 42 of 50 in 2016, CCSSM and alternative university and career preparation standards continue to focus on providing students with opportunities to engage in mathematical sense making, reasoning, modeling, generalizing, and communicating.

CCSSM has also motivated a new wave of next generation end-of-grade and end-of-course summative assessments, including those developed by the American Institute for Research (AIR), the Partnership for Assessment of Readiness for College and Careers (PARCC), and the Smarter Balanced Assessment Consortium (SBAC). Both the Common Core State Standards and next generation summative assessments have
compelled mathematics teachers to not only change the order in which they instruct mathematical content, but how they instruct it.

Teachers must learn to instruct and assess in ways that are not only effective in the classroom, but prepares students to succeed on new summative assessments. The rigorous expectations of the Common Core State Standards requires teachers to obtain support via professional development, whether on their own or at their place of employment, that increases and enhances their capacity to design and implement CCSSM-aligned instruction and assessments. Deci and Ryan’s (2000) self-determination theory can be used as a framework to understand what motivates middle grades mathematics teachers to obtain professional development that meet these criteria.

Administrators and school districts also need to understand the needs of its teaching staff and how to schedule professional development that effectively meets those needs and increase the potential for productive outcomes (e.g., student achievement, teacher retention). Therefore, effective professional development impacts all parties involved including administrators, teachers and students.

**Purpose of the Study**

The purpose of this study was to examine the motives behind teachers’ decisions to pursue professional development. Such professional development can take many forms (graduate courses, workshops, webinars) and be offered by a variety of providers (e.g., professional consultants, university faculty) to fulfill internal needs of self-improvement in order to ensure student success in middle school mathematics
The study attempted to determine what motivates middle school math teachers to attain professional development to improve their classroom instruction. Such improvements engage their students in instruction that addresses the Common Core’s mathematical content and practice standards. Teachers need to learn to instruct in ways that are not only valuable, in terms of success on standardized tests, but help to ensure students develop the knowledge and skills inherent in the Common Core State Standards for Mathematics and other standards promoting college and career readiness. Deci and Ryan’s (2000) self-determination theory can be used as a framework to study what motivates teachers to obtain professional development and how effective professional development incorporates the socio-cultural environment that promotes intrinsic motivation.

Research Questions

This study addressed the following three research questions:

1) What motivates middle school (grades 4-9) mathematics teachers to engage in professional development focused on improving classroom instruction that addresses the Common Core’s (or aligned) mathematical content and practice standards?

2) What motivates middle school (grades 4-9) mathematics teachers to engage in general professional development in their field?

3) What types of professional development are deemed useful and effective by
middle school (grades 4-9) mathematics teachers?

- Must one, some, all, or any of the three needs be met (i.e., autonomy, competency, relatedness), as proposed by Self-Determination Theory, for professional development to be deemed useful and/or effective?

**Self-Determination Theory as a Framework**

The study implemented a survey assessing the three needs proposed by Deci and Ryan (2000) that examined whether those teachers who seem motivated to not only seek out professional development, but effectively engage in it have met all three needs of autonomy, competence and relatedness. In turn, those teachers who feel stable in what they already know regarding middle school mathematics instruction and do not seem motivated to seek professional development, nor effectively engage in provided professional development are lacking any of those three needs.

In addition, the study examined, through the survey and individual teacher interviews, what teachers feel constitutes effective professional development. Participating teachers’ responses to the survey regarding Self-Determination Theory were examined. The overall goal of the study was to examine how motivation fits into engagement in professional development in an educational environment, by applying Self-Determination Theory to teacher motivation in an educational social context.

Collection and data analysis were based upon the Self-Determination Theory. Self-Determination Theory provides a way to assess motivation in humans participating in a social context. Specifically, Self-Determination Theory rates the three needs of
autonomy, competency and relatedness for existence to evaluate the idea of intrinsic motivation. This study looks at whether intrinsic motivation is a factor in teachers’ pursuance of professional development that increases and enhances their mathematics instruction.

**Definition of Terms**

The definition of the terms related to self-determination theory used in this study will derive from the research of Deci and Ryan.

1. **Self-Determination Theory**

   A. **Motivation:**

   Motivation – Deci and Ryan (2000) state that “to be motivated means to be moved to do something” (p. 54).

   Intrinsic Motivation – “doing something because it is inherently interesting or enjoyable” (Deci & Ryan, 2000, p. 55).

   Extrinsic Motivation - “doing something because it leads to a distinguishable outcome.” – (Deci & Ryan, 2000, p. 55).

   B. **Autonomy, Competency, Relatedness:**

   Autonomy – “literally refers to regulation by the self” (Deci and Ryan, 2006, p. 1557).

   Competency - a fundamental desire to feel effective in interacting with the environment (Deci & Ryan, 2000).

   Relatedness - is satisfied when people undergo a sense of closeness and develop an intimate relationships with others (Deci & Ryan, 2000).
2. Experience - “something we undergo… it is something that happens to us, not something accumulated and mastered by us” (Henrikson & Friesen, 2012, p. 1).

3. Meaning - “something that is continuously open to new insight and interpretation” (Henrikson, Friesen, 2012, p. 1).

4. Adult Learning - ‘the entire range of formal, non-formal and informal learning activities which are undertaken by adults after a break since leaving initial education and training, and which results in the acquisition of new knowledge and skills’. (Final report for: Study on European Terminology in Adult Learning for a common language and common understanding and monitoring of the sector (July, 2010), p. 6).

5. Situated Learning – Lave (1990) argues that situated learning is defined as acquiring knowledge as it normally occurs, as a function of the activity, context and culture in which it occurs.

6. Ohio Learning Standards - Academic Standards are clearly defined statements and illustrations of what all students, teachers, schools and school districts are expected to know and be able to do. (Ohio Department of Education, July 2015).

   Content Standards – “describe the knowledge and skills that students should attain, often called the ‘what’ of what students should know and be able to do” (Ohio Department of Education, July 2015).

   Performance Standards - are the “concrete statements of how well students must learn what is set out in the content standards, often called the "be able to do" of "what students should know and be able to do" Performance standards specify "how good is good enough." (Ohio Department of Education, July 2015).
7. Standards for Mathematical Practice – “describe the habits of the mind that teachers (at all grade levels) should develop in their students as they ‘grow in mathematical maturity and expertise’” (Courtney, 2014, p.5 [CCSSI], 2010, p. 8).

8. Professional Development - refers to the development of a person in his or her professional role (Villrgas-Reimers, 2003, p. 11)

   Teacher professional development – the professional growth a teacher achieves as a result of gaining increased experience and examining his or her teaching systematically” (Glatthorn, 1995, p. 41).

9. Social Cognition - “Social cognition broadly includes the cognitive processes used to decode and encode the social world” (Beer & Ochsner, 2006, p. 98).

10. Amotivation - “perceived non-contingency, low perceived competence” (Deci & Ryan, 2000, p. 61).

11. External Regulation - “salience of extrinsic rewards or punishments” (Deci & Ryan, 2000, p. 61).

12. Phenomenology - qualitative research design where the researchers “set aside all preconceptions, judgments or prejudices towards a particular topic in order to make an objective analysis of the information participants bring to an investigation” (Padilla-Diaz, 2015, p. 103).

13. Introjected Motivation - “ego involvement, focus on approval from self or others” (Deci & Ryan, 2000, p. 61).

15. Integrated Motivation - “hierarchical synthesis of goals, congruence” (Deci & Ryan, 2000, p. 61).


17. Identification - personal importance (Deci & Ryan, 2000).

18. Internalization - “refers to people’s ‘taking in’ or value of regulation” (Deci & Ryan, 2000, p. 71).

19. Integration - “further transformation of the regulation into their own, that subsequently, it will emanate from their sense of self” (Deci & Ryan, 2000, p. 71).

20. Andragogy - the art and science of helping adults learn (Knowles, 1968).

**Summary of Chapter I**

No one ever said teaching was easy. There are monumental obstacles that teachers face each and every day. On top of this, there is a constant influx of professional development that is often required of teachers. If teachers are required to participate in professional developments, then it is critical for school districts need to not only understand what motivates teachers to participate, but what teachers’ believe constitutes effective professional development. While doing this, school districts need to take into consideration the varying backgrounds and educational styles of teachers in their district. All professional development providers must also consider the needs of school districts, teachers and the environments in which adult learners flourish.
CHAPTER II
REVIEW OF THE LITERATURE

Overview

In the beginning of this report, a scenario involving a fictitious middle grades mathematics teacher, ‘Angie,’ illustrated an overwhelmed, stressed-out individual who was being required to participate in professional development at the end of her hectic day. There are several factors contributing to Angie’s feelings of stress and anxiety; the subsequent literature review will examine the most significant factors.

The literature review will begin with standards-based instruction in general, and the Common Core’s mathematical content and practice standards in particular. It is important to understand what is being asked of middle school mathematics teachers like Angie in order to determine the types of professional development opportunities that best address such expectations. Next, the literature review will discuss how research has demonstrated that students who are given a strong mathematics foundation in the middle grades can continue such success throughout secondary school and beyond.

Research involving motivation and its meaning within Self-Determination Theory concerning students’ engagement in the classroom will be discussed and how such a framework can be applied to middle grades mathematics teachers in general, and to teachers’ motivations regarding professional development specifically. The notion of what constitutes an adult learner (like Angie) and how adults learn best will be reviewed
as it relates to attempts to represent effective professional development. Finally, literature regarding effective educational professional development (or professional development in education) will be examined.

**Standards-Based Mathematics Instruction**

We left Angie sitting at her desk, overwhelmed and hoping the professional development she is mandated to participate in will be worth her precious and limited time. At this moment in her day, Angie is left to dwell on her feelings regarding the professional development at the end of the day. She could possibly be exhibiting feelings of guilt that she does not want to attend the professional development. Does this mean she may not be committed to her students?

We can only assume that Angie wants what is best for her students, but she seems unmotivated to attend the professional development. She knows she has responsibilities to herself, students and the State, but with all the other burdens of her day, professional development seems like just another added stressor. These internal conflicts affect her motivation to engage and participate in professional development. Angie wants her students to do well on state achievement tests. The conflicting issues regarding the upcoming professional development include: (1) whether or not Angie is intrinsically or extrinsically motivated to attend the professional development; (2) her prior experiences with professional development in general, and through her district, in particular; (3) how the way she learns affects her attitude toward professional development; and (4) her overall confidence as a middle school mathematics teacher. Angie may also be struggling with how she gets along with her professional peers in a learning environment.
Some of the external factors that may cause Angie concern include: (1) the Common Core State Standards and how her students can proficiently develop the understandings and skills inherent in them, and (2) the burdens of Ohio Department of Education standardized testing and teaching evaluations.

Historically in the United States there has been an ongoing debate on not only what mathematics should be taught in K-12 education, but how it should be taught; *The Reorganization of Mathematics for Secondary Education or 1923 Report* (Mathematical Association of America [MAA], 1923), the New Math—see *The New Mathematics* (Adler, 1972) or *The New Math: A Political History* (Phillips, 2014)—the Math Wars, triggered by the publication of the *Curriculum and Evaluation Standards for School Mathematics* (National Council of Teachers of Mathematics [NCTM], 1989) and criticized by those favoring more traditional methods (e.g., Mathematically Correct), and the Common Core State Standards for Mathematics (NGA Center & CCSSO, 2010). The debate about content (the “what” to teach) often focuses on notions of conceptual understandings versus basic skills (e.g., which is more productive to student learning, which should be developed first in students). There also exist tensions between content and pedagogy (the “how” to teach). According to Klein (2003), if decisions over content come first, then the choices of pedagogy can become limited, and in turn, the choice of pedagogy can limit the content that is being taught. This can cause stress and confusion for teachers who are bound by standards while searching for research-based instructional methods. Therefore, the need for effective professional development is essential for teachers.
In the United States, standards-based instruction in mathematics initiated in 1989 with the National Council for Teachers of Mathematics’ (NCTM) publication *Curriculum and Evaluation Standards for School Mathematics*. *Curriculum and Evaluation Standards for School Mathematics* (NCTM, 1989) provided an overview of what was to be taught in schools for each of three grade bands: K-4, 5-8, and 9-12. The NCTM standards pushed for a more progressive movement, similar to that of the 1920s, by pushing student-centered learning. By the end of the 1990s, all states (except Iowa) had developed their own standards in the core subjects. In addition, data from international assessments in 1995, 2007, and 2011 indicated that students in the United States performed below their international peers, especially in mathematics (TIMSS 2011). According to the Common Core State Standards Initiative (2016) common standards that are alike across states in K-12 schools provide teachers, parents, and students with a set of expectations to make sure all students have the skills and content knowledge needed to succeed in college, career, and life post-graduation regardless of where they live.

President George Bush’s No Child Left Behind Act of 2002 (NCLB) required that all students reach proficiency in Mathematics and English Language Arts by 2010. This legislation was intended to address the low performance levels in all content areas, including mathematics, by implementing policies like standardized testing and teacher/school accountability. In 2010, the Ohio State Board of Education outlined mathematics content by incorporating the Common Core State Standards in Math and English Language Arts as Ohio’s New Learning Standards as well as state designed standards in Social Studies and Science. Adoption of the Common Core Mathematics
Standards in Ohio has changed the way middle grades mathematics teachers instruct. According to the Ohio Department of Education (2010), the standards stress conceptual understanding of key ideas by continually returning to organizing principles such as place value or the properties of operations to structure those ideas. The Ohio Department of Education (2010) also claims that how students learn math has also been taken into account when designing the standards, defining what students should understand when studying mathematics.

The most recent TIMSS was given in 2015, and results will be posted toward the end of 2016. Currently, 42 out of the 50 states have adopted the Common Core Standards (CCS). CCSS were launched in 2009, and states began to adopt and revise in 2011. By 2013, 45 states adopted the CCS in English Language Arts, Literacy and Mathematics. The TIMSS scores up to 2011 could be viewed as an analysis of the NCTM standards, and the upcoming release of the 2015 TIMSS results may be an indicator of how the CCS has affected student learning in Mathematics.

According to Courtney (2014), “along with changes in mathematics content standards and their progressions, come increased emphasis on the mathematical processes and proficiencies – the Standards for Mathematical Practice” (p. 5). As indicated in the Standards for Mathematical Practice (SMP) describe the expertise that teachers “at all levels should seek to develop in their students” (p. 6). As such, the SMPs affect pedagogy, or instruction used in the classroom by mathematics teachers. It is important that mathematics teachers understand, utilize, model, and emphasize the mathematical practices in their classrooms. The SMPs are grounded in the NCTM’s process standards
of problem solving, reasoning and proof, communication, representation and connections (NCTM, 2000) and the National Research Council’s strands of mathematical proficiency: adaptive reasoning, strategic competence, conceptual understanding, procedural fluency, and productive disposition (National Research Council [NRC], 2001). All of these concepts and ideas can be overwhelming to teachers who have not been provided professional development regarding the mathematical content and practice standards. The SMPs describe how students should engage with the subject of mathematics, but do teachers understand how to instruct in a way the mathematical practices become relevant? It is imperative that teachers are provided continuous professional development regarding not only the mathematical content standards, but how to instruct in an effective way to provide successful learning outcomes.

**Teacher Evaluation**

The district and state are going to hold teachers, like our fictitious middle grades mathematics teacher Angie, accountable for both instruction and the performance of students by measuring both student growth and classroom observations. NCLB (2002) affected not only what teachers teach, but also how they are assessed as professionals. Ohio utilizes the Ohio Teacher Evaluation System Framework (2015), which is made up of two main components: teacher performance (planning, instruction, environment, differentiation, resources, collaboration, professional responsibility, growth) and student growth measures (value added, vendor assessments, and local measures). Teachers are formally observed in the classroom and that evaluation is compiled with student growth data, with the output being a score of either ineffective, developing, skilled, or
accomplished. These scores go in a teacher’s professional file, and follows them throughout their career. Due to the amount of regulations teachers have to meet, they have a professional investment in the instructional outcomes of their classroom. Mathematics teachers in Ohio face a tough task; they need to find research-based methods that work best for them and their students. Such methods must support their students’ learning (with varying levels of knowledge and diverse styles of learning) of the mathematical content and practice standards so that students can demonstrate proficiency on mathematics achievement assessments. It is not surprising that teachers, like our fictitious Angie, seem overwhelmed; meeting the requirements of legislation, assessments and accountability all while attempting to meet the diverse needs of students is a daunting task, which those having spent minimal quality time in actual classrooms can never fully understand.

**Math in the Middle Grades**

Each generation derives an image of how mathematics applies to their lives. Mathematics can be taught using a variety of researched-based methods and researchers regularly add new strands to existing instructional methods. Numerous researchers promote instruction of mathematical concepts and skills structured around problems to be solved (Checkly, 1997; Wood & Sellars, 1996; Wood & Sellars, 1997). Shellard and Moyer (2002) argue for three critical components to effective mathematics instruction: (1) teaching for conceptual understanding, (2) developing children’s procedural literacy, and (3) promoting strategic competence through meaningful problem-solving investigations.
Students in the middle grades experience significant junctures in their mathematical development. A common belief is a student’s love, fear, or hatred of mathematics stems from the delivery method they receive in the classroom. Middle School Students are “forming conclusions about their mathematical abilities, interest, and motivation that will influence how they approach mathematics in later years” (Protheroe, 2007, p. 52). Angie has the responsibility of building this bridge for her students, making it a solid one that can be the foundation for future high school courses.

Mathematics instruction at all grade levels is a key point of debate across education as a whole. Data from TIMSS reveals specific shortcomings of mathematics curriculum schools in the United States. In 2011, the U.S. was ranked 9th in the world in Mathematics (TIMSS, 2011). The study of Algebra serves as the bridge to those students who want to partake in courses that would lead them to a college/university. Students who are enrolled in Algebra courses in the 8th or 9th grade are more likely to complete a calculus course in high school as well as pursue higher education than those who do not complete the course (Wheelock 1995; Riley, 1997; Cooney & Bottoms, 2002). Marks (2000) concluded that effective instruction helped to predict middle schools student engagement and in turn, achievement in the higher grades. Epstein and MacIver (1992) found that ‘rich’ instruction at the middle school level led to increased achievement and improved overall student attitudes. Protheroe (2007) acknowledges that instruction in the middle grades should build on a student’s developing capabilities for increasing abstract reasoning that include the following: (1) students should be able to think hypothetically, (2) comprehend cause and effect, and (3) reason in both concrete and abstract terms.
These are critical thinking skills that are often difficult for middle school students. They are transitioning from learning basic skills to higher-order level of thinking tasks. From the scenario, we do not know what skills Angie is teaching her students, nor do we know the base of her knowledge or her background. This is true of most teachers, and represents a good example of how teachers are not only so very diverse in their practice, but do not openly share their methods or experiences.

**Teaching Style**

Teaching style in the classroom was described by Grasha (1996) as the enduring personal qualities and behaviors that appear in how educators conduct their classes. Most styles of instruction fall into two main scenarios, teacher-led (direct instruction) or student-led (student-centered) instruction. Direct instruction can be successful, but with the release of the common core standards, is often deemed less effective than other strategies because the common core relies on critical thinking on the part of the student, which can be difficult when delivered through direct instruction. An example of direct instruction, is when teachers stand in the front of the classroom, possibly modeling problems on a board, giving out all the information while students are expected to sit in their desks listening with the expectation to write down and remember what is taught. Schwerdt and Wuppermann (2011) found that lecture style teaching “is strongest among higher-achieving and more-advantaged students” (p. 66). Students are more passive and have no control over their learning. Those students who struggle in mathematics, have diverse learning styles or learning disabilities may quickly fall behind in this environment. Duckworth (2009) asserts that teacher-centered learning actually prevents
students’ educational growth.

The National Research Council (2001) compiled research on learning environments and found focal points that produced conducive learning environments, one of which being learner-centered. Student-centered learning occurs when students interact with the lesson being taught maybe through discovery, collaboration with other students or peer-tutoring to mention a few. According to Bonwell (2000):

Learning is not a spectator sport. Students do not learn much just by sitting in class listening to teachers, memorizing pre-packaged assignments, and spitting out answers. They must talk about what they are learning, write about it, relate it to past experiences, and apply it to their daily lives. They must make what they learn part of themselves. (p. 4).

Zahner (2011) found that some teachers may resist the notion of student-led learning in mathematics because “group mathematical discussion can disrupt the traditional construction of authority in mathematics classrooms” (p. 247). Zahner (2011) suggests that “extended discussion that appears to wander may, in fact, be more productive in terms of student learning” (p. 247).

Middle school seems to be that bridge where students cross-over when they leave elementary mathematics and head towards more complex, critical thinking problems. If that bridge is not a solid one, it will directly impact their transition into mathematics high school courses and post-secondary education.
Motivation

From the earlier vignette, it appeared that Angie was not very motivated and maybe even a bit frustrated with the thought of being required to attend professional development at the end of the school day. It’s possible Angie has had negative prior professional development experiences perhaps even involving her district, but we are unable to prove such an assertion with the information provided.

At their best, humans are inquisitive, vibrant, and self-motivated. Deci and Ryan (2002) affirm that humans in the most effective environment are “argentic and inspired, striving to learn; extend themselves; master new skills; and apply their talents responsibly” (p. 68). Often, it is the goal of school districts to provide this type of engaging environment for their students to ensure success, but do they also attempt to build a similar learning environment for their teachers?

All too often, teachers do not feel supported or their opinions valued when it comes to the types of professional development that schools require. According to Deci and Ryan (2000), certain environments can cause humans to be “diminished or crushed and that individuals sometimes reject growth and responsibility” (p. 68). Therefore, understanding motivation in humans is key to understanding the social contexts that produce positive outcomes, not only in an educational setting for students, but also for all school staff.

Early on, Abraham Maslow (1954) suggested a humanistic approach to motivation, but realized particular human needs have priority over others. Maslow
(1954) considered human needs in a hierarchical order. For instance, the biological and physiological needs (e.g., air, food, drink, sleep) come before the psychological needs of achievement, self-esteem, and the need for recognition (Maslow, 1954). Deci and Ryan (2000) claim inherent distinctions exist between physiological and psychological needs. When a person is hungry, there are few behaviors they will engage in that are not directed toward appeasing that hunger—the need to satisfy their hunger takes over any potential motivation of psychological needs (Deci & Ryan, 2000).

Regarding psychological needs, those who do not feel fulfilled psychologically usually make accommodations that will decrease such needs (Deci & Ryan, 2000). Deci and Ryan (2000) expand on Maslow’s concept of basic human physical survival needs, utilizing Self-Determination Theory, noting the three basic needs for self-esteem (competence), achievement (autonomy), and recognition (relatedness) are needed for intrinsic motivation to occur, enabling humans to self-regulate.

