Beginning Mathematics Teachers from Alternative Certification Programs: Their Success in the Classroom and How They Achieved It

Edward Ham

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ABSTRACT

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Edward Ham

This dissertation focuses on beginning mathematics teachers from alternative certification programs and their perceptions of what is required to be successful. A mixed – methods research study was completed with several goals in mind: (1) identifying how beginning mathematics teachers define success in the classroom during their earliest years, (2) identifying what important factors, attributes, or experiences helped them achieve this success, and (3) determining where these beginning mathematics teachers learned the necessary attributes, or experiences to become successful in the classroom. A sample of beginning mathematics teachers (n = 28) was selected from an alternative certification program in California for a quantitative survey. A subsample of teachers (n = 7) was then selected to participate further in a qualitative semi-structured interview.

The results of the study revealed that beginning teachers defined success in their beginning years by their classroom learning environment, creating and implementing engaging lessons, and a belief in their own ability to grow professionally as educators. Mathematics content knowledge, classroom management, collaboration with colleagues and coaches, reflection, a belief in one's ability to grow professionally as a teacher, a belief in the ability to have a positive impact on students, personality, and previous leadership experiences were several of the factors, attributes, or experiences identified as most important by the participating teachers. The participating teachers also felt that before and after, but not during, their teacher preparation program were the stages of

teacher development that best instilled the necessary factors, attributes, or experiences to become successful in a mathematics classroom.

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DEDICATION

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Chapter 1

Need, Purpose and Procedure

I. Need for the Study

Teachers can receive certification through two means: a traditional certification program, in which potential teachers will take college or university based education courses, or an alternative certification program. Several programs in California (the Los Angeles Unified School District Intern Program and Project Pipeline, in particular) originally prepared teachers of all levels and subjects but recently have shifted their programs' focus to higher need areas such as secondary mathematics, sciences, and special education. The Center for Future Teaching and Learning estimates that a third of the teacher workforce will retire within the next decade leaving California with 100,000 fewer teachers in the foreseeable future (Gallagher, 2005*)*. Not only is there a predicted shortage of teachers, but current teachers are also leaving the profession at an alarming rate. Alternative certification programs were developed to address the problems of teacher shortage and teacher retention by educating and developing highly qualified teachers more quickly than do traditional certification programs (Zumwalt & Craig, 2005).

Findings by the National Commission on Teaching and America's Future (NCTAF) have estimated that one-third of the teacher population leaves within the first three years of teaching and half of the teacher population leaves within the first five years of teaching. Alternative certification programs typically serve urban areas. NCTAF states that the attrition rates of teachers have a direct relation to the district poverty level; the attrition rate of alternatively certified teachers reaches as high as 60% (National Commission on

Teaching and America's Future State Partners, 2002). Evidence relating the retention rate between teachers from traditional certification programs and alternative certification programs is inconclusive; however, some research suggests that first year mathematics teachers from alternative certification programs have the lowest retention rate at approximately 60% compared to other types of programs and subjects (Zumwalt & Craig, 2005). According to the "Retention of New Teachers in California," the most efficient way to address the problems of teacher shortage and attrition rate is to focus on teacher development: by keeping teachers happy and successful, they are more likely to stay in the profession (Reed, Rueben, & Barbour, 2006). In Ingersoll's study, "Teacher Turnover and Teacher Shortages: An Organizational Anaysis," the problem of supply and demand for teachers is not brought about by retirement but by teacher job dissatisfaction (Margolis, 2008). The goal of the Los Angeles Unified School District Intern Program is "to prepare urban public teachers to effectively educate all students so that each contributes to and benefits from our diverse society" (Lewis, 2004) and by focusing on mathematics, they are trying to recruit mathematics teachers and train them to become successful.

Since alternatively certified mathematics teachers have the lowest retention rate, this study will focus on beginning teachers recently graduated from an alternative certification program in California and their success in the mathematics. The question arises: what makes a mathematics teacher successful? Is there a formula that any novice teacher can follow to increase the probability of success in the classroom? As of now there has been little research on beginning mathematics teachers and few standards for their success, but research does suggest effective characteristics and attributes of

successful mathematics teachers (Eble, 1971). In the *National Council of Teachers of Mathematics* (NCTM) *1991 Professional Standards*, NCTM developed specific standards, grouped into six categories, for successful mathematics teaching: worthwhile mathematical tasks, teacher's role in discourse, student's role in discourse, tools for enhancing discourse, learning environment, and an analysis of teaching (The National Council of Teachers of Mathematics on Teaching Standards for School Mathematics, 1991). Using these standards as a framework, this study will try to determine if and how successful beginning mathematics teachers apply these standards in the classroom.

This study will also try to determine at which stage of teacher development beginning teachers learn specific attributes that they deem necessary to succeed in the classroom. The goal of mathematics teacher certification programs is to educate and develop successful mathematics teachers but researchers have learned that teachers feel a disconnect between their certification programs and what actually occurs in the classroom (Brown & Borko, 1992). If teachers feel the education provided by their teacher certification programs is not worthwhile, where and when are they developing the attributes and qualities necessary to become successful mathematics teachers? This study will focus on the attributes and characteristics of beginning mathematics teachers and also where or when they acquired these attributes and characteristics.

II. Purpose of the Study

The purpose of this study is to examine the common teaching practices and characteristics of successful beginning mathematics teachers from an alternative certification program. The study also will work with the same teachers in an effort to

discover when they report having acquired knowledge of these teaching practices and characteristics.

Research Questions

This study will seek to answer the following research questions:

1) How do beginning mathematics teachers define success in regard to their first year of teaching?

2) To what factors, attributes, or experiences do beginning mathematics teachers attribute the success in their beginning years of teaching?

3) When and where do these beginning mathematics teachers believe they acquired and developed the factors or attributes identified in question 2?

III. Procedures of the Study

A sample of beginning mathematics teachers was selected from graduates of an alternative certification program in California. Since this study involved beginning teachers, only teachers who recently graduated from the Class of 2006, 2007, or 2008 were selected so that subjects would have had only one to three years experience in the classroom, relatively new teachers to the profession. To obtain the sample, administrators (the Program President and the Advisor in Mathematics and Science) from the alternative certification program in California were contacted and a meeting was set up. It was determined during the meeting that the administrators would send out information about the study to their students and have any teachers willing to participate contact the researcher in order to maintain the privacy of the students.

The study employed a mixed-methods methodology. According to Johnson and Turner, "the mixing of qualitative and quantitative methods will result in the most accurate and complete depiction of the phenomenon under investigation" (Johnson & Turner, 2003). The researcher and his colleague collaborated in developing two instruments for data collection: a quantitative survey and a qualitative semi-structured interview. The quantitative survey instrument was designed using the categories identified by NCTM as necessary for successful mathematics teaching and the qualitative interview was designed based upon the quantitative survey.

Data were collected in two stages. In the first stage quantitative data were gathered; all the participating teachers in the sample were asked to complete a 30 question survey geared towards answering questions about defining success in the classroom and how and where the respondents acquired the factors, attributes, or experiences necessary for succeeding in the classroom. The survey was separated into four sections: the first section required participants to rank attributes defining success in the classroom; the second section required participants to determine how frequently certain activities occurred in the classroom; the third section required participants to gauge their attitudes towards teaching and their beliefs in the classroom using a Likert scale; and finally, the fourth section required participants to answer questions about the different stages of teacher development.

In the second stage, qualitative data were collected; a subgroup of the sample was selected to participate in a semi-structured interview. The original sample was separated into two subsamples: "selected" teachers and "non-selected" teachers. The teachers interviewed were selected based on recommendations from the administrators in their

alternative certification program, their undergraduate mathematics Grade Point Average (G.P.A), and previous leadership experience. Using this combination of factors, teachers were identified as "successful" beginning mathematics teachers and further research was conducted using this subsample.

A semi-structured interview was scheduled for an hour at the convenience of the participating teachers approximately one month after the initial quantitative data were collected and analyzed. The interview consisted of 10 questions (with the freedom to include additional questions based on the teachers' responses) with the goal of the questioning to have the teachers justifying and expanding upon their responses to the initial quantitative survey. The structure of the qualitative interview followed the structure of the quantitative survey in that the interview was separated into three sections; the first section asked the participants to explain and expand upon the attributes for defining success; the second section asked the participants to identify important factors, attributes, or experiences necessary for attaining success in the classroom; and finally the third section asked participants to identify in which stage of teacher development they acquired the important factors, attributes, or experiences. Each of the interviews was transcribed and coded collaboratively with a colleague.

This study not only generated data on a group of beginning mathematics teachers, but also generated data on a subgroup of successful beginning mathematics teachers. Being able to separate the sample into two subsamples allowed comparisons to be made between the "selected" subsample and the "non-selected" subsample. Also, data from the "selected" subsample allowed for further insight into how beginning mathematics teachers responded to the goals of this study.

To answer the first research question, responses to the first section of the survey and responses to the first section of the interview were analyzed. The goal of these sections was to have teachers define success in their beginning years of teaching and have them answer the questions using their own experiences and ideas about success. Also, the survey responses of the two subsamples yielded quantitative data that were analyzed to determine if a statistically significant difference existed between the responses of the two groups in terms of defining success.

To answer the second research question, responses to the second and third sections of the survey and responses to the second section of the interview were analyzed. The goal of these sections was to identify which factors, attributes, or experiences were important in achieving success in the mathematics classroom. The responses from the qualitative survey further expanded upon these results by identifying which factors were most important in achieving success. The survey responses of the two subsamples yielded quantitative data that were analyzed to determine if a statistically significant difference existed between the responses of the two groups in identifying important factors, attributes, or experiences.

To answer the third research question, responses to the fourth section of the survey and responses to the third section of the interview were analyzed. The goal of these sections was to use the factors, attributes, or experiences identified in the second research question and determine which stage of teacher development was most instrumental in acquiring those necessary for succeeding in the classroom. Also, the survey responses of the two subsamples yielded quantitative data that were analyzed to determine if a statistical

significant difference existed between the responses of the two groups in identifying important stages of teacher development.

Chapter 2

Literature Review

I. Introduction

This chapter introduces the literature relevant to this study and consists of seven sections. The background provides information on alternative certification programs and the standards for effective mathematics teaching published by the National Council of Teachers of Mathematics. The NCTM Standards are placed into five categories and each of the following sections of this chapter will explore one of those categories: worthwhile mathematical tasks, teachers and students' roles in discourse, tools used for discourse, the learning environment, and an analysis of teaching and learning. The concluding section considers the different educational stages in beginning teachers' careers and how their teaching practices were influenced by each of these stages.

II. Background

All mathematics teachers must attain their teacher certification through either a traditional certification program or an alternative certification program. By definition, teachers choosing to receive their teacher certification through traditional means will prepare for their education starting in undergraduate university programs and continue through their graduate school programs with the goal of having a strong liberal arts and science background along with a knowledge of professional education and field experience (Zumwalt & Craig, 2005). According to Adelman (1986), an alternative certification program is "Any program (run by either a college, university, a state education department, a school district, or a private organization) which enrolls non-

certified, post-baccalaureate individuals and offers short-cuts, special assistance or unique curricula leading to eligibility for standard teaching certification" (Adelman, 1986). The difficulty this poses is that no uniformity exists among alternative certification programs; the programs run independently of each other and can have different goals and ideals and different methodologies to achieve these goals and ideals. For example, some alternative certification programs were developed in response to teacher shortages so that potential teachers could be recruited from other fields. Even unqualified teachers could obtain certification, whereas other alternative certification programs were developed to improve the quality of teachers by using a different curriculum for their teacher education courses (Zumwalt & Craig, 2005).

Not only do the curricula for these certification programs differ, they offer different beginning teaching experiences. Since many alternative certification programs are designed to fill a shortage of teachers, many of these programs are aimed at filling teaching positions in urban school districts. According to Huling-Austen (1986), teachers graduating from a traditional certification program were more likely to teach in desirable and attractive situations – schools with proven track records - whereas teachers graduating from alternative certification programs were more likely to teach in challenging and less desirable urban schools (Huling-Austen, 1986). However, it was also noted that teachers from alternative certification programs favored and were initially more open to teaching in this particular type of urban school district.

When comparing the differences between the two types of programs, one statistic to note is the retention rate of beginning teachers. The National Commission on Teaching and America's Future (2002) has estimated that one third of beginning teachers leave the

profession during the first three years of teaching while half of the teacher population leaves within the first five years (National Commission on Teaching and America's Future State Partners, 2002). However, retention rates for beginning mathematics teachers paint a similarly somber picture: first year mathematics teachers from a traditional certification program have a retention rate of 80% while those from an alternative certification program have a retention rate of 60% (Zumwalt & Craig, 2005). This may be attributed to the fact that traditionally certified teachers are placed in less difficult settings whereas teachers who participate in alternative certification programs may not have the support they need to succeed.

Regardless of the differences between traditional and alternative certification programs, the goals of these programs are essentially identical: to produce qualified teachers to improve student achievement. One comparison (from an alternative and a traditional program in the same region) illustrates this point:

> (1) The goal of the Los Angeles Unified School District Intern Program is "to prepare urban public teachers to effectively educate all students so that each contributes to and benefits from our diverse society" (Lewis, 2004).
>
> (2) The goal of the California State University Northridge School of Education is to "Provide exemplary professional education programs that prepare highly qualified educators to meet the challenges of urban education in a changing society" (Eisner, 2007).

The methods used by teacher certification programs to achieve their goals might differ. The National Council of Teachers of Mathematics (NCTM) has put together a set of standards necessary for effective mathematics teaching (The National Council of Teachers of Mathematics on Teaching Standards for School Mathematics, 1991). This

study will use the standards provided by NCTM as the driving force behind the research instruments and data analysis. Wilson, Cooney, and Stinson (2005) discovered that teachers' perspectives on good mathematics teaching were consistent with NCTM standards and their methods of teaching mathematics were similar to the methods recommended in the standards. Today, because many researchers and studies suggest that the NCTM Standards represent good mathematics teaching, there is an "implicit agreement" that the NCTM Standards represent good mathematics teaching (Perrin-Glorian, Deblois, & Robert, 2008).

The standards set by NCTM are divided into five categories are as follows: (1) worthwhile mathematical tasks, (2) teacher and student's role in discourse, (3) tools for enhancing discourse, (4) learning environment, and (5) analysis of teaching and learning (The National Council of Teachers of Mathematics on Teaching Standards for School Mathematics, 1991). The actual categories provided by NCTM place the teachers' role in discourse and the students' role in discourse into two separate categories, but for this study these two categories have been combined into one. These standards were developed not as an instructional guide for teaching mathematics, but rather as a tool for mathematics teachers to help guide processes of mathematical reasoning, problem solving, communications, and connections within mathematics.

III. Worthwhile Mathematical Tasks

Tasks are generally defined as the problems, exercises, questions, projects, and constructions used in the classroom that aid in the growth of a student's mathematical knowledge. However, to use tasks effectively, NCTM proposes using worthwhile

mathematical tasks that "do not separate mathematical thinking from mathematical concepts or skills, that capture students' curiosity, and that invite them to speculate and to pursue their hunches" (The National Council of Teachers of Mathematics on Teaching Standards for School Mathematics, 1991). Tanner describes the value in using these types of tasks by noting that teachers who teach using "drill and practice" methods without applications will result only in the memorization of facts without understanding. Memorized facts come at the expense of "adaptability to new tasks" which occurs in real life problem solving situations (Tanner & Jones, 2000). The traditional "drill and practice" tasks are considered low-level activities and do not provide an intellectual challenge or an understanding of the mathematics. Concentrating on such low-level tasks takes time away from "high level thinking such as reasoning and problem solving" (Silver, 1998). Bloom also identifies memorized facts as belonging to the knowledge category in his taxonomy, the lowest category in his hierarchy of cognitive tasks (Bloom, 1956). If the goal of teachers is to educate students to become thinkers, mathematics teachers must move beyond the traditional style of memorizing facts and algorithms to a style that incorporates the use of worthwhile mathematical tasks to encourage thinking (Buschman, 2004).

Tanner (2000) touches upon two different uses of worthwhile mathematical tasks: real life situations and problem solving. A common way of making a task worthwhile is to infuse mathematics into real world situations that "arouse the curiosity of students, challenge them to solve problems, and invite them to explore and create new mathematics concepts," and therefore emphasize connections between mathematics and the real world (Clarke, 2003). By showing students how mathematics influences the world, students

learn that mathematics is not a subject devoted to memorization but rather a subject that can explain how processes in the world operate.

> At every stage, mathematics is required to solve real problems. Indeed common existence is impossible without the application of mathematics. Whether it is obtaining a mortgage loan, purchasing annuities, constructing bridges or houses, orbiting in space, communicating across national boundaries on the internet, or playing the lottery, a knowledge of mathematics enables one to operate effectively. (Clarke, 2003)

However, as useful as incorportating real word problems is, overemphasizing such problems can lead to important concepts being left out, so teachers must choose when or how to use real world situations wisely (Ball, Ferrini-Mundy, Kilpatrick, Milgram, Schmid, & Schaar, 2005). In a survey among mathematics teachers, many of the participants noted the importance of problem solving using open-ended and unfamiliar questions in the classroom (Anderson, White & Sullivan, 2005). By using tasks effectively, teachers are following Polya's advice and are teaching students how to think and analyze problems using problem solving techniques rather than memorizing methods and algorithms. According to Polya, the goal of education is to teach students how to think and by having students solve problems without any guidance or having students solve problems with too much guidance will not help achieve the goal (Polya, 1945). Agreeing with Polya's stance on problem solving, Schoenfeld offers his own heuristics for problem solving: drawing a model or diagram of the problem, recalling or solving related problems that can lead to insight on how to solve the problem, working backwards to solve the problem, or trying different methods but verifying if the methods produce a probable solution (Schoenfeld, 1985).

How do teachers develop worthwhile mathematical tasks? Researchers have found that beginning teachers have a difficult time differentiating between individual lessons and individual tasks. They chose certain tasks without fully understanding the learning processes occurring throughout the lesson and chose these particular tasks because they gave students entertaining mathematics problems, quiet or busy work, materials to use for classroom discussions, or a practical activity (Watson & Sullivan, 2008). Beginning teachers have been able to duplicate activities they have been exposed to in student teaching or in their methods courses, but have had a difficult time devising their own original tasks in the classroom (Wilson, Cooney, & Stinson, 2005).

Teachers have a difficult time creating their own tasks because of the depth and understanding behind making a worthwhile task; it is much easier teaching procedures and algorithms than the understanding of why such procedures are needed. According to Vinner, "it is much easier to teach the procedure of solving a quadratic equation than to explain the meaning of a solution to any given equation in general" (Vinner, 2008). A way for beginning teachers to understand the development of worthwhile mathematical tasks is to observe experienced teachers and to practice developing their own lessons. With the development of the internet, many lesson plans and individual tasks and activities have been posted online where teachers can search for them and try to emulate or modify them for use in their own classrooms. Working together with colleagues and mentors will also expose beginning teachers to different types of mathematical tasks since part of the role of being a colleague and a mentor is to support beginning teachers as they develop their own teaching styles (Tanner & Jones, 2000). Aside from being exposed to different mathematical tasks, beginning teachers can learn by "discussing

teaching with colleagues, observing other teachers, collaborating, and listening to the wisdom of other teachers" (Wilson, Cooney, & Stinson, 2005).

To develop worthwhile mathematical tasks, mathematics teachers must also have a good grasp of the subject content knowledge. Teachers who felt competent in the subject matter were more likely to be comfortable using a constructivist approach to teaching problem solving (Forgasz & Leder, 2008). Mastery of subject content matter can positively predict gains in student achievement, but the actual nature or extent of mathematical knowledge necessary for subject content matter is unknown. Beginning teachers saw no connection between their undergraduate mathematics courses and the mathematics courses they were expected to teach, but by experiencing advanced mathematics they gained the confidence in their ability to understand the mathematics and to be able to answer their students' questions (Oliveira & Hannula, 2008). According to Wilson, Cooney and Stinson (2005), subject content knowledge is necessary to teach mathematics for understanding rather than memorization, to make connections between the different lessons and units and also between the individual tasks within a lesson, and to understand and be able to answer students' questions or explain misconceptions.

IV. Teachers' and Students' Role in Discourse

NCTM refers to "discourse" as "the ways of representing, thinking, talking, and agreeing and disagreeing" used in classroom discussions in conjunction with mathematical tasks between teachers and students. Teachers and students have different roles in the discourse of a classroom and NCTM separates these roles, but in this study the two

categories have been combined into a single category since this study focuses primarily on the teachers as opposed to the students. In a study by Schoenfeld, the drawbacks of teaching using only the traditional method of lectures and "drill and kill" exercises revealed that students developed limited mathematical thinking useful only in solving similar textbook exercises (Schoenfeld, 1985). For many teachers, mathematics is considered an "authoritarian discipline" (Szydlik, Szydlik, & Benson, 2003) where "practice" implies "doing several examples" (Watson & Sullivan, 2008) and applying memorized algorithms taught by the teacher. According to Clarke, every lesson should include activities where students use their minds, hands, and resources and questioning to direct discussions (Clarke, 2003). Good mathematics teachers consider the needs of both the individuals and the entire class when planning teaching methods by continuously assessing student work and reflecting on self-teaching practices and making the appropriate modifications or accommodations to achieve students' learning outcomes. Effective mathematics teachers use questions continually to assess both their lessons and the students, but learning how to use questions effectively is a subtle skill that takes practice (Tanner & Jones, 2000).

In addition to using questions appropriately in the classroom, a teacher must be able to lead and direct discussions. Discussions are crucial in achieving student learning outcomes and can be used as assessment tools in the discourse. According to Schoenfeld and Kilpatrick (2008), "The teacher's work in establishing and maintaining the nature of a discourse community cannot be underestimated … at first glance Ball's role as a teacher may not seem very great. A close look at her interventions, however, shows that she is carefully orchestrating the class's contributions and making sure that the

discussions remain productive and respectful." Teachers must guide and lead the activities and discussion in the mathematics classroom but they must also be wary of the students and take them into consideration (Hiebert & Carpenter, 1997). It is difficult for beginning teachers to develop the dialogue necessary to lead discussions effectively because teachers must take student involvement into consideration; leading a discussion within the classroom would mean sharing some of the teacher's authority with the students and also being open to and incorporating student ideas within the discussion (Blanton, 2002).