Psychologists have stressed the concept of motivation and the effect it has on our daily lives. It is hard to understand why we do the things we do. It is almost impossible for a person to understand their own motivation. Do people, in their everyday lives focus on what motivates them and analyze their behaviors? Probably not on a daily basis. Maslow (1954) suggested the starting point for motivation and its theory is the physiological drives in humans, homeostasis and appetite (p. 35). Once those physiological needs are met, the needs of the psyche can come into play. Deci and Ryan (2000) conclude that people reserve varying amounts and kinds of motivation. Psychologists and researchers have similar definitions of motivation. Deci and Ryan
(2000) state, “To be motivated means to be moved to do something” (p. 54). Furthermore, “orientation of motivation concerns the underlying attitudes and goals that give rise to action” (Deci & Ryan, 2000, p. 54). According to Deci and Ryan (2000), “Motivation concerns energy, direction, persistence and equifinality—all aspects of activation and intention (Ryan & Deci, 2000, p. 69). Guay et al. (2010), conclude that motivation entails the “reasons underlying behavior” (p. 712). Turner (1995) describes motivation as (integrated with cognitive engagement) “voluntary use of high-level self-regulated learning strategies, such as paying attention, connection, planning and monitoring” (p. 413). Gottfried (1990) defines academic motivation as “the enjoyment of school learning characterized by a mastery orientation; curiosity; persistence; task-endogeny; and the learning of challenging, difficult, and novel tasks” (p. 525).

Educational researchers realize that motivation plays a significant role in achievement and success (Guay et al., 2010). There are two types of motivation, intrinsic and extrinsic. Intrinsic, as defined by Deci and Ryan (2000) refers to doing something that is inherently enjoyable to the individual. That person participates in something that fulfills some sort of internal gratification. Extrinsic motivation is “doing something because it leads to a distinguishable outcome.” (Deci & Ryan, 2000, p. 55).

Angie’s current teaching environment appears to be stressful which can directly affect motivation. “Research on the conditions that foster versus undermine positive human potentials has both theoretical import and practical significance because it can contribute not only to formal knowledge of the causes of human behavior, but also the design of social environments (professional development) that optimize people’s
development, performance, and well-being” (Deci & Ryan, 2000, p. 68). To optimize Angie’s performance, maybe her schedule can be re-arranged by administration to allow for planning collaboration. Angie can also take control of her situation by attempting to utilize technology to make lesson planning easier, including overall organization. These concepts often come with experience and can also be the result of effective professional development where teachers learn to utilize new classroom resources.

**Introduction to Self-Determination Theory**

If the school environments is meeting Angie’s needs of autonomy, relatedness and competency, will she have intrinsic motivation? Self-Determination Theory, one of several micro-theories, is an area of psychology that investigates the idea of motivation and human personality. Self-Determination Theory uses utilizes an organismic meta-theory that emphasizes the significance of humans’ evolved inner self for personality development and behavioral self-regulation (Ryan, Kuhl, & Deci, 1997). When a person is motivated, they are curious, able to seek challenges and discover new perspectives. Deci and Ryan (2000) suggest that humans have a natural tendency to grow and develop as organisms. Motivation is innate and not learned. Self-Determination Theory assumes that also inherent in human behavior “is the propensity to be inquisitive about one’s social surroundings and engrossed in learning and developing one’s own knowledge” (Niemiec & Ryan, 2009, p. 133). The ideal scenario in all educational environments is teachers who are intrinsically motivated. Intrinsic motivation (Ryan & Deci, 2000) refers to behaviors that are without any external impediments. For example, if Angie was self-motivated, she would take on tasks because they are enjoyable and engaging, some
internal satisfaction is being met. Angie would continue her professional development because it serves to gratify an internal need of self-improvement in order to grow as an educator. When acting in an intrinsically motivated way, teachers are more likely to fully engage in the activity with intentions of success.

In order to be intrinsically motivated, three basic human needs of autonomy, competency, and relatedness must be met (Deci & Ryan, 2000). Angie seems to possibly be missing one or more of these critical components. According to Niemiec and Ryan (2009) the need for autonomy refers to the “experience of a behavior as volitional and reflectively self-endorsed” (p. 135). For example, teachers are autonomous when they devote their own personal time to pursue additional graduate degrees or professional development. From the scenario, we do not know if Angie is autonomous, but she seems to do a lot of work during her personal time at home. Competency incorporates the concept of doing something effectively (Niemiec & Ryan, 2009). Teachers feel competent when they can meet the challenges of their profession and ensure student success in the classroom. Angie seems to be lacking in this area, she does not trust her instincts and the contents of her lesson plans. According to Broeck, et.al (2010) “relatedness is defined as an individual’s inherent propensity to feel connected to others” (p. 982). La Guardia and Patrick (2008) discuss the importance of relationship support regarding motivation, how our relationship with others represents a way to fulfill our psychological needs. In the scenario, Angie seems to question her significance in the mathematics department, possible feeling as if she cannot relate to others, even that she is not competent enough to communicate on their level, Teachers (like Angie) can satisfy
their need for relationships if they feel part of the social group of a school whether it
concerns collaborative work with others in their department, social acceptance, and
willingness to participate in functions both within and outside of the school environment.
Deci and Ryan (2000) propose in their theory that extrinsic rewards like money payments
or promotions can undermine a person’s intrinsic motivation limiting a person’s self-
determination. For example, if a teacher is paid money or given some external benefit to
attend a professional development, they may just ‘show up’ for the external reward, and
they may not engage fully in the in-service activity. Deci and Ryan (2000) suggest that
the overall extent to which a possible environment (in this case educational) supports
autonomy, competence, and relatedness or the ability of a person (teacher) to “find or
construct the necessary nourishment” from the environment determines which people
(teachers) will experience such things as intrinsic motivation, internalization of extrinsic
behavioral regulation, and personal well-being (p. 229). Because teachers, like Angie,
play such an important role in a student’s education, it is important that she works in an
environment that supports all three of the needs conducive to providing intrinsic
motivation.

**Critics of Self-Determination Theory**

Not everyone agrees with the influence of Self-Determination Theory on human
motivation. Critics of Self-Determination Theory feel that it goes against the well-
known behaviorist ‘reward system’ that maintains the idea that careful use of rewards is
the most efficient way to induce motivation in people. For example, Skinner’s (1953)
notion of operant conditioning assumes that behavior is controlled by external rewards.
A scenario that could illustrate this theory is if a child is rewarded with good behavior, they are likely to continue that good behavior. Skinner (1953) believes that without that extrinsic reward, that the child would not resume the good behavior. Eventually, Skinner (1953) believes the child would connect good behavior with positive outcomes and the bad behavior with negative outcomes and this would carry over into adult life.

One weakness of this theory is if you stop rewarding the good behavior, bad behaviors could become prevalent. Skinner’s (1953) theory also lacks motivation and engagement. McClelland (1965) also maintained that needs are for the most part learned and different in strength based on the function of that learning, behaviors can be predicted based on the strength of those needs. Over the past 20 years, several research studies have been conducted that provide additional support to Self-Determination Theory regarding the fact that intrinsic motivation can be undermined by external rewards. “Carrot and stick (CAST) approaches to motivation, such as those found in operant conditioning, lead to a heightened focus on the tangible rewards of work rather than on the nature and importance of the work itself” (Stone, Deci & Ryan, 2008, p. 3). Initial research illustrated that monetary rewards undermined people’s intrinsic motivation leading future behavior to sink below baseline (Deci, 1972c, 1972b). Human motivation requires other processes other than external rewards. There is a clear discrepancy between the effects that extrinsic rewards have on the internal thought processes concerning innate motivation. Stone, Deci and Ryan (2008) conclude that behaviorist approaches can initiate short-term productivity increases by managing people's behavior, but the result is poor quality motivation which is unsustainable and
can give rise to other negative outcomes.

Other theorists have added to the research utilized in Self-Determination Theory. Vallerand (1992) proposed through research that there are three types of intrinsic motivation: intrinsic motivation to know (participating in activity for personal pleasure), intrinsic motivation toward accomplishments (participating in activity to grow or reach a goal), and intrinsic motivation to experience stimulation (sensory). Vallerand (1997) criticized past research done by Deci and Ryan because the studies looked at the behavioral aspect of the motivation and failed to answer the ‘why’ regarding intrinsic motivation. Vallerand (1997) proposed that there are three dimensions to motivation; intrinsic (personal pleasure and satisfaction), external regulation (behavior is regulated through external rewards) and amotivation.

Amotivation, a lack of motivation, has been connected to negative outcomes (Vallerand, 1997, 2007; Vallerand & Ratelle, 2002). In our scenario, Angie could be viewed as an amotivated employee when it comes to attending her mandated professional development. Amotivated people choose not to engage in an activity, which has been linked to learned helplessness, where humans withdraw any effort toward an activity because they fear a lack of control (Barkoukisa, et. al, 2008). Many teachers can become amotivated in regards to professional development, withdrawing any effort on their part, due to possible lack of control or contribution. Vallerand and colleagues (Vallerand et al. 1992, 1993) developed a theoretical framework for the complex layers of motivation that exist. The instrument is called the Academic Motivation System (AMS), which measures the three dimensions of motivation that include least to most determined by the self
The AMS scale is comprised of seven sub-scales which are defined by 28 items (Barkoukisa, et. al, 2008). Other researchers have done multiple studies in the areas of healthcare and workplace performance.

**Motivation – Human Growth**

If Angie harbors negative feelings about the professional development, is she going to display any personal growth from the learning experience? Self-Determination Theory is an organic meta-theory that involves an individual’s personal growth through looking at the concept of motivation and how it affects human functioning. According to Deci and Ryan (2000), if one’s internal needs are satisfied, there will be a positive outcome in relation to self-efficacy and motivation. Deci and Ryan (2000) state that, “to be motivated means to be moved to do something” (p. 54). Intrinsic motivation occurs when a person is motivated to do something because it is interesting and enjoyable, therefore resulting in high quality learning and achievement (Ryan & Deci, 1980, 1985, 2000). Most people can relate to this concept of interest producing high quality achievement. This also holds true for teachers in the field of education. If they are interested in a professional development and find it enjoyable, they are more likely to gain useful skills and information, while participating in a high quality learning social context. In Angie’s scenario, she seems to hold little, if any interest. It appears as if the professional development will be an unwanted burden on her day.

Ryan and Deci’s (2000) self-determination theory engages itself with “the investigation of people’s inherent growth tendencies and innate psychological needs that
are the basis for their self-motivation and personality integration, as well as for the conditions that foster those positive processes” (p. 68). According to Deci and Ryan (2000), Self-Determination Theory affirms that knowledge of human motivation requires a regard for the innate psychological needs for competence, autonomy, and relatedness. If a human is deprived of these three needs, they may experience negative outcomes. Deci and Ryan (2000) assert that, “psychological health requires satisfaction of all three needs; one or two are not enough” (p. 229). Vallerand, Pelletier and Koestner (2008) support the Self-Determination Theory by maintaining, “it is not the environment per se that matters, but rather what it means functionally in terms of supporting people’s psychological needs” (p. 257). It is important to go beyond the quantity of motivation, but take in the quality of the motivation (Vallerand, et. al, 2008). The idea of Angie sitting alone in her classroom, with feelings of stress and anxiety, does not portray a person in good psychological health when it relates to her working environment. Obviously, her psychological needs are not being met in the workplace. This should be a concern of not only her school administration, but the district as a whole.

**Social Context-Influence**

Angie appears to have good intentions, and wants to succeed as a teacher, but something seems to be holding her back. Deci and Ryan (2002) propose that “people are assumed to possess an active tendency toward psychological growth and integration” seeking challenges, perspectives in order to change cultural practices (p. 3). They are always on a natural path to personal growth and improvement. In addition to the personal
drive for growth and integration, Deci and Ryan (2002) state that “there are clear and specifiable social-contextual factors that support this innate tendency” and other factors that can sway away from human process (p. 5). Most everyone has experienced a social situation that was conducive to growth and one that is not. Teachers have also experienced professional situations and environments that support positive growth and also ones that thwart growth. In this case, Angie seems to be holding herself back be giving into her feelings of anxiety and incompetency when it comes to mathematics instruction and the relationship she feels she has with her peers. This lack of confidence in her abilities and relationships can definitely deny her growth in a professional capacity.

Angie’s personal and professional needs can be affected by her social environment. Descriptive illustrations of environments that support healthy functioning have been in many social, personality and developmental research studies and literature (Deci & Ryan, 2002). SDT involves three basic psychological needs that are pertinent to illustrating the phenomena (Deci & Ryan, 2002). The three needs of autonomy, competency and relatedness “provide the basis for categorizing aspects of the environment as supportive versus antagonistic to integrated and vital human functioning (Deci & Ryan, 2002, p. 6). If one of these three needs are absent, it directly affects intrinsic motivation.

**Human Needs**

Every human has needs that affect the way they live and engage in their culture as well as their social and physical environment. Communication is key, especially in
Angie’s case. She needs to be able to feel comfortable in communicating her needs to other staff in her building. According to Deci and Ryan (2002), “Living beings must engage in continual exchanges with their environment to draw from it those necessities that allow them to preserve, maintain, and enhance their functioning (p. 6). Needs (basic psychological) are described as necessary conditions that support a human’s personality and cognitive structures, and are just as vital as both physical development and overall functioning (Ryan & Deci, 2002). The psychological health of humans is just as important as physical health. Ryan and Deci (2002) conclude that these needs are expected to be “evident in all cultures and all developmental periods (p. 7). Angie’s psychological health may directly affect her physical presence in the classroom.

Types of Motivation

Self-Determination Theory (Self-Determination Theory; Deci & Ryan, 1985) is an expansive framework that distinguishes between different types of motivation based on the different reasons or goals that give rise to an action. Not only does Self-Determination Theory incorporate the notion of personal motivation, but it investigates the social conditions in that cultivates or hinders motivation. In straightforward terms, Self-Determination Theory is concerned with positive developmental tendencies along with the social environment that nurtures these tendencies (Ryan & Deci, 2000). Angie’s scenario does not shed much light on her working environment, we as readers, only share her perspective regarding her day. The most basic distinction of self-determination concerns intrinsic motivation, which refers to doing something because it is inherently interesting or enjoyable, and extrinsic motivation, which refers to doing
something because it leads to a distinguishable outcome.” (Deci & Ryan, 2000, p. 55).

For teachers, every day is different, Angie may possibly just find herself in a slump, and this is a bad day for a required professional development. Subsequently, Angie may hold these feelings of anxiety all of the time.

Within Self-determination Theory is a sub-theory referred to as Organismic Integration Theory (OIT). Deci and Ryan (1985) introduced this theory in order to detail and explain the various forms of extrinsic motivation and integration of motivational behaviors and the factors that either promote or hinder their regulation. Figure 1 illustrates the OIT taxonomy proposed by Deci and Ryan (1985, 2000). The far left, is amotivation (the failure to act) and the far right is intrinsic motivation (interest, enjoyment). In-between lies extrinsic motivation with four forms of extrinsic motivation: external regulation (reward/punishment), introjection (ego/approval), identification (valuing of activity), and integration (congruence) (Deci & Ryan, 1985, 2000).
Figure 1. A taxonomy of human motivation (Deci and Ryan, 2000 p. 61). This figure illustrates the separation of the three types of motivation.

“I have always believed that the experience of intrinsic motivation is its own justification” - Edward L. Deci (1995, p. 46)

Intrinsic Motivation

There has been a lot of research and work in literature and philosophy, across disciplines emphasizing “more than ordinary moments of existence”, or a heightened awareness of one’s self (Deci, 1995, p. 45). Is Angie ware of her inner-self and the reasons behind her motivation… or lack thereof? Numerous researchers have concluded that motivation is a key component in achieving success in education. According to Deci (1995) intrinsic motivation is the “desire to be the origin of one’s own action rather than be a pawn manipulated by external forces” (p. 27). In this case, Angie seems to be that
pawn manipulated by the external force of her principal mandating that she participate in the professional development. Research has suggested that rewards can decrease the need for intrinsic motivation, diminishing this quality in certain context. Teachers work many hours, often the reward being less monetary and more personal, fulfilling an internal need to help others in a learning environment. Deci (1995) states that money is often a seducer, but in the realm of teaching, money is usually not the driving force behind a teaching career due to the low income to education comparison.

**Cognitive Evaluation Theory**

Cognitive Evaluation Theory (CET, Deci & Ryan, 1985), a sub-theory of self-determination theory, specifies the social context produces varying levels of intrinsic motivation. Although it appears that Angie does not seem intrinsically motivated at work, she may be intrinsically motivated in other parts of her life. CET argues that “interpersonal events and structures (e.g., rewards, communications, and feedback) that conduce toward feelings of competence during action can enhance intrinsic motivation” (Deci & Ryan, 2000, p. 58). Angie’s incompetent feelings may be directly affecting her motivation. CET continues by stating that those feelings of competence will not increase the presence of intrinsic motivation unless they are accompanied by feelings of autonomy (Deci & Ryan, 2000). Numerous research studies have applied CET to educational environments, and have found that those situations that support autonomy have improved intrinsic motivation and have increased positive outcomes in students (Deci, Nezlik & Sheinman, 1981; Flink, Boggiano and Barrett, 1990; Ryan and Grolnick, 1986). In addition, multiple studies have illustrated that “autonomy-supportive (in contrast to
controlling) teachers catalyze in their students greater intrinsic motivation, curiosity, and the desire for challenge [e.g., Deci, Nezlek, & Sheinman, 1981; Ryan & Grofnick, 1986] (Deci & Ryan, 2000, p. 59). This idea can be easily adapted to include teachers as adult learners in a professional development environment. If Angie’s working environment supported her autonomy, her intrinsic motivation may increase.

Positive performance feedback has itself enhanced intrinsic motivation (e.g., Deci, 1971; Harackiewicz, 1979; Deci & Ryan, 2000), and in turn, negative feedback has crushed it (e.g., Deci & Cascio, 1972; Deci & Ryan, 2000). In any situation, when a person receives positive feedback about their actions, they are more likely to be intrinsically motivated to continue to do well and engage in the activity. At some point in her career, Angie may have received some criticism in the way that she teaches or interacts with her students. Maybe she has not received any feedback at all? As humans we all want to be acknowledged and given positive performance feedback… letting us know we are doing a good job.

When researching the environmental effects of intrinsic motivation, focus has been geared toward the issue of autonomy versus control. How much is internal and how much motivation is external. Are there benefits to both? If teachers are continuously extrinsically rewarded, are they likely to be motivated to do things without that reward? If Angie was given a monetary reward or some other form of compensation for each professional development she attended, would her attitude improve? Much research has been done on this controversial issue, and how extrinsic rewards can directly undermine intrinsic motivation in the workplace (Deci, 1971; Deci & Ryan, 2000; Lepper, Greene,
Ryan and Deci (2000) view that in order for intrinsic motivation to occur, the activity must be enjoyable and interesting to the person engaging in a particular activity, in this case teachers and professional development. Ryan and Deci (2000) question where this motivation comes from and how people self-regulate their behavior in the absence of intrinsic motivation. Without intrinsic motivation, how does one motivate themselves? For example, when an administrator attempts to persuade teachers (like Angie) to participate in a professional development, the behaviors of teachers can range anywhere from amotivation (refusal to participate) to active personal engagement and positive participation. Self-Determination Theory proposes that these various levels of motivation regarding the requested behavior (in this case by the administrator) can be internalized and integrated at varying degrees unique to a person’s personality (Deci & Ryan, 2000).

Deci and Ryan (2000) incorporated these ideas of multiple levels of motivation and have developed a continuum of self-determination ranging from amotivation (on the left, refer to Figure 1), toward complete intrinsic motivation. The ultimate goal is to achieve intrinsic motivation in order to meet the most optimal outcomes. In order for intrinsic motivation to occur, the three basic needs of autonomy, competence, and relatedness need to be met.
“Control leads to compliance; autonomy leads to engagement.” - Donald H. Pink

Autonomy

According to Deci (1995), to be autonomous means “to act in accord with one’s self, it means to feel free and volitional of one’s actions” (p. 2). Humans embrace an activity because of interest and commitment, stemming from a true sense of self (Deci, 1995). The opposite of autonomous is the implementation of control and acting without a sense of personal endorsement, where the self has been submissive to the controls (Deci, 1995). A teacher who resists the pressures to conform to educational practices that impeded the success of students, and which he/she believes is wrong is acting autonomously and living authentically. A teacher who succumbs to the pressure of an administrative decision, knowing that it may negatively impact the success of the students is being controlled and inauthentic. Teachers appreciate the opportunity to act on free will. In Ohio, districts are bound by standards, which tie the hands of teachers. Teachers do not often feel free to teach what or how they want, they are controlled by the regulations of the state.

Deci and Flaste (1996) propose that any activity that undermines a person’s feeling of autonomy, gives them a sense of feeling controlled, decreasing their motivation which may further lead to negative consequences. This can definitely be seen in Angie’s case. She is feeling controlled by her principal and the mandated professional development. Anyone that is told what and how to do something feels controlled and this can directly affect their motivation. “Autonomy support, the opposite of control, means
being able to take the other person’s perspective and work from there… actively encouraging self-initiation, experimentation and responsibility” (Deci & Flaste, 1996, p. 42). Teachers input matters, and when their perspective is taken into consideration, it encourages active participation, for example in a professional development opportunity. According to Deci and Flaste (1996), autonomy support minimizes pressure by withdrawing any controlling language and allowing as much choice creating a liberating, non-controlled effect. “Autonomy fuels growth and health because it allows people to experience themselves, as the initiators of their own actions” (Deci & Flaste, 1996, p.71). The question remains, how many schools create supports autonomy in their districts? Furthermore, is our American educational system supportive of autonomy, and if not, does it show?

“Whenever you are asked if you can do a job, tell 'em, 'Certainly I can!' Then get busy and find out how to do it.” — Theodore Roosevelt

**Competency**

Some teachers do enough to satisfy the needs of the administration when it comes to their work, others go above and beyond their expectations. According to Deci (1995), in the United States, we have connections between behavior and desired outcome and it is used as a motivation to attain achievement. Competence, in this study, refers to one’s feeling of effectiveness regarding interaction with a specific social environment while experiencing various opportunities to express one’s skills and capacities (Deci, 1975; Deci & Ryan, 2000, 2002; Harter, 1983; White, 1959). This need enables people to seek
out challenges that will enhance their skills through activity, and interaction is with confidence and clarity (Deci & Ryan, 2002). “The feeling of competence results when a person takes on and, in his or her own view, meeting optimal challenges” (Deci, 1995, p. 66). Furthermore, “The feeling of being effective occurs spontaneously only when one has worked toward accomplishment” (Deci, 1995, p. 66). What competency is not, is an attained skill or capability, but rather it is a “felt sense of confidence and effectiveness in action” (Deci & Ryan, 2002, p. 7).

Teachers need to feel competent and confident in their career as well as when participating in professional development. Angie neither feels confident in her abilities as a teacher nor competent as a member of her school community. As humans, we need constant support and justification to aid in this feeling of competency. Deci (1995) proposes that “The fact that perceived competence is related to intrinsic motivation leads directly to a very important set of issues about giving people feedback” (p. 67).

“Relatedness reflects the homonomous aspect of the integrative tendency of life, the tendency to connect with and be integral to and accepted by others” - Deci and Ryan

**Relatedness**

Deci and Ryan (2002) state that relatedness “refers to feeling connected to others, to caring for and being cared for” as well as a sense of belonging to a community (p. 7). Deci and Ryan (2002) imply that “Experiencing mutual reliance and respect is the heart of the relatedness need” (p. 266). The feeling of being connected is vital as well as goal sharing and long-term relationships. (Deci & Ryan, 2002). This concept is important in
all social situations as well as educational environments. If teachers feel a connection to others and their specific environment, they are more likely to have a useful positive engagement within the context. It is important that school districts create this type of connected, collaborative social environment to enhance productivity and ensure optimal outcomes.