Teachers, especially in urban districts with more diverse demographics, need to be aware of the cultural analysis of the content and add it to the pedagogical content knowledge necessary for effective teaching. By including the cultural analysis of the content, teachers become aware of the different needs of their students and the historical, social, and cultural implications in mathematics. When using real world problems in the classroom, teachers should include problems within a cultural context because "mathematical ideas have been and are used in all cultures" (Averill, Anderson, Easton, Te Maro, Smith, & Hynds, 2009). Boero and Guala (2008) believe cultural analysis of content to be one the most important aspects of teacher education, yet the literature provides insufficient information about how to teach cultural analysis of content and, as a result, is often not included within the mathematics education curriculum of pedagogical content knowledge or subject matter knowledge, resulting in teachers having no formal training for implementation (Boero & Guala, 2008).

Not only are the teachers' active roles in the classroom necessary for effective mathematics teaching, but teacher beliefs play a role in the classroom as well. A link

between teachers' beliefs and students' learning has been identified, suggesting that more research is necessary if researchers are to understand the role of beliefs in influencing student learning (Wilson and Cooney, 2002). Teachers' beliefs dictate how mathematics students are taught and how knowledge is imparted to students. Early research hypothesized that improving beliefs and mathematical content knowledge would lead to an improvement in teaching practice, but it was found that changing teachers' beliefs did not necessarily bring about a change in teaching practice (Perrin-Glorian, Deblois, & Robert, 2008). Chavout discovered that even though teachers embraced a constructivist model of teaching, their dominant beliefs and teaching practices remained traditional (Chavout, 2000), which suggests conflict and discrepancies between teachers' beliefs and actual teaching practices within the classroom (Ensor, 2001).

Certainly there are teachers whose beliefs are not aligned with the reform movement of mathematics education. Beswick found that many teachers did not believe in the problem solving nature of mathematics and their teaching practices remained traditional (Beswick, 2005). The conflict between traditional versus constructivist teaching methods continues, but according to recent research, as well as NCTM's standards, teaching mathematics is shifting towards a constructivist curriculum. However, this does not mean that memorization and mathematical algorithms are unnecessary; rather they must be balanced with other types of instruction.

> Mathematics instruction needs to be balanced. Students certainly need calculation and symbolic-manipulation skills that go beyond the merely mechanical. They must understand concepts sufficiently well to be able to handle new situations flexibly and confidently, to be able to recognize where mathematics can be applied to problems and to devise strategies (Evers & Milgram, 2004).

For teachers to become effective mathematics teachers, their beliefs should include some constructivist views, and these beliefs should be evident in their teaching practices as well.

Hamachek identifies four areas on which to focus if good mathematics teaching is the goal: personal characteristics, teaching style, perceptions of self, and perceptions of others. Students were asked to rank a list of teacher characteristics they felt contributed towards success in their mathematics classroom. "Good personal style in communicating" was one of the top choices. A good personal style in communicating meant being: "a clear and good communicator, [having] a sense of humor, self-confidence, an optimistic outlook, a high opinion of students, but also [being] able to be firm and fair when necessary" (Hamachek, 1971).

> Effective teachers appear to be those who are "human" in the fullest sense of the word. They have a sense of humor, are fair, empathetic, more democratic than autocratic, and apparently are more able to relate easily and naturally to students on either a one-to-one or group basis. Their classrooms seem to reflect miniature enterprise operations in the sense that they are more open, spontaneous, and adaptable to change (Hamacheck, 1971).

The importance of communication between teachers and students is stressed because as students move from elementary and middle school to high school, the amount of time students spend with their teachers decreases (Schoenfeld & Kilpatrick, 2008). This decrease in personal time with students emphasizes the need of teachers' communication skills in developing relationships with their students. In a mathematics classroom, teachers must pay attention to building personal relationships with students and use these relationships in holding discourses within the classroom (Franke, Khazemi, & Battey,

2007), and a good communicator can act as a stimulator, a questioner, a challenger, and a puzzler (Hamachek, 1971).

Developing a teacher's role in the classroom requires careful planning and implementation of teaching practices, but is also dependent on student learning. Research has shown that beginning teachers go into their teaching careers wanting to use a reform-oriented or constructivist method of teaching, but do not have the experience or skills necessary to implement their ideas. Part of the problem stems from the fact that upon entering the classroom, beginning teachers encounter students who do not meet their ideals and thereby cause a conflict. To become successful in teaching mathematics, not only do teachers have to be able to teach mathematics well, but they also have to prioritize their students' learning needs (Skott, 2001). It is critical to understand the process of student thinking and to develop knowledge of the process. Teachers have to be able to "build on student ideas, address students' misconceptions and mistakes, engage students in mathematics learning, and promote students' thinking about mathematics" (An, Kulm, & Wu, 2004). For teachers to be effective in the classroom, they must take their students' knowledge into consideration when planning lessons and activities.

Lesson planning plays an integral role in the classroom, and it is the teacher's duty to present lessons that are engaging and thought provoking for all students. Preparing a thorough lesson plan will allow beginning teachers to outline their thoughts and ideas about what they want to teach and the learning goals for their students. Most beginning teachers try to emulate lesson plans from mentors and colleagues, copying and modifying the lesson plans as they see fit. Teachers can also use their mentors and colleagues for constructive criticism and feedback on their lesson plans. As these teachers gain more

experience in the classroom and develop their own teaching styles, their lesson plans should begin to reflect the individual teacher and his or her students (Tanner & Jones, 2000). In a study of teacher lesson plans, the teachers who designed their own lesson plans were more successful because of two specific factors: the amount of time spent preparing the lesson and the preparation necessary to implement the lesson (Stein & Bovalino, 2001).

V. Tools for Discourse

Mathematics teachers must use a variety of tools to communicate with their students and to build understanding. NCTM identifies technology (computers, calculators, etc.), hands-on manipulatives, visual cues, stories, and oral presentations as classroom tools to aid in the comprehension of mathematics.

Since the 1990s, technology has played an important role in the mathematics curriculum: "Technology makes an additional topic in mathematics less important, others more important, and new topics possible (Heutinch & Munshin, 2000). As the line between mathematics and applied mathematics blur, technology can be used as an exploratory tool to manipulate and investigate mathematics. The new technologies can reform mathematics education by providing new curricula and challenging the norms set by traditional standards (Noss, 2002). Researchers have discovered that technology used in the curriculum as an exploratory tool can be effective in the mathematics classroom when used to acquire, evaluate, and analyze data, to model natural and social science phenomena, and to deepen and broaden understanding of mathematics by permitting the use of different representations (Schartz, 1999). According to Moses,

> Those who are technologically literate will have access to jobs and economic enfranchisement, while those without such skills will not. 60% of new jobs will require skills possessed by only 22% of the young people entering the job market now. These jobs require the use of a computer and pay about 15% more than jobs that do not… 70% of all jobs require technology literacy; by the year 2010 all jobs will require significant technical skills (Moses, 2001).

The use of technology in the classroom has a role not only in shaping mathematics, but also in preparing students for the future; as technology advances, the more students are aware of those technologies, the more they are able to adapt to them. However, the use of calculators and computers has been debated throughout the years; are they merely being used to simplify the processes of mathematics or are they being used to help develop an understanding of mathematical concepts? The use of calculators and computers must be regulated and used to enhance the understanding of mathematics as opposed to hindering the computation of basic mathematics skills and algorithmic procedures (Ball, Ferrini-Mundy, Kilpatrick, Milgram, Schmid, & Schaar, 2005).

Not only can computers and calculators be used to visualize mathematics, but hands-on manipulatives and visual cues also allow students to approach mathematics using both visual and tactile learning strategies (Wilson, Cooney, & Stinson, 2005). Berkas and Pattison's study originally dealt with special education mathematics students and the use of manipulatives for increasing student achievement but it was discovered that these tools benefited students within a regular mathematics classroom as well. To maximize the impact of manipulatives, they should be combined with "(1) virtual manipulatives software, (2) reflective practices, (3) cooperative learning, and (4) learning activities that are exploratory and deductive in approach" (Berkas & Pattison, 2007).

VI. Learning Environment

Ideally, in a mathematics classroom, the learning environment plays an integral role in learning outcomes by providing a safe and controlled environment for students to learn and discuss mathematics. The classroom itself should be conducive for learning and have a positive atmosphere by being clean and organized (Graeber & Tirosh, 2008), having walls decorated with posters and student work, and arranging seats for easy access to individual work, pair share, or cooperative learning.

One aspect of the learning environment that needs careful consideration is classroom management, especially for beginning teachers. According to Tanner, effective teaching and learning relies on classroom management and a disciplined classroom (Tanner & Jones, 2000). Research has shown that prospective teachers emphasize working with classroom management as opposed to subject matter, since classroom management tends to cause more problems than the subject matter (Oliveira & Hannula, 2008). If a mathematics classroom were undiscplined with management problems, teachers would have a difficult time implementing their teaching practices because of the behavior problems posed by students. Discipline problems are prevalent in challenging urban school districts, resulting in beginning teachers spending more time working with discipline problems than with the actual lesson and teaching. To become an effective mathematics teacher, a balance must be struck between classroom management and the mathematics activity or lesson, as these cannot exist without the other. Tanner and Jones (2000) offer advice for beginning teachers in establishing good management practices at the beginning of the school year: first impressions are important so it is necessary to make it a positive one, establish authority and rules in the classroom but be fair with

those rules, establish an organized routine in the classroom, and create a positive learning environment. For an effective mathematics lesson, teachers must balance use of their subject matter content, their pedagogical content knowledge, and effective classroom management (Tanner & Jones, 2000).

Teachers need to promote a culture of learning and seek active participation from their students. The classroom has to be one where students are allowed to have a voice, being able to share their ideas and opinions without fear from both teachers and their peers. However, not all students are inclined to speak up in the classroom, so teachers need to encourage certain students. Having students work in cooperative groups allows them to have a voice within their small groups where ideas can be expressed in a safe, and controlled environment. As their self-confidence builds, students will begin to participate in classroom discussions (Tanner & Jones, 2000). Using differentiated strategies, teachers can promote an interactive classroom where the students have a role in their learning.

VII. Analysis of Teaching and Learning

The last category of NCTM standards is "analysis of teaching and learning." A part of anaylzing teaching requires a reflection on teacher lessons to ensure that student learning outcomes are being achieved. By constantly assessing student learning outcomes, teachers can make modifications to their instruction to ensure that all students are learning. Teachers can make use of action research, seen as the "cyclical process of planning, action, and evaluation leading to further planning, action, and evaluation" (Benke, Hospesova, & Ticha, 2008), as a tool for reflection. Using action research,

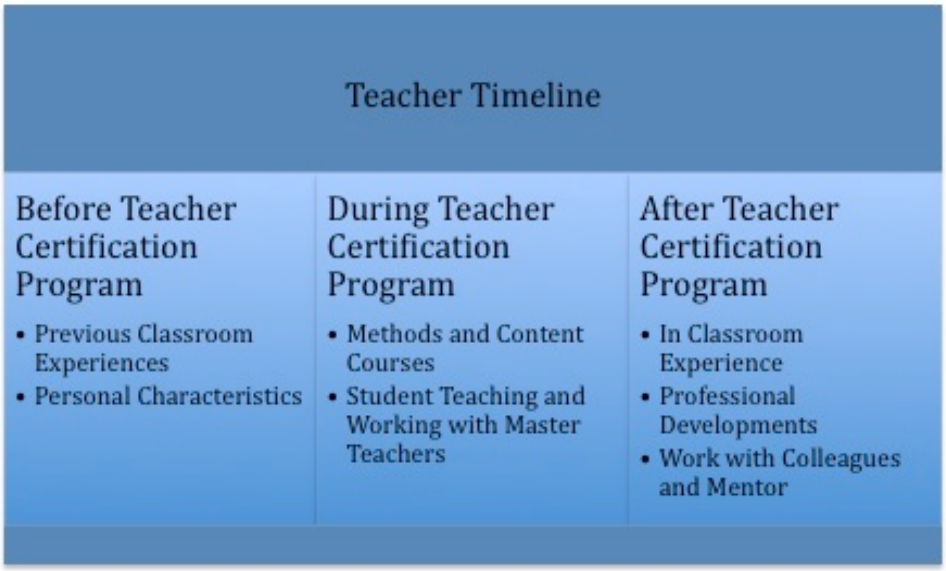
teachers are constantly reflecting on their own teaching practices, and encouraging their own professional growth. Teachers can reflect on their practices at different levels: at a local level where teachers can reflect on their current classes and students and how to improve their lessons, or at a global level where teachers can reflect on the overall purpose and ideas behind their lessons (Schoenfeld & Kilpatrick, 2008). However, beginning teachers have difficulty reflecting on their own teaching practices and when they do, they tend to focus on reflections at a local level. Oliveira and Hannula (2008) not only agree with the fact that beginning teachers have a difficult time reflecting, but also note that beginning teachers have an even more difficult time taking action with their reflective practices by being flexible and making the appropriate modications to their teaching practices (Oliveira & Hannula, 2008). Reflection is something that cannot be taught, but is, rather, gained through experience and practice within the classroom setting. The process of developing and implementing ideas as teaching practices and examining student assessment initiates the teacher as a reflective practioner (Haggarty, 2002). Effectively using reflection will result in a "Progressive transformation of mathematic teachers' actual practice in relationship to their individual and professional experience, their knowledge and their beliefs or conceptions about mathematics and mathematics teaching" (Perrin-Glorian, Deblois, & Robert, 2008).

VIII. Stages of Teacher Development

Literature on mathematics teaching points to three periods which contribute to the growth and development of mathematics teachers: the period during which teachers themselves grow up, participating in their mathematics classes and observing their mathematics teachers, the period when teachers enroll in their teacher certification programs to learn

and become mathematics teachers through educational courses and beginning fieldwork, and the period after they graduate from their teacher certification programs and enter their own classroom. A brief comparison among the three stages of teacher development can be seen in Table 1.

Table 1. Stages of Teacher Development



Teachers' early experiences in their own mathematics classrooms can have profound effects on their teaching practices (Perrin-Glorian, Deblois, & Robert, 2008). Linares and Krainer's research supports the importance of teachers' own experiences by emphasizing the relationship between teachers' early educational experiences and their beliefs (Llinares & Krainer, 2006). Even in the context of a reform oriented movement, teachers tended to use traditional methods of teaching because of their own classroom experiences in a traditional learning environment (Tanner & Jones, 2000). Not only do early experiences in the classroom influence teaching, but personal characteristics have an

impact as well. As previously seen, teachers' communication style and personal characteristics have a profound effect on student achievement.

Enrolling in a teacher certification program initiates the process of becoming an effective mathematics teacher. To gain admission into a mathematics education program, prospective teachers must have a strong background in undergraduate mathematics, ensuring that they have an understanding of subject matter knowledge. Preparation from a teacher certification program is the "strongest predictor of teacher efficacy" (Darling-Hammond, Chung, & Frelow, 2002). The curricula provided by teacher education programs introduce methods courses that include the four components of pedagogical content knowledge: students' understanding, subject matter, media and tools for instruction, and instructional processes. The methods courses are important because they introduce the combination of subject content and pedagogy (Graeber & Tirosh, 2008) and methods courses that specialize in mathematics teaching and learning introduce modern constructivist views of mathematics education.

> The first significant rupture identified in the development of these beginning teachers' identities occurred during their teacher education program. All of them recognized that the course on the didactics of mathematics contributed strongly to a change in perspectives about teaching and learning mathematics and the mathematics teacher's role. For example, they stressed the importance of promoting student-centered teaching methodologies and the use of several strategies and resources, in contrast to the teaching style they were used to when they were secondary students (Oliveira & Hannula, 2008).

Education methods courses impart education theory and are an integral part of teacher education, but another important component of teacher certification programs is the fieldwork necessary to make the transition from theory to practice.

Student teaching affords prospective teachers working relationships within the communities formed with other prospective teachers and working relationships with master teachers in student teaching. The master teacher and student teaching support prospective teachers and give them an opportunity to practice mathematics teaching in a controlled classroom environment where they can receive feedback on their teaching practices (Tanner & Jones, 2000). The master teacher also acts a role model whom the prospective teachers can emulate in both teaching practices and effective classroom management. Student teaching also allows prospective teachers to challenge their previous conceptions of mathematics teaching and implement new ideas and teaching practices gained from their methods courses within a controlled classroom environment (Haggarty, 2002).

Teacher education can provide much help to the prospective teacher, but some aspects of mathematics teaching can be learned only through actual classroom experience (Graeber & Tirosh, 2008). Concurring is Lortie, who states that teachers should be "learning by doing rather than formal training" (Lortie, 1975). Wilson, Cooney, and Stinson (2005) reported that classroom experience was a "great teacher of pedagogy and pedagogical knowledge of mathematics" and that the classroom experience led to good teaching practices because of the ability to implement new ideas and reflect upon those practices (Wilson, Cooney, & Stinson, 2005). Also, beginning teachers encountered problems that were never addressed in their teacher education programs so they had to discover their own solutions or work together with their colleagues to solve the problems (Veeman, 1984). Studies have seen the importance of collaborating with colleagues in areas such

as teaching practices, classroom management, and other problems that arise in the mathematics classroom (Perrin-Glorian, Deblois, & Robert, 2008).

Chapter 3

Research Methodology

I. Introduction

This chapter elaborates on the study's methodology. Following a review of the research questions and an outline of the study's basic design is a detailed discussion of the research subjects and data collection instruments. The final section discusses the procedures used to analyze the data.

II. Research Questions

A teacher's beginning years are typically the most difficult (Wilson, Cooney, & Stinson, 2005). This study will focus on a teacher's beginning years in the classroom, examining beginning teachers' characteristics and their beliefs about what is required to be successful in the classroom. The research questions are as follows:

1) How do beginning mathematics teachers define success in regard to their first year of teaching?

2) To what factors, attributes, or experiences do beginning mathematics teachers attribute their success in the beginning years of teaching?

3) When and where do these beginning mathematics teachers believe they acquired and developed the factors or attributes identified in question 2?

III. Mixed – Methods Research Design

To answer the research questions questions, the study uses a mixed-methods design that combines both quantitative and qualitative research designs. According to Chatterji

(2010), "Mixed-method tools allow for more flexible evaluation design options, with a possibility of combining evidence in various ways, as dictated by the purposes of an investigation and object of inquiry … Causal inferences would be best made with one of the experimental (quantitative) designs that apply to the object of inquiry, scaffolded with descriptive and qualitative methods (Chatterji, 2010)." The quantitative data resulted from a non-experimental design, in the form of a survey, used to examine how teachers define success and the factors or attributes necessary to achieve that success using a non-random sample, while the qualitative data were gathered through semi-structured interviews.

IV. Sample

Background of the Alternative Certification Program

The sample for this study came from a single alternative certification program in California. All the participants, upon graduating from the program, received a Preliminary Single Subject Credential in Mathematics. The researcher is knowledgeable about the alternative certification program, having graduated from the program in 2005. The curriculum of the program is set forth in Table 2 (www.teachinla.com/cert/di_single.html).

Table 2: Curriculum of Alternative Certification Program

Courses (over an 18 month period)
Pre-Service Teacher Training
Classroom Organization and Management
Foundations of Education (online)
Curriculum and Methods of Teaching English Language Development
Curriculum and Methods of Teaching Math

Courses (over an 18 month period)
Voices of Diversity
Methods of Teaching and Learning in a Multicultural Society
Integrated Standards and Assessment in Mathematics
Advance Classroom Management
Portfolio Development: Construction, Reflection and Assessment
Practice in Teaching Skills: Networking One-on-One
Cultural Community Connection
California Teaching Performance Assessment
Formative Assessment for California Teachers

The program begins with an intensive three-week pre-service period of teacher training where teachers are exposed to introductory education theory, teaching methods for the classroom, lesson planning, and field experience. The field experience, a combination of observations and student teaching, varies from teacher to teacher depending on the observed school and master teacher. At the conclusion of the pre-service teacher training, teachers enter their own classroom while concurrently attending weekly night courses over an 18 month period to satisfy the hourly requirements necessary for attaining a teaching credential.

Most alternative certification programs prepare teachers to teach in high-needs areas, especially urban school districts (National Commission on Teaching and America's Future State Partners, 2002). The alternative certification program under discussion is run by one of the largest school districts in the nation. A majority of the schools in the district are classified as Title I schools, reflecting the urban nature of the district. The district's most recent demographic data categorize students as follows: 6.7% Asian, 10.9% African American, 73.7% Hispanic and 8.7% White (Planning, Assessment, and Research Division, 2008-2009). The prospective sample for this study consisted of

recent graduates of the alternative certification program from the Class of 2006, 2007 and 2008. Since this study focused solely on beginning mathematics teachers, only teachers who were relatively new to the profession with one to three years of classroom experience were considered.

Sample and Subsamples

The sample was selected with the assistance of the administrators for the program. To provide privacy for their graduates, administrators made the initial contact. The administrators were provided with a brief synopsis of the study to aid in recruiting teachers. If the graduates were interested in participating in the study, they contacted the researcher. A group of 35 teachers made initial contact and 28 of those decided to participate.

After gathering the sample, the original sample was partitioned into two groups. One of these groups consisted of teachers identified as "successful" based upon on the following criteria: recommendations from administrators within their alternative certification program and their colleagues, mentors, and coaches, their grade point average from undergraduate mathematics courses, and previous leadership positions held. This subsample is now referred to as the "selected" subsample. The remaining teachers participants constituted a second subsample, now referred to as the "non-selected" subsample.

Selection Criteria for the "Selected" Subsample

Three criteria were used in identifying teachers to be placed in the "selected" subsample and each criterion addresses a different component of teaching mathematics. The administrators and teachers from the teacher education program are all current or former teachers selected by the district to help train future teachers because of their expertise and experience in the classroom so the study relied on the expertise of these administrators from both the teacher education program and schools to identify "successful" teachers in the classroom based upon their observations and evaluations. A component of the alternative certification program required administrators from the program, school administrators, master teachers, and mathematics coaches to continually observe, assess, and offer feedback teachers throughout the 18-month process. The recommendations of these individuals were deemed to be accurate assessments of a teacher's pedagogical content knowledge and classroom management skills.

Each teacher's undergraduate mathematics grade point average was utilized as a criterion. Because of the known positive correlation between successful mathematics teaching and mastery of the content knowledge, grade point average in undergraduate mathematics courses was chosen as representative of the participants' mastery of content knowledge. Many studies have demonstrated that a teacher's mathematical content knowledge helps support student achievement and that the mathematical content knowledge also predicts student achievement gains (Ball, Bass, & and Hill, 2005).

Leadership experience was also taken into consideration. Successful teachers should have the ability to lead and direct a classroom and prior leadership experience was chosen

as representative of a teacher's ability to lead a classroom. For these reasons, these three criteria were used in selecting teachers to be further studied.

The rubric in Table 3 was used to identify participants in the "selected" subsample.

Table 3: Rubric for identifying "selected" subsample

Criterion	Ratings	Points Possible
Undergraduate Mathematics Grade Point Average	3.5 – 4.0	20 points
	3.0 – 3.5	15 points
	2.5 – 3.0	10 points
	2.0 – 2.5	5 points
	0 – 2.0	0 points
Recommendations	Highly recommended	30 points
	Recommended	20 points
Leadership Experience	Leadership Position - Yes	10 points
	Leadership Position - No	0 points
	Leadership Experience – Strongly	10 points
	Leadership Experience - Agree	5 points
TOTAL POSSIBLE		**70 points**

The cutoff score for participation was 45 points, chosen to ensure that participants received points from all three criteria; a participant's mathematics grade point average should not be too low, a recommendation must be mandatory, and a participant must have some previous leadership experience. The accumulated points for the potential interviewed teachers can be seen in Table 4.

Table 4: Participant's Point Value on Selection Rubric

Criterion	Rating	1	2	3	4	5	6	7	8	9	10
Undergraduate Mathematics G.P.A.	3.5 – 4.0										X
	3.0 – 3.5	X		X	X		X				
	2.5 – 3.0		X			X		X	X		
	2.0 – 2.5									X	
	0 – 2.0										
Recommendations	Highly recommended	X	X	X	X		X				
	Recommended					X		X	X	X	
Leadership	Position – Yes	X	X			X					
	Position - No			X	X		X	X	X	X	X
	Experience – Strongly Agree		X	X		X					
	Experience - Agree	X			X		X	X			X
TOTAL POINTS		60	60	55	50	50	50	45	30	25	25

From a list of 10 potential teachers to be included in the "selected" subsample, seven were selected based on these criteria. Of the three that were not selected, one potential teacher exhibited no prior leadership experience, while the second potential teacher exhibited no prior leadership skills combined with a very low undergraduate mathematics grade point average. Also, the third potential teacher had the highest undergraduate mathematics grade point average, but administrators did not recommend him as "successful" because of his lack of classroom management. These three were then placed into the "non-selected" subsample.

Demographics

Of the 35 teachers contacted, 28 (80%) chose to participate in the research. The 28 graduates all took the online survey. Application of the selection rubric seen in Table 4

identified seven teachers to be placed in the "selected" subsample, with the remaining 21 teachers to be placed in the "non-selected" subsample. To encourage participation in the research, all the participants were compensated for their time by inclusion in a raffle for four $50 gift cards, and those selected for an additional interview were compensated with an additional $50 gift card.

Twenty-one males and seven females were included in the study; the "selected" subsample consisted of six males and one female. This statistic differs from that of the general secondary teacher population; 45% of all secondary teachers are male (U.S. Bureau of Labor Statistics, 2009). In this study 75% of the secondary mathematics teachers were male and of those interviewed, 87.5% were male.

Educational Environment

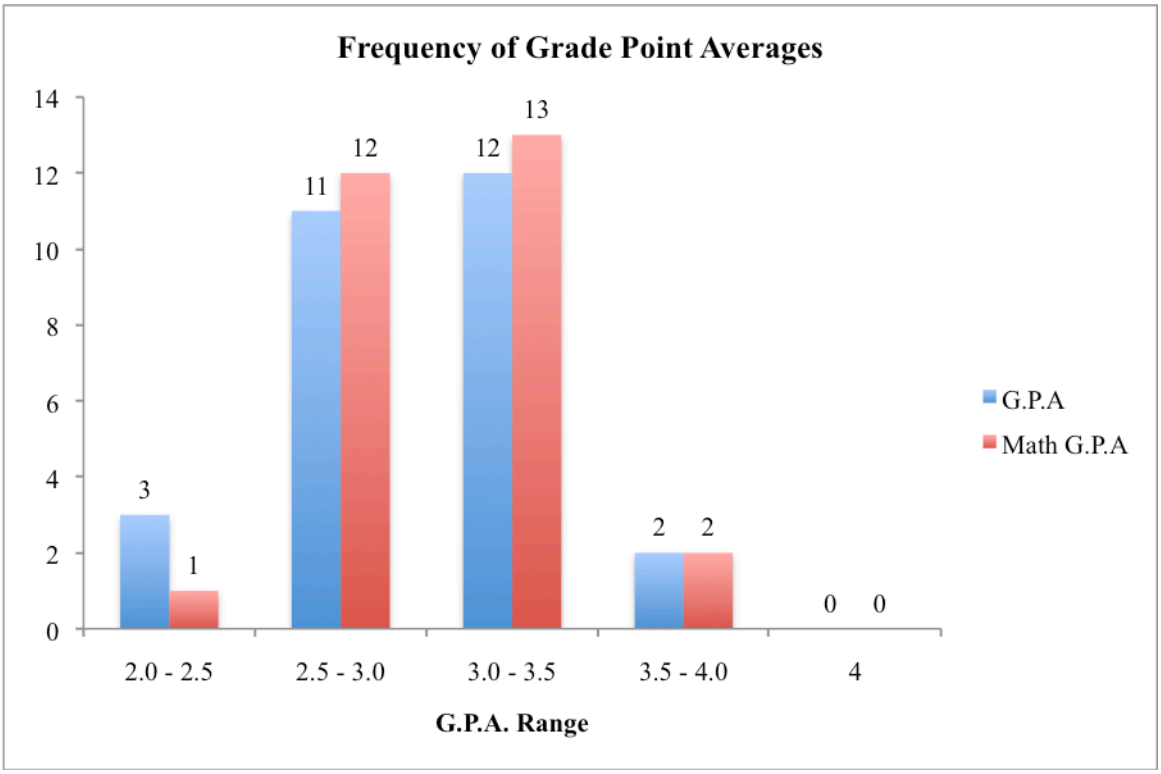
A general characteristic of alternative certification programs is that their graduates tend to teach in low performing or urban schools. All of the participants in this study were graduates of a district-run alternative certification program, one of whose requirements is that the graduates must teach at a school within the district for five years . Twenty of the 28 teachers worked at a Program Improvement Year 5 Status school (PI5 Status). According to the California Department of Education, "A Title I school will be identified for PI (Program Improvement) when, for each of two consecutive years, the Title I school does not make AYP (Adequate Yearly Progress) in the same content area (English-language arts or mathematics) *schoolwide or for any numerically significant subgroup*, or on the same indicator (Academic Performance Index [API] or high school graduation rate) schoolwide (PI Accountability Team, 2009)." Four of the remaining eight teachers

worked at a PI3 school, only because the schools they were working at were relatively new; one school had been open only for four years, while the other school had been open only for three years. Based on these numbers, 24 of the 28 teachers surveyed worked in a Title 1 school considered to be low performing.

Mathematics Content Knowledge

On the quantitative survey, participants were asked to provide measures of academic success by providing their overall undergraduate grade point average (G.P.A.) and their G.P.A. for undergraduate mathematics courses. The average G.P.A. for the entire sample was in the 2.5 – 3.0 range, while the average undergraduate mathematics G.P.A. was also in the 2.5 – 3.0 range. Table 5 shows the distribution of overall G.P.A. and the undergraduate mathematics G.P.A.

Table 5. Grade Point Average Distribution (n = 28)



The G.P.A. in mathematics courses was used in lieu of specific indicators of content knowledge that could not be administered individually. As reported previously, undergraduate mathematics G.P.A. was a criterion used in selecting the seven partipants to be included in the "selected" subsample from the original sample size of 28. However, for two reasons, the researcher decided that more emphasis should be placed on the recommendations than from the G.P.A.

Originally, the reseracher wanted to select only participant's with a high undergradaute mathematics G.P.A., but in this study, a high undergraduate mathematics G.P.A. did not necessarily predict success in a mathematics classroom. Administrators reported that

many high G.P.A. teachers needed significant improvement in their classroom management skills.

Admission to the alternative certification program did not require its teachers to have a major in mathematics; however, teachers were required to have completed the calculus sequence (single-variable and multi-variable calculus), and to have passed two state examinations: the California Basic Education Skills Test (CBEST) and the California Subject Examinations for Teachers (CSET) in mathematics. Since not all particpants were required to be mathematics majors, the number of mathematics courses taken varied, possibly skewing the undergraduate mathematics G.P.A data, yet the content on the state examinations required a firm grasp of higher college-level mathematics. The CBEST requires a precentage above 50% to pass ("CBEST Passing Requirements," 2010) and the CSET requries a score above 60% for each of the three subtests to pass ("CSET Subject Matter Requirements," 2010). Table 6 shows the mathematics content necessary for successful completion of the two state examinations.

Table 6: Mathematics Content on CBEST and CSET

State Examination		**Mathematics Content**
CBEST		Estimation and Measurement
		Statistical Principles
		Computation and Problem Solving
		Numerical and Grahical Relationships
CSET	110: Algebra and Trigonometry	Algebraic Structures (Group and Field Theory)
		Polynomial Equations and Inequalities
		Functions
		Linear Algebra
		Number Theory of Natural Numbers
		Trigonometry
	111: Geometry and Statistics	Parallelism
		Plane Euclidean Geometry

State Examination		Mathematics Content
		Three – Dimensional Geometry
		Transformational Geometry
		Probability
		Statistics
	112: Calculus and the History of Mathematics	Limits and Continuity
		Derivatives and Applications
		Integrals and Applications
		Sequence and Series
		Chronological and Topical Development of Mathematics

As can be seen from Table 6, the mathematics content necessary to pass the examinations are varied and includes topics from upper division mathematics courses (abstract algebra and lienar algebra).

Once the sample was separated into two subsamples, "selected" and "non-selected", the G.P.A. data for each of these subsamples were analyzed. Both subsamples were consistent with the overall sample as both the participants in the "selected" subsample and the participants in the "non-selected" subsample reported an overall G.P.A. in the range of 2.5 – 3.0 and an undergraduate mathematics G.P.A. in the range of 2.5 – 3.0. A t-test analysis at the 0.05 confidence level indicated no statistical significance between the "selected" and "non-selected" subsample averages. The data and the recommendations and observations provided by administrators suggest that mathematical competence did not predict success in the classroom.

Leadership Experience

Participants were asked whether or not they had held any previous leadership positions. The rationale behind this question was to gauge whether teachers had prior experience

either leading a group of people or being comfortable in front of a large group of people, which were deemed essential skills to have in running a classroom. The underlying assumption was that teachers with prior leadership experience would be more effective leading a classroom, making classroom management an easier transition for beginning mathematics teachers. Of the 28 teachers, 12 participants (approximately 43%) had held a leadership position, while 16 participants (approximately 57%) had not. Interestingly enough, the two subgroups separately maintain the same percentages: in both groups, 43% had held a leadership position whereas 57% had not. There was no difference between the subgroups in leadership experience.

V. Research Instruments:

Overview of the Quantitative Survey

The two research instruments used for this study were developed by the researcher and Nicholas Wasserman (2010). The first research instrument is a 30 question survey partitioned into four sections. The first section consisted of one question seeking a ranking eight attributes of good teaching; the second section consisted of nine questions asking the participants to rate on a frequency scale how often certain classroom activities occurred; the third section consisted of 15 Likert-type questions asking the participants to rate their attitudes and beliefs about teaching mathematics; and the fourth section consisted of six questions regarding attitudes toward the different stages of teacher development (see Appendix A for actual survey). A brief breakdown of the survey questions can be seen in Table 7.

Table 7. Breakdown of Survey Questions

Types of Survey Questions Used			
Section 1: 1 Ranking Question: *Label the following attributes as most important (1), important (2), or least important (3).*	Section 2: 9 Questions Using a Frequency Scale: *Please respond to how frequently you do the following statements.*	Section 3: 15 Questions Using a Likert Scale: *Do you agree or disagree to the following statements?*	Section 4: 6 Questions Regarding Stages of Teacher Development: *Please respond to the following statements regarding your teacher certification program.*

Development of Quantitative Survey

The questions on the survey were developed using the *National Council of Teachers of Mathematics (NCTM) 1991 Professional Standards* and the five categories outlined for teaching mathematics: worthwhile mathematical tasks, teacher and student roles in the classroom, tools for enhancing discourse, the learning environment, and an analysis of teaching (The National Council of Teachers of Mathematics on Teaching Standards for School Mathematics, 1991). The items for ranking, the frequency scale questions, and the Likert scale questions were derived from the NCTM Standards and each item or question addressed one of the five categories listed above and provided information for Research Questions one and two. The remaining questions on the survey sought information for the third research question regarding teachers' attitudes about the

different stages of teacher development. (See Appendix B for list of questions and its matching category).

Beta-survey 1.0 was developed with only two sections: ranking a list of eight given attributes from 1 (most important) to 8 (least important), and 25 Likert questions. This approach was selected because all the questions would be measured using the same simple units making it much easier to both collect and analyze data (Oppenheim, 1992). However, after consulting with experts in the field of mathematics education and mathematics, it was determined that a Likert scale was not appropriate for each item. For example, the statement "You give worthwhile mathematical tasks to your students, that include mathematical reasoning and problem-solving and are engaging" was presented on a Likert scale and would most likely result in an overwhelmingly positive response. Rather than using an attitude scale, asking teachers to answer this question on a frequency scale would yield more useful information by differentiating between what a teacher's beliefs and attitudes are as opposed to a teacher's actual practice in the classroom (Forgasz & Leder, 2008). The statement was modified to "You engage students through worthwhile mathematical tasks – like mathematical reasoning and/or problem solving" on a frequency scale of never, monthly, once a week, more than once a week, or daily. Questions about a teacher's attitudes and beliefs were measured using an attitude scale and questions about a teacher's action in the classroom were measured using a frequency scale.

During the consultation, it was also discovered that each Likert questions would most likely warrant a positive response. To avoid this phenomenon, several of the statements were turned into negative statements. This would ensure that the participants completing

the survey read each question thoroughly to answer each question properly. Based on the expert consultations an additional section was appended using a frequency scale and several statements and questions were changed into a negative form, resulting in beta-survey 1.1.

Two veteran mathematics teachers participated in a pilot study of beta-survey 1.1. At the pilot study's conclusion, participants discussed any difficulties they encountered, any vagueness in directions or questions, or general concerns. Based on their comments, it was determined that ranking eight attributes from most important to least important was difficult because several attributes were considered very important and it was tough to determine how to rank these items. To correct this, rather than having participants in the study rank eight attributes one by one, three tiers were established (most important, important, and very important) where each of the eight attributes would be placed. The ranking section was modified to ask participants to categorize their definitions of successful teaching into tiers of most important, important, or least important.

A panel of experts in mathematics education assessed beta-survey 1.2 leading to several changes. First, some demographic questions were implemented. Participants were asked to include information about their gender, their overall undergraduate grade point average, their grade point average in undergraduate mathematics courses, their previous leadership experiences, and the school they were currently teaching at. Demographics were used to highlight similarities and differences among the sample. A second suggestion from the panel was the exclusion of leading questions. Table 8 lists the changes made for several leading questions.

Table 8: Changes Made to Leading Questions

Working Versions	Final Versions
You do not get **frustrated** with students when they ask questions, encouraging participation in class.	You minimize student participation during class due to various pressures such as time constraints of the curriculum.
You facilitate classroom discussions, **lecturing** only when necessary, and have students actively participate in their learning.	You facilitate classroom discussions where students actively participate in the learning process, as opposed to primarily teacher-presented information.
You give **worthwhile mathematical tasks** to your student, that include mathematical reasoning and problem solving and are engaging.	You engage students in though provoking activities that involve mathematical reasoning and/or problem solving.

In Table 8, the bolded terms lead participants to lean towards a certain disposition such as the terms "frustrated" and "lecturing" both having negative connotations in the classroom. These changes were implemented and Beta-survey 1.3 was developed.

Beta-survey 1.3 was given to a pilot study of sample size ten. The pilot study had two main goals: to ensure that participants understood the directions to each section and to also ensure that participants understood each question. The sample consisted of retired mathematics teachers, veteran mathematics teachers, beginning mathematics teachers, and students in mathematics education. Participants of the pilot study were asked to complete the survey and then a discussion was held with each participant to determine if the goals of the pilot study were achieved. Based on the results of the pilot study no major changes were implemented; the only changes involved altering select words.

Validity

Validity is a measure of how well a quantitative survey measures what it is supposed to measure (Fink & Litwin, 1995). Content validity is both subjective and non-statistical (Anastasi & Urbina, 1997). A group of reviewers, who have extensive knowledge of the subject matter, evaluates the content of the survey and ensures that "it includes everything it should and does not include anything it shouldn't" (Fink & Litwin, 1995). Hence, content validity is not measured statistically, but rather represents the opinion of a group of experts. According to Fink and Litwin (1995), content validity "provides a good foundation on which to build a methodologically rigorous assessment of a survey instrument's validity."

To ensure validity of this study's survey, a group of experts within the field of mathematics education offered feedback and constructive criticism at different stages of the survey's development. The information panel resulted in a number of changes and modifications.

Reliability

Reliability measures the consistency of a research instrument. There are different types of reliability and the researcher chose to examine two: internal consistency reliability (estimated by examining Cronbach's alpha) and test-retest reliability (estimated by examining the correlation coefficient).

In educational research, Cronbach's alpha is the most commonly used method of reliability (Daniel & Witta, 1997). Cronbach's alpha assumes that it is measuring only a single construct (Gliner & Morgan, 2000). Since the quantitative survey developed by

the researcher aims to measure several different constructs using three different scales, questions were grouped together to obtain an appropriate Cronbach's alpha for the appropriate construct. Table 9 lists the question groupings and the appropriate Cronbach's alpha value.

Table 9: Cronbach's Alpha Results

Questions	**Cronbach's alpha**
2, 3, 4, 5, 6, 7, 10	$\alpha = 0.644$
8, 9	$\alpha = 0.618$
11, 13, 14, 15, 16, 18, 20, 21, 22, 23, 25	$\alpha = 0.662$
29, 30	$\alpha = 0.599$

Although Cronbach considered a value of 0.7 as preferable (Nunnally, 1978), researchers consider a Cronbach's alpha greater than 0.6 as satisfactory (John & Roedder, 1981), and this value of 0.6 is becoming a "common threshold for sufficient values" (Hair, et al. 2006). Based on the 0.6 criterion, the grouped questions can be deemed to be reliable.

Another measure of reliability is test-retest reliability and its foundation comes from the idea that if a survey is reliable, than a person taking the survey multiple times should have results that are very close each time. Two aspects must be addressed in attempting to calculate a test-retest reliability score. First, the length of time between the test and the retest must be addressed. If the time is too close together, than respondents to the test may recall answers or even have looked up answers to difficult questions on their own time. Also, it has been noted by researchers that as the time between the test and the

retest increases, the reliability of the instrument decreases. Second, a sample must be obtained to determine the test-retest reliability (Gliner & Morgan 2000). In this study, a group of four beginning teachers was used to estimate the test-retest reliability. The survey was administered twice within a 6-month interval. Table 10 shows each participants correlation coefficient from the test and the retest.

Table 10: Test-Retest Coefficient Correlation Results

Participant	Correlation Coefficient (r)
1	r = 0.84
2	r = 0.81
3	r = 0.69
4	r = 0.80
AVERAGE	0.79

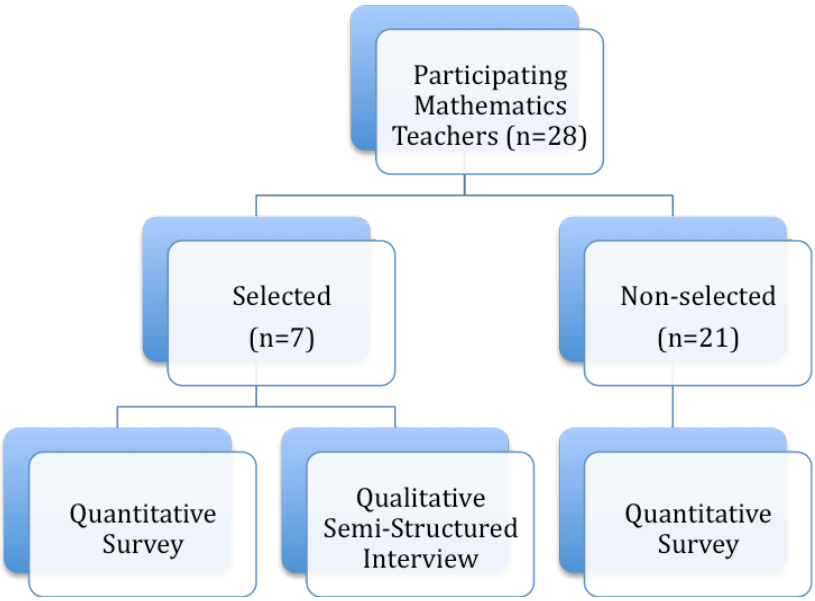
According to Fink and Liwin (1995), a research instrument is considered reliable if the correlation coefficient is equal to or greater than 0.70. Using two different measures of reliability, Cronbach's alpha and test-retest reliability, the quantitative survey used in this study can be considered to be reliable.

Overview of the Qualitative Semi-Structured Interview

The second research instrument was a semi-structured interview for gathering qualitative data; however, only those selected as "successful" beginning teachers were interviewed (See Figure 1: Breakdown of Research Participants and Instruments). The two

subsamples are referred to as the "selected" subsample and the "non-selected" subsample. A semi-structured interview was used because the interview sought to uncover reasons behind certain responses and also sought to explore these reasons in depth (Newman & McNeil, 1998). Also, even though the interview contains a specific list of 10 questions (see Appendix C), a semi-structured interview allowed the interviewer the flexibility to vary question order and insert probing questions based on each partipant's responses (Gibson & Brown, 2009).

Figure 1. Breakdown of Research Participants and Instruments



The goal of the interview was to analyze each teacher's response to the survey and to expand upon those responses. The interview was broken into two stages; the first stage focused on each teacher's ideas and definitions of success, and also the factors, attributes, or beliefs that were believed to have contributed to each respondent's success. Information from the first, second and third sections of the initial quantitative survey was

used to guide the interviews as well. This phase of the interview was designed to help answer research questions one and two.

The goal of the second phase was to obtain a clearer consensus on the different stages of teacher development by combining the previous interview responses and the fourth section of the survey that asked the teachers when and where they acquired the attributes reported in the survey and interviews. The second interview phase was designed to shed light on whether the teachers acquired their attributes that they believe lead to successful teaching before entering their alternative certification program (pre- program), during their alternative certification program (during program), or after completing the alternative certification program (post- program). The second stage of the interview provided the information necessary to answer Research Question three.