Deci and Ryan (2000) conclude that “Organizational procedures can provide an institutional opportunity to support the need for relatedness in teachers” (p. 266). Managerial behaviors that can directly support relatedness in social contexts, according to Deci and Ryan (2002) include the following: hold regular meetings, set reward structures that support cooperation, not encouraging competition, avoid triangulation (no negative speak), share information whenever feasible, and conduct team building exercises when appropriate (p. 267). The managerial behaviors can aid in fostering the feeling of connectivity in teachers, acknowledging their need to feel supported in a positive learning environment. Angie’s scenario does not give many clues as to her working environment, but it does lend itself to the idea that she questions her relationships with others and how they view her competency as a professional.

**Extrinsic Motivation**

In self-determination, there are two types of motivation that may give rise to action, intrinsic and extrinsic motivation (Deci & Ryan, 2000). As discussed, intrinsic motivation fulfills an internal satisfaction because it is interesting and enjoyable. Deci (1996) makes a point that humans thrive when they make their own decisions without any
extrinsic reward. Intrinsic motivation is an important type of motivation, but too often it occurs infrequently in learning situations. In theory and literature, extrinsic motivation has contrasted with intrinsic motivation in that a person experiencing this motivation is seeking some external reward or achievement, and that is the only desire it fulfills. Deci and Ryan (2000) establishes that self-determination theory proposes that there are different types of extrinsic motivation, some not representing this notion of impoverished motivation, but can include action.

Adult learners can perform actions that are extrinsically motivated with resentment or willingly if there is value of a particular task (Deci & Ryan, 2000). Extrinsic motivation can occur if one feels “externally propelled into action” or if a goal is “self-endorsed and thus adopted with a sense of volition” (Deci & Ryan, 2000, p. 55). Deci and Ryan (2000) concludes that extrinsic motivation can fluctuate in the degree that it is autonomous. Angie seems to be extrinsically motivated, she seems to feel resentment toward being mandated to participate in a professional development. If a teacher participates in a professional development because they do not want to suffer consequences at work, and they feel that is valuable to their teaching career, is doing it to avoid sanctions. Another example, if a teacher is participating in a professional development because learning the information is valuable to their career, but may be of no particular interest personally to that teacher. These two extrinsic motivation examples illustrate how extrinsic motivation may differ in regards to autonomy (Deci & Ryan, 2000).
Types of Extrinsic Motivation

According to Deci and Ryan (1985, 2000), there are four unique types of extrinsic motivation that fall between amotivation and intrinsic motivation (refer to Figure 1) that are incorporated in their Organismic Integration Theory (OIT). The least autonomous is referred to as external regulation (Deci & Ryan, 1985, 2000). “Such behaviors are performed to satisfy an external demand or obtain an externally imposed reward contingency” (Deci & Ryan, 2000, p. 61). An example of external regulation would be a school district paying teachers a stipend to attend a professional development. Teachers are showing up to professional development because they are being paid and are therefore being controlled. Deci and Ryan (2000) conclude that external regulation is the only type of motivation that is recognized by operant theorists like Skinner (1953) and compared to intrinsic motivation in numerous lab studies.

The next type of extrinsic motivation is referred to as introjected regulation (Ryan & Deci, 1985, 2000). Introjection illustrates a “type of internal regulation that is still quite controlling because people perform such actions with the feeling of pressure in order to avoid guilt or anxiety or to attain ego-enhancement of pride (Deci & Ryan, 2000, p. 62). An example of this would be school administrators ‘guilting’ teachers into participating in professional development for ‘the good of the student’. Teachers feel obligated to attend to avoid the feeling of others thinking they do not value their students. Another example, teachers could attend the professional development to feel pride, enhancing their ego of achievement, possible above others.
Heading toward the more self-determined right of the taxonomy in Figure 1 is integrated regulation. “Here the person has identified with the personal importance of the behavior and has thus accepted its regulation as his or her own” (Deci & Ryan, 2000, p. 62). For example, a teacher attends a professional development, or furthers their education because they value it as a life goal, valuing the learning activity.

The most autonomous form of extrinsic motivation is referred to as integrated regulation (Deci & Ryan, 1985, 2000). In this case, the identified regulations have been assimilated into one’s self (Deci & Ryan, 2000). “This occurs through self-examination and bringing new regulations into congruence with one’s other values or needs” (Deci & Ryan, 2000, p. 62). Integrated forms of extrinsic motivation do share some similarities of intrinsic motivation, both are autonomous and unconflicted (Deci & Ryan, 2000). It is still extrinsic, however, because it done for instrumental value due to the expected outcome and is separate from the behavior, even though it remains valued by the self (Deci & Ryan, 2000). Teachers in this case could actively seek out professional development or further their education to meet a personal goal or satisfaction, but not because they enjoy it or find it interesting.

Angie could easily flow through these types of extrinsic motivation as her teaching career progresses... For example, Angie’s first professional development might have offered some compensation for attending, she gained some external benefit (external regulation). Angie may then have begun attending professional development because others were attending, so she participated to avoid the pressure of guilt (introjected regulation). Next, Angie attends other professional development because she understands
the importance of continued education (integrated regulation). Finally, as Angie she may actively seek out professional development because it meets a personal satisfaction (identified regulation).

**Amotivation**

Some theorists have treated the idea of motivation as a unitary concept (e.g., Bandura, 1986) and have only been focused on the different aspects between motivation and amotivation (Deci & Ryan, 2000). Amotivation is “the state of lacking an intention to act” (Ryan & Deci, 2000, p.61). Amotivation can be a direct result of not valuing an activity (Ryan, 1995). For example, when a teacher is amotivated, they are lacking any intention or sense of personal causation to actively engage in a professional development because either they do not value it or feel competent enough to participate in it (Deci & Ryan, 2000).

**Overview of Research Education Regarding Self-Determination Theory**

“Self-determination Theory assumes that inherent in human nature is the propensity to be curious about one’s environment and interested in learning and developing one’s knowledge” (Niemeic & Ryan, 2009, p. 133). Niemeic and Ryan (2009) suggest that this idea is too often ignored and teachers induce external controls into learning environments which can decrease the level of relatedness amongst teachers and students, inhibiting the process of high-quality learning. These practices reflect the immense pressure placed upon teachers (Ryan & Brown, 2005) in the belief that motivation occurs only when external rewards or punishments are in place for learning to
occur (Niemeic & Ryan, 2009). A connection can be made between this ideology and a social context where teachers are participating in a professional development as adult learners. All too often, teachers (like Angie) are persuaded to engage in learning opportunities because they are offered some external compensation like money or compensatory time. As punishment, they may be made to feel guilty or face some type of professional discipline if they are not motivated to attend.

Self-determination theory looks at these behaviors in education concerning students and whether these behaviors are intentional or motivated, between self-motivation and intentional regulation (Deci, et. al, 1991). According to Deci, et. al, (1991), “When a behavior is self-determined, the regulatory process is choice, but when it is controlled, the regulatory process is compliance (or in some cases defiance)” (p.327). It is important to examine this idea of choice versus compliance and the outcome involving teachers in professional development situations. Self-determination identifies that the idea of choice will provide a more beneficial outcome than compliance in terms of motivational behavior (Deci & Ryan, 2000). In turn, the motivation of adult learners would be intrinsic through choice, yielding positive results.
Adult Learning Theories

“Learning involves change. It is concerned with the acquisition of habits, knowledge, and attitudes. It enables the individual to make both personal and social adjustments” - Crowe and Crowe (1963)

Everyone learns differently, and that includes teachers in the roles of students during professional development experiences. Teachers are experts at getting information across to students, but have very unique, individual modes of learning themselves and they are usually aware of their own personal learning styles. Adult learners differ from their younger counterparts due to the abundance of lived experiences and diverse knowledge they bring to a learning opportunity. Adults also have an increased sense of self and an innate understanding of their capabilities. As such, it would benefit teacher educators, professional developers, and educational administrators to clearly understand how adults learn best (Lieb, 1991).

Knowles (1984) described how many prior researchers attempted to take the learning theories developed for young students and adapt them for adult learners (e.g., Brunner, 1959; Kidd, 1959; Kempfer, 1955; Verner & Booth, 1964). Houle (1961) partitioned adult learners into three subgroups based on their reason for continuing their education: (1) goal oriented learners who are determined to accomplish predetermined objectives, (2) activity oriented in which the participants yearned for social contacts, and (3) learning oriented who seek knowledge for the purpose of knowing (p. 61). Tough’s (1971) research focused on not only the ‘why’ of adult learning, but also ‘how’ they learned and the resources they accessed to help them succeed. According to Knowles
Tough “came to the conclusion that an adult learner proceeds through several phases in the process of engaging in a learning project, and speculated that helping them gain increased competence in dealing with each phase might be one of the most effective ways of improving their learning effectiveness” (p. 39).

Andragogy (Greek-man-leading) can be identified as similar to the term pedagogy (Greek- child-leading). Andragogy is a theory that holds a set of assumptions regarding how adults learn. Andragogy emphasizes the significance of the practice of learning with the agreement that it is problem-based and collaborative rather than instructive. There needs to be direct equivalence between the teacher and the learner. Andragogy as a study of adult learning initiated in Europe in 1950's and was then pioneered as a theory and model of adult learning from the 1970's by Malcolm Knowles.

Malcom Knowles is an American practitioner and theorist of adult education who defined andragogy as "the art and science of helping adults learn" (Fidishun, 2000; Zmeyov, 1998). Knowles’ (1975, 1980, 1984) theory of andragogy is a theory that was developed to explain adult learning. Knowles (1980) identified at least five characteristics of adult learning that include: changes in self-concept (achievement of self-direction reflects adulthood), role of experience (adult learner experience, acclamation of experience), readiness to learn (timing of learning experiences), and orientation to learning (problem solving rather than subject centered), and motivation to learn (maturity leads to internal motivation) (Knowles 1984:12 in Smith, M., 2002). Knowles (1984) was well aware of the pedagogy of learning and its importance in the realm of education, but he wanted to make a distinction between the assumptions made
about pedagogy and the assumptions about andragogy. Knowles (1984) establishes that andragogy “applies to children and youth as they mature”, and therefore will need to be instructed using andragogical methods (p. 43).

Most adults are in learning situations because they want to be there. The idea that adults are internally motivated to learn and become self-directed is an essential concept. Knowles (1984) believes that as we grow into adulthood, the internal drive to learn increases. This human behavior leads one to be self-directed, becoming apparent in most cases as one reaches adulthood, moving toward a less structured environment with more responsibility that poses more challenges. Because of this innate drive to learn, adults become both goal and learning oriented. They set learning goals that are currently relevant in their lives. As they set these goals, adult learners bring with them the unique lived experiences that they have accumulated throughout their life. These ideas are important when organizing and implementing a professional development. When teachers are planning instruction, they take into account their unique audience, so any situation where adults are learning should be given the same consideration. Adult learners resist learning when they feel others are imposing information, ideas or actions on them (Fidishun, 2000).

Knowles (1984) suggested four principles that are applied to adult learning: (1) adults need to be involved in the planning and evaluation of their instruction, (2) experience (including mistakes) provide the foundation for the learning activities, (3) adults are most interested in learning subjects that have immediate relevance and impact to their job or personal life, and (4) adult learning is problem-centered rather than
content-oriented (Kearsley, 2010). Educators that work with adults need to understand and value the concepts within the adult learning theories and incorporate them into the methods of instruction, in this case professional development of teachers.

Knowles (1984) defined these principles and example applications in regards to computer training scenarios with adults. These principles can be pulled from these examples and mirrored for educational professional development opportunities. Knowles (1984) stated there is a need to explain the reasons specific things are being taught, in his case, computer commands, functions and operations. In comparison, teachers are no different, it is beneficial in all aspects of learning to explain the reasons ‘why’ things are being taught for educators to understand the value of what is being learned. Next, Knowles (1984), when adults are learning about computers, learning should be task oriented, not memorization. Teachers participating in professional development do not want to be lectured, they want to engage in relevant, hands-on activities that are pertinent to the field. Knowles (1984) concluded that instruction should take into account the varying backgrounds of learners and instructional materials and activities should allow for diverse levels of prior experience with computers. Teachers also come to learning opportunities with varying degrees of knowledge and backgrounds, therefore it is vital that professional development opportunities allow for that flexibility. Finally, Knowles (1984) established that because adults are self-directed, they should be allowed to discover new knowledge without the dependence on others. Similarly, teachers in learning situations should be given those same opportunities to explore, collaborate and learn, at the same time being able to ask for assistance when needed. Adult learners are
often practical and like to be acknowledged and respected as learners with a variety of lived experiences.

**Adult Learning Theories and Professional Development**

*“In education, change is inevitable.”* - (Yvonne Trotter, 2006, p. 8)

Adults in education are constantly being exposed to new and innovative standards, instructional methods and curriculum. Like Angie, teachers are often struggling to keep up on the latest methods, while often questioning their competency in the classroom. Trotter (2006) acknowledges that every year, school districts have the enormous challenge of organizing and delivering effective and engaging professional development opportunities that staff feel is both worthwhile and valuable. Due to the high-stakes testing, learning standards, No Child Left Behind Act (NCLB), and the Every Student Succeeds Act (ESSA), it is essential that school districts “recognize the knowledge base of the teachers” (Trotter, 2006, p. 8). Trotter (2006) emphasizes that school districts and adult educators need to be aware of the adult learning theories will enable districts in offering engaging and sustainable professional development opportunities. According to Trotter (2006), there are age theories (personal issues at age development), stage theories (adults passing through specific stages of life), cognitive development theory (adult intellectual development), and functional theory (learner plays primary role),

*“Teachers are required not only to be experts in their content area, but are also expected to be fluent in child psychology, skilled in communication, execute brilliant classroom management strategies, and navigate the unrelenting gauntlet of educational
politics” (Beavers, 2009, p. 25). Oji (1980) researched adult learners concerning teacher in-service education. Oji (1980) identified four essential characteristics for successful adult learning: (1) concrete experiences, (2) constant supervision and advising, (3) encourage to discover new and complex roles, and (4) provide support and feedback. Teachers want learning experiences that are practical and they can immediately take back and implement in the classroom (Trotter, 2006). Daloz (1986, 1999) identified key themes of instructional methods that were effective with adult learners: adults use experience as a resource, adults need to plan their own educational goals, and the goal of adult education regarding professional development is individual development through reflection, inquiry and feedback. Consistent themes across researchers are that adult learners (teachers) are goal-oriented, value input on their learning opportunities, appreciate the opportunity to make discoveries on their own, and practicality is essential.

**Situated Learning**

A teacher’s goal is to create a safe and accepting learning environment that will meet the needs of diverse learners. At the same time, educators, researchers and administrators are always on the hunt to find the ideal learning environment in order to achieve optimal success for teacher learning. It is essential, that for teachers like Angie, there is a suitable learning environment for adults that take into consideration their needs. For this study, the concept of situated learning and its importance to adult learning and the connections it has to self-determination will be examined in order to identify the connections they have to produce successful learning situations.

The cognitive revolution that began in the 1960s enabled researchers in the field
of education to move from behavioral studies to studies of human cognition. Researchers in the area of mathematics have been gaining new perspective from psychology and new instructional approaches based on these insights (Anderson, Reder & Simon, 1996).

Situated learning (e.g., Collins, 1988; Greeno, Smith, & Moore, 1992; Lave, 1988; Lave & Wenger, 1991) was brought to light by Jean Lave and Etienne Wenger as a model of learning in a community of practice, whether it be in education or other various careers. Lave (1988) related this to mathematics by citing the example of Carraher, Carraher, and Schliemann’s (1995) account of Brazilian street children who could perform complex addition problems in a real-world context of selling items in the street, but could not perform similar tasks when on paper. Lave (1988) concluded that there was a break in the continuum of techniques to solve the arithmetic problems in situated contexts versus school-like settings.

Situated cognition theory can inspire educators to engage learners in an environment that approximates as closely as possible context in which their new ideas and behaviors will be applied (Schell & Black, 1997). The learning allows an individual, in this case teachers, to learn by socialization, visualization, and imitation. Inserting content matter in the ongoing experiences of the teachers and creating opportunities for them to live the content in the context of real-world challenges, enables knowledge to be acquired and then the learning transfers from the professional development opportunity to the realm of practice in the classroom. Situated learning has influenced mathematics researchers in education (e.g. Cobb, Yackel & Wood, 1992; Resnick, 1994) by allowing new perspectives and methods to learning and instruction. The concept of situated
learning and its connection with mathematics shows an emphasis between what is learned in the classroom and applications in real-world situations, like the workplace.

Young (1993) suggested that teachers should be aware of four critical tasks when incorporating situated learning in the classroom environment. Teachers must first select situations that will engage the learner in complex, realistic, problem-centered activities that will support the desired knowledge to be acquired. Teachers must also provide a scaffold for new learners. This is important because it allows the learners to have goals and steps to take to achieve those learning goals. As learners acquire additional skills, less support will be needed. Teachers must then change their roles from delivering content to facilitators of learning by tracking progress, continuing assessment of the learners, building collaborative learning environments, encouraging reflection, and helping learners become more aware of contextual cues to aid understanding and transference (Ottoson, 1997).

There are four claims of situated learning identified in the National Research Council (1994) report: (1) action is grounded in the concrete situation in which it occurs, (2) knowledge does not transfer between tasks, (3) training by abstraction is of little use, and (4) instruction needs to be done in complex, social environments. For teachers, this means that learning opportunities are provided in educational situations, the focus of knowledge is on the task at hand, and the instruction needs to be collaborative and student driven.

**Self-Determination Theory and Adult Learning**

“Self-determination theory (Deci & Ryan, 1985, 1991), when applied to the realm
of education, is concerned primarily with promoting in students an interest in learning, a valuing of education, and a confidence in their own capacities and attributes” (Deci, Vallerand, Pelletier, & Ryan, 1991, p. 325). This study will take this concept and swap students for adult learners, specifically teachers in middle school mathematics. For example, Self-Determination Theory will be concerned with promoting in teachers an interest in learning, a valuing of continued education, and a confidence in their own capacities and attributes (Deci, Vallerand, Pelletier, & Ryan, 1991). Research has acknowledged that this process results in an increase in the quality of learning and understanding as well as personal growth (Deci, Vallerand, Pelletier, & Ryan, 1991).

The concepts that drive self-determination theory involving the three needs of autonomy, competency and relatedness can be identified within the situated learning theory as well as social contexts in which adult learners thrive. Brown, Collins & Duguid (1989) suggest that the assumption that conceptual knowledge can be abstracted from situations in which it is learned and used limits the effectiveness of such practices. Brown, Collins & Duguid (1989) argue knowledge is situated in the culture in which it is developed and used.

A more specific connection between Self-Determination Theory and situated learning is made by Lave (1988), when he concluded that knowledge needs to be represented in an authentic context, in which what is learned will be applied, this can relate to the need for competency. Lave (1998) also suggests that learning requires social interaction and collaboration, which identifies with the need of relatedness. Lave and Wenger (1991) also describe learning as “an integral part of generative social practice in
the lived world” (p. 35), and that social practice can be an integral part of the relatedness need of self-determination theory. Nardi (1992) went even further by identifying that an individual divorced from a social group is no longer the model user, eluding that relatedness is essential in the situated learning process. Collins (1988) defined situated learning as the notion of learning knowledge and skills in the contexts that reflect the way they will be used in real life (p. 2), which can be connected with the ideas of both autonomy and competence.

**Professional Development**

“*Unless you have a theory about how to support instructional practice, you don’t have a prayer.*” —Richard Elmore (CPRE TIMSS Policy Forum 2002)

It would be interesting to see how Angie’s school day plays out, and if she has a positive professional development experience. The teaching profession allows for and often requires an immense variety of professional development opportunities for educators. Professional development opportunities include, but are not limited to, embedded professional development, outside professional development and the pursuit of additional licensure and degrees. Because of this open-ended array of educational development, teachers within the same school district have diverse educational backgrounds and unique modes of teaching and learning. In any educational setting there will be teachers of varying experiences and teaching abilities. Such variation requires school districts to provide professional development opportunities that mirror the types of differentiated instruction requested of their teachers.

District administrators should take into account staff credentials, years of
experience, specialties (e.g., classroom management, technology), prior professional
development, and teachers’ need for continuing education units (CEUs) in order to
effectively utilize professional development opportunities. Since teachers are required to
continually participate in professional development by administrators and school
districts—to collect CEUs, keep up-to-date with learning standards, and instructional
practices—how can schools and districts make sure that they are providing engaging,
relevant, and effective professional development? Professional development that teachers
will deem beneficial and worthwhile?

If possible, districts need to determine what differentiates professional
development into what teachers would classify as: (1) meeting the requirement of simple
attendance, and (2) engaging, valuable, and worthwhile. Because teachers have such
diverse backgrounds and individual wants and needs, the plausibility of generalizing
professional development experiences to meet the second category (above) seems a
daunting task indeed.

In addition, there needs to be both an understanding regarding the role adults play
as learners and what criteria constitutes effective professional development. School
districts and teachers have a shared interest in effective professional development due to
the fact that a typical outcome of professional development is increased and enhanced
student achievement.

Attempts to generalize what makes professional development effective is not an
easy task. Teachers have varying professional and educational backgrounds that affect
the methods that they use to instruct in the classroom. There are also personality
differences among staff. Teachers react and attempt to conform to the environment in
which they work. Some teachers seem to be always active, and willing to pursue any
development they feel may strengthen their teaching skills, while others are more
reserved and comfortable with the instructional methods they already employ. Faculty
that appear passive or unmotivated could have acquired this character as a learned
behavior from their past social environments.

Researching effective professional development is a worthwhile task because it
can lead to not only increased effectiveness in the classroom, but researchers can also
study how teachers react in certain social environments. For example, how a middle
grades mathematics teachers function in certain adult learning environments. Everyone
learns in a unique way and may prefer custom modes of learning, and adults whether they
are mathematics teachers or not, are no different. In a professional learning environment,
some may prefer whole group, small group of even one-on-one. Teachers are expected to
differentiate instruction for their students, those that develop and instruct adult learning
opportunities should be expected to do the same.

The social environment of a professional development also plays a role. For
instance, if you gather a group of middle school mathematics teachers, there may be an
increased opportunity for sharing, discussion and collaboration. If you were to put a
middle school mathematics teacher in a social context that includes all social studies
teachers, the mathematics teacher may feel no relation to the others and may not gain
anything from the environment. In any social context, human nature can be either docile
or active. This suggests more than personality differences are at play and is a function of more than just organic faculties (Deci & Ryan, 2000). Deci and Ryan (2000) conclude that “Research on the conditions that foster versus undermine positive human potentials has both theoretical import and practical significance because it can contribute not only to formal knowledge of the causes of human behavior but also to the design of social environments that optimize people's development, performance, and well-being” (p. 69).