Development of the Qualitative Semi-Structured Interview

Originally, the interview process was going to be completed in two separate sessions. The first interview would focus on the responses from the quantitative survey and expand upon those ideas, whereas the second interview would focus on the different stages of teacher development. However, due to time constraints and financial burdens, the two sessions were combined into a single interview.

Beta-interview 1.1 combined the two interviews into a single interview. A pilot study was conducted using version 1.1 to check if the questions received the expected responses. During the pilot study interview, the researcher discovered that some questions were not fully fleshed out, especially questions 1 and 6. Question 1 needed a more thorough introduction in that there was confusion as to differentiating the markers

that determine success and the factors or attributes leading up to success. Question 6 required much more time for a response than expected. After interviewing the pilot study participants, the interview's final form was fixed.

Reliability and Validity

According to Klenke (2008), unlike quantitative research instruments, in qualitative interviews reliability and validity is "infrequently discussed" because "techniques for establishing rigor and quality in interview studies are much less prescriptive or in some cases, completely negligible." Rather than checking for reliability of the qualitative interview, Klenke (2008) suggests checking for reliability in the coding of the transcripts by establishing intercoder reliability, the process of comparing a researcher's codes and themes with another coder. In this research study, intercoder reliability was maintained with a colleague, Nicholas Wasserman. Once the codes and themes were established, Nicholas Wasserman and the research collaboratively coded the transcripts. However, Newman & McNeil (1998) gives a suggestion to ensure reliability during an interview: all participants must be presented with each scripted question in the same manner and within the same frame of reference.

As is the case with reliability, validity of interviews is rarely described. The researcher addressed the validity of the interview by acknowledging and controlling his own biases and doing his best to ensure that the questions were free from bias (Newman & McNeil, 1998).

VI. Data Collection

Once the sample and research instruments were developed the data collection process began. To simplify the data collection process, the survey was made available online using the services of Lime Survey at https://www.limeservice.com/index.php. After initially contacting the participating teachers, they were sent an internet link (http://eh2351.limequery.com/) via e-mail allowing them access to the survey. Providing the survey online simplified data collection and also made it easier for participating teachers to complete the survey at their own convenience. Lime Survey maintained a database of the survey responses, allowing the researcher to export the data into both Excel and SPSS (statistical software) compatible files.

To reduce the non-response rate of the Internet survey, Fowler suggests getting to know the participants through repeated contact using different means and also informing them about the study to "induce people to respond without the intervention of an interviewer" (Fowler, 2002). However, Fowler (2002) also suggests alternative methods of filling out the survey, so for those teachers who preferred it, a hard copy version of the survey was created, to be provided through the mail. None of the teachers requested the hard copy of the survey, as all the participating teachers completed the survey online.

After the data from the initial survey were collected and analyzed, the second phase of data collection commenced and the subsample was interviewed. To maximize the participation rate, Fowler (2002) suggests being informative about the study beforehand and telling the participants the stake they held in the research. The teacher' responses to the initial survey were reviewed, analyzed and recorded in preparation for the individual

interviews. Since the interview focused on responses to the initial survey, the initial survey information was made available for the interviewees to remind of them of their previous responses. The interviews were conducted using a template of 12 questions but the researcher maintained the freedom and flexibility to further explore whenever certain responses warranted it. Each teacher was contacted via e-mail or telephone to arrange an appointment for a 30 to 45 minute interview at his or her convenience. Each of the interviews was audio recorded for the purpose of transcribing the interviews for further analysis. During the interview, the researcher kept a recording template for the purpose of writing notes and comments to specific questions for easy referral throughout the interview (see Appendix D for sample recording template).

VII. Data Analysis

In a mixed-methods study, both quantitative data and qualitative data are available to analyze. The survey participants were separated into two subsamples for analysis: "selected" and "non-selected." After the responses were collect, the data were changed into numerical form to ease analyses. An introductory statistical analysis was performed on the entire sample's data. Descriptive statistics, including mean, standard deviation, median, mode, and interquartile range were calculated for each question. A correlation matrix was also generated to determine if any questions were highly correlated.

Once the data from the entire sample were analyzed, the descriptive statistics (mean, standard deviation, median, mode, and interquartile range) were calculated for each sample. Using these descriptive statistics, hypothesis testing was used to compare the results between the subsamples looking for any questions that were statistically different,

using either a t-test or Mann – Whitney test at 95% significance level depending on the data. The Mann – Whitney test is often used to test for differences of items answered with a Likert scale (Black, 2010).

The quantitative data were statistically analyzed by using descriptive statistics, hypothesis testing using either the t-test or Mann – Whitney test depending on the nature of the data, and a correlation coefficient matrix. Factor analysis of the questions was considered but ultimately deemed unnecessary because of the small sample size (Guadagnoli & Velicer, 1988).

The interview provided qualitative data about how "successful" teachers defined success, the factors or attributes necessary to achieve success, and also where they believe they acquired these successful factors or attributes. All the interviews were transcribed and analyzed to look for similarities or patterns among the responses. Coding is a device used to sort and describe the common themes in the interview responses (Gibson & Brown, 2009). The transcripts were then collaboratively coded with a colleague using NVivo, a qualitative research software designed for coding. The first part of the interview was transcribed and coded line-by-line using the categories from NCTM and several more that were not mathematics related (See Appendix E for full list of coding strands and categories) to determine areas on which successful teachers focus. The interview responses from the second phase of the interview were also coded with particular attention to the different stages of development and those stages which were deemed influential in developing mathematics teaching.

Chapter 4

Results and Analysis

I. Introduction

This chapter will aim to answer the research questions by examining and analyzing the results from both the survey and the interview. Doing a mixed methods study resulted in both quantitative and qualitative data. The quantitative data were statistically analyzed in terms of descriptive statistics, hypothesis testing, and correlation, while the qualitative data were analyzed through collaborative coding using both technology (NVivo) and a colleague.

II. Research Question 1

The first research question was "How do beginning mathematics teachers define success in regard to their first year of teaching?" To answer this question, the first part of the survey was structured for the participants to identify and rank eight attributes into three tiers as most important (1), important (2), and least important (3) in terms of defining their success. If participants felt a non-listed attribute was most important, then they were allowed to write in their own definition of success in a separate free response question.

Results from Quantitative Analysis

The researcher looked at the quantitative data provided by the survey and calculated several descriptive statistics: the mean, standard deviation, median, mode, and interquartile range. The statistics were then used to make generalizations among the

sample by determining which items were most important. The results of the first part of the survey are shown in Table 11.

Table 11. Results of Rankings (n = 28)

Survey Ranking Attribute	**Mean**	**Standard Deviation**	**Median**	**Mode**
1g: Good classroom learning environment – including classroom management and student participation, etc.	1.11	0.31	1	1
1b: Creating and implementing engaging lessons for all students	1.50	0.64	1	1
1h: A belief in yourself as a teacher to grow professionally	1.57	0.63	1.50	1
1d: Having good rapport with students	1.61	0.63	2	1, 2
1f: Good student test scores	2.00	0.90	2	1, 3
1e: Positive feedback on teaching from colleagues, administrators, and/or students	2.04	0.74	2	2
1a: Using assessments to cater to all student learning needs	2.21	0.74	2	2
1c: Participating in productive collaboration	2.46	0.69	3	3

Table 11 was arranged by descending order of most important to least important based on the means, medians, and modes. A good classroom learning environment was listed most often as most important as it had the lowest mean, 1.11, the lowest standard deviation, 0.31, and a median and mode of 1. Since the standard deviation was relatively low, a majority of the data will be clustered around the mean, 1.11. Also, since the median and

mode were 1, classroom learning environment was chosen most often by the participants and also as most important by over 50% of the participants. Figure 2 represents the histogram for the responses to a good classroom learning environment.

Figure 2. Frequency of Responses to Good Classroom Learning Environment (n = 28)

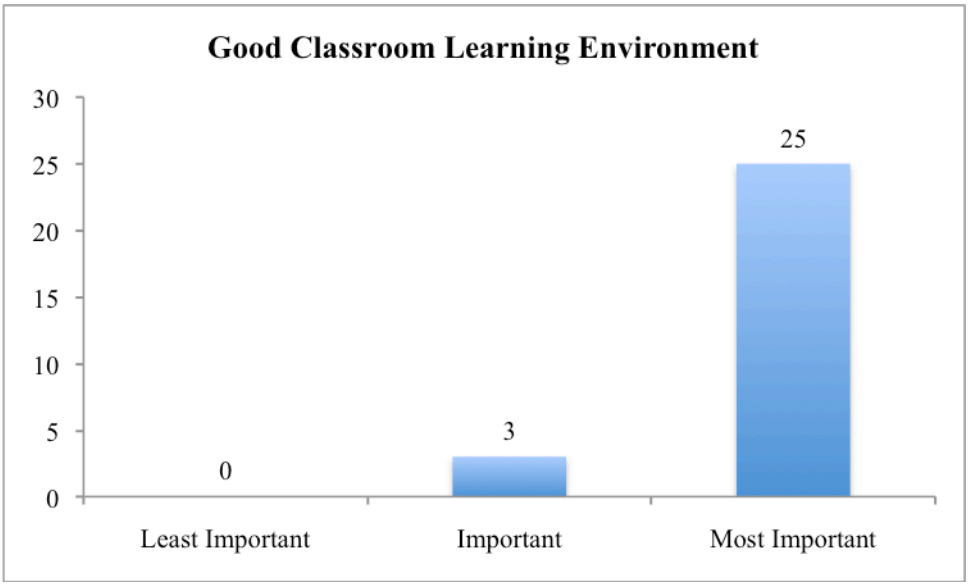


Figure 2 reinforces the idea that the participating teachers viewed classroom management as essential for succeeding in the classroom.

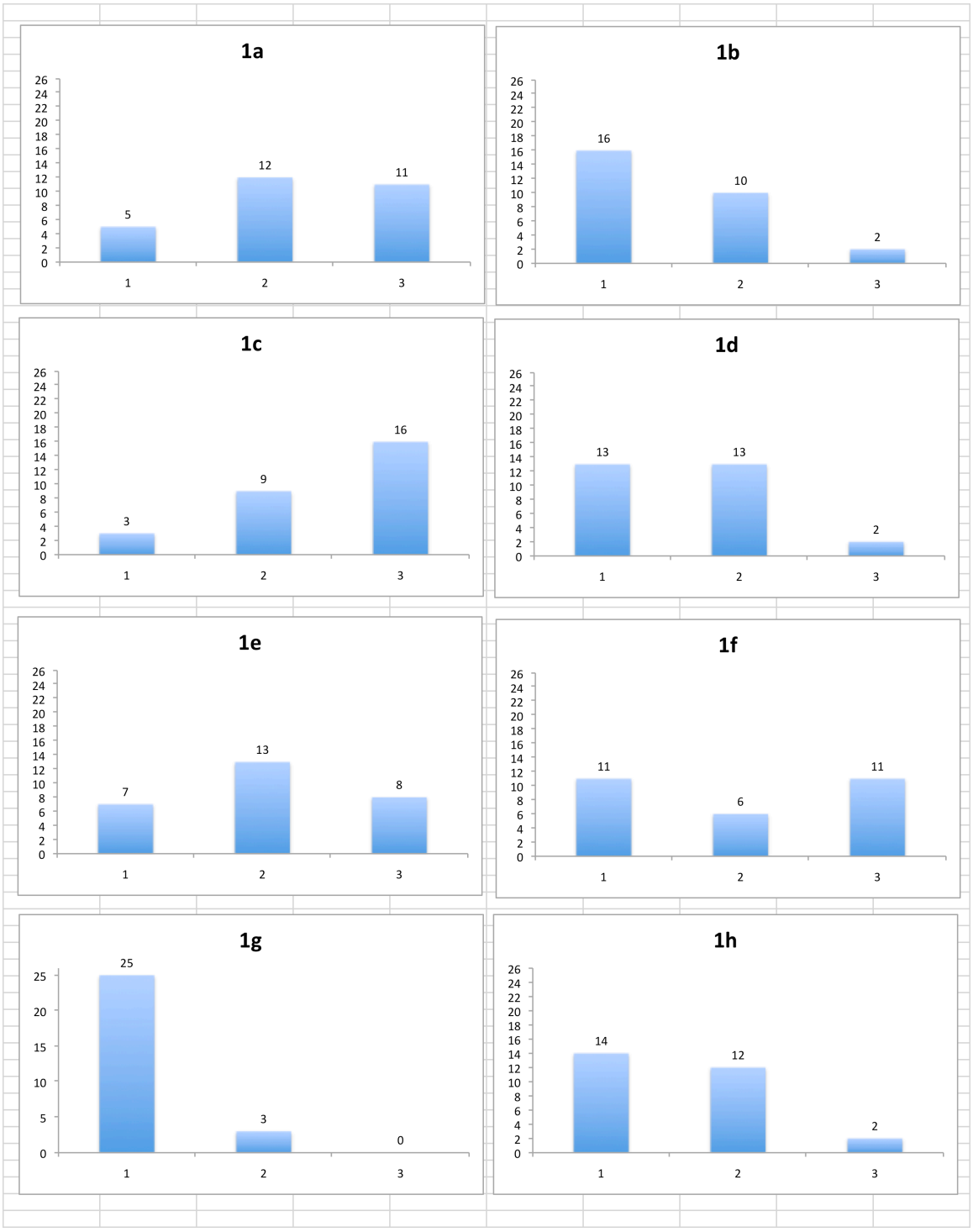
The other items of interest to note are 1b, 1h, and 1d (creating and implementing engaging lessons, a belief in yourself as a teacher to grow professionally, having good rapport with the students, respectively). Their means were higher than 1g, but their means were also clustered within a small range of 0.11 (1b = 1.50, 1h = 1.57, and 1d = 1.61) and with similar standard deviations (1b = 0.64, 1h = 0.63, and 1d = 0.63). In fact, during the qualitative interviews there appeared to be a direct correlation between a good classroom learning environment and creating and implementing engaging lessons.

Both 1a (using assessments to cater to all student learning needs) and 1c (participating in productive collaboration) were ranked the lowest on average, especially participating in productive collaboration (mean of 2.46). Further illustrating the low importance of participating in productive collaboration were the median and mode of 3.

Histograms

For further analysis, histograms were created to establish a visual representation of the distribution of frequency of responses regarding each ranking item as most important, important, and least important. The results can be seen in Figure 3, whose representations substantiate the rankings of Table 11.

Figure 3. Histograms of Individual Survey Ranking Responses (n = 28)



The findings from the statistical analysis of the means, the standard deviation, the median, and the mode, classroom learning environment (1g), creating and implementing engaging lessons (1b), and a belief in yourself as a teacher to grow professionally (1h), were reinforced from the histograms. Their respective histograms show the response distribution for both classroom learning environment (1g) and creating and implementing engaging lessons (1b) were skewed towards a ranking of 1. The histogram for a good classroom learning environment (1g) shows its importance to those participating in the survey: 23 out of 26 participants (approximately 88.5%) ranked it as most important. The histogram for creating and implementing engaging lessons (1b) is skewed towards the ranking of 1 as well, but the responses are a little more spread out (hence, the higher standard deviation) with two participants ranking it least important. The histogram for a belief in yourself as a teacher to grow professionally (1h) shows that the response rate for 1s and 2s are similar, with 50% of the participants deeming it most important and 43% of the participants deeming it important.

One of the more interesting findings was the response to good student test scores (1f). The responses had a mean of 2, a standard deviation of 0.90, and a median of 2. However, the results from the histogram show that the responses were bimodal in that the same number of participants ranked it most important and least important (11 each), representing the conflicting views that beginning teachers have toward test scores and their importance in the classroom. Whereas some teachers felt test scores were very important in defining their success as teachers, some teachers felt that the test scores were not as important as the other factors listed. This phenomenon will also be addressed in the qualitative analysis.

Free Response Question

The survey also contained a free response question aimed at determining other measures of defining success not identified in the ranking list. The question asked "In the previous question, is there something else you would like to include as most important (1)? If so, please describe (otherwise leave blank)." The responses can be seen in Table 12.

Table 12. Responses to Free Response Question (n = 8)

Responses to Free Response Question	**Attribute**
The most important thing the first year is student rapport, classroom management, and student discipline.	1g: Good classroom learning environment – including classroom management and student participation, etc.
	1d: Having good rapport with students
DISCIPLINE!	1g: Good classroom learning environment – including classroom management and student participation, etc.
Being able to be flexible with whatever comes your way.	
Flexibility	
Personality	
Not being biased to any students over others.	
Being able to motivate students to create goals for their future.	

Responses to Free Response Question	Attribute
Student attitudes towards mathematics	

Interestingly, several of these responses were included in the original ranking of eight items, further enhancing the importance of those responses, so Table 12 was split into two columns and the repetitions were identified with the appropriate attribute. Two of those responses were directly related: "the most important thing the first year is student rapport, classroom management, and student discipline" and "DISCIPLINE!", which further supports the previous findings that a good classroom learning environment was the most important measure of a teacher's success.

Originally, when the researchers were designing the survey, the flexibility and personality of the teacher were not considered measures of success, but rather factors or attributes that helped beginning teachers achieve success. However, two teachers responded that flexibility in the classroom, the ability to adapt to different situations as needed, was indeed a measure defining their teaching success.

Student Attitudes towards Mathematics

In the original rankings, student outcomes were primarily focused on student test scores, but several participants mentioned different measures of student outcomes that are typically observed but difficult to measure: motivation and student attitudes towards mathematics. These teachers felt that by motivating their students to do well in their mathematics classrooms and even in the future and changing their students' attitudes

towards mathematics was directly correlated in defining the success of a beginning teacher. This was reflected in the qualitative interviews as well.

> I think that how students feel about math after the first year of teaching is an indication of success. If the students start liking the subject then that can be an indicator of success. Oftentimes, the attitudes of students towards math is so negative at the beginning of the classroom and by changing students attitudes, it's a measure of a successful teacher. And it's important, because one of the big problems is that students don't see the importance or relevance of math and by just getting them to enjoy it, that's a huge step in the right direction. I mean, at the beginning of the year in my classes, especially the lower classes, you can tell the students hate the subject as it reflects in their work and effort. [Gerry]

The argument can be made that motivation is directly a result of creating and implementing engaging lessons for all students (1b), but the researcher has chosen to look at these two separately because student motivation can be the result of several inputs as opposed to solely engaging lessons.

Correlation

In the qualitative interviews, participants highlighted the relationship between creating and implementing engaging lessons for all students and a good classroom learning environment, especially classroom management. Based on this information, the researcher chose to run a correlation coefficient matrix (see Table 13) using the top three measures of success to determine if these attributes were significantly correlated at the 0.05 level (two-tailed). The researcher wanted to quantify the previously mentioned relationship but the correlation matrix revealed no significant correlation among the responses.

Table 13. Correlation Matrix of Most Important Attributes (n = 28)

Correlations				
		Ranking [1b]	**Ranking [1g]**	**Ranking [1h]**
Ranking [1b]	Pearson Correlation	1	-.092	.000
	Sig. (2-tailed)		.641	1.000
	N	28	28	28
Ranking [1g]	Pearson Correlation	-.092	1	.053
	Sig. (2-tailed)	.641		.789
	N	28	28	28
Ranking [1h]	Pearson Correlation	.000	.053	1
	Sig. (2-tailed)	1.000	.789	
	N	28	28	28

Since no correlation was found among the most important attributes, the next step was to determine if any correlation existed between the eight items. The resulting table can be found in Appendix L. There are several significant correlations at the 0.05 level, both positive and negative. Table 14 lists the attributes that were significantly correlated ranked in order from highest negative correlation to highest positive correlation.

Table 14. Significantly Correlated Items (n = 28)

Ranking Attributes	**Ranking Attributes**	**Pearson Correlation Coefficient**
1a: Using assessments to cater to all student learning needs	1g: Good classroom learning environment – including discipline, management, student participation, etc.	-0.580
1c: Participating in productive collaboration with colleagues	1e: Positive feedback on your teaching from colleagues, administrators, students, etc.	-0.536
1d: Having good rapport with students	1f: Good student test scores relative to the school average	-0.457

Ranking Attributes	Ranking Attributes	Pearson Correlation Coefficient
1e: Positive feedback on your teaching from colleagues, administrators, students, etc.	1h: A belief in yourself as a teacher to grow professionally.	-0.437
1a: Using assessments to cater to all student learning needs	1b: Creating and implementing engaging lessons for all students	0.393
1e: Positive feedback on your teaching from colleagues, administrators, students, etc.	1f: Good student test scores relative to the school average	0.441

The positive correlations shown in Table 14 appear to be logical. It would be wise and beneficial for teachers to use information from previous assessments when creating and implementing engaging lessons. Interesting findings were the attributes correlated with positive feedback; positive feedback was positively correlated with good student test scores yet negatively correlated with a belief in yourself as a teacher to grow professionally. Is it possible the feedback from colleagues and administrators focused on improving test scores at the expense of being able to grow professionally independent of test scores? This question will be further addressed in the qualitative analysis.

Results from Qualitative Analysis

Seven participants were chosen for interviews to expand on their ideas and their responses to the survey. Pseudonyms were given to each of the interviewed participants. The initial part of the interview asked the participants to look over their original rankings and explain the thought processes behind the items they considered most important. The interviews were collaboratively coded to include these rankings and several other definitions of success based on data taken and examined from the interview. Table 15

lists all the ways the interviewed teachers defined success along with the number of sources who mentioned the same definitions.

Table 15. Definitions of Success (n = 7)

Definitions of Success	**Number of Sources**
A belief in yourself as a teacher to grow professionally	6
Engaging lessons/Inquiry	5
- *helps with discipline*	3
- *keeps students interested*	3
- *can be evaluated easily*	1
Classroom management, including discipline, establishing rules and learning environment	5
Good student test scores	3
- *measure by which state, administrators, assess teachers*	3
Student growth in terms of knowledge, attitude, and test scores	3
Productive collaboration with other teachers	2
Good rapport with students	2
Feedback from administrators, colleagues, and students on both classroom management and methods	2
Surviving	1
Flexibility of the teacher	1
Using assessments to cater to all student learning needs (both oral and written assessments)	1
Staying positive in the classroom	1

Several of the items were subdivided into further categories based on the number of similar responses. The top three categories in the qualitative data matched the top three categories in the quantitative data analysis.

Connection between Good Classroom Learning Environment and Engaging Lesson Plans

Particularly interesting was the relationship between engaging lesson plans and classroom management. Three teachers commented that creating and implementing engaging lessons helped with classroom discipline. Having the students focus on the mathematics in an engaging manner ensured their behavior in the class.

> I also think that engaging lessons and a good classroom learning environment kind of go hand in hand. Each allows the other to happen; if my lessons are engaging, I don't have to worry about classroom management. Also, if my classroom management behaves well, I'm more willing to take the risks and make really interactive and engaging lessons because I don't have to worry about keeping my students on track. [Gerry]
>
> That's why the main thing is the classroom control aspect and so I put it number 1, a good classroom learning environment: discipline, management, student participation. If you don't have the student discipline and management you really can't get anything done. So, in a sense, I don't think I realized this so much in the beginning. I had all these great ideas for [engaging lessons] and they were going nowhere my first year. Kids were not understanding and they couldn't pay attention because it was too noisy so that's why I put that number 1. [David]
>
> … and by engaging and creating that [lesson], wow I'm not going to have as many disciplinary problems because it's when they stop doing something they like, that's when [discipline problems occur]. [Robert]

These teachers felt that without a proper learning classroom environment, they could not implement engaging lessons because of the risk of losing control of the classroom. Interestingly enough, these teachers also felt that having an engaging lesson also helped

with classroom management in that if the students were engaged in the learning, they would be less likely to cause disciplinary problems.

Contradiction in Productive Collaboration

In the quantitative surveys, participation in productive collaboration ranked near the bottom as least important. Several hypotheses suggest why this might be the case, but two teachers specifically explained why they felt productive collaboration was not as important to them.

> As the youngest teacher at Monroe, I always felt that other teachers did not take me seriously, so I really had to believe in my own abilities … I cannot control my colleagues and I cannot be responsible for what type of collaboration we have. It's a two way street, even if I reach out to my colleagues and get nothing in response, there's nothing I can do about it. I can only control what I do for myself in my own classroom. [Natasha]

> … other teachers have them in rows sitting forward. [Harry] told me I was ruining the kids. [Harry] told me I'm teaching the kids how to talk in class and [he's] teaching them how not to talk in the class. They can't not talk all the time, they have to get the math, they have to talk and communicate. [He's] old school and doesn't want to change. I feel like all the teachers here are like that … [Mark]

In these cases, it was not that the teachers did not want to collaborate with others, they just never received support from colleagues that would have enabled them to do so. If done properly, collaboration can be a very important aspect in teaching as evidenced from two teachers who felt it was very important to them.

> We had math coaches that were both very experienced math coaches, very experienced math teachers who had taught for a very long time. And they weren't people that disliked teaching so moved into administration. They were people that were asked to move on. And you could tell they still wanted to be in the classroom. And they were very good. They were strict with us to but they did lot of teaching us how to teach. They were always available after school. If you tell them my classes weren't going well. They would tell you what to do. You just tell them I'm coming up to polyhedrons and I'm nervous about it. And they

> would give you tons of advice on it. You know they would go as far as modeling a lesson in their office. And they made a huge big difference for me. And I've talked to other [interns] with math coaches who weren't so helpful and I think they struggled because of it. And the teacher next door to me is a board certified teacher. And he's very popular at the school. And very good. And gave me a tremendous amount of advice on discipline, how to structure a classroom. [David]

> … Mr. Martin was the department chair and so naturally I knew he was the guy. I just figured department chairs knew what they were doing and so you know they all said if you need anything, let me know. So first time I went to Mr. Martin and we just had a few sessions and he told me anytime you need assistance, send a kid over I'll chew him out whatever. And that's how I started with him. And then our math coach at the time said "If you ever need anything with technology go talk to Mr. Sans." He has all of this technology and knows how to use it and will gladly teach you… So I also knew that Mr. Sans was a really good disciplinarian and he will literally, my first year I would send a kid over, and he would make him stand there and say what are you doing, I'm going to call your mom and I thought he was crazy. And it helped because I didn't have to chew him out and so, yeah. That's how I knew to talk to those 2 guys. [Charles]

Productive collaboration appears to be something over which beginning mathematics teachers have little control and is dependent on the willingness and effectiveness of their colleagues. As David pointed out "…I've talked to other [interns] with math coaches who weren't so helpful and I think [the interns] struggled because of it."

Controversy over Student Test Scores

One topic on which there was little agreement during the interviews was teachers' attitudes toward good student test scores. Some of the teachers felt they were most important, while some felt they were least important. This was reflected in the initial quantitative survey as the attribute "Good student test scores relative to the school average" resulted in a bimodal between most important and least important (11 responses each). It is important to note is the context of the situation: all seven teachers worked in Title 1 schools, with six of them at PI 5 schools and the other at a PI 3 school, only

because it was relatively new. Several teachers chose good student test scores as most important not because they felt that way, but because of how the government and administrators primarily use good student test scores to assess PI 5 schools and their teachers.

> I'm in a debate. This is my dilemma. The way things are going on with education, my students are producing good test results and that's how I'm being judged as a teacher so that's why my emphasis is on the test scores, the test scores. That's why I ranked that as [most important] … and its sad the math teachers are being judged like that because the Spanish teachers or the art teachers aren't being pressured. [Larry]

> Test scores are also very important. As you know, we are a PI5 school and the district is considering putting our school up for takeover. A part of me hates that these test scores are all we're determined by, but bottom-line, what happens to our school is based on these tests cores, so we have no choice to oblige. At the end of the school year, I can see how my students performed in comparison to the rest of the school, which really gives me some sense of job security with the way education in the state is heading. I mean, our CAHSEE results just came out and we received acknowledgement from Villagorosa because of our drastic improvement. It was one of the best improvements in the district. [Gerry]

The fact that these teachers worked in urban environments put pressure on them to obtain good student test scores as a means of job security and school status even though they disagreed with such an approach.

Differences between Subsamples

The entire sample was split into two subsamples: "selected" and "non-selected". As stated previously, the subsamples were chosen using a combination of factors: recommendations from administrators in their alternative certification program as experts in the field of teaching, mathematics G.P.A. as a measure of content knowledge, and previous leadership experience. The data for each subsample were analyzed separately to examine how the responses of each respective subsample compared to the whole sample

and also to examine if there were any significant differences at the 0.05 level, especially regarding the selection criteria separating the two subsamples: pedagogy, mathematical content knowledge, and previous leadership experience. Descriptive statistics for the two groups can be seen in Table 16. The scale of the responses ranged from 1 (most important), 2 (important), and 3 (lease important).

Table 16. Comparison of Means and Medians between Groups (n = 28)

Survey Ranking Attribute	**"Selected" Subsample (n = 7)**		**"Non-selected" Subsample (n = 21)**	
	Mean	Standard Deviation	Mean	Standard Deviation
1g: Good classroom learning environment – including classroom management and student participation, etc.	1.14	0.38	1.10	0.30
1b: Creating and implementing engaging lessons for all students	1.43	0.53	1.52	0.68
1h: A belief in yourself as a teacher to grow professionally	1.14	0.38	1.71	0.64
1d: Having good rapport with students	1.57	0.53	1.62	0.67
1f: Good student test scores	2.00	1.00	2.00	0.89
1e: Positive feedback on teaching from colleagues, administrators, and/or students	2.29	0.76	1.95	0.74
1a: Using assessments to cater to all student learning needs	2.43	0.79	2.14	0.73
1c: Participating in productive collaboration	2.14	0.69	2.57	0.68

Based on the results shown in Table 16, the subsample ranking of attributes as most important did not differ from that of the whole sample; each subsample still ranked a good classroom learning environment, creating and implementing engaging lessons, and a belief in yourself as a teacher to grow professionally as the most important attributes to define success. Once determining that the results of each subsample were in line with the entire sample, the researcher employed hypothesis testing to test for any significant differences between the two subsamples, using an independent two-sample t-test at the 0.05 significance level. Table 17 displays the results of the t-test.

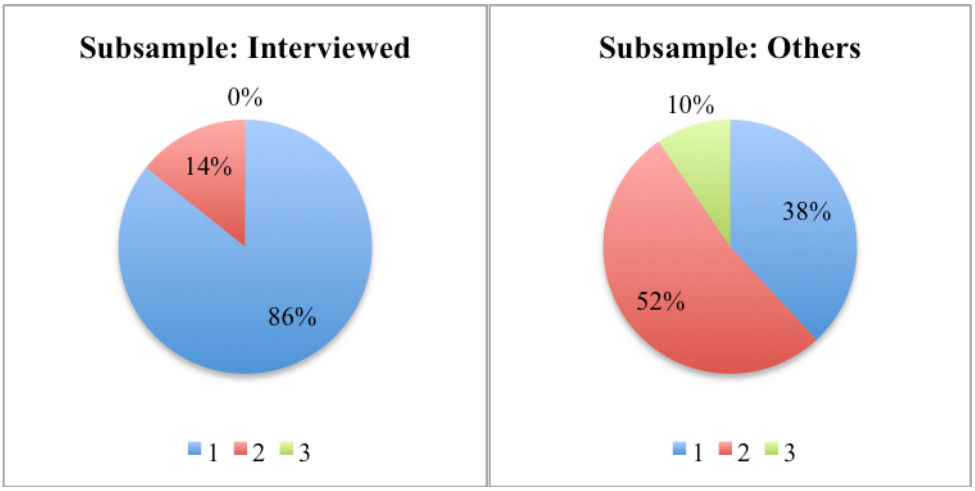
Table 17. Results of Two-Sample t-Test between Groups (n = 28)

Survey Ranking Attribute	**"Selected" Subsample (n = 7)**		**"Non-selected" Subsample (n = 21)**		**t-test results at 95%**	
	Mean	Standard Deviation	Mean	Standard Deviation	t-test value	Critical t-stat
1g: Good classroom learning environment – including classroom management and student participation, etc.	1.14	0.38	1.10	0.30	0.30	2.26
1b: Creating and implementing engaging lessons for all students	1.43	0.53	1.52	0.68	-0.38	2.16
1h: A belief in yourself as a teacher to grow professionally	1.14	0.38	1.71	0.64	**-2.85***	2.10
1d: Having good	1.57	0.53	1.62	0.67	-0.19	2.16

Survey Ranking Attribute	"Selected" Subsample (n = 7)		"Non-selected" Subsample (n = 21)		t-test results at 95%	
rapport with students						
1f: Good student test scores	2.00	1.00	2.00	0.89	0.00	2.26
1e: Positive feedback on teaching from colleagues, administrators, and/or students	2.29	0.76	1.95	0.74	1.02	2.23
1a: Using assessments to cater to all student learning needs	2.43	0.79	2.14	0.73	0.85	2.23
1c: Participating in productive collaboration	2.14	0.69	2.57	0.68	-1.43	2.28

Of the eight attributes, only one was found to be significantly different between the two subsamples: a belief in yourself as a teacher to grow professionally (1h). Those in the "selected" subsample were more likely to rank this attribute as most important in comparison to the "non-selected" subsample. The rate of responses can be seen in the pie charts of Figure 4 (Pie charts were preferred to histograms because the sample sizes between the groups were unequal.

Figure 4. Comparison of Responses to "A Belief in Yourself as a Teacher to Grow Professionally" between the Two Subsamples.



Those in the "selected" subsample were more likely to select a belief in one's ability to grow professionally as most important, whereas those in the "non-selected" subsample were split between most important and important, with a majority of the participants selecting it as important compared to the other listed attributes.

Correlation

During the qualitative interviews, several participants noted the important relationship between creating and implementing engaging lessons for all students and a good classroom learning environment so a correlation coefficient matrix was calculated (see Appendix L) for each of the respective subsamples to determine if the quantitative data support the qualitative data. In the "selected" subsample, only one pair of attributes was significantly correlated; whereas, in the "non-selected" subsample, six pairs of items were significantly correlated. Unfortunately, no significant correlation could be found among the attributes just mentioned; however, in the "selected" subsample using

assessment to cater to all student learning needs (1a) and a good classroom learning environment (1h) were significantly negatively correlated at the 0.05 level with a Pearson Correlation Coefficient of -0.801. It appears that the most important focus for these teachers was in making sure the classroom environment was suitable for students, rather than using assessments to influence the lessons in student learning.

In the "non-selected" subsample, six pairs of items were significantly correlated. However, when comparing the correlated attributes found here to the correlated attributes in the whole sample, only one new significant correlation was found: good student test scores relative to the school average (1f) and a belief in yourself as a teacher to grow professionally (1h) with a Pearson Correlation Coefficient of -0.434.

III. Research Question 2

The second research question to be answered was "To what factors, attributes, or experiences do beginning mathematics teacher attribute the success in their beginning years of teaching?" The second part of the survey contained 24 Likert scale and frequency statements asking about frequencies and attitudes toward teaching in the classroom. The responses were analyzed both quantitatively and qualitatively to find an appropriate answer to the research question.

Analysis Methodology

The statements were separated into different categories: statements about how frequently respondents performed a task in the classroom and statements about respondent's attitudes related to mathematics teaching. These sections were analyzed separately, as

each section had a different interpretation based on the scale used to measure responses. The Likert statements used a scale of Strongly Disagree, Disagree, Neutral, Agree, and Strongly Agree. The frequency statements used two scales, depending on the type of statement, Less than once a month, Monthly, Once a week, More than once a week, and Daily or Never, Rarely, Frequently, and Always (see Appendix A for the actual survey).

Once the data were collected, the researcher used two different measures to determine which factors the participants felt were most important. The first method combined the means (X) and standard deviations (s), using the formula $\frac{(X-\mu)}{s}$, for each question and produced a Z-statistic. After calculating the Z-statistic, the researcher selected -1 and 1 as benchmark criteria in selecting which factors were important. The reasoning behind this selection was that the researcher wanted to focus on questions in which a majority of the responses were either positive or negative, using the neutral attitude as the middle. If we assume $\frac{(X-\mu)}{s}$ is larger than 1, then the distance from the mean is far from the neutral and within one standard deviation so that range stays completely on either the left or right of the neutral point.

Typically, mode and median are used in analyzing Likert scale data but in this study, the researcher used the mean and standard deviation first to filter out certain attributes by using the statistics to identify clusters of responses strictly on either a positive or negative side. When looking at median and mode first, many of the attributes were considered to be important but that is not what the researcher was looking for. Rather, the researcher was trying to establish which attributes were unanimously positive or negative in response. After using the means and Z-statistic to identify the significant factors, the

researcher then looked at the histograms of each response to determine which statements were overwhelmingly positive or negative. For each statement the researcher identified factors in which at least 70% of the respondents' attitudes were positive or negative. By identifying these factors looking solely at the frequencies and histograms, the exact same factors using the mean and standard deviation were identified with no new factors being contributed.

Results from Quantitative Analysis

Tables 18 and 19 list the questions, means, standard deviations, Z-statistics, and the percent of responses clustered on either the positive or negative spectrum for factors or attributes found to be significant for each category. The results were separated into two tables depending on the type of question, frequency or Likert responses.

Table 18. Descriptive Statistics for Significant Frequency Questions (n = 28)

Frequency Statements	Mean	St. Dev.	Z-Statistic	% Positive or Negative
4. You collaborate and/or co-plan with other teachers on teaching, learning, and student assessment	1.93	0.94	-1.14	68% (N)
5. You find time for yourself to reflect on teaching, learning, and/or student assessments.	4.00	0.82	1.22	75%
8. You minimize student participation during class due to various pressures such as time constraints, curriculum, etc.	1.82	0.61	-1.11	89%
9. You directly give answers when student have questions, as opposed	1.96	0.51	-1.05	89%

to giving hints aimed towards helping students solve the problem themselves.				
10. You pay attention to the particular class of students that you teach while planning lessons, incorporating ideas that would be of specific interest to them	3.21	0.63	1.13	86%

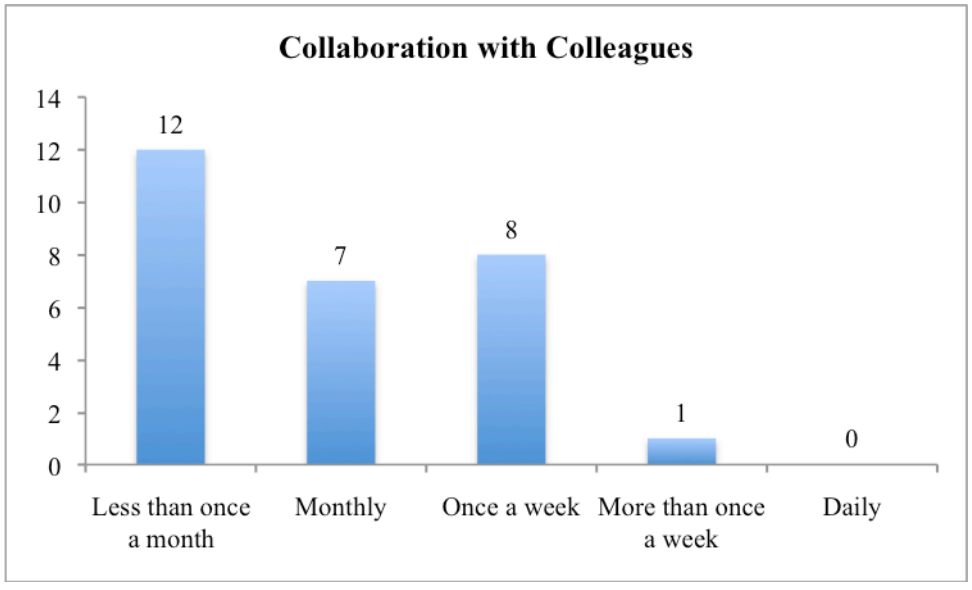
Table 19. Descriptive Statistics for Significant Likert Questions (Attitudes) (n =28)

Attitude Statements	**Mean**	**St. Dev.**	**Z-Score**	**% Positive or Negative**
11. You feel confident in your mathematical knowledge to answer student questions that come up during class.	4.21	0.83	1.46	89%
13. You are a confident problem solver, able to solve novel problems.	4.21	0.63	1.93	89%
14. You know the state standards and assessments in your subject area that your students are required to know.	4.25	0.93	1.35	82%
16. You believe your efforts as a teacher have a positive impact on students and/or student achievement.	4.07	0.72	1.50	79%
18. You view yourself as a person who has something to contribute to education, dedicated to growing and learning as a professional.	4.32	0.55	2.41	96%
25. You are currently satisfied with your job.	3.86	0.80	1.07	68%

Collaboration with Colleagues

Several of the findings were of special interest. The statement "You collaborate and/or co-plan with other teachers on teaching, learning, and student assessment" was the only statement reacted to negatively with a mean of 1.93 and a standard deviation of 0.94. The results are seen in Figure 5. This suggests that the participating teachers rarely collaborated on teaching, meeting approximately once a month with colleagues. During the course of an academic school year, that would amount to eight collaborative meetings. The statement was meant to measure how many times beginning teachers collaborated on matter of teaching and instruction rather than working with colleagues concerning classroom management and discipline.

Figure 5. Frequency of Responses to Collaboration with Colleagues (n = 28)



The most interesting aspect of the collaboration issue was that the responses from the quantitative survey tend to contradict the responses from the qualitative interview. In the

rankings, from Research Question 1, collaboration with colleagues was deemed least important and in the quantitative data from Research Question 2, collaboration with colleagues rarely occurred (approximately once a month). However, in the qualitative interviews, four of the seven participants interviewed stated, "Support from team teachers and colleagues in regard to classroom management, methods, and general advice" as one of the most important factors in their achieving success in the classroom. In contrast, two of the remaining three teachers wanted support, but never received the proper support from colleagues.

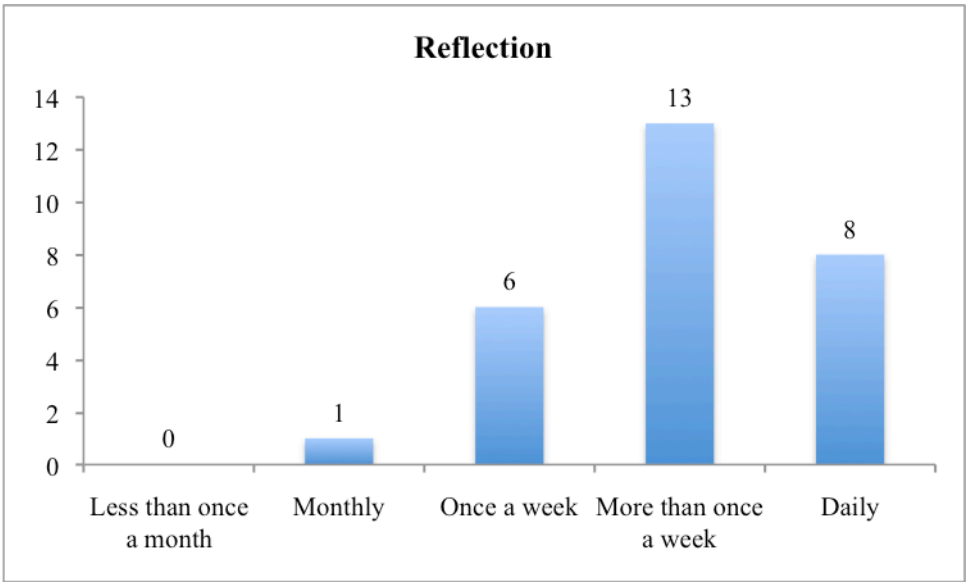
> As the youngest teacher at [Monroe], I always felt that other teachers did not take me seriously, so I really had to believe in my own abilities and use both the students and administrators as a guide to my success… When I didn't have the support to rely on, I knew I had to find it within myself to succeed. Also, it says positive feedback from colleagues, administrators, and/or students but I want to mention that is was less of colleague and much more of administration and students who gave me feedback. [Natasha]
>
> We had a math coach, but I would say she was one of those veteran teachers ready to retire. [Larry]

As mentioned previously in Research Question 1, productive collaboration is not entirely dependent on the beginning teacher, as colleagues need to be both willing to collaborate and become a proper role model for beginning mathematics teachers.

Reflection

The statement "You find time for yourself to reflect on teaching, learning, and/or student assessments" had a relatively high mean of 4.00 (More than once a week) and a standard deviation of 0.82, but from the histogram in Figure 6, it can be seen that beginning teachers reflected on their practice quite often. A majority of the respondents reflected on their teaching practices several times a week or daily.