Professional development is an ongoing learning opportunity most often situated in the context in which it will be used. The learning experience can as broad as middle school instructional strategies and as specific as strategies in numeracy that benefit middle school mathematics students with specific learning disabilities. Many professional development opportunities are situated in a collaborative learning environment with colleagues that can not only provide ideas and support, but new professional relationships can be formed.

Continuous professional development for teachers is the heart of school reform in regards to curriculum, instruction, and student achievement. Teachers play a critical role in educational reform because they have the overwhelming responsibility to ensure that students meet the high standards that school districts and states have adopted (Garet et al., 2001). Teachers face continuous challenges, for example rigorous performance standards and teacher accountability practices that call for ongoing professional development. The sole purpose of professional development is to prepare and support teachers by providing the knowledge and skills they need to enable students to achieve high standards of learning and overall development (U.S. Department of Education, 1996). Research is
showing that student performance and success is directly influenced by teachers’ high quality professional development and that the effects of teacher knowledge are observed across the curriculum (Darling-Hammond, 1999).

The American Federation of Teachers (2008) concluded that “The nation can adopt rigorous standards, set forth a visionary scenario, compile the best research about how students learn, change textbooks and assessment, promote teaching strategies that have been successful with a wide range of students, and change all the other elements involved in systemic reform - but without professional development, school reform and improved achievement for all students will not happen” (p. 1).

Goldhaber and Brewer (1996) evaluated the effect of teacher degree-level on educational performance by including data from the National Educational Longitudinal Study of 1998 (NELS) and concluded that some teacher characteristics have a strong effect on student achievement.

**Motivation and Professional Development**

According to Karabenick and Conley (2011), there are three types of dominant theoretical approaches to motivation regarding education and learning. They are Expectancy-Value, Achievement Goals, Teacher Affect and Emotion. Expectancy-Value Theory (Karabenick & Conley, 2011; Richardson & Watt, 2006; Watt & Richardson, 2007) provides evidential links between teacher motivation and their engagement in the professional development, commitment to the learning, teaching with fidelity, and their desire to participate in the professional development. Teacher efficacy (perceived ability
to affect outcomes) is a vital component of this theory. Most teachers are concerned with how their teaching will affect their students. If teachers have the confidence that they can use the instructional strategies in their classroom makes it more likely that they will implement them in the classroom (Hart, 2002; Karabenick & Conley, 2011; Ross & Bruce, 2007; Wilson & Cooney, 2002). The value that teachers put on teaching mathematics and science are also essential concerning professional development (Anderman & Wolters, 2006; Eccles, 2005; Eccles et al., 1998; Karabenick & Conley, 2011 Schunk, et al., 2008). That value is most often based on their students’ needs (Eccles et al., 1998; Karabenick & Conley, 2011; Wigfield & Eccles, 2002). According to Karabenick and Conley (2011), “The combination of value in addition to efficacy can provide information for the predicted likelihood that teachers will opt to become involved in professional development, profit from it, and be motivated to change their practices as recommended by professional development interventions” (p. 11).

Karabenick and Conley (2011) state that Achievement Goals concern the reasons why teachers engage in both learning and performance tasks. Their confidence in the learning of the new skills is linked with their confidence of taking it into the classroom and demonstrating them to students. The idea is that the mastery goals (professional development content) focus on competence while performance goals (teaching/instruction) represent demonstration competence (Elliot, 2005; Karabenick & Conley, 2011; Pintrich, 2000).

Most professional development research in the past has ignored the emotional factors that exist in learning situations, including those that involve adults (Karabenick &
Conley, 2011). More recent studies have examined the role of emotions in learning for both students and teachers (Karabenick & Conley, 2011; Linnenbrink & Pintrich, 2002; Pekrun et al., 2002; Schutz & Pekrun, 2007). According to Karabenick and Conley (2011), “Teacher emotions, including anger and frustration (Sutton, 2007) are especially thought to be tied to their identities (Gregoire, 2003; van den Berg, 2002), to their beliefs and goals in the classroom (Schutz, Cross, Hong, & Osbon, 2007), and thus the likely influence on PDM (Professional Development Motivation)” (p. 12). If a teacher displays anger or frustration, they are less likely to positively engage in the professional development.

Effective Professional Development

Teachers have all experienced professional developments that were valuable and applicable, and those that were a waste of precious time. Teachers (like Angie) have enormous pressures, and anything that takes away from their time planning lessons, grading papers, or talking to parents better be worth their while. Effective professional development produces changes in teachers’ instructional practice, which can be linked to improvements in student achievement (Odden et al., 2002). Professional development is a significant part of a teacher’s life. Most educators recognize the need for ongoing learning opportunities, but are often left out of the loop when planning them. They are the ones on the ‘front lines’ and are aware of their needs and the needs of the students.

The concept that needs addressed when contemplating professional development, is what constitutes effective professional development in the field of teaching. Teachers’ value professional development if three variables exist: teachers must have time to
practice and prepare for application of the professional development they acquired, the subject matter should be relevant to their situation and they should feel they have support in the learning environment. (Barnett, 2004; Kent, 2004; Lee, 2005; Salpeter, 2003).

The American Federation of Teachers (2008) suggested eleven guidelines for effective professional development, they are as follows:

(1) Professional development should deepen and broaden knowledge of content, (2) professional development should provide a strong foundation in the pedagogy of particular disciplines, (3) professional development should provide knowledge about the teaching and learning processes (4) professional development should be rooted in and reflect the best available research (5) the content of professional development should be aligned with the standards and curriculum teachers use, (6) professional development should contribute to measurable improvement in student achievement, (7) professional development should be intellectually engaging and address the complexity of teaching, (8) professional development should provide sufficient time, support, and resources to enable teachers to master new content and pedagogy and to integrate this knowledge and skill into their practice, (9) professional development should be designed by teachers in cooperation with experts in the field, (10) professional development should take a variety of forms, including some we have not typically considered, and (11) professional development should be job-embedded and site specific. (p. 13)
Joyce and Showers (2002) acknowledge that professional development must be implemented in the classroom and influence what is taught, how it is taught, and the social environment of the school so that students’ gain knowledge and skills, increasing their ability to demonstrate their learning.

Researchers have also examined what does not work in regards to professional development. Those professional development opportunities that regard a one-size fits all approach ignores individual teachers’ learning needs (American Federation of Teachers, 2008; Dunn & Dunn, 1998; Peery, 2002; Redding & Kamm, 1999). Teachers are often taught methods and strategies concerning instruction, but the neglect lies in the implementation in the classroom. The National Center for Education Statistics (2001) found that only 12 to 27 percent of teachers felt their professional development activities improved their teaching. The American Federation of Teachers (2008) acknowledged that “Professional development programs are fragmented, with teachers receiving bits and pieces of training on the latest topics” (p. 2). Teachers are being taught an abundant amount of the ‘latest methods’, with little in-depth analysis, and are less likely to implement them in the classroom.

In the realm of education, there is great concern that teachers have little, to no input involving the inclusion of the types of professional development in their school districts. Teachers limited involvement in professional development planning often results in training that is not related to their interests or professional needs (Black, 1998; Dunn & Dunn, 1998). Another concern of teachers is that school districts often bring in outside resources to provide learning opportunities, and these entities may not be familiar
with the specific school environment, nor the needs of the teachers. Because of this lack of local knowledge, the entire training program desperately lacks credibility (Black, 1998; Peery, 2002).

**Summary of Chapter II**

Motivation is an important underlying concept in human behavior. It affects everything we do and the outcomes of what we have done. A teacher’s motivation directly impacts their classroom, relationships with others and their overall school environment. Motivation to participate in a learning situation determines the effect that learning will have in other areas. If a teacher is motivated intrinsically to participate in a professional development, they are more likely to gain useful information and engage in positive relationships. The opposite is also true, of a teacher attends a professional development due to extrinsic circumstances, they are more likely not to take away the value of the learning opportunities and are less likely to collaborate and form ongoing professional relationships. The adult learning process is also an important component to professional development. The numerous methods in which adults learn is as significant as attending to the needs of how students learn. In order to provide effective professional development, teachers need to be intrinsically motivated to engage and actively participate in the process. Those that provide the development must be in tune to the learning needs of their audience and make the content relevant and applicable to their curricular and instructional needs.
CHAPTER III

METHODODOLOGY

Overview

Angie, from Chapter One, may be a fictitious character in an education vignette, but her feelings of anxiety and stress, along with her frustrations about how policies and mandates affect the day-to-day functioning of her classroom are all too common amongst teachers. Like Angie, most teachers regularly attend some form of professional development. Along with meeting state and district demands, it is important professional development meet the needs of each teacher. It is also important to understand what motivates teachers in order to provide the optimal adult learning experiences.

The purpose of the proposed research was to examine the motives behind middle school mathematics teachers’ decisions to pursue professional learning opportunities and their perspectives regarding what comprises effective professional development. The study also sought to understand potential relationships between motivation and teachers’ feelings toward professional development. The proposed study utilized a phenomenological approach, which sought to research, describe and analyze the meaning of individual lived experiences: “how they perceive it, describe it, feel about it, judge it, remember it, make sense of it, and talk about it with others” (Patton, 2002, p. 104). The target population was middle school mathematics teachers in grades 4-9, focusing on the transition between elementary and high school.
The study addressed the following three research questions:

1) What motivates middle school (grades 4-9) mathematics teachers to engage in professional development focused on improving classroom instruction that addresses the Common Core’s mathematical content and practice standards?

2) What motivates middle school (grades 4-9) mathematics teachers to engage in general professional development in their field?

3) What types of professional development are deemed useful and effective by middle school (grades 4-9) mathematics teachers?

   - Must one, some, all, or any of the three needs be met (i.e., autonomy, competency, relatedness), as proposed by the theory of self-determination, for professional development to be deemed useful and/or effective?

The researcher conducted a survey comprised of questions involving demographics, motivation, perception of mathematical standards and professional development, among other education related inquiries. Based on the responses, the researcher selected four middle grades math teachers to conduct one-on-one interviews to clarify and expand upon teachers’ survey responses. All information yielded from both the survey and interviews was used to provide an overall perspective of the professional development experience from a teacher’s viewpoint.

**Setting**

Participants were situated in various school districts in Northeast Ohio. These school districts were randomly sampled from a list of Northeastern Ohio public school districts found on the Ohio Department of Education website. The study focused on
middle school (grades 4-9) mathematics teachers in these districts. Schools included in the study range from very high achieving districts rated as excellent to those districts rated as failing per the recommendations of the Ohio Department of Education. Because these districts are located in Ohio, professional development regarding Ohio’s Learning Standards in Mathematics, which align with the Common Core State Standards for Mathematics, were included in the survey and post-survey interviews.

**Research Design**

"Phenomenology is an inventory of consciousness as of that wherein a universe resides”

- (Merleau-Ponty, 1963, p. 215)

**Qualitative Method Research - Phenomenology**

In order to understand a lived experience, one has to tap the source. A teacher’s lived experience is the heart of their career. The discussions found in any teacher’s lounge are narrative stories and reflections regarding the happenings both in and out of the classroom. This social experience is often a platform for encouragement, support, feedback and forming professional relationships. The concept of ‘lived experience’ can include so many aspects of one’s life, and in this case the focus is the experience in the teaching profession. A teacher’s lived experience can be associated with the classroom environment, relationships with other staff, administrative policies, professional development, etc.

Edmund Husserl (1901, 1913) brought about the concept of phenomenology in the early twentieth century. Husserl’s (1901, 1913) described personalistic phenomenology characteristics both personal and social experience in everyday life. He
classified phenomenology as a type of descriptive psychology. Understanding the participants’ lived experiences marks phenomenology as based on Husserl’s philosophical work, and that reflects current research’s intentions. Hegel (1910, 1967) challenged the norm of using the scientific model in analyzing human behavior, cultures and their interaction with the environment. Bruner (1990) later discussed how the cognitive movement changed from the construction of meaning toward the process of meaning, which aided in the acceptance of phenomenology as a research method.

According to Hendrikson and Friesen (2012), “Phenomenology is the study of experience, particularly as it is lived and as it is structured through consciousness” (Hendrikson & Friesen, 2012, p. 1). Phenomenological research reveals the meaning and core of an experience being studied to bring about a rich, comprehensive graphic account of the specific phenomena under examination (Marshall & Rossman, 2016). It is a type of research where the key is to identify the inherent and unchanging meaning of the issue under study (Langdridge, 2007). According to McPhail (1995), some essential phenomena include “values, meanings, intentions, morals, feelings, and the life experiences and creations of human beings” (p. 160). This study will examine the value, meanings, intentions, morals, feelings and life experiences of middle school mathematics teachers in a professional development environment.

Phenomenology exposes details and seemingly trivial aspects within lived experiences that may be taken for granted, with a goal of creating meaning and achieving a sense of understanding (Wilson & Hutchinson, 1991). One of the goals of the study was to bring about those details of professional development and motivation that may
seem trivial to some, but important in the realm of education and adult learning as a whole. Administrators, professional development creators and teachers may find the underlying motivation of teachers vital to their cause of teacher development. Because motivation can affect the engagement and participation in development opportunities, understanding how to develop intrinsic motivation in teachers is key. Therefore, an outcome of this phenomenological study is to address the meaning and value of the experience of teachers being studied along with providing a rich, descriptive understanding of the phenomenon itself. As such, this research may promote a better understanding of motivation towards professional development regarding teachers, such as an understanding of the environment required to support intrinsic motivation in teachers.

**Role of the Researcher**

As the researcher in a qualitative study, my role at the beginning was to identify a meaningful topic in my field, and developing a comprehensive research plan. A researcher should never forget their own personal bias, attitudes, and beliefs as a significant factor in the research process (Merriam, et. al, 2002). As both a middle school teacher and researcher, it was my responsibility to be aware of any biases I may have and how they may affect the study. For example, during the creation of the survey, I did not pose any questions in a way that may sway responses. Also, during interviews, I was careful not frame and deliver questions that might insert my perspective into the study. I had the responsibility of promoting objectivity in the study.
Pilot Study Results

A pilot study was conducted with four mathematics teachers to examine whether the survey questions and interview questions would yield outcomes similar to Deci and Ryan’s (2000) conclusion that the three needs of autonomy, relatedness, and competency were necessary for intrinsic motivation to occur. This pilot study led to the current study.

The population for the pilot study was purposefully sampled from an inner city secondary school located in Northeast Ohio. Four middle school mathematics teachers participated in the pilot study. Participants were chosen based on the student populations for which each instructed; student populations ranged from at-grade-level to well-below-grade-level, in regards to student mathematical skills. Ninety-five percent of these students were on an individualized education plans and many had both learning and behavioral disabilities. Teachers were categorized for data analysis purposes as teacher $A$, $B$, $C$, and $D$.

Data Collection

The pilot study used qualitative research methodology. Teachers were emailed a survey (created using Qualtrics software) containing questions related to Deci and Ryan’s (2000) three human needs of autonomy, competence and relatedness. The survey also posed questions regarding teacher demographics, professional development, and familiarity with PARCC. After the survey, one teacher was asked to participate in an interview that would expand upon the survey questions. Peer review along with close analysis of multiple choice options with item specific questions in comparison to SDT were used to reinforce validity and reliability.
Data Analysis

Teachers were asked questions specific to Deci and Ryan’s (2000) three needs; needs that must be met for intrinsic motivation to occur. Based on their responses, they were given a rating of low, average, or high. Table 1 illustrates the comparison of teachers and their responses to autonomy, competency, and relatedness questions.

Table 1.

Comparison of Teachers versus Deci and Ryan’s (2000) three human needs for intrinsic motivation

<table>
<thead>
<tr>
<th>Teacher</th>
<th>Autonomy</th>
<th>Competency</th>
<th>Relatedness</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Low</td>
<td>Average</td>
<td>Average</td>
</tr>
<tr>
<td>B</td>
<td>Low</td>
<td>High</td>
<td>Average</td>
</tr>
<tr>
<td>C</td>
<td>Average</td>
<td>Average</td>
<td>High</td>
</tr>
<tr>
<td>D</td>
<td>High</td>
<td>Average</td>
<td>Average</td>
</tr>
</tbody>
</table>

Teacher A scored low on both autonomy and competency regarding mathematics instruction and content. Teacher C scored high in both autonomy and relatedness to mathematical colleagues. According to Deci and Ryan (2000), teacher A does not have two of the three basic needs to attain intrinsic motivation. In regards to teacher A responses to professional development, A is not a member of any mathematical professional organization, strongly disagrees with the professional development effectiveness provided by their place of employment. Once aware of the PARCC assessment, teacher A was the only participant who did not take it upon themselves to
attain professional development pertaining to the PARCC and stated they were unlikely to attain a higher degree. This notion fits the Deci and Ryan’s (2000) idea of missing needs and lack of intrinsic motivation. The other three participants responded that they were motivated to obtain professional development regarding PARCC and they concurred that the professional development provided by their employer regarding PARCC was effective. The responses to the survey question regarding the overall validity of the PARCC assessment varied. Teacher A and D neither agreed nor disagreed, teacher B disagreed, teacher C strongly disagreed that the assessment is a valid way to measure student learning. Survey questions included, but were not limited to autonomy via mathematics instruction, mathematics competence, and relatedness with mathematics colleagues, professional development and PARCC. Table 2 illuminates some example responses to specific questions.
Table 2

Responses to Interview Questions Regarding Focus of the Pilot Study

<table>
<thead>
<tr>
<th>Question Content</th>
<th>Focus</th>
<th>Teacher Example Responses</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mathematics content instructional strengths and weaknesses</td>
<td>Competency</td>
<td>A: “Word problems can be a weakness if I don’t study them before I teach them.”</td>
</tr>
<tr>
<td></td>
<td></td>
<td>B: “Geometry is my strength because it is my personal favorite”.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>C: “I am able to differentiate for the children.”</td>
</tr>
<tr>
<td>How PARCC affects your mathematical instruction</td>
<td>Autonomy</td>
<td>A: “This is my first year teaching mathematics so everything I teach this year is based on the PARCC.”</td>
</tr>
<tr>
<td></td>
<td></td>
<td>B: “PARCC model content helped me to set up my classroom for the year”.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>C: “The PARCC helps me to get them to show their work”.</td>
</tr>
<tr>
<td>PARCC discussions with colleagues</td>
<td>Relatedness</td>
<td>A: “The discussions aren’t usually positive.”</td>
</tr>
<tr>
<td></td>
<td></td>
<td>B: “I wish there was more camaraderie between teachers and administration.”</td>
</tr>
<tr>
<td></td>
<td></td>
<td>C: “Yes, I do feel supported by admin because they are in and out of the classroom.”</td>
</tr>
<tr>
<td>Necessity of professional development</td>
<td>Professional Development</td>
<td>A: “Yes, I feel obligated to obtain professional development.”</td>
</tr>
<tr>
<td></td>
<td></td>
<td>B: “I have gone on my own and watched the PARCC modules on computer”</td>
</tr>
<tr>
<td></td>
<td></td>
<td>C: “Absolutely… I feel obligated… education is an ongoing process”.</td>
</tr>
<tr>
<td>Observations of student struggles regarding PARCC assessment</td>
<td>PARCC</td>
<td>A: “I feel it’s the questions”.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>B: “A gauge on what should be taught”.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>C: “It’s vocabulary”.</td>
</tr>
</tbody>
</table>

Teacher A is aware of their mathematical abilities and responses fit the low mathematical competency rating on the survey. As a first year teacher, teacher A is using PARCC mathematics guides to inform curriculum and instruction, which also aligns with
low score of instructional autonomy. The survey score for relatedness was average, but in the interview, the participant responded about the negative discussions about the PARCC with colleagues. Teacher A never elaborated on any positive relationships with other teachers. Teachers B and C scored between high and average regarding autonomy, competency and relatedness. Their three needs were met regarding intrinsic motivation, and their interview responses reflected this phenomena.

**Discussion**

According to Deci and Ryan (2001) self-determination theory focuses on people’s needs for self-motivation that can bring about positive outcomes. The three needs of autonomy, competency and relatedness must be met before this intrinsic motivation can occur (Deci, 2000). One out of the four participants scored low on the survey regarding both autonomy and competency that also mirrored the responses in the interview. That teacher also had limited internal motivation based on other responses which fits Ryan and Deci’s (2000) theory of self-determination. The three other participants all scored at least average in the three areas of need and they had motivation to obtain higher degrees and seek professional development on their own. Their follow-up interview responses also supported these findings. An initial conclusion can be made, from this small sample, that when teachers have a feeling of instructional autonomy in the classroom, competence regarding mathematical content, and solid, positive relationships with colleagues, they are more likely to experience intrinsic motivation to obtain professional development.

The outcome of this pilot study led to the research questions in this study. It is important
that a larger population sample, specifically middle school mathematics teachers, be used to see if the conclusion of the pilot study stands.

**Sample Selection**

In a qualitative study, the selection of the participants is usually the first step (Giorgi, 1997, 2009). In this study, middle school mathematics teachers are the ones experiencing this ‘lived experience’. They are the focus of the majority of professional developments in school districts because they have the most impact on the success of students. The in-depth experience of the individual is the goal of this qualitative study, not necessarily the idea of generalizing it to the entire teaching population (Lincoln & Guba, 1985). Therefore, the targeted population of this study is solely middle school mathematics teachers. These teachers were chosen because of their significant impact on the students’ mathematical experience that leads them into high school and beyond. Survey participants included current middle school mathematics teachers in grades 4-9 in public school districts in Northeast Ohio. The survey was distributed to schools with whom permission was granted. The survey was voluntary, and only those middle school mathematics teachers who wished to participate completed the survey. Those school districts have adopted Ohio’s Learning Standards that reflect the Common Core.

From the survey, four middle school mathematics teachers were sampled for an in-depth exploration of their personal experiences regarding motivation and professional development based on survey responses. Participants selected from the survey volunteered for the interview, and their responses will be compared along with the concepts regarding self-determination theory.
An initial email was sent to superintendents and principals of school districts in Northeast Ohio in June, asking permission to conduct research in their district. A follow up email was sent in January, each school district being contacted no more than twice. For those districts who gave approval for the study, the Qualtrics Survey was distributed in early February for participating teachers to complete. Thirty-nine participants logged into the Qualtrics survey, thirty-five of which completed the survey in its entirety. Only those participants who completed the survey in its entirety were used in this study because information obtained from all survey questions was necessary to analyze data relevant to the research. Once surveys were complete, participants were recruited for a follow-up interview.

The last question of the survey asked if those that took the survey would be willing to participate in a follow up interview. Of the thirty-five completed surveys, eight participants answered ‘yes’ to the final question. Next, those eight participants who showed interest in the interview portion of the study were contacted via email with at most one follow up reminder request. Of those eight participants, four were willing to follow through with the interviews. Two interviews were conducted in person. Due to scheduling issues, two interviews were conducted by phone. All interviews were audio-recorded and transcribed. Throughout my interactions with the participants, I felt it was essential to tell their life story as it relates to middle school mathematics education, professional development, and motivation to attain it.

**Data Collection**

Qualitative research can include a wide variety of data collection techniques that
include: (a) participation in the setting, (b) direct observation, (c) in-depth interviews, and (d) document analysis (Marshall & Rossman, 1999). This study used data collected from online surveys via Qualtrics Software as well as teacher interviews. In qualitative research, it is important to analyze data as it is being collected to allow for flexibility (Atkinson, 1996). By utilizing Qualtrics Software, I was able to analyze the data as the teachers are responding to the survey.

Middle school mathematics teachers were given an online survey that incorporated the concepts of basic demographics, self-determination, knowledge of common core and opinions concerning aspects of professional development. Once the surveys are completed, four teachers volunteered for an interview to provide more in-depth explanations of their survey responses. The result is a descriptive and well-detailed account of the experiences of adult learners in the field of education.

**Survey and Interviews**

Surveys (see Appendix A) were conducted online using Qualtrics. Teachers were provided a link to the survey via email that included consent for participation. The survey took approximately 20-25 minutes depending on how in-depth the responses were in open-ended questions. Survey questions included the following topics:

- Basic demographics (e.g. years’ experience, degrees earned, etc.)
- Questions framed around self-determination theory (motivation) regarding autonomy, competency, relatedness
- Experience with Common Core learning standards
- Role as adult learners
• Professional development (Both experience and opinions on effective PD)

Once the surveys were complete, data was gathered and analyzed using Qualtrics reports to aid in comparing and contrasting results of the responses. Four teachers were sampled to conduct interviews that will remain confidential.

The interview is often one of the main data sources of a qualitative research (1983, 1994, 2009 Kvale with Brickman). The purpose of the interview is to clarify and add upon the responses to the survey. All interviews were digitally recorded and fully transcribed by the researcher. The interviews were conducted at a place and time that was convenient to the participant. The length of the interviews was approximately one hour, but there was be no constraint. According to Giorgi (2009), phenomenological interview questions should be descriptive. The interview questions (see Appendix D) in this study focused specifically on the teacher’s personal experience with professional development and their perspective on engaging professional development. At the end of the interview, a leading question was asked, such as “Is there anything more about your experience that you feel is important that we may not have touched on?” All interviews were transcribed verbatim solely by the researcher. Participants in the interview were guaranteed confidentiality that was explicit in the consent form.

**Data Analysis**

“The outcomes of education - learning, performance, and adjustment-can be reliably measured, which is essential for doing research” - Deci, 1995, p. 47

The pilot study for this research was analyzed by combining the outcomes from both survey and transcribing audio-recorded interviews with the participants. From the
surveys and transcriptions, common themes developed and were grouped together in clusters. Significant topics were identified and compared to Deci and Ryan’s (2000) concept of self-determination and the three identified needs of autonomy, competency and relatedness.

Hycner (1999) asserts that “the phenomenon dictates the method of data analysis (p. 156). In this case, the phenomena is both the motivation of teachers and their thoughts on professional development. When reviewing data in a phenomenological study, the researcher should examine the data without breaking it into pieces, but to look to identify essential features, connections and relationships (Coffey & Atkinson, 1996). In addition, Freeman (2011) acknowledged that understanding cannot be conceived as a fixing of meaning but how the meaning is generated and transformed. When examining the data results of this study, it is essential to discover meanings in the data; therefore one needs an attitude open enough to let unexpected meanings emerge (Giorgi, 2011; Lopez & Willis, 2004). To justify research outcomes, the qualitative data will be coded, categorized and transferred into analytical matrices (Miles & Huberman, 1994) which will be used to identify emergent themes and patterns.

The audio recording of each interview conducted with the teachers was listened to repeatedly, in order to become familiar with the words and feelings of the participants (Holloway, 1997; Hycner, 1999). During the data analysis of both the surveys and the interviews, clusters of themes were formed by grouping the units of meaning together (Creswell, 1998; Groenewald, 2003; King, 1994; Moustakas, 1994) and significant topics identified (Groenewald, 2003; Sadala & Adorno, 2001). Bracketing is a method of
phenomenological inquiry that requires the placing aside of one’s own personal perspective about the phenomenon being studied or what one already knows about the phenomenon prior to and throughout research (Carpenter, 2007; Chan, Fung, & Chien, 2013). In this study, bracketing was used to avoid inserting personal perspective and avoiding bias, the researcher will not influence the participants understanding of the phenomena. Because the researcher will put aside personal perspective during the data collection process, bracketing is also a method of demonstrating the validity of the data collection and analysis process (Ahern, 1999; Chan, Fung, & Chien, 2013).

**Validity and Reliability**

The aim of any study is to produce accurate, trustworthy results while avoiding error in conducting the analysis of research data. Error can occur anywhere in the research process and compromise the outcomes and usefulness of the results (Morse, 1991). Reliability is the indicator of validity in qualitative research (Burns & Grove, 1997). Joppe (2000) defines reliability as:

“The extent to which results are consistent over time and an accurate representation of the total population under study is referred to as reliability and if the results of a study can be reproduced under a similar methodology, then the research instrument is considered to be reliable” (p. 1)

The intent of this study is to illustrate consistent clusters themes throughout the data regarding motivation and professional development that can be viewed as a reliable snapshot of a larger population of teachers by using matrices along with bracketing. A good qualitative study can help researchers “understand a situation that would otherwise
be enigmatic or confusing” (Eisner, 1991, p. 58). Patton (2001) states that validity and reliability are two concepts that any researcher should be concerned with regarding the design of a qualitative study, analyzing results and examining the quality of the study. In order to make sure a qualitative study is reliable, it must be trustworthy. Patton (2001) states that reliability is a direct consequence of the validity in a study. The findings of a research study is considered to be valid if the outcomes represent an accurate and consistent way the phenomenon was intended to be described (Burns & Grove, 1997; Issac & Michael, 1995). Sandelowski (1993) acknowledges that the rigor of qualitative research is “less about adherence to the letter of rules and procedures, than it is about fidelity to the spirit of qualitative work” (p. 2).

Lincoln and Gruba (1985) confirm that there are four essential criteria for evaluating the trustworthiness and rigor of qualitative studies: credibility, auditability, fittingness, and conformability. Credibility is when the participants and practitioners in the field recognize the truth in the findings. In this study, the researcher utilized a practitioner, for added interpretation of outcomes, with 20 years’ experience as a teacher, principal, and administrator. Validation of the final results came with the recognition by participants that the phenomenon was present in their experience.

The research study was judged as credible by the presence of essential descriptive information and mutual agreement of the readers of both the survey and interview data (Sandolowski, 1986, 1993). Methods used to support credibility were audio-recorded interviews as well as supplemental notes taken by researcher during the interview process. The circular and iterative data analysis took place when the interview audio is
listened to repeatedly, multiple reading of transcripts by both reader and volunteer practitioner, and by the compilation of themed matrices from survey data. The intention is to share the findings of the study with the participants to ensure validation.

Auditability allows for rigor regarding procedure and reliability. For a study to be auditable, all of the study elements must be present and stored in a secure setting. The reviewer (in this case a veteran practitioner) can follow the study step-by-step, and fully understand the research process. This practitioner can use the original data from surveys and interviews and arrive at a similar conclusion as the original researcher. The research was reviewed by committee members for accountability and rigor.

Fittingness will be apparent in this study due to rich descriptions of phenomena that the participants experience, motivation and professional development. The readers of the study will feel as if they are experiencing the phenomena of being a middle school mathematics teachers who are participating in professional development, this concept is known as the “phenomenological nod” (Munhall, 1994, p. 202). The description should be so vivid that the reader “can almost literally see and hear its people” (Glaser & Strauss, 1965, p. 9). Conclusions of the study should be shared with teachers, principals, administrators, and districts as a whole. Interpretations should be similar to those experiences illustrated in the study.

Issacs and Michaels (1995) asserted that conformability established the validity of data and the reliability of judgements in the research process from beginning to end. In this study, the accurate recording of data and findings was consistently re-affirmed by consultation with committee members from the beginning of the study. In addition, an
outside practitioner confirmed the accuracy of not only the data collected, but the findings of the study.

**Limitations**

This study focused on middle school mathematics teacher motivation regarding successful participation and engagement in professional development involving instruction via the Ohio Learning Standards and Standards for Mathematical Practice. The survey was presented completely online; the final part to gathering data was a face-to-face interview with purposefully selected teachers from various Northeastern Ohio school districts. The adults in similar circumstances could easily vary, but it is generally assumed that all adult learners share similar experiences in the field of education.

Data was generated from surveys online, and teacher interviews and reflected the lived experience and opinions of only those involved. The outcome of the study may not generalize the opinions and feelings of all adult learners in the field of education.

**Delimitations**

The interpretation of the results of the data, including surveys and interviews, are left to the interpretation of the researcher. These perceptions reflect, with varying levels of accuracy, the actual experiences of the participants surveyed and interviewed.

**Assumptions**

The first assumption that this study makes is that all participants in the study were middle school mathematics teachers that took the role of adult learners in a professional development environment. As adult learners, they were active in their own learning and take responsibility for the intensity of engagement in the learning activity. These learners
have accumulated a vast pool of knowledge and experience in which they draw their ‘lived experiences’ that are noted in this study. They are motivated to participate in the professional development because the acquisition of knowledge concerning middle school mathematics instruction involving standards directly benefits their success not only in their classroom, but their career as a whole. This knowledge can be directly applied to both their social and professional roles in education, because adults have very specific and immediate reasons for learning (Knowles, 1970, 1980).

The second assumption is that the phenomenological method was the correct methodology to utilize for this particular research, in this case, the experiences of middle school mathematics teachers regarding motivation, roles as adult learners and what constitutes effective professional development.

**Summary of Chapter III**

This research study encompasses the qualitative method of phenomenology to examine the lived experiences of teachers regarding their motivation toward professional development and how that may affect their engagement in the learning process. Teachers will be examined using surveys and interviews, which will be analyzed for similar themes, and differences will be identified. To aid in validity and reliability this study utilizes factors that support credibility, auditability, fittingness, and conformability. Both limitation and assumptions have been taken into consideration during the interpretation of data results.
CHAPTER IV
RESULTS

Overview

This chapter presents results of analyses of participant surveys and interviews as they relate to the research questions, and consists of three sections essential to reflecting the study’s findings. The first section, Instruction, introduces participants who shared their life experiences that aided in this study. This section provides data regarding participant demographics as well as experiences in middle school mathematics education that includes pedagogical organization as well as teacher experiences with the content standards and standards for mathematical practice. The next section, Motivation, analyzes participant narratives, articulating themes that emerged from both survey and interviews concerning the three needs involved in Self-Determination Theory. The third section, Adult Learning and Professional Development, deals with data analyzed involving both preferred adult learning environment and professional development and how these concepts connect to the research question. The overarching goal of the chapter is to demonstrate the consistency with which themes regarding instruction, motivation and professional development occurred throughout the data, suggesting potential use as a reliable snapshot of larger populations of middle school mathematics teachers.
Summary of Participants

It is critical to this research that a clear, concise picture of study participants be revealed. As described earlier, all 35 participants who completed the survey were teaching middle school mathematics (grades 4-9) at various school districts in Northeast Ohio. Of these 35 participants, 80% (28 teachers) held a master’s degree. Furthermore, teaching experiences of these 35 teachers ranged from 3-27 years and 80% (28 teachers) had at least 10 years of experience teaching middle school mathematics.

The four participants for the interview portion of the study came from four different school districts and are identified using the following pseudonyms to ensure anonymity: Ann, Bob, Carl, and Dave. Ann possesses a master’s degree, had seven years of experience teaching middle school mathematics, and was currently part of a 6th grade teaching team. Bob also holds a master’s degree and had 17 years of experience teaching in grades 4-9. He received his teaching degree from Teach for America and discovered teaching by being assigned to impoverished areas in the United States. Carl holds a master’s degree and had 12 years of experience in the middle grades. Finally, Dave holds a master’s degree and had 23 years of experience teaching middle school mathematics.

Interview participants were asked questions that expanded on their survey responses and concerned topics that included but were not limited to: middle school mathematics instruction, motivation, adult learning and professional development. All four participants indicated an eagerness to participate and answered all questions to the best of their abilities.
Instruction

Regarding middle school mathematics, participants responded to numerous survey questions concerning: class organization, experiences with the Common Core State Standards for Mathematics (i.e., Ohio Learning Standards for Mathematics), preferred instructional style, experiences with the Standards for Mathematical Practice, and various curricula questions. All such questions exemplified the preferred knowledge base, instructional approaches, and learning environments reflected in the survey results.

Pedagogical Organization

The way subject areas, teaching assignments, and classrooms are organized can influence a teacher’s views and perceptions of standards, classroom environment, pedagogy, and approach to preparing for standardized assessments (e.g., Chan, Terry, & Bessette, 2009; DelViscio & Muffs, 2007). Table 3 summarizes survey results regarding overall pedagogical organization.

Table 3

Middle School Preferred Pedagogical Organization Style

<table>
<thead>
<tr>
<th>Organization</th>
<th>Frequency (n = 35)</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Departmentalized Instruction</td>
<td>17</td>
<td>49%</td>
</tr>
<tr>
<td>Taught by Subject Area Specialist</td>
<td>11</td>
<td>31%</td>
</tr>
<tr>
<td>Self-Contained</td>
<td>2</td>
<td>6%</td>
</tr>
<tr>
<td>Team Taught</td>
<td>4</td>
<td>11%</td>
</tr>
<tr>
<td>None of the choices fit my school</td>
<td>1</td>
<td>3%</td>
</tr>
</tbody>
</table>

The majority of study participants worked in departmentalized instructional
environments, where teachers teach in teams, and specialize in one or more content areas. Departmentalized instruction decreases a teacher’s workload (i.e., “preparation time”) by lessening the number of subjects taught by each teacher. Departmentalized instruction indirectly affects job satisfaction by increasing efficacy; therefore, potentially improving student achievement (Ryan & Deci, 2002; Wilkins, 2008). At the middle grades, departmentalized instruction most often occurs in grades five through nine, fourth-grade is usually taught as an inclusion class with multiple subject areas within one room (McGrath & Rust, 2002; Reys & Fennell, 2002).

**Teachers’ Experiences with “New” Math Standards**

Middle school mathematics teachers have the overwhelming task of building the vital bridge between elementary and high school mathematics. When creating lessons and planning instruction, Ohio middle school teachers are bound by the Ohio Learning Standards for Mathematics (ODE, 2010). The Ohio Learning Standards for Mathematics are aligned to the Common Core State Standards for Mathematics (CCSSO & NGA Center, 2010) and outline what mathematics knowledge and skills students are expected to develop at each grade level. Table 4 illustrates the responses teachers provided regarding their experiences with Ohio’s Learning Standards for Mathematics.
Table 4

*Teacher Experiences with Ohio Learning Standards for Mathematics (i.e., Common Core State Standards for Mathematics)*

<table>
<thead>
<tr>
<th>Experience with Standards</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>New to the Common Core Mathematics Standards</td>
<td>0%</td>
</tr>
<tr>
<td>Basic Understanding of the Common Core Mathematics Standards</td>
<td>25.7%</td>
</tr>
<tr>
<td>Proficient Understanding of the Common Core Mathematics Standards</td>
<td>68.6%</td>
</tr>
<tr>
<td>I deem myself an Expert with Common Core Mathematics Standards</td>
<td>5.7%</td>
</tr>
</tbody>
</table>

A majority (68.6%) of the participants felt their understanding of the Common Core State Standards for Mathematics (i.e., Ohio Learning Standards for Mathematics) was proficient. These teachers believed they understood what the standards required them to teach and felt comfortable helping students develop the requested knowledge and skills. The average years of experience for these 24 teachers was 14.1 years with standard deviation 7.3 years. The large standard deviation (relative to the mean) suggests teachers’ experiences with the Common Core State Standards for Mathematics Standard was dependent on the district in which they taught.

Nine, 25.7% of, teachers felt their understanding of the Common Core State Standards for Mathematics Standards was basic. The average years of experience for these teachers was 13.9 years with standard deviation 6.8 years. As with the “proficient” teachers, the large standard deviation (relative to the mean) reinforces the notion teachers’ experiences with the Common Core State Standards for Mathematics Standard is dependent on the district in which they taught. No participant felt they were new to
these mathematics standards and two participants deemed themselves an expert with the Common Core State Standards for Mathematics. The two teachers who deemed themselves an expert each had 27 years teaching middle school mathematics.

In 1989, the National Council of Teachers of Mathematics published the *Curriculum and Evaluation Standards for School Mathematics*, which provided objectives for mathematics curriculum as well as assessments (NCTM, 1989). The two participants who deemed themselves an expert would have started teaching a year after these standards were released and had been teaching during all subsequent revisions made by the Ohio Department of Education.

**Interview participants’ experiences with “new” math standards.** All four of the interview participants felt their understanding of the Common Core State Standards for Mathematics Standards was proficient. When asked how these content standards impacted the way they teach mathematics, interview participants had the following responses:

**Ann:** The three teachers I work with in the 6th grade created a map directly from the standards and are totally standards-driven. I tend not to stray from that… I am pretty strict with that. (7 years teaching math)

**Bob:** I think the standards are doing a better job of being more specific. I can agree with what the teachers [in his school] are saying… it’s not what the standards are saying, but how to get the students to truly learn it. (17 years teaching math)

**Carl:** I personally use them as a guide. I personally do not think that they have
changed much how I teach. (12 years teaching math)

Dave: It has an impact. Teaching them has been around a long time. Common Core got a really bad name. The rigor is there, but is it developmentally appropriate for this young age (6th grade)? (23 years teaching math)

Teachers’ responses indicate the Common Core State Standards have had some impact on all four teachers, at least to some degree—Carl to a much lesser degree than the other three. In addition, Bob and Dave’s responses suggest a relationship between the Standards and student learning, whereas Ann’s response focuses more on the Common Core’s impact on her instructional actions. It was also evident from the interviews that much of the standards are left open to interpretation of meaning, and teachers can view expectations of the standards differently.

It should be noted the Common Core State Standards for Mathematics is comprised of both the Standards for Mathematical Content (e.g., Apply properties of operations as strategies to add, subtract, factor, and expand linear expressions with rational coefficients; Grade 7 standard) and the Standards for Mathematical Practice (e.g., Construct viable arguments and critique the reasoning of others; Grades K-12 standard). Unfortunately, when most people, including teachers, talk about the “Common Core State Standards for Mathematics” what they typically mean is the Standards for Mathematical Content. As such, when discussing teachers’ understanding of the Common Core State Standards (for Mathematics), as in this last section, the researcher is referring specifically to the Standards for Mathematical Content.
The Standards for Mathematical Practice

The Standards for Mathematical Practice (SMPs) are grounded in the NCTM process standards and describe how students engage in learning mathematics (NCTM, 2010). A teacher’s knowledge of the SMPs not only affects their pedagogy, but how they incorporate the practice standards in their classrooms (e.g., employing diverse approaches). Table 5 illustrates participant self-perception of proficiency with SMPs. Experiences with both the content standards and the SMPs impacts a teacher’s instructional style. The majority of participants (22 of 35) indicated they had at least a proficient understanding of the Standards for Mathematical Practice.

Table 5

<table>
<thead>
<tr>
<th>Perceived Level of Understanding</th>
<th>Frequency (n = 35)</th>
</tr>
</thead>
<tbody>
<tr>
<td>First time hearing of the Standards for Mathematical Practice</td>
<td>0</td>
</tr>
<tr>
<td>Basic understanding of the Standards for Mathematical Practice</td>
<td>13</td>
</tr>
<tr>
<td>Proficient understanding of the Standards for Mathematical Practice</td>
<td>20</td>
</tr>
<tr>
<td>I deem myself an Expert regarding the Standards for Mathematical Practice</td>
<td>2</td>
</tr>
</tbody>
</table>

A majority of teachers (57.1%) felt their understanding of the Standards for Mathematical Practice or mathematical practices was proficient. These teachers believed they understood what the mathematical practices required them to teach and students to do, and felt comfortable helping students develop such processes and proficiencies. The average years of experience for these 20 teachers was 15.4 years with standard deviation 6.6 years. As with the content standards, the large standard deviation (relative to the
mean) suggests teachers’ experiences with the SMPs was dependent on the district in which they taught.

Thirteen, 25.7% of, teachers felt their understanding of the Standards for Mathematical Practice was basic. The average years of experience for these teachers was 12.7 years with standard deviation 7.3 years. No participant felt they were new to these mathematical practices and two participants deemed themselves an expert with the SMPs ($x= 22$ years, $\sigma = 7.1$ years).

Two of the interview participants felt their understanding of the Standards for Mathematical Practice was proficient, one felt their understanding was basic, and one expert. Although the teacher with the least number of years of experience teaching mathematics (Ann; 7 years) self-identified her level as basic, the teacher self-identified as expert was not the one with the most years teaching mathematics (Dave; 23 years). Rather, Bob, with 17 years of mathematics teaching, identified himself as expert.

Interview participants were asked about their topics of conversation with their colleagues concerning the SMPs, and the interview participants’ responses were:

Ann: [Did not respond specifically to SMPs, when asked, continued to talk about the standards.] There is not too much reading into the standards and finding what they mean… like we would have someone else do that… we are more into finding the resources. (self-identified as Basic)

Bob: I use the SMPs, my biggest ones are numbers one (perseverance) and three (construct viable arguments and critique reasoning of others). I have presented them to teachers in different formats and emails. (self-identified as Expert)
Carl:  [Recalled content standards conversation, but not SMPs.] (self-identified as Proficient)

Dave: We bypass a lot of the SMPs, at this age (6th grade) we still do basic level math. (self-identified as Proficient)

When asked about what they believed their students struggled with the most regarding the Standards for Mathematical Practices, interview participants responded as follows;

Ann:  [Did not respond to this question. Diverted back to the content standards.]  
(self-identified as Basic)

Bob:  In regards to SMPs, I think the hardest thing for students is arguing respectfully. Being patient with each other. (self-identified as Expert)

Carl:  The most difficult SMP is attending to precision. Whether they [students] were not taught it, or their attention is not there. (self-identified as Proficient)

Dave: We do not use SMPs. (self-identified as Proficient)

Although Dave identified himself as proficient at understanding the Standards for Mathematical Practice, his school neither uses nor focuses on the practice standards. In addition, although Bob identified himself as expert at understanding the SMPs, his response focused on the act of arguing, rather than justification, viability, conjecture, plausibility, critiquing, and logical progressions.
Alignment between teachers’ understandings of the Standards for Mathematical Content and Standards for Mathematical Practice

Of the nine teachers that self-identified as having a Basic understanding of the Common Core State Standards, 7 (77.8%) also self-identified as having a Basic understanding of the SMPs. The two remaining respondents, self-identified as having a Proficient understanding of the SMPs. Seventeen of the 26 teachers (65.4%) that self-identified as having a Proficient understanding of the Common Core State Standards also self-identified as having a Proficient understanding of the SMPs. Six of the 26 teachers (23.1%) self-identified as having a Basic understanding of the SMPs, and one teacher (3.8%) self-identified as having an Expert understanding of the SMPs. One of the two teachers that self-identified as having an Expert understanding of the Common Core State Standards also self-identified as having an Expert understanding of the SMPs; one self-identified as having a Proficient understanding of the SMPs.