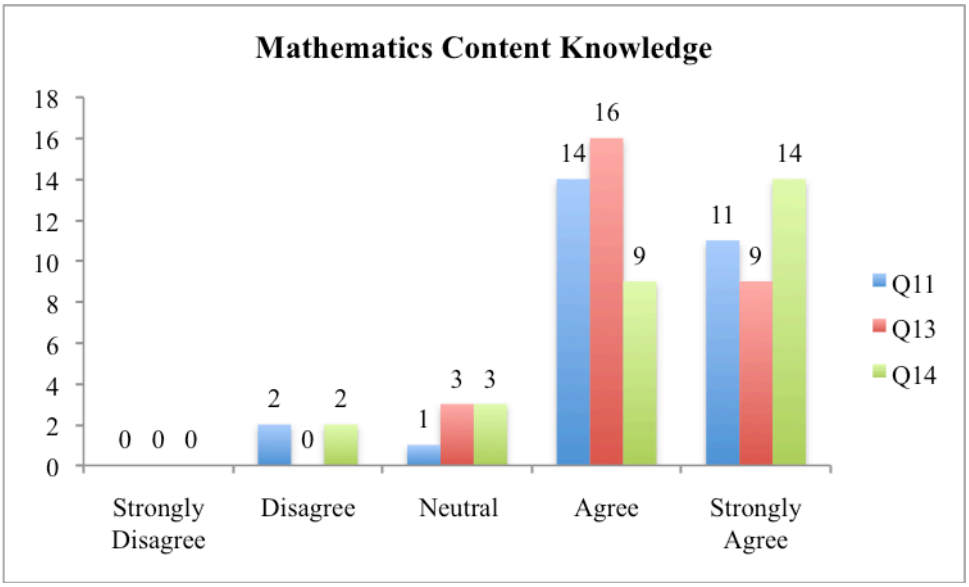
Figure 6. Frequency of Responses to Reflection (n = 28)



Mathematics Content Knowledge

Six statements were found to have been significant for beginning teachers, yet the six statements can be separated into three categories: mathematics content knowledge, beliefs as a teacher, and job satisfaction. Three of the statements dealt specifically with mathematics content knowledge in that participating teachers felt confident in their knowledge of mathematics and their ability to solve and answer questions, along with knowing the connection between mathematics content and the state standards. Mathematics content knowledge and student achievement are positively correlated so knowing that these beginning teachers feel positive about having a strong foundation in mathematics will only reflect positively in their teaching. The histogram in Figure 7 shows the positive responses to these statements regarding mathematics content knowledge.

Figure 7. Frequency of Responses to Questions Regarding Mathematics Content Knowledge (n = 28) (see Questions 11, 13, and 15 of the actual survey in Appendix A)



As informative as the histograms are, the interviews revealed more telling information about the participating teachers and how they viewed mathematics content knowledge. Four of the seven teachers felt that an important factor in the classroom was that their own struggles with mathematics better helped them understand the frustrations their students face.

> [B]ecause it took me 13 years to finish [college], the mathematics content is spaced out. And because I went through a quarter system, there is even less time to have to process the information. The reason why I can be very strong in algebra is because I took [more than] 3 times myself. In high school, in middle school, and I redid it in high school. Summer school. And when I came around in college, when I started doing my undergraduate math program, I took algebra again. [Robert]
>
> When I was in those upper level math classes, they were really hard for me. I'm the type of person that had to study really hard to get it. It [helps me identify and understand my students' problems], it does a little bit. But sometimes I forget. I forget about my struggles and how that experience was. [Larry]

It's important to have a good grasp of the mathematics content, but in addition, being able to identify and understand students' frustrations and problems with mathematics can contribute to being successful in the classroom.

The teachers with the strongest mathematics backgrounds also brought something different into the classroom.

> I think that really understanding the content is important, but what is more important is knowing what concepts will follow students later in their mathematics education. I think having that knowledge of how math is structured and how students are going to learn it will be useful in determining how to utilize the curriculum to its fullest. [Natasha]

Several teachers mentioned that being strong in mathematics allowed them to see the "horizon of mathematics content," and utilize it in planning their curriculum. Especially when teachers are pressed for time to cover all the state standards, knowing which topics are important in future mathematics courses would allow a teacher to prioritize certain topics.

In Research Question 1, creating and implementing engaging lessons was one attribute that helped determine success in the mathematics classroom. Several teachers also noted that their mathematics content knowledge was instrumental in helping them creating engaging lessons because of their knowledge of the connection between mathematics and real world applications.

> Actually, I think my background in physics helps me even more because it helps me to understand the connection between math and its applications to the real world. I can then make this connection much more explicit in my lessons in all my subjects such as physics, calculus, and geometry. Students are definitely much more engaged when this connection is made. I know those that graduated with a degree in math, a lot of their upper division courses were theoretical math courses and I'm not sure how helpful those classes would be in teaching these

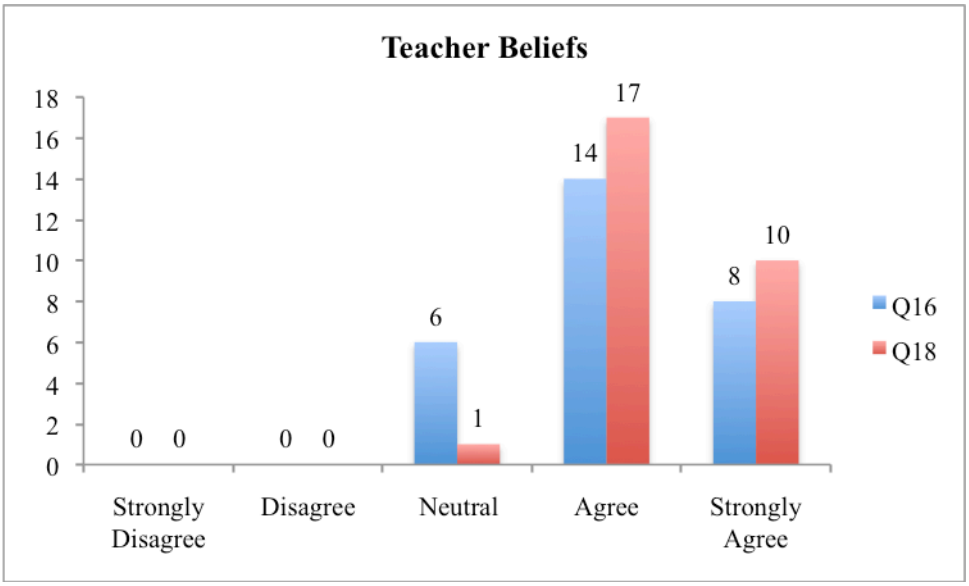
> subjects. That's why I felt like my background helps even more because I've been doing applied math since my days in college. [Gerry]
>
> I did not enjoy the higher level math, the upper theoretical stuff. I actually did not enjoy it all. I struggled quite a lot with it. But algebra, algebra 2, calculus, I actually really enjoyed it. So, teaching it I find it enjoying and especially doing projects with it and different ways of exposing it to the kids. [Charles]

Being able to connect mathematics to the real world and make it relevant for the students not only helps create engaging lessons for the students, but also shows students the importance of learning mathematics.

Teacher Beliefs

The questionnaire contained two statements regarding beliefs as a teacher: (16) You believe your efforts as a teacher have a positive impact on students and/or student achievement and (18) You view yourself as a person who has something to contribute to education, dedicated to growing and learning as a professional. The objective of statement 16 was to measure the teachers' attitudes towards efficacy and the objective of statement 18 was to measure the teachers' attitudes towards growing professionally. The histogram in Figure 8 shows the responses to each statement.

Figure 8. Frequency of Responses to Questions Regarding Teacher Beliefs (n = 28)



The responses to Question 18 (growing professionally) had the highest mean, 4.32, and the smallest standard deviation, 0.55, meaning that most of the responses were overwhelmingly positive with very little variation in the responses. Growing professionally was also one of the attributes considered to be most important in determining success in the classroom.

> I'm continually trying to grow because I see a lot of teachers here that are stuck in their ways… [A]nd I just feel like it's really difficult to stay with one lesson and not do anything to it. Even a good lesson, there is something to do to get [all students] involved and that's something I'm struggling with, just reflecting and trying to make things better and grow as a teacher. [Charles]
>
> …teachers have to have self belief that if things are not working out, they can change things to help them be successful. I am constantly learning and growing, and never satisfied with who I am as a teacher. I mean, I believe I'm doing well, but I also believe that there is a lot of room for improvement and growth. Like, I love to teach, it's my passion, and I'm willing to work hard to become the teacher that I want to be. [Gerry]

Never being satisfied with oneself and always striving to become a better teacher and growing professionally is seen as important if teachers are to gain success in the classroom.

Correlation

The researcher wanted to identify correlations among the questions, but running a correlation matrix on all the items resulted in 38 correlations (see Appendix N). Instead, a correlation matrix was generated using only the items found to be most significant in the quantitative analysis with results depicted the Table 20 (see Appendix O for actual correlation coefficient matrix).

Table 20. Correlation Matrix of Significant Items (n = 28)

Item	Item	Pearson Correlation Coefficient
5. You find time for yourself to reflect on teaching, learning, and/or student assessments.	10. You pay attention to the particular class of students that you teach while planning lessons, incorporating ideas that would be of specific interest to them.	0.432
5. You find time for yourself to reflect on teaching, learning, and/or student assessments.	13. You are a confident problem solver, able to solve novel problems.	0.504
8. You minimize student participation during class due to various pressures such as time constraints, curriculum, etc.	9. You directly give answers when students have questions, as opposed to giving hints aimed towards helping students solve the problem themselves.	0.455
8. You minimize student participation during class due to various pressures such as time	18. You view yourself as a person who has something to contribute to education, dedicated to growing	0.398

Item	Item	Pearson Correlation Coefficient
constraints, curriculum, etc.	and learning as a professional.	
10. You pay attention to the particular class of students that you teach while planning lessons, incorporating ideas that would be of specific interest to them.	16. You believe that your efforts as a teacher have a positive impact on students and/or student achievement.	0.375
10. You pay attention to the particular class of students that you teach while planning lessons, incorporating ideas that would be of specific interest to them.	18. You view yourself as a person who has something to contribute to education, dedicated to growing and learning as a professional.	0.437
11. You feel confident in your mathematical knowledge to answer student questions that come up during class.	13. You are a confident problem solver, able to solve novel problems.	0.474
11. You feel confident in your mathematical knowledge to answer student questions that come up during class.	25. You are currently satisfied with your job.	0.380
16. You believe that your efforts as a teacher have a positive impact on students and/or student achievement.	18. You view yourself as a person who has something to contribute to education, dedicated to growing and learning as a professional.	0.505
16. You believe that your efforts as a teacher have a positive impact on students and/or student achievement.	25. You are currently satisfied with your job.	0.533

Several items were positively correlated with job satisfaction, an important attribute for beginning mathematics teachers. Teachers who are more satisfied with their jobs are more likely to stay in the profession. According to the data, teachers who were more confident in their mathematics content knowledge were more likely to be satisfied with

their job based on having a correlation coefficient of 0.380 and teachers who believe their efforts in the classroom make a positive impact on their students and student achievement were even more likely to be satisfied with their job based on a correlation coefficient of 0.533.

Results from Qualitative Analysis

During the interviews, participating teachers were asked to expand upon their quantitative survey responses and speak in more depth about which factors or attributes helped them become successful in the classroom. Participants were asked to select three of four factors that, in their view, best helped them achieve success. The responses were then categorized into groups corresponding to the categories set by NCTM (see Chapter 2) and to several other categories created when factors were not aligned with the NCTM categories. The results appear in Table 21.

Table 21. Responses from Interviews Regarding Important Factors or Attributes (n = 28)

Category	**Factor/Attribute** **Note-** The number in parentheses after each factor/attribute indicates the number of participants that mentioned each specific factor or attribute.
Knowledge for Mathematical Tasks	Struggling in own math courses helps understand students' frustrations with math (4)
	Math content knowledge gave confidence in classroom to think on the fly (3)
	Horizon of math content (2)
	Math content allowed understanding of relationship between math and its applications to the real world[7]
Role in Discourse	Make content accessible to students (2)

Category	**Factor/Attribute** **Note-** The number in parentheses after each factor/attribute indicates the number of participants that mentioned each specific factor or attribute.
	- Visual learners themselves (2)
	Groupwork (2)
Learning Environment	Classroom management (5) - establishing rules (2) - discipline (2) - "trial and error" (2)
	Giving students ownership of the classroom by putting up work and using their input to decorate or lesson plan (2)
Tools to Enhance Discourse	CST/CAHSEE exams for teaching to the test and developing lessons (1)
	AVID- advancement via individual determination (2) - teach students learning skills (2)
	Internet resources (2)
	Use of technology in the classroom (2)
	Professional developments, conferences (1)
Analysis of Teaching and Learning	Reflection (2)
Personality	Social, joking personality to help build relationships in the classroom (6) - put on a show (1) - carefree (1) - tough but fair (1) - line between friend and teacher (2)
	Caring about students and building trust (2)
	Willing to take criticisms to improve as a teacher from both

Category	**Factor/Attribute** **Note-** The number in parentheses after each factor/attribute indicates the number of participants that mentioned each specific factor or attribute.
	students and colleagues (1)
	Sacrifice- willingness to put the time in (2)
	Similar background to students (4)
Support	Support from mentor or colleagues in terms of math content and methodology (3)
	Support from literacy coach, staff, and administration for venting, advice (6)
Previous Experiences	Outside experience (LAPD Explorers, ROTC, TA, mom is a teacher) (5)
	Previous classroom experiences (3) - high school teachers as role models (2) - college professor as role model (1)

Personality

Not only were participating teachers asked to identify factors or attributes they felt were important in achieving success, but they were also asked to identify which of those were the most important. Of the seven participants, six teachers mentioned that two of the most important factors were their personality and the support provided from team teachers, colleagues, or coaches in regard to classroom management, methods, and general advice.

Personality was seen as most important because it allowed teachers to build relationships with students in the classroom. Doing so allowed them to communicate better, making both discipline and instruction easier to manage.

> I was superstrict but that wasn't me. I was really mean because all teachers said you have to be superstrict so I was kind of a [jerk] and I didn't build any kind of relationships with the kids and it showed after a few weeks. They stopped listening to me and some of them started to become disrespectful and lots of that throughout the whole year. They can see that I wasn't very interested in them at all and they felt if I didn't care, then why should they care about the class. A lot of it was because I was just not being me and I wasn't trying to get to know them. I never knew about that. Nobody ever told me, get to know your students. All they told me was to be strict and have them in fear and you'll be all right... [A]nd after I found that out I started getting to know the kids and dynamic started to change so much and it's so true how important the relationships were. [Charles]

> But I see teachers who don't get along well with their students and the students dislike them and the whole thing is a negative atmosphere. And I've heard it said several times, if the students like they'll do better for you. I think it's true. The students came in after the CSTs [California Standards Test] and they're like "[Mr. C]! I did this and that, I understood it." It makes me feel good. They were trying for me. [David]

Certain aspects of a teacher's personality were seen as necessary in building these relationships with students. Teachers expected to be social with the students and joke around with them at times, but were also able to be tough and fair while maintaining that distance between friend and teacher. Several teachers noted that part of their job was "caring about students and building trust."

Also important were the characteristics of their personalities that required them to become better teachers. One teacher specifically mentioned that she had to be "willing to take criticisms from colleagues, administrators, and students to improve as a teacher," while two other teachers mentioned "sacrifice," the willingness to put extra time into

their craft to become a more successful teacher as essential for being a successful mathematics teacher.

Collaboration and Classroom Management

Support from colleagues in terms of collaboration was separated into two subcategories: support in terms of teaching mathematics methodology and support in terms of general classroom advice and venting. According to the interviews, more teachers cited support in terms of classroom advice and venting as more important than the support in terms of teaching methodology (six to four sources).

> With my students from that first year, it helped out that I had a strong team. I had 3 teachers who had already started out the year with them [Robert entered the classroom late]. One of the teachers, 2 of them as a matter of fact, had real good parent relationships so they immediately started making phone calls whenever I had discipline problems. Doing this, doing that. When I came around, I kind of piggy backed off that and moved into that. [Robert]

> There was a literacy coach here who was helping me when I was a[n] [intern] and we would talk about our problems and she would observe my classrooms and she would take notes. I would tell her my problem students, and ask, "Can you help me out? What's going on?" She would come into my classroom and observe… She would just let me know what is happening. When you are doing this, this is what the students are doing. And leaves it up to me how to change it. She was basically my coach. She was good… We had a math coach too but I would say she was one of those veteran teachers ready to retire. But I felt I got more help from the literacy coach rather than the math coach. [Larry]

These teachers were more concerned with classroom discipline and needed support in that regard before going into the mathematics. As previously stated in Research Question 1, a good classroom learning environment and engaging lessons go hand in hand, so based on these qualitative responses, beginning mathematics teachers need more support in classroom management than in methodology.

Previous Leadership Experiences

A majority of those interviewed had some type of previous leadership experience. Noticeable was the wide variety of leadership experiences held by the teachers. Two of the teachers served as teacher's assistants prior to entering the program and saw those experiences as valuable when leading their own classrooms.

> That I was a TA [teacher's assistant] for many years. I had the classroom experience. I had never led a class, but I worked with kids before and I knew what I was walking into and there were not that many surprises… I knew what to expect that first semester. There weren't any surprises for me. So that to me was very important. It taught me a lot. [Mark]

Two other teachers were involved in the Los Angeles Police Department Explorers (LAPDE) and Reserve Officers Training Corp (ROTC) throughout high school. Being involved in these programs was seen as helping with classroom management.

> I used to be involved with LAPD explorers. I started when I was 14 and that program allowed me to have control of a group of students or a group of cadets. That's where I got them from, classroom management. Being an authoritative figure. Those experiences have really allowed me to have good classroom management. [Larry]

> I did a year of military training but you know, for the most part out of the years in high school I went through the ROTC program where I received a lot of leadership skills so having had those leadership qualities and skills evolved from a student cadet to all of a sudden into the service. I still have that; I know how to lead. That mentality. [Robert]

Being in these programs taught the respondents both leadership and management skills. The mentality and skills of being an authority figure transferred to the classroom, allowing a smoother transition in maintaining classroom discipline.

Even more interesting was the background of several of the remaining teachers. Four of them grew up in the same areas where they currently teach. Since the teachers and students grew up in the same community, they had a special bond.

> I think that having a similar background to the students that I teach, in that I am also Latino and from the community gives me a different perspective and helps me sympathize with my students and what they have to deal with in their day to day life. As a result, I can relate to them very well and I have an excellent rapport with them. [Gerry]
>
> Building these relationships takes time and effort thought but luckily I am a pretty sociable guy so I was able to build these relationships with students. It also didn't hurt that I am from the community so I see many of my students around town outside of a school environment. [Mark]

Being able to understand and communicate with students on a more personal level allowed these teachers to build rapport and relationships with students faster.

Differences between Subsamples

After analyzing the data for the entire sample, the researcher separated the data from the two subsamples ("selected" and "non-selected") to determine if any of the responses were significantly different. In particular, the researcher wanted to know if the groups were significantly different in mathematical content knowledge, pedagogical content knowledge, and prior leadership experience. When analyzing Likert data with ordinal data, a non-parametric test should be used. Therefore, when choosing to analyze for a significant difference between the two subsamples, the statistic of choice was a nonparametric test called the Mann-Whitney Test (Black, 2010). The Mann-Whitney Test is based on several assumptions:

1. The observations from both groups are independent of each other.

2. The responses are ordinal (meaning that any one response is either less than, equal to, or greater than any other response).

3. The null hypothesis is that the distributions of both groups are the same.

4. The alternative hypothesis is that the probability of one observation exceeding the other population by 0.05.

SPSS was used to run the calculations and several significant differences were found (see Appendix P for actual table). The results of the Mann-Whitney Test can be seen in Table 22.

Table 22. Mann-Whitney Test Results Looking for Significant Differences Between the "Selected" and Non-selected" Subsamples (n = 28)

Statement	**Significance Level**
15. Your classroom is conducive for learning, free from behavioral and other distractions.	0.028
17. You believe the key to success in mathematics is primarily in the abilities and/or backgrounds of the students as opposed to the quality of the teachers and schools.	0.002
18. You view yourself as a person who has something to contribute to education, dedicated to growing and learning as a professional.	0.005
19. You are not well organized when it comes to teaching, grading, planning, etc.	0.029
20. You bring an enthusiasm, dynamism, excitement and interest daily for the mathematics you teach and how you present it in your classroom.	0.018
23. You have had previous experiences or jobs outside of teaching that have helped you feel comfortable in front of large groups of people.	0.010
24.You do not have adequate resources at your school, department, and in your classroom.	0.030

As expected, two of the significant differences followed directly from the criteria of the selection rubric: the two subsamples significantly differed at the 0.05 level in terms of previous leadership experience and classroom management. Statement 15 was a measure of a good classroom learning environment, so the significant difference between the two groups shows that those in the "selected" subsample (mean = 4.57) felt that they were more likely to maintain a good classroom learning environment than those in the "non-selected" subsample (mean = 3.90).

Previous leadership experiences were found to be valuable, especially in helping with classroom management and discipline. It is interesting to discover a significant difference between the responses of the two groups in terms of leadership experience along with a significant difference in exhibiting a good classroom learning environment: those "selected" (mean = 4.00) were more likely to have experienced some type of leadership than those in the "non-selected" subsample (mean = 3.00). Those teachers who were selected as successful were more likely to have previous leadership experience useful for leading a classroom, and possibly as a result, also more likely to maintain a good classroom learning environment.

Statement 17 was intended to measure the participating teachers' beliefs in students. A significant difference exists between the two groups as those "selected" (mean = 2.14) were more likely to have the belief that all students can succeed, as opposed to those in the "non-selected" subsample (mean = 3.05). At first glance, it appears those in the "non-selected" subsample did not have strong beliefs in their students but during the qualitative interview, one participant responded that "he/she believed in all students and their ability

to succeed in the classroom, but the teachers' role is integral with achieving student success so it cannot be discounted." [Gerry]

In response to classroom organization in statement 19, a significant difference existed between the two subsamples. However, the results showed that the "non-selected" subsample (mean = 2.05) felt more organized than the "selected" subsample (mean = 3.14). Also for statement 24, those "selected" (mean = 2.43) had more school resources available compared to the "non-selected" subsample (mean = 4.10). It is possible that some participants could have carelessly misunderstood these questions, as they were two of the negative statements in the survey.

IV. Research Question 3

The third research question was "When and where do these beginning mathematics teachers believe they acquired and developed the factors or attributes identified in question 2?" The latter questions in the survey and the second part of the semi-structured interview were developed to answer the third research question.

Stages of Teacher Development

The goal of Section 4 of the survey was to determine which stage of teacher development was perceived as most instrumental to teaching success. There are three stages of teacher development to be considered. The first stage is pre-program, all the experiences and observations learned by the participant prior to entering the alternative certification program. These experiences can include the childhood experiences in the mathematics classroom, or in any other classroom for that matter, ranging from elementary to college.