In summary, 25 of the 35 teachers (71.4%) had self-identified understandings for the Common Core State Standards and SMPs that matched. Seven teachers (20%) had self-identified understandings for the Common Core State Standards at a higher level than the SMPs and three teachers (8.6%) had self-identified understandings for the SMPs at a higher level than the Common Core State Standards. For the interview participants, two teachers identified themselves as proficient with both the Common Core State Standards and the SMPs (Carl, Dave), Ann self-identified as Proficient with the content standards and Basic with the practice standards, and Bob self-identified as Proficient with the content standards and Expert with the practice standards.
Content Standards Influence on Instruction

Teachers were asked about the instructional style they preferred to use most often in their classrooms. The number of teachers that indicated each instructional style is illustrated in Table 6.

Table 6

*Instructional Style Indicated by Teachers*

<table>
<thead>
<tr>
<th>Instructional Style</th>
<th>Number of Teachers</th>
</tr>
</thead>
<tbody>
<tr>
<td>Teacher Modeling</td>
<td>26</td>
</tr>
<tr>
<td>Students Take Notes from Lecture or Textbook</td>
<td>6</td>
</tr>
<tr>
<td>Teacher Using Manipulatives</td>
<td>23</td>
</tr>
<tr>
<td>Small Group Instruction</td>
<td>23</td>
</tr>
<tr>
<td>Technology</td>
<td>20</td>
</tr>
</tbody>
</table>

As illustrated in Table 6, the least frequently indicated instructional style was Students Take Notes from Lecture or Textbook (17.1% of teachers). In addition, 65.7% of teachers (23 of 35) indicated a preference for Small Group Instruction. This deviates from traditional styles of whole group teacher led instruction.

What is being taught influences how it is taught. Participating teachers were asked whether or not the content standards had a direct influence on their instruction. Furthermore, if the content standards did directly influence teachers’ instruction, they were asked to indicate whether such influence was positive or negative. Teachers’ responses are shown in Table 7.
Table 7

*Content Standards Influence on Instruction*

<table>
<thead>
<tr>
<th>Content Influence on Instruction</th>
<th>Frequency (n = 35)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Strong Negative</td>
<td>4</td>
</tr>
<tr>
<td>Somewhat Negative</td>
<td>2</td>
</tr>
<tr>
<td>None too Little</td>
<td>3</td>
</tr>
<tr>
<td>Somewhat Positive</td>
<td>19</td>
</tr>
<tr>
<td>Strong Positive</td>
<td>7</td>
</tr>
</tbody>
</table>

Nineteen of 35, or 54.3% of middle school mathematics teachers surveyed expressed the content standards had a somewhat positive influence on their planning and instruction style. In addition, 74.3% of teachers (26 of 35) expressed the content standards had a somewhat or strong positive influence on their planning and instruction style. Only three teachers indicated the content standards had little to no influence, or were not applicable, to their instruction.

Of the 26 teachers indicating the content standards had a somewhat or strong positive influence on their planning and instruction style, 5 (19.2%) indicated that the content standards had a strong positive effect on their planning and instruction, while 15 (57.7%) indicated that the content standards had a somewhat positive influence on their instructional style. Overall, 74% of the teachers surveyed have a positive view of the content standards, directly influencing their planning and instruction in the classroom.
Interview participants’ views on standards’ influence on instruction. Each of the interview participants had a different view on the content standards’ influence on their instruction. Ann (7 years of experience) indicated the content standards had a somewhat positive influence on their instruction; whereas Bob (17 years of experience) indicated the content standards had a somewhat positive influence on their instruction. Dave (23 years of experience) indicated the content standards had a somewhat negative influence and Carl (12 years of experience) believed they had a strong negative influence on their instruction. Each interview participant was asked, “What types of mathematical instructional methods do you feel are helpful?” These responses, along with prior responses regarding interview participants self-identified understandings of the content and practice standards, preferred instructional styles, and how each viewed their students’ struggles with the SMPs are all illustrated in Table 8.
Table 8

Standards Influence on Instructional Style

<table>
<thead>
<tr>
<th>Participant (Years of Teaching)</th>
<th>Level of Understanding of Content Standards / Influence of Content Standards on Instruction</th>
<th>Level of Understanding of Practice Standards / Students’ Struggles with SMPs</th>
<th>What types of mathematical instructional methods do you feel are helpful?</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ann (7 years)</td>
<td>Proficient / Somewhat Positive</td>
<td>Basic / SMPs not Mentioned</td>
<td>- I start with direct instruction, a day or two of that and then I break into stations.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>- I like to use manipulatives.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>- I am not one to use a textbook. - -- Starting with . . . direct instruction, then small group so you can see one-on-one how everyone is doing.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>- A lot of games and a lot of competition.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>- Not sitting in a seat working on a worksheet.</td>
</tr>
<tr>
<td>Bob (17 years)</td>
<td>Proficient / Strong Positive</td>
<td>Expert / Students Arguing Respectfully</td>
<td>- Anything that is hands on, visual with pictures.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>- I encourage partners to argue about math before instructions are given.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>- If you give them a challenging problem . . . think about this.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Maybe you will get to a solution . . . maybe you won’t.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>- Student centered . . . teacher moves around and direct students.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>- As a whole class . . . have different pairs share out.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>- Teacher is a facilitator</td>
</tr>
</tbody>
</table>
Although Table 7 provides a high degree of information, it does not help identify what it was about implementing the content standards that impacted Dave and Carl’s instruction in such a negative manner. It is important to note that there is correlations between the participants’ view of standards impact to the type of instruction that they use in the classroom. Carl and Dave both feel that the standards have a negative influence on their instruction, and both lean toward teacher-directed activities. Ann and Bob feel that
the standards have a positive impact on instruction and they both implement student-led activities.

One survey question contained a statement indicating that standards forced the teachers to teach middle school mathematics content in a way that they would not normally teach, the participants were to indicate whether or not the statement was true or not true. When responding to the question, 85.7% of the participants indicated the statement was not true. This again indicates that those surveyed agree the standards have a positive influence on their classroom instruction.

The method in which a teacher assesses student knowledge often reflects their instructional style. (Hill, Schilling, & Ball, 2004). The middle school mathematics teachers were asked to choose from multiple assessment styles and rank them in order from most to least used in the classroom. The top two rated forms of assessment were: (1) short answer questions such as performing a mathematical procedure (37%), (2) extended response item for which a student must explain or justify solution (27%).

Overall, the data regarding instruction from the survey alone projects the majority of middle school mathematics teachers undergo departmentalized instruction, are proficient in both the content standards as well as the standards for mathematical practice, and those standards have a positive effect on their planning and instruction in the classroom. The interview participants, however, were equally divided in these areas. Both Ann and Bob concurred with the majority of survey respondents and felt as if the impact of the standards was positive on their instruction as a whole. They use multiple methods of instruction to convey the standards that included whole group, small group,
Manipulatives and both student and teacher-led instruction. Carl and Dave both agreed that the impact of the standards was negative, and impeded effective instruction in the classroom because of the precision and constraints of how the standards outline the specific grade-level content. They felt that traditional straightforward instruction is essential, and that teacher-led instruction is often most effective to transfer mathematics content knowledge. Carl stated that in addition to teaching, he tutors students in another school district that uses student-led instruction, and conveyed: “the high school kids literally say that they have not heard their teacher speak yet”.

It is evident that middle school mathematics teachers rest upon various linear stages of instruction ranging from traditional direct instruction to progressive student-led instruction, each having their own perception of what is effective in the classroom. Most adhere to the content standards and recognize their importance in guiding instruction. It is imperative at this point to again acknowledge that the diverse backgrounds and school instructional environments have an enormous effect on the instruction that takes place in the classroom, and this was evident in the responses. The demographic result of the survey and interviews suggested the idea of one set of content standards that are specific to each grade-level can nevertheless lead to various perspectives of content knowledge to be conveyed as well as perspective on effective instructional and learning styles.

Motivation

In order to answer the research question proposed in this study, participants were surveyed regarding basic motivation in the field of teaching, as well as several questions relating to three needs of self-determination that include autonomy, competency, and
relatedness. In order to find out what motivates middle school mathematics teachers to participate in professional development, it was essential to determine their current level of motivation by examining feelings of autonomy, competency and relatedness. Also, it is important to discover those teachers who are currently intrinsically motivated in their field, and how this affects motivation to attain professional development.

**Three Human Needs**

Motivation is essential in all aspects of life as well as in one’s work. Motivation is what drives us to set goals and achieve success in various areas of our life (Deci & Ryan, 2000). In order to apply the theory of Self-Determination (Deci & Ryan, 2000), it was crucial to analyze the participants regarding the three needs of autonomy, competency, and relatedness. In order for the participants to be recognized as having intrinsic motivation, the three needs would need to be satisfied. In this study, participants were categorized into three areas of motivation: amotivation, extrinsic motivation, and intrinsic motivation.

Participants were asked thirteen questions that revealed autonomy, sixteen questions concerning competency, and ten questions involving the concept of relatedness. The questions were framed using components of both the Basic Psychological Need Satisfaction in General Scale (Deci & Ryan, 2000; Gagné, 2003), and Basic Needs Satisfaction at Work Scale (Deci, Ryan, Gagné, Leone, Usunov, & Kornazheva, 2001; Ilardi, Leone, Kasser, & Ryan, 1993; Kasser, Davey, & Ryan, 1992) keeping main components, but re-framing questions to reflect the focus of this specific research in education. One point was awarded for each degree to which the person experiences
satisfaction of each of the three needs. Some of the questions were worded in a negative way, and those scores were reversed and one point was granted accordingly.

Given its abundant use, one can assume the scales have been extensively studied. The scales have been used in numerous studies involving needs satisfaction (Conroy & Coatsworth, 2007a, 2007b; Gagné, 2003; Johnston & Finney, 2010; Kashdan, Julian, Merritt, & Uswatte, 2006; Kashdan, Mishra, Breen, & Froh, 2009; Meyer et al., 2007; Neff, 2003; Niemiec et al., 2009; Thøgersen-Ntoumani & Ntoumanis, 2007; Vansteenkiste, Lens, Soenens, & Luyckx, 2006; Wei et al., 2005).

The dilemma during the process of scoring needs statements in this study was determining mastery due to the number of questions located within the survey. The Basic Psychological Need Satisfaction in General Scale (Deci & Ryan, 2000; Gagné, 2003) and Basic Needs Satisfaction at Work Scale (Deci, Ryan, Gagné, Leone, Usunov, & Kornazheva, 2001; Ilardi, Leone, Kasser, & Ryan, 1993; Kasser, Davey, & Ryan, 1992) indicated how to score each statement, and which ones earned a point of satisfaction, but there was an absence of percentage regarding what was used as a scale determining a need was satisfied. In many contexts, mastery is often defined as a percentage. The 80% mastery threshold consistent with expert guidance was summarized by Ellis (2005); Guskey (2010); McDonald (2002); and Salvia, Ysseldyke, and Witmer (2017), which recommended levels of 80–95%. If participants surveyed received a point for at least 80% of the questions under each need, it was assumed in this study that the need was satisfied. If a participant received between 79-51% of the points for that corresponding need, it was presumed that the need was partially met. Finally, if the participant received
between 50-0% of the points under a need category, it was assumed that the basic psychological need was not satisfied. Table 9 displays the results of the questions involving the three basic psychological needs concerning self-determination.

Table 9

*Three Needs of Self-Determination*

<table>
<thead>
<tr>
<th>Level</th>
<th>Autonomy</th>
<th>Competency</th>
<th>Relatedness</th>
</tr>
</thead>
<tbody>
<tr>
<td>High – Need satisfied (80-100%)</td>
<td>37%</td>
<td>89%</td>
<td>54%</td>
</tr>
<tr>
<td>Moderate – Need partially satisfied (79-51%)</td>
<td>46%</td>
<td>11%</td>
<td>29%</td>
</tr>
<tr>
<td>Low – Need not satisfied (50-0%)</td>
<td>17%</td>
<td>0</td>
<td>17%</td>
</tr>
</tbody>
</table>

The majority of the participants conveyed through their responses that the basic psychological need of autonomy has been partially satisfied. When asked if they felt free to teach middle school mathematics in a way that they feel it should be taught in the classroom, 49% agreed. The teachers were also surveyed regarding whether the content standards affected the way that they instruct, 54% disclosed that the content standards have an absolute influence on how they teach mathematics.

The highest level of needs satisfied fell within the category of competency. Throughout the survey, there were questions entrenched regarding competency in middle school mathematics content knowledge, competency in instruction and competency regarding curriculum. All 35 participants who completed the survey in its entirety were in agreement when they responded to a specific question acknowledging they were an effective middle school mathematics teacher. When asked specifically if they were a confident and capable mathematics teacher, 80% of the participants expressed that the
A little over half of the respondents to the survey scored that their psychological need of relatedness in education was satisfied. When teachers were asked if they often felt excluded from the other mathematics teachers in their building, 68% stated that it was not true. They were asked if they felt connected to their mathematics peers both personally and professionally, 57% of participants conveyed that the statement was true.

When examining individual participant motivation, it was central to this study to analyze which participants were categorized as being amotivated, extrinsically motivated, or having the all three needs met and fulfilling the requirements of intrinsic motivation. Table 10 illustrates these findings. If participants scored a high level in all three needs, then in this study, those needs were assumed to be satisfied, leading to intrinsic motivation being present. If a participant scored high in 1-2 of the basic psychological needs, then it is assumed that a type of extrinsic motivation is present. This study did not ask specific questions regarding the four types of extrinsic motivation, therefore, specific extrinsic labels concerning external regulation, introjection, identification, and integration could be not be identified with this particular data set. If there was a complete absence of a high score, meaning that the need was not fully satisfied, this study will assume that the participant falls under the amotivation category.
Table 10

**Participant Motivation Outcomes**

<table>
<thead>
<tr>
<th>Amotivation Needs Not Met</th>
<th>Extrinsic Motivation Needs Partially Met</th>
<th>Intrinsic Motivation Needs Met</th>
</tr>
</thead>
<tbody>
<tr>
<td>Non-relevance</td>
<td>Driven by some external reward</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(External Regulation, Introjection, Identification, Integration)</td>
<td>Find interest and enjoyment in activity</td>
</tr>
<tr>
<td>2 (6%)</td>
<td>26 (74%)</td>
<td>7 (20%)</td>
</tr>
</tbody>
</table>

In order for one to be intrinsically motivated, Self-determination theory maintains that all three basic psychological needs of autonomy, competency, and relatedness need to be met (Deci and Ryan, 2000). According to the survey questions that centered specifically on the three needs of autonomy, competency and relatedness, 20% of the middle school mathematics teachers are intrinsically motivated in their field of education. Reflected in their survey responses, they are motivated to excel in their discipline because they are interested and find satisfaction in education. The majority, 74% of the teachers, are extrinsically motivated with 1-2 of their needs being satisfied. In some way, they are powered by an external reward that may include avoiding a consequence, seeking approval from others, an immediate reward, or a social reward. Finally, 6% of the participants conveyed that not one of the three needs were satisfied. These educators are not motivated to engage in any goal directed behavior in their field.

Of those middle school mathematics teachers who participated in the interview portion of the study, Bob was the only teacher who fell within the intrinsic motivation category. Ann, Carl and Dave were all extrinsically motivated. Ann’s needs of
autonomy and competency were satisfied, but her need for relatedness was not. She indicated a score of less than true when asked about feeling connected with the teachers in her building. In addition, Ann indicated in numerous areas of the survey that she does not participate in collaborative groups, activities or networks with her colleagues.

Both Carl and Dave’s need of competency were satisfied, but their needs of autonomy and relatedness were not met. From the survey results and interview, Carl feels his instruction is bound by the constraints of the content standards. Carl indicated he “looks at the standards as a textbook” and it drives his instruction. This view impedes his feelings of autonomy. Carl also indicated a score of less than true when asked if he felt connected to teachers in his building. He revealed in the survey that he rarely works on teacher committees or attends professional development with his colleagues. Specifically, Carl stated he would like to attend professional development with other mathematics teachers in his school, but administration always selects the same “golden teachers,” who “are the gold standard and considered the best”. Carl suggested he “does not play the political game well”. In this instance, the school administration could be obstructing his feeling of relatedness. Dave indicated that he never participated as a mentor to other teachers, nor has been mentored himself. He also has rarely participated in teacher collaboratives or networks, nor attended professional development with his teaching peers. When it comes to autonomy, Dave failed to score high enough to indicate that the need was satisfied. Both the content standards and the standards for mathematical practice strongly influence the way he teaches mathematics; he does not feel he has freedom in his instruction. Dave is not convinced that the mathematics
content standards are “developmentally appropriate” for middle school students. He stated that they (content standards) “continue to push… push… push, without allowing the students time for mastery”.

**Adult Learning and Professional Development**

Everyone learns in a unique way, and this is no different for middle school mathematics teachers. Teachers are supposed to be experts at conveying information to students, and students expect them to adhere to both their learning style and create an engaging environment. When it is time to learn, teachers expect the same consideration from those providing the professional development. The survey included specific questions about the preferred adult learning mode and environment. As professionals, 89% indicated that they learn best in small groups. 9% indicated that they learn best on their own.

**Mode of Learning**

When it comes to the learning mode, participants were invited to select all modes of learning that worked best for them in a professional development environment. Adults have an increased sense of self and their own capabilities as learners. (Knowles, 1980). The results are displayed in Table 11.
Table 11

*Preferred Modes of Learning for Participants in a Professional Development Environment*

<table>
<thead>
<tr>
<th>Mode of Learning</th>
<th>Choice Count</th>
</tr>
</thead>
<tbody>
<tr>
<td>Prefer to see the information and visualize the relationships between ideas using charts and graphs</td>
<td>26</td>
</tr>
<tr>
<td>Prefer to hearing the information, rather than reading it, with sound or music</td>
<td>7</td>
</tr>
<tr>
<td>Prefer hands-on, experiential learning, using physical objects as much as possible</td>
<td>24</td>
</tr>
<tr>
<td>Prefer to read information for myself and gain my own perspective using speech and writing</td>
<td>9</td>
</tr>
<tr>
<td>Prefer to learn alone, possibly a self-study</td>
<td>5</td>
</tr>
<tr>
<td>Prefer the use of logic and systems, to understand the reasons behind the content and skills</td>
<td>20</td>
</tr>
<tr>
<td>Prefer to learn in groups, socializing with people as much as possible</td>
<td>13</td>
</tr>
</tbody>
</table>

The most preferred mode of learning was visual, incorporating charts, graphs and other visual representations of information. Next, was hands-on, experiential learning using physical objects. The least favored mode of learning for the mathematics teachers surveyed was both auditory, self-directed, and learning alone. In comparison to the teacher’s instructional style (Table 6), small group, use of modeling instruction, and implementation of manipulatives ranked as the top three. Students taking notes from books or lectures ranked the least popular, similar to the teachers’ responses. A presumption can be made that the way a teacher instructs connects to the way they learn (Borko, 2004). The teachers in this study appear to prefer learning by socialization, visualization and imitation.

In the realm of education, professional development is often both a requirement and a necessity. Professional development can include embedded professional
development, outside professional development and the pursuit of additional licenses and
degrees. Many teachers who attend professional developments have diverse educational
backgrounds and lived experiences. Such variation can make the notion of providing an
effective professional development a problematic one. It is imperative that both school
administrations as well as professional development providers understand the needs of
the teachers as well as the district as a whole.

Preferred Method of Learning

Middle school mathematics teachers were surveyed regarding their preferred
method of professional development, the results are conveyed in Table 12.

Table 12

<p>| Participant Preferred Type of Mathematics Professional Development. |
|---------------------------------------------------------------|----------------|</p>
<table>
<thead>
<tr>
<th>Type of Professional Development</th>
<th>Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>A 'sit and get', a one-time deal</td>
<td>14</td>
</tr>
<tr>
<td>Quarterly monitored professional development where an in-service professional</td>
<td>17</td>
</tr>
<tr>
<td>meets with you four times a year and you provide data to monitor progress</td>
<td></td>
</tr>
<tr>
<td>Daily monitored professional development, where in-service professional is in your</td>
<td>2</td>
</tr>
<tr>
<td>building at all times</td>
<td></td>
</tr>
<tr>
<td>I do not prefer any professional development</td>
<td>2</td>
</tr>
</tbody>
</table>

It is evident that teachers prefer a quarterly monitored professional development
where there is continued follow-up throughout the school year. In a close second,
teachers desire a one-time professional development where they feel they will receive all
the information that is required. Of those surveyed, 74% indicated that they get a choice
regarding the professional development in which they participate.
Effective Professional Development

Teacher feedback regarding their preferences for professional development is crucial because continuous professional development for teachers is central to school reform in regards to curriculum, instruction and student achievement. If teachers buy into the professional development, they are more likely to be engaged and gain positive outcomes from the learning opportunity (Lave & Wenger, 1990). The teachers were asked to rank the top three factors that they look for when researching or evaluating professional development. The three concepts that were stated most often were: (1) directly relevant to teaching in the classroom, (2) length, and (3) format.

One of the sole purposes of professional development is to prepare and support teachers by providing the knowledge and skills that they need to be successful in their teaching endeavors. Districts have the innate responsibility to aid in enabling their teachers to become successful educators. To meet this goal, mathematics teachers need to continually develop the skills that they need to ensure success in the classroom. Twenty-nine out of the thirty-five teachers surveyed indicated that the majority of the professional development they receive from their place of employment is academic and 77% suggested that it is useful. When asked specifically about the mathematics professional development that they have participated in, the participants indicated that they frequently developed assessments or tasks as part of a formal professional development activity involving middle school mathematics. The teacher responses suggested that they rarely practice what they learned and rarely received feedback as part of a professional development activity. In addition, the teachers signified that sometimes
the professional development they receive is consistent with their own professional goals as well as the goals of their department. Moderate emphasis has been placed on mathematics content standards, instruction, concepts, assessments and technology.

Interview Participants’ Preferred Methods of Learning. The teachers that participated in the interview were questioned about their perspective regarding professional development and the support provided by their school district. Each participant was asked about what they considered effective or not effective. After analyzing her survey responses, Ann was categorized as having extrinsic motivation, being driven by an external factor. Ann most preferred professional development from the math coach at her local educational service center. She appreciated the resources provided by the coach, acknowledging that it was extremely helpful during state assessments. Ann commented on a professional development that she did not find effective, stating “it was a guy talking to us. It was a whole series of lectures… on differentiation, I think?” Ann indicated in the survey that ineffective professional developments were “ones that are just not a good use of my time - redundant and present useless information.” She expressed that district mandated professional development “does not really do anything for me”. When asked how her administration supports her in her development, Ann suggested her principal’s “hands are often tied, but he does his best to get things for us”.

Bob was categorized as having intrinsic motivation, all three of his psychological needs were scored as met. His most preferred professional development was a two day learning opportunity provided by a professor from a university located in Ohio, Bob
stated that it “was a high-level algebra and geometry class using toys… it was awesome!”

He suggested that at first he was hesitant about the professional development, but he
“made new connections and learned new things”. When questioned about an example of
an ineffective professional development, Bob stated that he attended one on technology
that was “disjointed, unorganized… three days of frustration. We had to self-teach it to
ourselves during the school year”. Bob indicated that his principal’s background is in
science, and he has “been progressive in pursuing the current research and what learning
truly means”. He had a unique view on why some in his building are not receptive to
professional development, he implied that teachers are ‘grieving their competency”. Bob
felt that teachers who do not feel competent in teaching mathematics, are less likely to
engage in professional development. He declared “Fear of competency is a strong…
strong thing”.

Carl was categorized as having extrinsic motivation, falling short in the categories
of autonomy and relatedness. He prefers any professional development where he is
“working in groups and learning new strategies”. Carl’s opinion is clear that professional
development is essential, stating “Would you go to a doctor who has not been trained in
30 years?” He stated “I always try to improve”. One professional development that
caused him great frustration when one technology application provider “shoved twenty-
three apps down our throats in fifty minutes. By the third one I gave up understanding.”
He continued to state that he did not appreciate “speed lectures on topics I am not great
at.” Carl advised that his administration only sends the ‘golden teachers’ to professional
development opportunities in mathematics. He continued by saying “they are considered
the gold standard… but what about the rest of us?” Carl said that the teachers “never come back and share” what they have learned.

Dave also is extrinsically motivated according to his responses to the survey. He feels his county mathematics teacher meetings are effective because “we all like to be on the same page.” Dave feels professional development is necessary and ‘technology is the big thing right now”. He believes any professional development that concerns “grading practices” is ineffective. Dave also indicated during the interview that he suspects “veteran teachers are more open to professional development than younger ones because RESA is burning them out”. He feels that his school administration is “definitely supportive, but we have to live within our means”. Dave continues by suggesting the administration’s “hands are tied financially and by schedule and time restraints”.

Two survey participants failed to have any of the three needs of autonomy, competency and relatedness that Deci and Ryan (2000) indicated needed to be present for intrinsic motivation to occur. Therefore, they both were categorized as having amotivation in the field of mathematics education. When surveyed as to whether the professional development offered by their employer was effective and useful, one teacher indicated that it was neither effective nor useful, and one teacher indicated that it was slightly useful. Both teachers expressed a dislike for professional development comprising of various technology applications. The teachers were questioned regarding professional participation, and both indicated that they have never observed lessons being modeled, they both have never developed curricula or assessments collaboratively.
Summary of Chapter IV

Chapter IV contained a review of the findings of the phenomenological study. These findings were revealed through analysis of survey responses and interviews. The chapter begins with a description of the participants that included demographics, background in education, and experience with content standards, standards for mathematical practice, instruction and assessment styles. It also included a description of the findings regarding motivation and the three needs of intrinsic motivation that include autonomy, competency and relatedness. Next, the findings concerning preferred adult learning environments were discussed. The participants lived experiences involving professional development was analyzed.

Motivation affects all aspects of teaching and learning. To be an effective teacher, means becoming a life-long learner who is willing to continually develop essential skills that will cultivate successful classrooms. The benefits of fostering intrinsic motivation in teachers will increase the effectiveness of sustainable professional development that encourages innovation in the classroom.
CHAPTER V

DISCUSSION, IMPLICATIONS, AND RECOMMENDATIONS

Purpose and Research Questions

The purpose of this research was to examine the motivation behind middle school mathematics teachers’ decisions to pursue professional learning opportunities and their perspectives regarding what comprises effective professional development. This study sought to understand the relationship between teachers’ motivation and perceptions as they relate to professional development. A phenomenological approach was employed to research, design and analyze the meaning of the middle school mathematics’ teachers lived experience in education, in particular, their motivations to take and perception of professional development.

Findings described in Chapter IV support the three research questions by addressing:

1) What motivates middle school (grades 4-9) mathematics teachers to engage in professional development focused on improving classroom instruction that addresses the Common Core’s (or aligned) mathematical content and practice standards?

2) What motivates middle school (grades 4-9) mathematics teachers to engage in general professional development in their field?

3) What types of professional development are deemed useful and effective by
middle school (grades 4-9) mathematics teachers?

- Must one, some, all, or any of the three needs be met (i.e., autonomy, competency, relatedness), as proposed by Self-Determination Theory, for professional development to be deemed useful and/or effective?

This chapter draws conclusions based on the examination of the findings through the theoretical framework of Self-Determination Theory. As findings were pulled from data, it became apparent that motivation played a significant role in teachers’ attitudes toward professional development, which, in turn, had the potential to impact their classroom instruction. Therefore, Self-Determination Theory will be applied to construct conclusions and implications to the field of education. This chapter begins by examining the study’s results in relation to literature involving concepts aligned with instruction, adult learners, professional development and motivation concerning self-determination theory. Next, conclusions regarding the research question and sub-question are made and discussed, based on the study’s results. Finally, the chapter discusses implications for policy and practice and the need for future research.

**Study Results and their Relation to Existing Literature**

Results of this study concerning instruction, motivation, adult learning and professional development will be aligned to the literature in Chapter II by comparing this study’s findings to existing research. Instruction will be analyzed by looking at how the standards impact planning and instruction. This chapter will also revisit Self-Determination Theory and its usefulness in understanding human motivation, exploring further the concepts of autonomy, competency and relatedness by examining the lived
experiences of middle school mathematics teachers regarding instruction and professional development.

**Instruction**

The ongoing debate about *what* and *how* mathematics should be taught may always be a point of contention, but it is clear from this study that teachers are conforming to the standards set forth in Ohio. As described in Chapter II, standards-based mathematics instruction began in 1989 with the publication of *Curriculum and Evaluation Standards for School Mathematics* (NCTM, 1989). It provided an overview of the mathematics that should be taught in schools over specific grade bands (e.g., grades 5-8). In 2010, Ohio adopted the Common Core State Standards and teachers are required to align their instruction to the content. The Common Core State Standards for Mathematics provide teachers with a set of expectations to ensure all students have the skills and content knowledge needed to succeed in college and career. These standards have transformed the way middle school mathematics teachers instruct.

91.4% of teachers in this study (32 of 35) believed the Common Core’s content standards influenced their instruction somewhat or strongly (Table 7). Of these 32 teachers, 26 (81.25%) felt the content standards had impacted their instruction in a positive manner, whereas only six (18.75%) felt the standards had impacted their instruction in a negative manner (Table 7). It is clear from the results that the majority of middle school mathematics teachers surveyed abide by the content standards, think about them as they plan for and reflect on their instruction, and believe in their effectiveness.

**Interview participants’ instruction.** All four interview participants conveyed
that they follow the Common Core content standards; only one teacher (Dave) questioned the level of rigor and its appropriateness at the middle school level. Dave, who uses technology as his favorite mode of instruction, acknowledged that the level of rigor existed, but questioned whether or not it was appropriate, stating his concern that “what are we asking them to do...they (content standards) continue to push… push… push, without (the students) having that mastery”. Dave also was inclined to implement direct-instruction methods, which according to Duckworth (2009) can prevent a student’s growth, which can possibly play a role in Dave’s frustration. For Dave, it was a high level of rigor, for Carl it was the notion of time constraints as the reasoning behind the content standards’ negative influence on their teaching. Carl, who uses modeling through direct instruction, felt that there were parts of the standards that always get left out because of time limits within the school year and state exams. He stated this year it came down to probability or geometry and he chose probability because it was “20% of the standards”. Carl then stated that he “got called down to the principal’s office and I had to justify why I was teaching probability”. He noted that all of the other teachers were focusing on the geometry unit, but he felt statistics were more important due to state testing.

Both Ann and Bob acknowledged that the content standards had a positive effect on their instruction. Ann, who implements small groups with the use of manipulatives, stated that she was “totally driven by the standards and I do not stray from them”. Bob, who stated explicitly that he uses student-centered instruction, feels that the rigor is appropriate and he is “thrilled with the common core”. An assumption can be made that
those teachers who implement a type of teacher-led instruction seem to find fault with the standards because they may not be seeing the student growth that they desire (Duckworth, 2009). The two interview participants who participated in student-led instruction found value in the content standards, because the content standards reflect their teaching method by asking students to participate in critical thinking which is supported by student-centered instruction (Zahner, 2011). Bonwell (2000) acknowledged students “must talk about what they are learning, write about it, relate it to past experiences, and apply it to their daily lives. They must make what they learn part of themselves” (p. 4).

**Adult Learning**

Everyone has a distinctive learning style, and teachers are no different. In a professional development setting, teachers take on the role of students. They are regularly viewed as the experts of transferring knowledge to their students, so occasionally it goes without exception they are the model students who can adapt to any style of learning. Adults, however, bring an abundance of lived experiences and diverse knowledge to a learning environment that needs to be respected and considered when developing an effective learning situation.

Knowles (1984) suggested four principles that are applied to adult learning. The first principle is that adults need to be involved in the planning and evaluation of their instruction. According to the findings, 74% of the teachers indicated they get a choice in the professional development in which they participate. The second principle that Knowles (1984) proposed was that experience (including mistakes) provide the
foundation for the learning activities. When asked about their preferred mode of learning, 69% conveyed that they were hands on learners, preferring to learn through experience. Bob declared that his most rewarding learning experience was when he was able to play with Legos, learning to use them in mathematics. The third of Knowles (1984) principles stated that adults are most interested in learning subjects that have immediate relevance and impact their job and personal life. According to the findings of the survey, teachers ranked relevancy as the top ‘look for’ in regards to professional development. Both Ann and Carl stated that district-wide professional developments was of little use to them specifically in the classroom. Finally, the fourth of Knowles (1984) principles is that adult learning is problem-centered rather than content-oriented. The findings indicated that 83% of the middle school mathematics teachers expressed their learning opportunities were academic in content, and the learning opportunities in which they had negative experiences were whole group situations where the instructor conveyed all of the information, and no problem-solving was evident.

Teachers strive to create a safe and tolerant learning environment in which their students can thrive. Educators and district administrators are also searching for the ideal learning environment for teacher learning. Situated cognition theory focuses on the significance of engaging learners in an environment that simulates as close as possible to the context in which what is learned is applied (Schell & Black, 1997). This type of learning would allow teachers to learn by socialization, visualization and imitation. It is all about creating that real-world experience for teachers that they try to provide for their students. Teachers in this study let it be known that they favored quarterly monitored
professional development where an in-service professional meets with them up to four times a year, in which progress monitored data is provided. One of the claims that The National Research Council (1994) Report identified regarding situated learning stated that action should be grounded in the concrete situation in which it occurs (National Research Council Report, 1994). This is indicated in the teachers’ responses when the majority reported they preferred in-house professional development.

A connection between situated learning and self-determination theory was made by Lave (1988) when he concluded that knowledge needed to be represented in an authentic context, in which what is learned will be applied representing competency. Lave (1988) also suggested that situated learning involved social interaction and collaboration which relates to the need of relatedness. Collins (1988) identified situated learning as gaining knowledge reflected real-life learning which can be connected to both autonomy and competence. The findings indicated that teachers prefer learning opportunities to be relevant and directly applicable to their classroom, which can reflect autonomy and competency. They prefer to learn in small groups with visual cues and hands on experience with their peers which reveals their need for relatedness. Finally, the findings signified that they prefer the environment in which they learn to be in the context in which they will use the knowledge, demonstrating again their need for autonomy and achieving competency.

**Professional Development**

Understanding what constitutes effective professional development is a daunting, but worthwhile endeavor. It can lead to not only increased success in the classroom, but
researchers can also investigate how teachers interact in diverse social environments. Sixty-nine percent of the middle school mathematics teachers in this survey conveyed that they considered the professional development offered to them by their district was useful. The concept of useful and effective professional development is critical because it is at the heart of any school reform effort. Teachers must meet the high expectations that their districts place upon them regarding effectiveness and student performance.

Most of the professional development research in the past has not taken into account the emotional factors that exist in social learning situations (Karabenick & Conley, 2011). This study, however, examines those emotions involved in the psychological need of relatedness as well as the emotional connections to the feelings of autonomy and competence. One might argue that competence is not necessarily a feeling, but more of a gauge of confidence in one’s skills as a teacher. Bob, however, conveyed that he believes teachers who shy away from professional development and have a negative attitude are “grieving their competency”. He felt there is a direct link to emotion concerning competency and this directly relates to engagement in professional development. Bob stated “If teachers do not feel competent in their teaching of mathematics, they will not engage in professional development because they do not want to be embarrassed because they feel that they are not a strong teacher”.

Teachers’ value professional development if three variables exist that include time to practice what is learned, relevancy, and support (Barnett, 2004; Kent, 2004; Lee, 2005; Salpeter, 2003). This idea is supported in its entirety by the findings of this study. The teachers surveyed wanted in-house professional development, it to be relevant to middle
school mathematics, and continued support through multiple meetings throughout the school year.

**Self-Determination Theory and Motivation**

Psychologists often stress the concept of motivation and the affect it has on our daily lives. Deci and Ryan (2000) suggested that “to be motivated means to do something” (p. 54). Deci and Ryan (2000) also concluded that people, in this case teachers, reserve varying amounts and types of motivation. Self-determination theory is an expansive framework that investigates the notion of motivation. In its most basic form, it investigates what fosters “intrinsic motivation, which refers to doing something because it is interesting or enjoyable, and extrinsic motivation, which refers to doing something because it leads to a distinguishable outcome” (Deci and Ryan, 2000, p. 55). Amotivation, a lack of motivation altogether, has been connected to negative outcomes (Vallerand, 1997, 2007; Vallerand & Ratelle, 2002).

This study focused on sorting middle school mathematics teachers into the three categories of motivation that included amotivation, extrinsic motivation and intrinsic motivation. In regards to the research question regarding “what motivates” the middle school mathematics teachers… the ‘what’ is reflected back on the three needs of autonomy, competency and relatedness. The findings in this study discovered the majority of the teachers, 74%, were extrinsically motivated, meaning they are relying on some external force to drive their motivation in their field. Deci and Ryan (2000) concluded that extrinsic rewards like money payments or promotions can undermine a person’s intrinsic motivation. Seven of the thirty-five surveyed met all three needs and
are considered intrinsically motivated. According to Deci (1995), these teachers who foster intrinsic motivation have the “desire to be the origin of one’s own actions rather than be a pawn manipulated by external forces” (p. 27). Only two teachers indicated the complete absence of meeting the three needs of autonomy, competency or relatedness. Amotivation can be a direct result of not valuing an activity (Ryan, 1995). One of the participants that scored in this category indicated they found the professional development offered by their district neither useful nor not useful. Both participants were not given any choice in professional development they were required to attend, which could directly influence their motivation to participate.

All teachers have needs that affect the way they live and engage in their specific social context. Deci and Ryan (2002) suggested that humans need to continually “engage in exchanges with their environment to draw from it those necessities that allow them to preserve, maintain and enhance their functioning” (p. 6). The differences between extrinsic and intrinsic motivation and the subsequent interaction with the educational environment was clear from the outcomes of the interviews. Three of the participants interviewed indicated they participated in the professional developments offered by their district because they were required to do so. There was no eagerness or passion when discussing the learning opportunities. Some of the professional developments they sought on their own accord were not deemed effective. Ann considered one interesting, but she suggested it was not immediately applicable in her classroom. Carl actually felt excluded from professional developments because he was no one of the “golden teachers” that administration chose to go on mathematics professional developments.
These three teachers were attending the professional developments to either avoid a consequence, gain approval from others, or to possibly meet some extrinsic professional goal. Bob scored as intrinsic and it was apparent when examining his interview data. He actively sought professional development, was open to the activities and enjoyed the learning opportunities. Bob felt extremely confident in his abilities, he is self-driven and feels a great connection to his peers both personally and professionally. He enjoyed speaking about his learning experiences and his enthusiasm was apparent in the tone of his voice. More than once he apologized for straying off topic because the realm of teaching was so appealing to him.

Overall, the findings supported the literature regarding concepts of instruction, adult learning, professional development and motivation in regards to the self-determination theory. The research outcomes reinforced the idea that instruction is bound by the standards, adults learn best in the context in which the knowledge is applied, professional development needs to take into consideration the needs of adult learners, and finally motivation plays a key role in the overall engagement in professional development. Meeting the three needs of intrinsic motivation is the “what” that motivates teachers to attain professional development and engage in the learning opportunity in a way that will foster positive outcomes in the classroom and school district as a whole.

**Addressing the Research Questions**

In the earlier scenario, involving a fictitious teacher named Angie, the teaching environment was stressful and Angie seemed inherently overwhelmed. This sentiment
can completely impact her motivation. This scenario plays out all too often in classrooms across the United States. Motivation has a direct effect on our daily lives, including the lives of educators, and its significance to the notion of success and productivity cannot be ignored. Similar to Angie, teachers’ motivation can be directly affected by their environment (Deci & Ryan, 2000). This study examined middle school mathematics teachers’ environments and their lived experiences involving professional development related specifically to instruction. Ryan and Deci’s (2000) self-determination theory was used as a framework to aid in answering the following three research questions:

1) What motivates middle school (grades 4-9) mathematics teachers to engage in professional development focused on improving classroom instruction that addresses the Common Core’s (or aligned) mathematical content and practice standards?

2) What motivates middle school (grades 4-9) mathematics teachers to engage in general professional development in their field?

3) What types of professional development are deemed useful and effective by middle school (grades 4-9) mathematics teachers?

- Must one, some, all, or any of the three needs be met (i.e., autonomy, competency, relatedness), as proposed by Self-Determination Theory, for professional development to be deemed useful and/or effective?

If the three basic needs of autonomy (self-driven), competency (confident in ability), and relatedness (feeling connected) are present, Self-Determination Theory suggests a person will be intrinsically motivated (Deci & Ryan, 2000). When a person is
motivated, in this case a teacher, Deci and Ryan (2000) imply he or she will have a tendency to grow and develop as an educator.

In order to answer the research questions about what motivates teachers, the three needs of Self-Determination Theory must be examined. In this study, the three needs were considered the representation of “what” motivates the teachers in the generality of their field, and regarding professional development. Deci and Ryan (2000) acknowledged that the three basic needs for self-esteem (competence), achievement (autonomy) and recognition (relatedness) are needed for intrinsic motivation to occur, allowing for humans to self-regulate. Educational researchers have come to the conclusion that motivation plays an essential role in achievement and success (Guay et al., 2010). Individual research questions are addressed as follows:

1) What motivates middle school (grades 4-9) mathematics teachers to engage in professional development focused on improving classroom instruction that addresses the Common Core’s (or aligned) mathematical content and practice standards?

The response to this research question is external motivation by the state mandated common core aligned instruction. The majority of the middle school mathematics teachers sampled emulated their instruction by both the content standards and standards for mathematical practice. Those participants who were interviewed had a proficient understanding of the standards, but did not spend much time really submerging into understanding their meaning. Teachers have an external investment in the standards because they are not only required to abide by the standards, but they are also
professionally evaluated by their effectiveness in the classroom as well as student performance on state exams.

2) What motivates middle school (grades 4-9) mathematics teachers to engage in general professional development in their field?

A preliminary conclusion can be made from the findings conveyed by the thirty-five participants of this study that middle school mathematics teachers are extrinsically motivated when it comes to attaining professional development. Both the survey and interviews indicated that teachers are all too often driven by an external force to obtain professional development, whether it is to avoid a consequence for not attending the required training, seeking approval from their peers, or to meet some personal external goal.

3) What types of professional development are deemed useful and effective by middle school (grades 4-9) mathematics teachers?

This study found that middle school mathematics teachers deem professional development effective if it is immediately applicable in the classroom, relevant to their needs, and conducted within the social context in which it will be applied. These findings reflect and supported the conclusions made by researchers involving adult learning, situated learning and effective professional development (e.g.).

Must one, some, all, or any of the three needs be met (i.e., autonomy, competency, relatedness), as proposed by Self-Determination Theory, for professional development to be deemed useful and/or effective?

Motivation is intrinsic and not learned, therefore, it is essential that schools and
districts create an environment that both sustain and generate each teacher’s intrinsic motivation. In this study, only 20% of the middle school mathematics teachers are intrinsically motivated in their field of education. Therefore, schools and districts need to develop an environment where teachers can be self-driven, feel confident in their abilities in all areas of education, and feel personally and professionally connected to their peers. If this occurs, teachers are more likely to be intrinsically motivated to obtain professional development as well as continuously work on enhancing their craft. An example of an intrinsically motivated educator is one that is self-driven, possibly devoting their own personal time to obtain further education, whether it be an additional degree of professional development. That teacher will not only be confident in their skills, but they will be effective in the classroom. Finally, such a teacher will feel a deep connection to his or her peers, possibly providing or receiving continuous mentoring or participating in collaborative activities. Effective teachers should never question their significance nor the impact they have in the classroom.

**Implications of the Findings for the Field of Education**

This section discusses the implications of the findings and conclusions of the study in relation to educational policies and practices. This phenomenological study of teacher motivation regarding professional development proposes implications for creating school environments that support the three basic psychological needs of autonomy, competency, and relatedness to foster intrinsic motivation in teachers. This phenomenological study also raises questions about the current school environments that may render an educational environment that is conducive to extrinsic or amotivated
educators. It also suggests that it may be difficult to initiate school reform in districts that do not strive to create an environment that develops intrinsic motivation within its staff as a whole.

School districts that make it a priority to maintain an educational environment that fosters autonomy within its instructional staff, competency involving expectations and relatedness amongst its teachers will begin to move toward sustaining an intrinsically motivated staff that can surpass district expectations because they fulfill an internal satisfaction while working in their field. School districts also need to work on recognizing those teachers that are extrinsically or amotivated and develop a plan to enhance their motivation by meeting their psychological needs. The findings produced by interviewing four middle school mathematics teachers clearly identified which teachers had their needs met. Bob clearly stood out as an intrinsically motivated teacher whose needs were satisfied by his environment. Schools can take the small step of asking probing questions to begin to determine where to focus in regards to having their teachers becoming autonomous, competent educators who feel connected to those around them.

**Autonomy**

Autonomy occurs when humans embrace an activity because of interest and commitment, stemming from a true sense of self (Deci, 1995). The opposite of autonomy is the implementation of control, acting without a sense of personal endorsement (Deci, 1995). It can be said that in the world of education, the adoption of the common core standards initiated control of instruction that can halt the feeling of autonomy in its tracks, but some educators personally endorse the content standards and do feel a sense of
comfort in being guided by them. A teacher who submits to the pressures of administrative decisions, knowing that those decisions may have an adverse impact regarding the success of their students will not convey any measure of autonomy. From a curriculum and instruction standpoint, it is imperative that districts walk the fine line between total control of instruction, and allowing teachers the ability to feel a level of autonomy in their work.

**Competency**

In the United States, we have definite connections between behavior and desired outcomes, and it is often used as a motivation to attain achievement (Deci, 1995). Competence refers to one’s feeling of effectiveness regarding their interaction within a specific social environment while having the opportunity to express one’s capabilities (Deci, 1975; Deci & Ryan, 2000, 2002; Harter, 1983; White, 1959). Schools that provide an environment that aids in developing competence will allow teachers to seek out challenges that will enrich their skills through activity, in which its interaction is with confidence and clarity (Deci & Ryan, 2002). As humans, teachers need constant encouragement and justification to continually enhance their feeling of competency.

**Relatedness**

Deci and Ryan (2000) suggested that “Experiencing mutual reliance and respect is the heart of the relatedness need” (p. 266). If teachers feel personally and professionally connected to their peers, they are more likely to collaborate and participate in group learning activities. It is essential that school districts establish a social context that supports relationships amongst its teaching staff. All humans, including teachers, want to
feel accepted by their peers and connected to the environment around them.