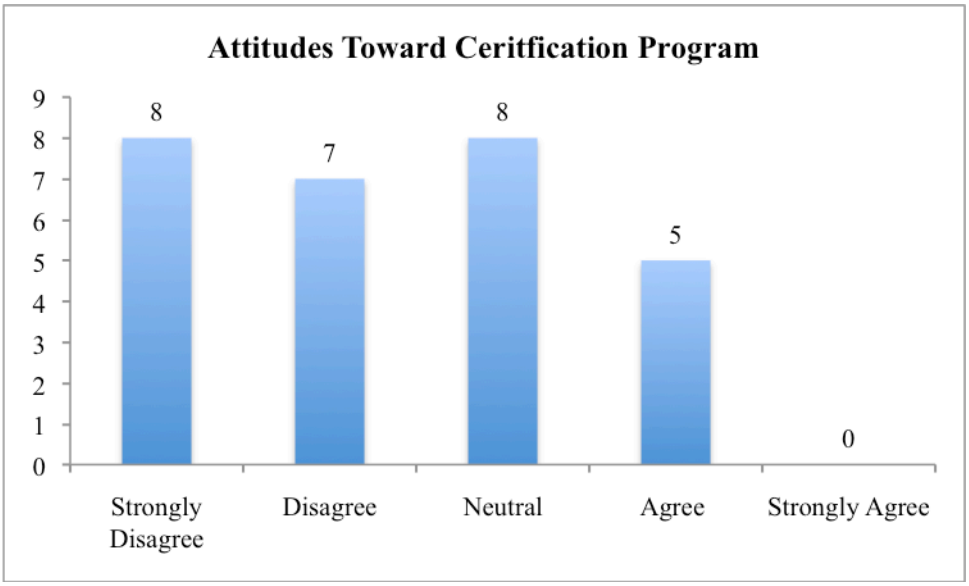
The second stage of teacher development is during-program, or time spent in the alternative certification programs. This includes all the classes, mentoring, and advice provided for and learned by the instructors in the alternative certification programs. Participants participate in a four-week 'boot camp' prior to entering the classroom, and spend their first year teaching concurrently taking courses from the program once a week. The third stage of teacher development is post-program, or everything learned from experiences in the participant's mathematics classroom or mentoring or advice provided by the school during their beginning years. Three questions were designed to ask the participants to respond to each of the three stages in terms of preparation and influence. Since teachers in the alternative certification program take courses concurrently with teaching in their own classroom, it is important that participating teachers be able to differentiate the second and third stages.

Results from Quantitative Analysis

Attitudes toward the Three Stages of Development

Question 26 focused on the during-program stage of teacher development and asked the participants to respond to the following statement: Your teacher certification program prepared you well to succeed in teaching mathematics. The participants' feelings towards their alternative certification program were mostly negative; the average response was 2.36 (disagree) with a standard deviation of 1.10. The median of the responses was 2 (disagree) and it was also bimodal in that both 1 (strongly disagree) and 3 (neutral) garnered eight responses each. The histogram in Figure 9 shows the response rate.

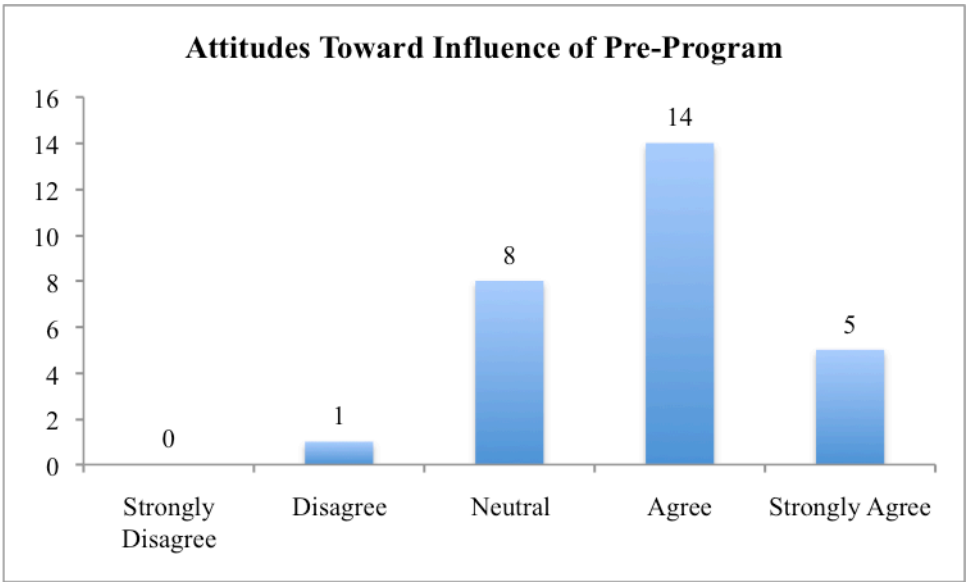
Figure 9. Frequency of Responses for Attitudes towards During-Program (n = 28)



A majority of the participants held indifferent or negative attitudes toward the preparation provided by their alternative certification program as the distribution is slightly skewed toward the left. From the qualitative interviews, participants felt a disconnect between what they were being taught in their courses and what actually occurred in the classroom. This phenomenon will be further explored in the qualitative analysis.

Question 27 focused on the pre-program stage of teacher development and asked participants to respond to the following statement: Your personality and experiences growing up were more influential in your becoming a successful mathematics teacher than your teacher certification program. The responses to this question were generally more positive; the average response was 3.82 (agree) with a standard deviation of 0.77, the median was 4 (agree) and the mode was also 4 (agree). The histogram can be seen in Figure 10.

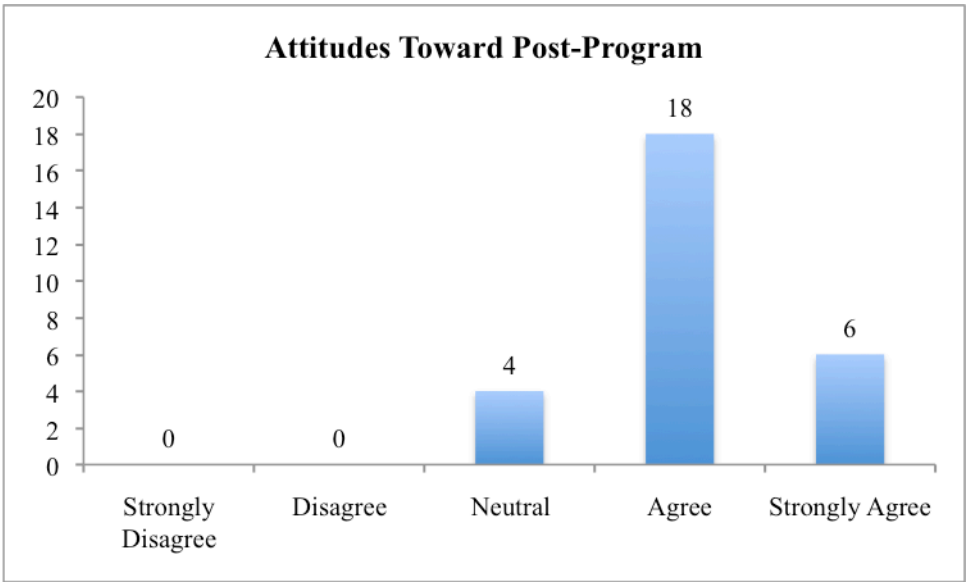
Figure 10. Frequency of Responses for Attitudes toward Pre-Program (n = 28)



The participants' feelings about the preparation provided by their pre-program experiences were generally more positive. The results show the importance of early experiences on teachers' classroom performance.

Question 28 focused on the post-program stage of teacher development by having the participants respond to the following statement: You gained more abilities and awareness outside your teacher certification program about being a successful mathematics teacher than through your teacher certification program. Experience in the classroom appears to be the most important stage of teacher development as 24 of the 28 agreed with the previous statement. None of the participants disagreed with the statement, as the remaining four participants responded with "neutral." The histogram can be seen in Figure 11. The average response was 4.07 (agree) with a standard deviation of 0.60; the median was 4 (agree), and the mode was also 4 (agree).

Figure 11. Frequency of Responses for Attitudes toward Post-Program (n = 28)



The results highlight the importance to teacher growth of classroom experience. The distribution is also skewed toward the right.

Participants' attitudes towards the pre- and post- stages of teacher development were generally much more positive in comparison to their attitudes toward the during-program phase of teacher development. This can be interpreted in two ways: (1) a teacher's upbringing and personality combined with the knowledge gained within his/her own classroom is more important than what is learned during the alternative certification program, or (2) the alternative certification program in question is not fully preparing their potential teachers.

Correlation

The responses from Questions 26, 27, and 28 were analyzed to see if any correlation existed among the responses because during the qualitative interviews, all the participants

held a positive view of the pre- and post-program stages of teacher development while holding a negative view towards the during-program stage of teacher development. As expected, Table 23 shows that responses to Question 26 and Question 28 were negatively correlated.

Table 23. Correlation Between Attitudes Towards Different Stages of Teacher Development (n = 28)

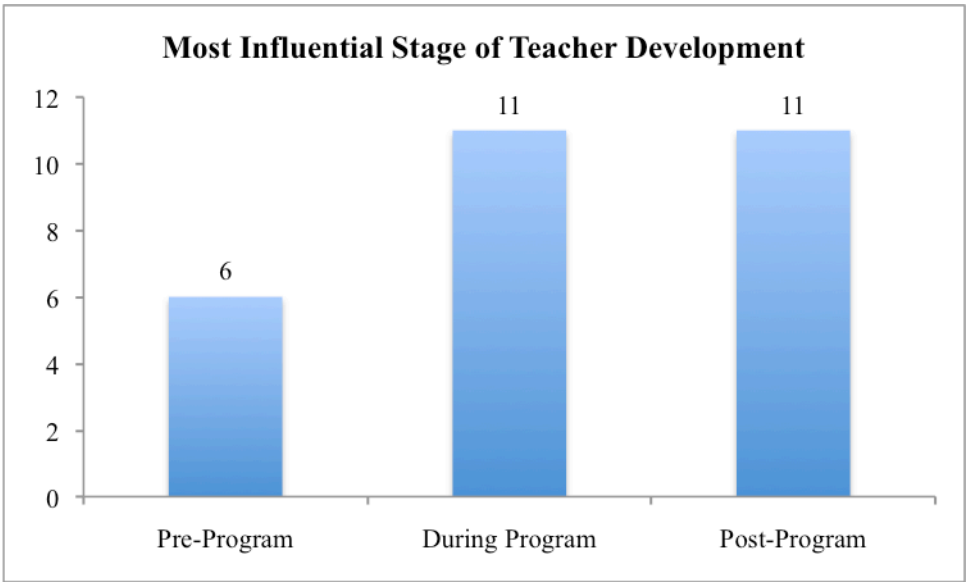
Correlations				
		During Program	**Pre-Program**	**Post-Program**
During Program	Pearson Correlation	1	-.053	-.376*
	Sig. (2-tailed)		.788	.049
	N	28	28	28
Pre-Program	Pearson Correlation	-.053	1	.028
	Sig. (2-tailed)	.788		.886
	N	28	28	28
Post-Program	Pearson Correlation	-.376*	.028	1
	Sig. (2-tailed)	.049	.886	
	N	28	28	28
*. Correlation is significant at the 0.05 level (2-tailed).				

The Pearson Correlation Coefficient between Questions 26 and 28 was -0.376. Those participants more likely to have attitudes that downplayed the influence of their alternative certification program were more likely to have positive attitudes about the influence of in class experience in terms of being successful in the classroom and vice versa. This could possibly be explained by the fact that many beginning teachers felt underprepared from their alternative certification program; they had to make up deficiencies by learning on the job. This has been noted to be a common disadvantage of graduating from an alternative certification program.

Most Influential Stage of Teacher Development

Question 29 and 30 asked the participants to determine which of the three stages of teacher development (pre-, during, or post-) was most influential and best prepared them for being successful in the classroom. Rather than gauging their attitudes toward each of the stages, the researcher wanted to establish which stage was viewed as most important to their success as teachers. Question 29 asked the following: Which period of your life was most influential in shaping your model of good mathematics teaching? The participants' average response was 2.18 (during program) with a standard deviation of 0.77, the median was 2 (during program), and the mode was bimodal between 2 (during program) and 3 (post-program). The histogram can be seen in Figure 12. Interestingly, these results seem to somewhat contradict the responses from Question 26. In their responses to Question 26, the participants generally had a neutral or negative attitude towards the during-program stage, yet in their responses to Question 29, the median and mode (one of them) tended toward the during program stage. Analysis from the qualitative interviews attempts to explain this contradiction.

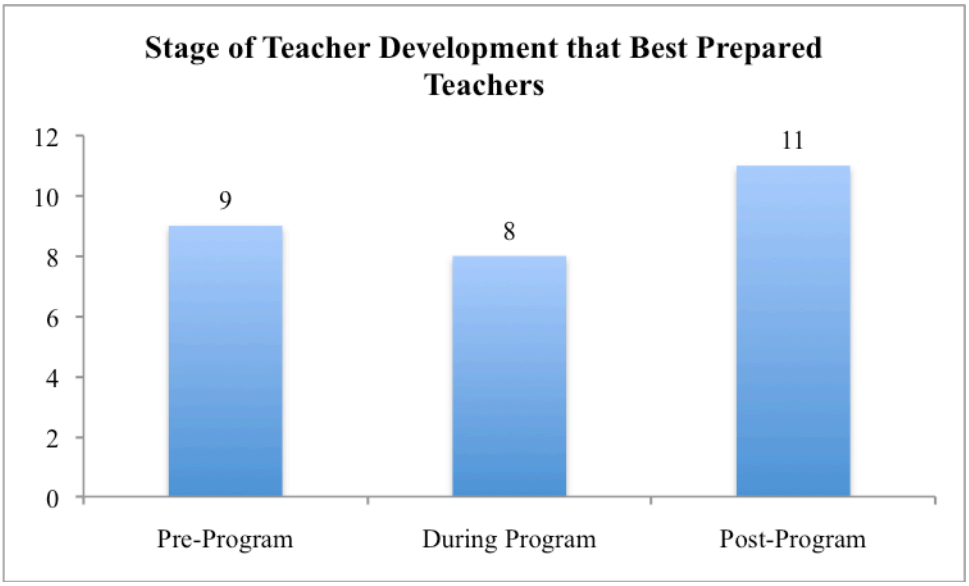
Figure 12. Frequency of Responses for Most Influential Stage (n = 28)



Stage of Teacher Development that Best Prepared Beginning Teachers

Question 30 asked the following: Look back at your rankings from Section 1. Which period of your life prepared you most to be able to do those things that you selected to best define success in the first year of teaching. The average response was 2.07 (during program) and the standard deviation was 0.86. Other descriptive statistics were also calculated; the median was 2 (during program) and the mode was 3 (post-program). Even though the average and median cluster toward the during program stage, the distribution of the data show the spread of responses and, in fact, during program received the fewest responses, allowing the results for pre-program and post-program to offset each other. It is interesting to note that the pre-program and post-program received the highest number of responses (9 and 11 respectively), which correlated with the fact that the participants generally held positive attitudes towards these two stages of teacher development. These responses can be seen in Figure 13.

Figure 13. Frequency of Responses for Best Preparation (n = 28)



Results from Qualitative Analysis

During the first part of the interview, the researcher, using a premade template (see Appendix D for a sample copy), took extensive notes and compiled a list of all the important and most important factors/attributes mentioned during the discussion. The goal of second part of the semi-structured interview was to have participants determine which stage of teacher development was most instrumental in attaining the most important factors or attributes from Research Question 2. The results from the interview can be seen in Table 24.

Table 24. List of Most Important Factors and Selected Stage of Development (n = 7)

Factor or Attribute		Participant	Stage of Teacher Development		
			Pre-	During-	Post
Support from team teachers, colleagues, and coaches in terms of classroom management, and general advice		Larry			X
		Robert			
		Mark	X	X	X
		Charles			X
		David			X
		Gerry			X
Personality	'one man show'	Robert	X		X
	Social, joking	Mark	X		
	Carefree	Charles	X		
	'Tough but fair'	Natasha	X		
	Sacrifice	David	X		X
Classroom management in terms of discipline and structure		Larry	X		X
		Robert	X		X
		Mark	X		X
		Gerry			X
Previous experiences in leadership role	LAPDE	Larry	X		
	ROTC	Robert	X		
	TA	Robert	X		
		Mark	X		
Support from team teachers, colleagues, and coaches in terms of methodology		David			X
		Gerry			X
Use of CST/CAHSEE assessments to prepare		Larry			X

curriculum				

Based on the data in Table 24, both pre- and post-program stages were much more influential in helping respondents acquire the factors/attributes perceived as necessary for achieving success in the classroom. Only one participant noted the help of his alternative certification program and that was in providing classroom support.

Support from Colleagues and Coaches

Support offered to beginning mathematics teachers was separated into two categories: support in terms of classroom management and general advice, and support in terms of teaching mathematics and methodology. The "selected" teachers felt support in classroom management was more essential than the support in teaching methodology, probably reflecting a feeling that students must be well-behaved before any teaching can really occur.

The participating teachers were asked to reflect on where they acquired this support, and all the participants selected post-program; in fact, all the support was provided from the schools at which they worked. Interestingly enough, one participant, Mark, mentioned all three stages of development as influential in gaining support from his colleagues. In regard to pre-program, Mark replied, "My work as a [teacher's aide] made me realize the importance of colleagues." Mark even mentioned the support offered by his alternative certification program: "It was a little [help] but not as much. I mean, yeah they tried, but their focus didn't match mine. A lot of things people told me, they weren't really doing it."

Other participants went out of their way to mention the lack of support offered by their alternative certification program. Natasha stated, "Because I didn't get support from colleagues or the DI program, I often asked the students what was good and bad about my class. They were brutally honest but also that first year I learned a lot."

All the participants who mentioned support as an influential factor in achieving success had to find their own support group in the schools at which they worked.

> When I first began teaching, I was able to go to other teachers for support in everything from classroom management to teaching methods… Mr. [P] was someone that helped me with the instruction in the classroom. I remember observing his Calculus classes and everyone was so engaged that I wanted my classes to look just like that. In terms of classroom management, the math coach, Ms. [B], and a veteran teacher, Ms. [H], were able to give me plenty of advice on how to handle discipline. If you first look at Ms. [H], she's a small little lady, but when you see her in the classroom, you completely know who's in control of that class. It wasn't that the class was just well-behaved, but you also got a sense that kids respected her as well, so both of them were able to help me learn how to handle a classroom. [Gerry]

> In my first faculty meeting or department meeting, I introduced myself to the department and at the time, Mr. Martin was the department chair and so naturally I knew he was the guy. I just figured department chairs knew what they were doing... So the first time I went to Mr. Martin and we just had a few sessions and he told me anytime you need assistance, send a kid over I'll chew him out whatever. [Charles]

> I think a lot had to do with having a group of teachers that you could vent to and could share experiences with. I think that's very helpful. I'm very thankful [to be] introduced me to the social justice SLC and now we have the little core group of teachers and I felt like that has been important. I can talk about problems, and it's a support group for teachers. I think that for me, it's my sanity and I think it's very important to have a cohort of teachers to go and talk to. [Mark]

In their experiences, instead of being offered support from their alternative certification program and schools, the participating teachers had to seek out their own support system in their schools based on what they felt was most necessary.

Personality

Personality was also selected as an attribute necessary for achieving success in the classroom. Often personality is acquired through one's own experiences and upbringing. When asked to describe their personalities, the phrases "social," "extrovert," "a joking personality," "put on a show," "carefree," "tough but fair," "caring," and "trustworthy" repeated themselves several times. These traits were acquired through the respondents' own experiences growing up.

Two of the participants said that characteristics of their personality in the classroom were acquired post-program as a necessity to help achieve success in the classroom. Robert mentioned that he was "social in the classroom, to better build relationships," but stated that his personality inside the classroom differed from outside of the classroom, " I'm more, I don't know. I'm different. More reserved." David specifically mentioned the sacrifice and hard work he put into his profession, but also mentioned that he is typically not hard working, but rather that he had to acquire this trait to become successful in the classroom. In response to the question, "Where did you get the [hard working and sacrifice] traits?", Davis responded, "Definitely not growing up. I wasn't very disciplined. But wanting to do a good job as a teacher, I had to put the time and effort in. I mean, you're in charge of kids' lives." Certain personality traits were not culled from upbringing and experiences, but rather arose out of a necessity to become a better mathematics teacher.

Connection between Classroom Management and Previous Experience

Four teachers identified classroom management as being an important factor. Of those four, three (Larry, Robert, and Mark) noted that learning about classroom management occurred in both the pre- and post-program stages. When asked about where in the pre-program stage they learned about classroom management, all three responded that their previous leadership experiences (LAPDE, ROTC, TA) were instrumental in learning about classroom management. Larry talked about how his experience in the LAPDE allowed him to be "an authoritative figure" which transferred into the classroom and how "those experiences have really allowed me to have good classroom management." Robert's experience in ROTC allowed him to "project his voice" and "raise my voice without yelling," which was instrumental in his classroom management skills. It appears that prior leadership skills, especially as an authority figure, are useful in establishing good classroom management, thus allowing more learning to take place.

Negative Attitudes Towards During-Program Stage of Teacher Development

The quantitative data revealed that a majority of the participants (82%) held indifferent or negative attitudes towards the during-program stage of teacher development, or their teacher certification program in general. During the qualitative interviews, participants were asked to further expand upon their experiences, both positive and negative, in their teacher certification program (during-stage) and several common themes were established.

Participants felt a disconnect between the program's curriculum and what actually occurs in the classroom. More specifically, teachers felt that too much emphasis was placed on education theory, and not enough emphasis on practice for the actual classroom.

> …experience is more important than theory. Don't get me wrong; I think theory is important but as a beginning teacher I think the immediate focus should be on short term goals rather than the bigger picture that theory brings. [Gerry]
>
> We had a lot of other teachers just telling us about [education] theory, but it doesn't always really work in a classroom. There was a huge disconnect between the theory and practice; especially in an urban classroom. [Mark]

Widening the disconnect between theory and practice is the fact that participants noticed what might be deem a certain hypocrisy in the certification program: participants were being taught and expected to differentiate instruction for all students, while the material presented by the certification program was mostly lecture and teacher-oriented, further disengaging the participants.

> It kind of reminds me of what not to do as a teacher. After awhile I just stopped paying attention. It's a model of a real world situation. I cannot run my classroom like this. If it doesn't work for adults, how is it going to work for kids? [David]

Furthermore, when taking methods courses to learn practical tools necessary for the classroom, the schedule and pace of the courses and curriculum was much too fast for the participants. According to Charles, "there's not enough time to process everything and that was a problem."