**Providing Effective Professional Development**

In connection with developing an environment that supports the needs of its teachers, effective professional development can foster positive reform within school districts, with a direct influence on the success of students. In order for professional development to be effective, it needs to be conducted in an environment in which the new knowledge will be directly applied. Research has been conducted involving professional development as well as ideal adult learning environments. Districts need to recognize teachers, as adult learners, having a unique learning styles that are devised by their diverse educational backgrounds and lived experiences. School districts who adhere to the research and provide environments that sustain effective professional development will see the desired improvements with staff, students and the district in its entirety.

**Limitations of the Study**

To expand upon the limitations outlined in Chapter III, this study is limited in scope and variation. A limited sample of middle school mathematics teachers from multiple districts Northeast Ohio were used as participants in this research. This study provides a relatively small snapshot of motivation and professional development utilizing Ryan and Deci’s (2000) Self-Determination Theory as a theoretical framework. Self-Determination Theory can be applied to other fields as well as other demographics that can yield diverse outcomes. It was also assumed in this study that all participants were honest in their responses to both the survey questions and during interviews, and that the researcher withheld any bias when analyzing the data. Finally, it is also acknowledged
that the perspective of the researcher influences the reporting of the findings.

**Recommendations for Further Research**

In regards to instruction, further research is needed concerning the knowledge and effectiveness of the Standards for Mathematical Practices within the Common Core Learning Standards. In this study, it could be assumed that teachers like Ann (self-identified as basic in proficiency) were confused about the differences between the content standards and the Standards for Mathematical Practices because she diverted to the content standards when asked specifically about the practices. Bob (self-identified as an expert in proficiency) only focused on two, Carl (self-identified as proficient) did not implement them at all, and Dave (self-identified as proficient) bypassed them altogether because he felt they were too rigorous for 6th grade mathematics students.

Future research is required concerning teacher motivation regarding professional development. This study was representative of a small sample of thirty-five middle school mathematics teachers working in districts located in Northeast, Ohio. The intent of this study was to convey the lived experiences of these teachers through a phenomenological study by examining the findings of both surveys and interviews. Research that incorporates larger sample sizes as well as involving a broader span of teachers across all content areas and grade levels will be significant in adding to this research. The continued investigation of all aspects of developing intrinsic motivation within teachers is a worthwhile endeavor due to its overwhelming benefits in the field of education. There also needs to be additional research conducted regarding what constitutes effective professional development, not only in mathematics, but in all areas
of education. How about teachers teaching in ways aligned with how they prefer to learn?

Summary of Conclusion

Although Angie was fictitious teacher, her stress and workload are all too real in the lives of educators. Professional development is an essential piece of teacher learning that is added into a teachers’ already over-scheduled life. This study of teacher motivation involving professional development where middle school mathematics teachers participated in a phenomenological process revealed that meeting the basic psychological needs of autonomy, competency and relatedness can foster intrinsic motivation in teachers. That motivation carries over to adult learning opportunities, specifically professional development. The degree to which a teacher is motivated directly affects their engagement in the learning experience. That engagement or lack thereof, can vastly impact the success of the students, teachers, school and subsequently the overall function of the district. Focusing on the psychological needs of teachers is an area that is all too often overlooked by administrators. Teachers that are amotivated or extrinsically motivated, through continued support of their school administrators, can be developed into intrinsically motivated, productive staff members that will exceed all expectations in the realm of education.
APPENDICES
Date:
Greetings,

My name is Amy Crawford and I am writing to request permission to conduct a research study at your school district. I am currently a Doctoral Candidate at Kent State University in Curriculum and Instruction, with an emphasis on Middle School Mathematics Education. For my dissertation, I am researching human motivation, in this case with grades 4-9 mathematics teachers, and their motivation to seek out and/or engage in professional development regarding mathematics instruction that includes Ohio’s Learning Standards in Mathematics.

In the early fall of 2016, with your permission, I would like to email a link to an online Qualtrics Survey that includes 25 questions concerning motivation, instructional practices, and thoughts on professional development to your grades 4-9 mathematics teachers. The online survey will be sent to several school districts in Northeast Ohio. You can view the survey at https://kent.qualtrics.com/SE/?SID=SV_bsdxBJw5pIrsBfv to determine whether this is something that you would approve your teachers participating in. If your approval is granted, participants can complete the survey on any computer via the Qualtrics link. The survey should take no longer than twenty minutes to complete.

From the overall survey results, which includes all districts surveyed, I will purposefully choose 6-8 teachers to interview at their convenience. Interviews will last approximately one hour and involve teachers’ responses to questions related to professional development. Interview session will be audio-recorded and all responses will be confidential.

Once the interviews have been conducted, I will remove any identifying information from the surveys. At this point the surveys will be confidential, and only I and my dissertation committee will have access to the results.

Survey results will be pooled for the study and individual results will remain absolutely confidential. Should this study be published, only pooled results will be documented.

No costs will be incurred by either your school district or the individual participants. Your approval to conduct this study will be greatly appreciated. I will follow up with an
email in August.

Please contact me via email if you are interested and approve of your mathematics teachers participating in this study. Also, do not hesitate to contact me if you have any questions or concerns.

Thank you for your time and consideration.

Amy Crawford
APPENDIX B

CONSENT FORM

Informed Consent to Participate in a Research Study Interview

Study Title: SELF-DETERMINATION THEORY AND MIDDLE SCHOOL MATHEMATICS TEACHERS: UNDERSTANDING THE MOTIVATION TO ATTAIN PROFESSIONAL DEVELOPMENT

Principal Investigator: Amy Crawford and Dr. Scott Courtney

You are being invited to participate in a research study interview based upon your responses to a previous Qualtrics survey. This consent form will provide you with information on the research project, what you will need to do, and the associated risks and benefits of the research. Your participation is voluntary. Please read this form carefully. It is important that you ask questions and fully understand the research in order to make an informed decision. You will receive a copy of this document to take with you.

Purpose: This study will to research the motivation behind teachers’ will to pursue professional development and higher education to satisfy internal needs of self-improvement involving instructional methods in order to ensure student success regarding the Common Core Learning Standards.

Procedures

The participants of this study will have already completed a Qualtrics survey to enable the researcher to explore the motivation behind their reasons for not only teaching mathematics, but attaining professional development. The data will be used to provide an understanding of the internal motivation of teachers regarding professional development concerning the Common Core Learning Standards. After the survey, a follow-up interview, lasting approximately one hour, will take place with selected teachers to expand upon the answers to the survey questions. If necessary, up to two more brief interviews (10-15 minutes) will take place for clarification. These interview questions will focus on the professional development teachers have already received and hope to receive in the future regarding Common Core Learning Standards.
**Audio and Video Recording and Photography**

Audio/Video recording devices will be used during follow-up interview so that participant answers can be accurately transcribed for the purpose of the study.

**Benefits**
This research will not benefit you directly. However, your participation in this study will help us to better understand research the motivation behind teachers’ will to pursue professional development and higher education to satisfy internal needs of self-improvement involving instructional methods in order to ensure student success regarding the Common Core Learning Standards.

**Risks and Discomforts**
There are no anticipated risks beyond those encountered in everyday life.

**Privacy and Confidentiality**
Your study related information will be kept confidential within the limits of the law. Any identifying information will be kept in a secure location and only the researchers will have access to the data. Research participants will not be identified in any publication or presentation of research results; only aggregate data will be used.

Qualtrics is dedicated to protecting data using the highest standards. The servers are protected by high-end firewall systems and security scans are performed regularly. Data is stored in a specific location, not in a ‘cloud’. Qualtrics also uses Transport Layer Security (TLS) encryption (also known as HTTPS) for all transmitted data. Qualtrics deploys the general requirements set forth by many Federal Acts, including the FISMA Act of 2002. They meet or exceed the minimum requirements as outlined in FIPS Publication 200.

**Voluntary Participation**
Taking part in this research study is entirely up to you. You may choose not to participate or you may discontinue your participation at any time without penalty or loss of benefits to which you are otherwise entitled. You will be informed of any new, relevant information that may affect your health, welfare, or willingness to continue your study participation.

**Contact Information**
If you have any questions or concerns about this research, you may contact Dr. Courtney at XXX-XXXX or Amy Crawford at XXX-XXXX. This project has been approved by the Kent State University Institutional Review Board. If you have any questions about your rights as a research participant or complaints about the research, you may call the IRB at 330.672.2704.

**Consent Statement and Signature**
I have read this consent form and have had the opportunity to have my questions answered to my satisfaction. I voluntarily agree to participate in this study. I understand that a copy of this consent will be provided to me for future reference.

________________________________  _____________________
Participant Signature     Date

(If a waiver of documented informed consent has been approved and/or you are using a web-based consent, you may modify the above to include a statement such as, “My completion and return of this (survey, questionnaire, or instrument) will be indicative of my consent to participate in this research study. I have been given a copy of this consent form” or “I may print a copy of this consent statement for future reference.”)
APPENDIX C

SURVEY
APPENDIX C

SURVEY

Middle School Mathematics - Motivation to Attain Professional Development

Q1 Highest Degree Earned
   - Bachelor's (1)
   - Master's (2)
   - Post Graduate Degree (Ed, PhD, etc.) (3)

Q2 I am (will be) working on obtaining a higher degree in the near future.
   - Very Unlikely (1)
   - Unlikely (2)
   - Somewhat Unlikely (3)
   - Undecided (4)
   - Somewhat Likely (5)
   - Likely (6)
   - Very Likely (7)

Q3 How many years have you been teaching including this year?

Q4 How many years have you been teaching mathematics, including this year?

Q5 What grade levels have you taught in mathematics?
   - K-3 (1)
   - 4-9 (2)
   - 10-12 (3)

Q6 Are you a member of, or do you subscribe to the following?
   - Mathematics Professional Organizations (1)
   - Mathematics Scholarly Journals (2)
   - Mathematics Practitioner Journals (3)
   - Other (4) ____________________
   - None of the Above (5)
Q7 How frequently have you engaged in each of the following activities specifically related to the teaching and learning of mathematics:
<table>
<thead>
<tr>
<th>Event</th>
<th>Never (1)</th>
<th>Once or twice a Year (2)</th>
<th>Once or Twice a Term (3)</th>
<th>Once or Twice a Month (4)</th>
<th>Once or Twice a Week (5)</th>
<th>Almost Daily (6)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Attended conferences related to mathematics or mathematics education</td>
<td>❌</td>
<td>❌</td>
<td>❌</td>
<td>❌</td>
<td>❌</td>
<td>❌</td>
</tr>
<tr>
<td>(1) Participated in teacher study groups. (2)</td>
<td>❌</td>
<td>❌</td>
<td>❌</td>
<td>❌</td>
<td>❌</td>
<td>❌</td>
</tr>
<tr>
<td>(2) Participated in teacher networks or collaboratives of teachers</td>
<td>❌</td>
<td>❌</td>
<td>❌</td>
<td>❌</td>
<td>❌</td>
<td>❌</td>
</tr>
<tr>
<td>supporting professional development. (3)</td>
<td>❌</td>
<td>❌</td>
<td>❌</td>
<td>❌</td>
<td>❌</td>
<td>❌</td>
</tr>
<tr>
<td>(3) Acted as a coach or mentor to other teachers or staff in your</td>
<td>❌</td>
<td>❌</td>
<td>❌</td>
<td>❌</td>
<td>❌</td>
<td>❌</td>
</tr>
<tr>
<td>school. (4)</td>
<td>❌</td>
<td>❌</td>
<td>❌</td>
<td>❌</td>
<td>❌</td>
<td>❌</td>
</tr>
<tr>
<td>(4) Received coaching or mentoring. (5)</td>
<td>❌</td>
<td>❌</td>
<td>❌</td>
<td>❌</td>
<td>❌</td>
<td>❌</td>
</tr>
<tr>
<td>(5) Participated in a committee or task force focused on curriculum</td>
<td>❌</td>
<td>❌</td>
<td>❌</td>
<td>❌</td>
<td>❌</td>
<td>❌</td>
</tr>
<tr>
<td>and instruction. (6)</td>
<td>❌</td>
<td>❌</td>
<td>❌</td>
<td>❌</td>
<td>❌</td>
<td>❌</td>
</tr>
</tbody>
</table>
Engaged in informal self-directed (e.g., discussed math or math education topics with a colleague, read a journal article on math or math education, use the internet to enrich knowledge and skills) (7)

Q8 Please rate your experience level with the Common Core Mathematics Standards overall.

○ New to the Common Core Mathematics Standards (1)
○ Basic understanding of the Common Core Mathematics Standards (2)
○ Proficient understanding of the Common Core Mathematics Standards (3)
○ I deem myself an expert regarding the Common Core Mathematics Standards (4)

Q9 Which of these categories best describes the way your classes at this school are organized?

○ Departmentalized Instruction (1)
○ Taught by Subject-Area Specialist (non-departmental) (2)
○ Self-Contained (e.g., teacher multiple subjects) (3)
○ Team Taught (4)
○ None of these choices fit my school's organization (5)
Q10 Please rate the following statements accordingly.
<table>
<thead>
<tr>
<th></th>
<th>Strongly Disagree (1)</th>
<th>Disagree (2)</th>
<th>Agree (3)</th>
<th>Strongly Agree (4)</th>
</tr>
</thead>
<tbody>
<tr>
<td>I am an effective math teacher (1)</td>
<td>❍</td>
<td>❍</td>
<td>❍</td>
<td>❍</td>
</tr>
<tr>
<td>Teaching math is more difficult for me than others teachers in my school (2)</td>
<td>❍</td>
<td>❍</td>
<td>❍</td>
<td>❍</td>
</tr>
<tr>
<td>Most of the math teachers and I share ideas when it comes to preparing lessons (3)</td>
<td>❍</td>
<td>❍</td>
<td>❍</td>
<td>❍</td>
</tr>
<tr>
<td>I feel free to teach math in a way that I believe it should be taught in the classroom. (4)</td>
<td>❍</td>
<td>❍</td>
<td>❍</td>
<td>❍</td>
</tr>
<tr>
<td>When planning math lessons, I feel pressured to teach a certain way. (5)</td>
<td>❍</td>
<td>❍</td>
<td>❍</td>
<td>❍</td>
</tr>
<tr>
<td>The Common Core Standards does NOT affect the way I teach math. (6)</td>
<td>❍</td>
<td>❍</td>
<td>❍</td>
<td>❍</td>
</tr>
<tr>
<td>The Standards for Mathematical Practice greatly affects the way I teach math. (7)</td>
<td>❍</td>
<td>❍</td>
<td>❍</td>
<td>❍</td>
</tr>
<tr>
<td>I feel that I teach mathematics in a way that mirrors the Common Core Standards for my students to be successful. (8)</td>
<td>❍</td>
<td>❍</td>
<td>❍</td>
<td>❍</td>
</tr>
<tr>
<td>I believe that the Common Core Mathematical Standards will prepare my students for success. (9)</td>
<td>❍</td>
<td>❍</td>
<td>❍</td>
<td>❍</td>
</tr>
<tr>
<td>Question</td>
<td>Response Options</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>----------</td>
<td>------------------</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>I regularly take it upon myself to seek out professional development regarding Common Core Standards/Standards for Mathematical Practice. (10)</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>My place of employment regularly provides professional development to math teachers concerning Common Core Standards/Standards for Mathematical Practice. (11)</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
</tbody>
</table>

**Q11 Please choose the instructional style(s) that best represents your style of teaching mathematics?**

- Teacher Modeling (1)
- Students take notes from books/lectures. (2)
- Teaching using manipulatives (3)
- Small group instruction (4)
- Computers, calculators, technology to learn mathematics (5)

**Q12 Please rate your experience level with the Standards for Mathematical Practice.**

- First time hearing of the Standards for Mathematical Practice (1)
- Basic understanding of the Standards for Mathematical Practice. (2)
- Proficient understanding of the Standards for Mathematical Practice. (3)
- I deem myself an expert regarding the Standards for Mathematical Practice. (4)
Q13 Please rate the following: (0 = Not At All True; 3 = True)
<table>
<thead>
<tr>
<th>Statement</th>
<th>0 (1)</th>
<th>1 (2)</th>
<th>2 (3)</th>
<th>3 (4)</th>
</tr>
</thead>
<tbody>
<tr>
<td>I feel a sense of freedom in the math that I teach. (1)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Most of the things I teach, I feel I &quot;have to&quot;. (2)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>I feel that other mathematics teachers that I care about also care about me. (3)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>I often feel excluded from the other mathematics teachers in my building. (4)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>I feel very confident that I teach math well. (5)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>I have serious doubts that I teach math well. (6)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>I feel like my lesson plan decisions reflect how and what I really want to teach. (7)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>I feel that the Common Core Standards force me to teach in a way that I would not normally choose. (8)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>I feel connected to the other math teachers in my building both personally and professionally. (9)</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>I feel that the other mathematics teachers in the building are cold and distant toward me. (10)</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>I feel I am a capable math teacher. (11)</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>I feel disappointed with my performance as a math teacher. (12)</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>I feel my math lesson plans express who I am as a teacher. (13)</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>I feel pressured to do too many things as a teacher. (14)</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>I feel close and connected to the other teachers in my building. (15)</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>I have the impression that my students do not like me. (16)</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>I feel competent to achieve my goals as a teacher. (17)</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
</tbody>
</table>
I feel insecure about my abilities as a math teacher. (18)

Q14 Please indicate the degree to which your state's curriculum framework or content standards influences what you teach in mathematics:
- Not Applicable (1)
- Strong Negative Influence (2)
- Somewhat Negative Influence (3)
- Little or No Influence (4)
- Somewhat Positive Influence (5)
- Strong Positive influence (6)

Q15 Please indicate how well you are prepared to:

<table>
<thead>
<tr>
<th>Teach Math at your assigned level (1)</th>
<th>Not Prepared (1)</th>
<th>Somewhat Prepared (2)</th>
<th>Well Prepared (3)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Integrate math with other assignments (2)</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>Provides mathematics instruction that meets mathematics content standards (e.g., district, state, or national) (3)</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>Use a variety of assessment strategies (including objective and open-ended formats) (4)</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>Teach problem-solving strategies (5)</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>Teach mathematics with manipulatives, such as counting blocks or geometric shapes. (6)</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
</tbody>
</table>
Q16 Please rank in order from most used (1) to least used (8) the following strategies when assessing students in math class.

- Objective Items (e.g., multiple choice or true/false) (1)
- Short answer questions such as performing a mathematical procedure (2)
- Extended response item for which a student must explain or justify solution (3)
- Performance tasks or events (e.g., hands-on activities) (4)
- Individual or group demonstration or presentation (5)
- Mathematics Projects (6)
- Portfolios (7)
- Systematic observation of students (8)

Q17 As a professional, I learn better in the following environment:

- On my own (1)
- Small group (2)
- Large group (3)

Q18 The mode of learning that works best for me is: (More than one can apply)

- Prefer to see the information and visualize the relationships between ideas using charts and graphs. (1)
- Prefer to hearing the information, rather than reading it, with sound or music. (2)
- Prefer hands-on, experiential learning, using physical objects as much as possible. (3)
- Prefer to read information for myself and gain my own perspective using speech and writing. (4)
- Prefer to learn alone, possibly a self-study. (5)
- Prefer the use of logic and systems, to understand the reasons behind the content and skills. (6)
- Prefer to learn in groups, socializing with people as much as possible. (7)

Q19 The type of professional development that I most prefer:

- A 'sit and get', a one-time deal. (1)
- Quarterly monitored professional development where an in-service professional meets with you four times a year and you provide data to monitor progress. (2)
- Daily monitored professional development, where in-service professional is in your building at all times. (3)
- I do not prefer any professional development. (4)
Q20 What are the top three things that you look for in a professional development opportunity.

❑ First: (1) ____________________
❑ Second: (2) ____________________
❑ Third: (3) ____________________

Q21 The overall professional development provided by my place of employment is both effective and useful in the classroom.

❑ Extremely useful (1)
❑ Useful (2)
❑ Slightly useful (3)
❑ Neither useful nor useless (4)
❑ Slightly useless (5)
❑ Useless (6)
❑ Extremely useless (7)

Q22 Describe a professional development that you attended that you did NOT find useful nor effective in the classroom.
Q23 Thinking about all of your professional development activities in mathematics or mathematics education, how often has the following occurred for you?

<table>
<thead>
<tr>
<th>Observed demonstration of teaching techniques. (1)</th>
<th>Never (1)</th>
<th>Rarely (2)</th>
<th>Sometimes (3)</th>
<th>Often (4)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Led group discussion. (2)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Developed curricula or lesson plans that other participants or the activity leader reviewed. (3)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Reviewed student work or scored assessments. (4)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Developed Assessments or tasks as part as a formal professional development activity. (5)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Practice what you learned and received feedback as part of a professional development activity. (6)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Given a lecture or presentation to colleagues. (7)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Q24 Indicate how often your professional development activities have been:

<table>
<thead>
<tr>
<th>Consistent with your mathematics department or grade-level plan to improve instruction. (1)</th>
<th>Never (1)</th>
<th>Rarely (2)</th>
<th>Sometimes (3)</th>
<th>Often (4)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Consistent with your own goals for your professional development. (2)</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>Built upon what you had learned in earlier professional development activities. (3)</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>Provided follow-up activities that related clearly to what you learned. (4)</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
</tbody>
</table>
Q25 How much emphasis did your professional development activities in math or math education place on the following topics?

<table>
<thead>
<tr>
<th>Topic</th>
<th>None (1)</th>
<th>Moderate (2)</th>
<th>Major (3)</th>
</tr>
</thead>
<tbody>
<tr>
<td>State Mathematics Content Standards (e.g., what they are and how they are used) (1)</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>Alignment of mathematics instruction to curriculum (2)</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>Instructional Approaches (e.g., Use of Manipulatives (3)</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>In-depth study of mathematics or specific concepts within mathematics (e.g., fractions) (4)</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>State or district mathematics assessments (e.g., preparing, understanding, interpreting assessment data) (5)</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>Technology to support student learning in mathematics (6)</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
</tbody>
</table>

Q26 If selected, would you be open to participating in a confidential interview that will last approximately one hour to expand upon your responses?
   ○ Yes, feel free to contact me via email (1)
   ○ No thank you (2)

Q27 If you are open to participating in an interview, please provide your email below:
APPENDIX D

INTERVIEW QUESTIONS

Self-Determination Theory and Middle School Mathematics Instruction: Motivation to Attain Professional Development

1. In what ways do you feel that you are an effective mathematics teacher?

2. What mathematics content do you feel is a strength and what is a weakness regarding your instruction?

3. How have the Common Core Learning Standards affected the way that you teach mathematics?

4. What types of mathematical instructional methods do you feel are helpful?

5. What are some of the topics of conversation with your colleagues when you are discussing the Common Core Learning Standards or Standards for Mathematical Practice?

6. What types of professional development have you participated in during past year of teaching?

7. In regards to the Common Core Learning Standards, what do you think students
8. What types of mathematics professional development do you feel is effective?

9. Do you feel obligated to obtain professional development/higher education in mathematics to become more effective in the classroom? Why or Why Not.

10. Do you feel supported by your administration and feel that they understand your needs in the classroom?
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