> Its kind of frustrating. I do get a lot of [the material] sinking in, but at the same time I'm not receiving everything. It's the pace. I'm getting things through the program, but I want a lot more time. Time to comprehend. … I always say its too fast, I need to understand, but nothing. I need the time to process it. [Robert]

Not only did the participants mention the lack of practice and the pacing of the courses, participants were particularly frustrated about the coursework being asked of them. The

coursework was often termed as "busywork" and solely a "means to end" in completing the program. The "busywork" was also mentioned as "irrelevant to the profession and the school." In the participants' eyes, the amount of work given, and the time necessary to complete the work, could be more efficiently used to help them prepare for their own mathematics classrooms.

Culturally Relevant Teaching

For the issues examined in this study, participating teachers' attitudes toward their alternative certification program were generally negative except for one aspect: culturally relevant teaching. Five participating teachers mentioned it as one of the more (if not the only) relevant topics learned in their alternative certification program. Because the district is a large, diverse and urban school district, the alternative certification program included cultural diversity as a mandatory course.

> I think the only thing I have learned, and I'll be honest, is making things culturally relevant. CCRE. It's a big unit. Cultural relvance is also where you get the engagement. You're tying onto what their likes are, their differences… Our group leaders are diverse. And the other thing was technology. Technology is so culturally relevant because it's their culture! Our kids are, they're the technatives, I think that's they call them. And we're the ones who are trying to learn the technology… Not only is it going to be helpful for their future but it's helpful for their engagement and that's culturally relevant. They need to have it, because that's where you're going to get connections. [Robert]

> There are a few things I'd take here and there. For example, we just took a cultural diversity class and that kind of made me realize, I'm not really that culturally open to my class. I don't really bring in any cultural examples so students don't have a lot of access to books to certain cultures. It's definitely one big area of improvement. And it's a worthwhile investment, because culture is very important. "Oh I know that, I know that food, or dance," and they'll be even more interested in what you're going to say. [Charles]

Culturally relevant teaching was not seen as an important factor in making a successful mathematics teacher, but it is interesting to note because it was the sole alternative certification program topic found to be relevant by these beginning mathematics teachers.

Differences between Subsamples

Attitudes toward Stages of Teacher Development

Once the entire sample data were analyzed, they were then separated into two subsamples ("selected" and "non-selected") from which descriptive statistics were first found and then the Mann-Whitney test was applied to check for any statistically significant differences at the 95% level. The results from the descriptive statistics can be seen in Table 25 and showed similarities among the responses between the two groups.

Table 25. Descriptive Statistics of Two Subsamples (n = 28)

Question	**Statistic**	**Subsample**	
		Selected (n =7)	Non-Selected (n = 28)
26 (During-Program)	Average	2.29	2.14
	Standard Deviation	0.76	1.2
	Median	2	2
	Mode	2	1
27 (Pre-Program)	Average	4.00	3.86
	Standard Deviation	0.82	0.77
	Median	4	4
	Mode	4	4
28 (Post-Program)	Average	3.71	4.14

	Standard Deviation	0.76	0.51
	Median	4	4
	Mode	3	4

Responses of the two groups on Question 26 and Question 28 resulted in different medians and modes. For Question 26, a higher number of participants from the "non-selected" subsample chose "strongly disagree" in response to their attitudes towards their alternative certification program while the "selected" subsample mostly chose "disagree" in response to the same question. However, both groups displayed a negative attitude toward their program. For Question 28, a higher number of participants from the "selected" subsample chose "neutral" in response to their attitudes about experiences from the post-program stage of teacher development, while the "non-selected" subsample mostly chose "agree" in response to the same question. The results from the Mann-Whitney test (Table 26) show no significant differences between subsamples on the responses to Questions 26, 27, and 28.

Table 26. Mann-Whitney Test Results Comparing Responses Between Subsamples (n = 28)

Hypothesis Test Summary

	Null Hypothesis	Test	Sig.	Decision
1	The distribution of Section IVa [26] is the same across categories of Sample.	Independent-Samples Mann-Whitney U Test	.891	Retain the null hypothesis.
2	The distribution of Section IVa [27] is the same across categories of Sample.	Independent-Samples Mann-Whitney U Test	.526	Retain the null hypothesis.
3	The distribution of Section IVa [28] is the same across categories of Sample.	Independent-Samples Mann-Whitney U Test	.081	Retain the null hypothesis.

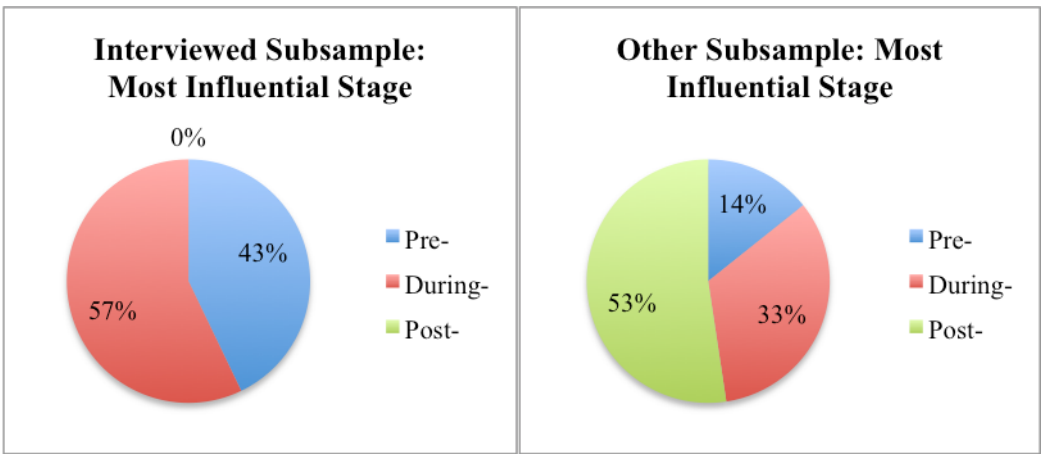
Asymptotic significances are displayed. The significance level is .05.

Most Influential Stages of Teacher Development

However, when comparing the responses to Questions 29 and 30, which ask about the most influential stages of teacher development, there exist differences between the responses of the two subsamples. The descriptive statistics for Question 29 identified clear differences between samples when asked about the most influential stage in teacher development each sample had in selecting an influential stage of teacher development. The "selected" subsample had a response average of 1.57 with a standard deviation of 0.53, with a median and mode of 2 whereas the "non-selected" subsample had a response average of 2.29 with a standard deviation of 0.74, with a median and mode of 3 (Selecting 1 meant choosing pre-program, selecting 2 meant choosing during-program,

and selecting 3 meant choosing post- program.) The responses reflected in the pie charts of Figure 14 (pie charts were once again used because the sample sizes differed, so converting data into percentages allows them to be on the same scale) shows differences in the responses.

Figure 14. Comparison of Responses to Most Influential Stage of Teacher Development (n = 28)



Of those ”selected”, three chose Pre-Program and four chose During-Program as most influential, but none of them chose Post-Program as most influential to their modeling of good mathematics teaching. However, those from the “non-selected” subsample, 11 of 20 (55%) chose Post-Program as most influential. There appears to be a clear divide over what stage teachers view as most influential; those from the “selected” subsample (who were selected based on recommendations of successful teaching, mathematical content knowledge, and leadership experiences) felt Pre-Program and During-Program were influential whereas the “non-selected” subsample overwhelmingly chose During-Program and Post-Program.

Also interesting to note was that during the interviews, participants were more likely to select pre- or post-program in acquiring the skills necessary to achieve success in the classroom; during-program was only mentioned once in response the most important factors or attributes. When asked to explain why they chose the during-program stage as most influential, several of the participants changed their answers based on the interview.

> Oh that's interesting. I may have, but I don't remember. I would like to say post-program has been most influential to my teaching. [Charles]
>
> Well, now that I think about it, post-program. It was very influential and the best in preparing me for the classroom. That was definitely my biggest developmental period. [David]
>
> I would say no. I would change it to post-program. It would definitely be the most influential. [Larry]

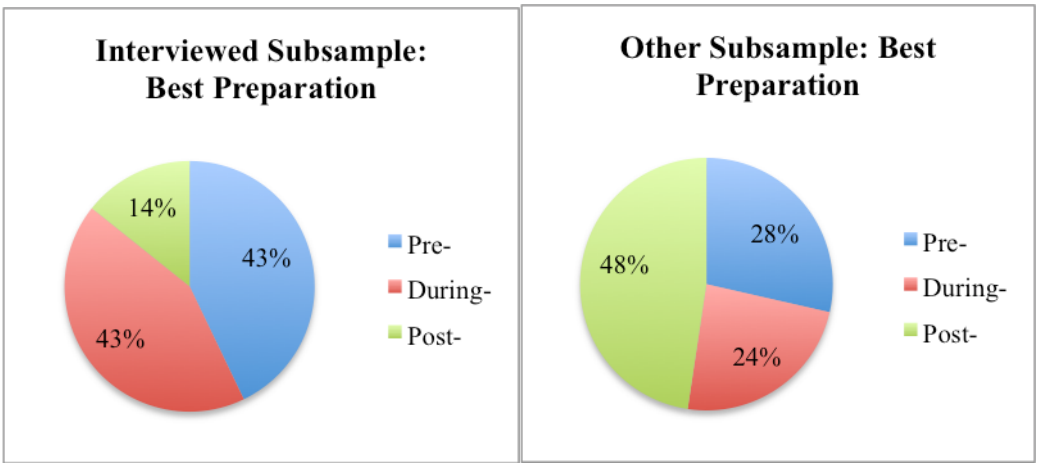
The semi-structured interview format allowed the participating teachers to reflect on their achievement in the classroom and also to reflect on how they acquired the skills necessary to succeed. Those interview participants who changed their answers selected post-program, which corresponded to the most frequent choice of the "non-selected" subsample. Such choices reflect the fact that beginning teachers continue to learn, even in their own classrooms. As Gerry puts it,

> Experience and reflection is the best teacher. You have to be able to do the hard part: realize that as a new teacher you will for the most part suck and be willing to change and try new things until you find what works for your students. You will make many mistakes but the process of planning, delivering, and reflection based on measureable outcomes is key in eventually becoming a successful teacher. [Gerry]

Stage of Development that Best Prepared Teachers

Question 30 asked participants to select the stage of teacher development that best prepared them for the classroom. Differences occur in the two subsamples' respective descriptive statistics. Those "selected" had a mean of 1.71 with a standard deviation of 0.76, along with a median and mode of 2. The "non-selected" subsample had a mean of 2.43 with a standard deviation of 0.87, along with a median of 2 and a mode of 3. The pie charts in Figure 15 show the response percentages for each stage of development.

Figure 15. Comparison of Responses to Best Preparation (n = 28)



It might appear contradictory based on the reported feelings about their alternative certification program, but during the interviews several teachers felt the during-program stage best prepared them because they came into the profession with very little background in how to run a classroom. Their alternative certification program exposed them to many ideas and strategies that they had never seen before, so they chose that stage as the best preparation.

Chapter 5

Summary, Conclusions, and Recommendations

I. Summary

The beginning years of mathematics teaching are some of the most trying and difficult years in a teacher's career. These years are instrumental to the teaching profession, as the early years determine whether or not a teacher will continue in the profession. The sooner beginning mathematics teachers establish success in the classroom, the more likely they will remain in the profession. The general focus of this study was to explore successful mathematics teaching, but from the point of view of a beginning mathematics teacher. The study sought to establish how beginning mathematics teachers defined and achieved success in the classroom and also to determine where in their teacher development they believed that they had acquired the learned important factors or attributes necessary for achieving success.

A non-random sample was selected from an alternative certification program in California. This specific program was used because the unique characteristics of the program and district were intriguing to the researcher, since he himself was a product of the same alternative certification program and taught in the district for three years. The researcher was able to recruit 28 beginning teachers to participate in the research. The study's population was drawn from an urban school district resulting in a high percentage of Title 1 Schools and English language learners (ELLs).

The study employed a mixed-methods research methodology in which both quantitative and qualitative data were collected. The researcher collaborated with a colleague in

creating two research instruments for data collection: a quantitative survey (containing rankings, frequency questions, and Likert scale items) and a qualitative semi-structured interview. The quantitative survey was developed using the *National Council of Teachers of Mathematics (NCTM) 1991 Professional Standards* and the five categories outlined for successful mathematics teaching: worthwhile mathematical tasks, teacher and student roles in the classroom, tools for enhancing discourse, classroom learning environment, and an analysis of teaching (The National Council of Teachers of Mathematics on Teaching Standards for School Mathematics, 1991). The survey was separated into four sections, with each section aimed toward answering a specific research question. The qualitative semi-structured interview was developed to expand further upon the responses from the quantitative survey and also determine the role in which each stage of teacher development played in a successful classroom. The reasoning behind collecting both quantitative and qualitative data was that the analysis of the qualitative data would provide further evidence supporting the findings from the analysis of the quantitative data.

All 28 participants took the quantitative survey, which was provided online. Seven of the 28 participants were selected to participate in further research, in a semi-structured interview. These seven participants were selected after having been identified as "successful beginning teachers" based upon a selection rubric combining three criteria: recommendations from the alternative certification program administrators and administrators from their respective schools, as representative of pedagogical content knowledge and classroom management, their G.P.A. in undergraduate mathematics courses as representative of mathematical content knowledge, and previous leadership

experiences as representative of classroom management and the ability to lead a classroom. After all quantitative data were collected and analyzed, each of the semi-structured interviews was prepared for each of the seven participants. The interviews were used to expand upon their responses from the quantitative survey. The semi-structured interviews took place during a school week and were recorded and then transcribed. Once all the data were collected, the researcher statistically analyzed the data from the quantitative survey data and collaboratively coded the transcripts from the qualitative interviews.

II. Conclusions

Research Question 1: How do beginning mathematics teachers define success in regard to their first year of teaching?

Beginning mathematics teachers defined success most often in three ways: (1) having a good classroom learning environment, including classroom management, discipline, and student participation, (2) creating and implementing engaging lessons for all students, and (3) a belief in yourself as a teacher to grow professionally. Not only where these three attributes prominent in the quantitative surveys, but they were also commonly discussed during the qualitative interviews.

During the qualitative interviews participants were asked to talk in detail about views of what it takes to be successful in the classroom. Several participants mentioned the connection between having a good classroom learning environment and implementing engaging lessons for all students. These two attributes are dependent on one another, in that having good classroom management allows the teacher to implement engaging

lessons more easily and that having engaging lessons can help with classroom discipline. Apparently because of this relationship, these two attributes were identified as being most important for beginning mathematics' teachers in defining success in the classroom.

Participants also selected the attribute "a belief in yourself as a teacher to grow professionally" as most important. During the interviews, participants reiterated the importance of not being satisfied with the status quo; rather, teachers should constantly be looking to improve themselves for the sake of their students. Being responsible for the well-being of a group of students fueled these respondents' desire to grow professionally.

Research Question 2: To what factors, attributes, or experiences do beginning mathematics teacher attribute the success in their beginning years of teaching?

Based on the quantitative surveys, the factors, attributes, or experiences identified as important were: collaboration with colleagues, mathematics content knowledge in being confident about the course material and being able to answer any student questions, reflection, a belief in one's ability to grow professionally, and a belief of having a positive impact on students.

Based on the qualitative interviews, the factors, attributes, or experiences identified as important were: collaboration with colleagues, personality, classroom management, and previous leadership experiences. Success of these teachers was a direct result of being able to control a classroom by using their personalities to build relationships with the students. With the exception of collaboration with colleagues, all the factors, attributes and experiences discovered from both the quantitative and qualitative data have a common theme: they are all internal factors under the direct control of the teacher.

The importance of solid mathematics content knowledge became clear; in fact, several studies have shown a positive correlation between strong mathematics content knowledge of the teacher and academic success of the students. In this study, two reasons emerged for the perceived importance of content knowledge. Findings from the quantitative survey suggest that mathematics content knowledge establishes a confidence in the classroom: knowing the course material and being able to explain it to students while maintaining the confidence to answer any type of student questions. Yet the findings from the qualitative survey expand on the idea of a strong mathematics content knowledge. Being strong in mathematics allows for a teacher to understand the horizon of mathematics content. Knowing what mathematics concepts and topics will be important in future courses can dictate one's approach in the mathematics curriculum. Also, mathematics can be a difficult subject and several participants noted that their own struggles in their high school and undergraduate mathematics courses allowed them to both relate to the students' struggle and give insight as to how to help their students.

The beliefs of the mathematics teacher also played an important role in their success in the classroom. The quantitative data showed the importance of a teacher's belief in one's ability to grow professionally and to have a positive impact on students. The teachers in this study clearly saw themselves as making a difference in their students' lives; they wre not satisfied with the status quo and sought to improve themselves for the sake of their students.

The findings from the qualitative interviews were all interrelated. Participants identified personality and their previous leadership experiences as key components of maintaining proper classroom management. Teachers used their personality to build relationships

with students, often showing the students that they care about their well being, and also giving the classroom a homely feeling. Previous leadership experiences gave teachers prior opportunities in leading a group, essential for running a classroom. Interesting to note were the varieties of previous leadership experiences: Los Angeles Police Department Explorers, Reserve Officers Training Corp, the Army, and prior stints as a teacher's assistant. The participants were able to combine their personalities and previous leadership experiences and modify them for use in their own classrooms, making classroom management less of a problem than it might have been.

Collaboration with colleagues was found to be important in both the quantitative and qualitative data. In the quantitative survey, participants were asked how often they collaborated with other teachers on matters of teaching, learning, and student assessment but during the interviews, a large range of collaborative experience became apparent as participants mentioned collaborating with colleagues in terms of teaching methods and student assessment, asking for general advice for classroom management, and even venting when things go wrong and they are frustrated. Collaboration is often viewed as simply working together with colleagues, but these findings suggest the importance of establishing why teachers collaborate.

The sample was separated into two subsamples, "selected" and "non-selected," to determine if there were any significant differences between the two groups. The "selected" subsample was chosen using three criteria representative of successful mathematics teaching, whereas the "non-selected" subsample did not meet the three criteria. Using a Mann-Whitney test at the 0.05 level, several significant differences were found between the two subsamples. The "selected" subsample was more likely to have

had prior leadership experiences, better classroom management, an enthusiastic personality in the classroom, and were more concerned about one's ability to grow professionally as a teacher. These findings suggest that "successful" beginning teachers have a firmer grasp on classroom management and focus on growing professionally as opposed to their counterparts.

Research Question 3: When and where do these beginning mathematics teachers believe they acquired and developed the factors or attributes identified in question 2?

The three stages of development to be considered were pre-program, during-program, and post-program. Analysis of the quantitative data suggests that participating teachers generally held a negative attitude towards the during-program stage and their alternative certification program in general, while holding a more positive attitude towards the pre- and post-program stages. This phenomenon was further explored during the qualitative interviews and further analysis of the qualitative data revealed that the "selected" teachers selected pre- and post-program as most important in acquiring and developing the skills necessary to become successful in the classroom. What is more important is to establish why the participating teachers held these attitudes towards each of the three stages of teacher development. Seeing as how many of the factors, attributes, and experiences were internal factors, these findings suggest that the certification program did not have direct control of these factors. Personality, previous leadership experiences, and the beliefs of a teacher are mostly inherent and acquired outside any formal certification program. Interviews offered several reasons for the negative views about the during-program stage: the emphasis of theory over practice furthered the disconnect between the curriculum and what really occurs in the classroom, the schedule and fast pace of the

courses did not allow for the teachers to absorb the material sufficiently, and the amount and content of some of the coursework was deemed to be of questionable value.

III. Recommendations

Further studies of this kind should strive to include larger sample sizes from more than a single district or type of program. Instead of using a limited sample within a single district, a larger wide-scale sample, regardless of type of teacher preparation or type of school they work at, could produce more generalizable results useful for all beginning mathematics teachers. In this study, the sample size (n=28) was relatively small and drawn from one alternative certification program in one specific district. By focusing on one alternative certification program, it was also difficult to find a large group of teachers because of the limited number of participants per program. With the state of the California economy, school district budgets had to be reduced and as a result teacher certification programs had to limit the enrollment of their potential teachers so not as many teachers were being accepted or graduating from these programs. Combined with the fact that fewer teachers were being hired, finding a large sample for this study proved to be difficult.

A direct result of increasing the sample size would be an increase in the sizes of the subsamples. Not only would the sample size of the subsamples be larger, but also the sample sizes should be similar. Creating subsamples of similar sizes will allow for more significant generalizations between the two subsamples of "selected" and "non-selected" subsamples. With an increase in sample size, future researchers should take into account

the amount of time necessary to properly interview participants, transcribe the interviews, and code the transcriptions.

Another limitation of the study is that these findings may relate to only a particular group of teachers. A majority of the teachers who participated in the survey and all the teachers who participated in the interviews worked in Title 1 schools, meaning that these findings might relate and be useful for only those teachers in a similar school setting. The researcher is currently addressing this limitation by working together with his colleague, who performed a similar study using identical methodology with a sample of beginning mathematics teachers from a traditional certification program in Texas. The idea is to determine generalized answers to the research questions regardless of preparation route.

Further studies that wish to reuse the survey instruments created by the researcher and his colleague should also strive to ensure that the quantitative survey describes the three stages of teacher development properly. The researcher chose to describe the three stages through a general introductory e-mail, and as a result, by the time the participants completed the survey, their ideas about the three stages might have changed. Perhaps this is why some participants changed their answers to several questions during the qualitative semi-structured interview.

The qualitative interviews were designed to expand upon the quantitative surveys and the qualitative interview succeeded in introducing new ideas that could potentially be incorporated into the original quantitative survey. For example, when initially creating the survey, the scope of mathematics content knowledge and collaboration with colleagues was underestimated. Knowing the differing ideas about these two concepts

and including them in the quantitative survey would make the survey more informative and give a better picture of the overall sample.

Also, the qualitative semi-structured interviews should allow for ample time and provide a location conducive for interviewing. Based on pilot studies, the researcher felt forty-five minutes was sufficient to complete the interview and therefore planned to schedule each interview for an hour. However, by deciding to interview participants at their respective schools during school days, many distractions and disruptions occurred throughout the interviews. For example, during a meeting with a participating teacher during his 1st period conference period, 10 minutes were wasted listening to the announcements on the school speaker system. At several points during the interviews, the researcher wanted to probe deeper but chose not to because of the time constraints.

The first year is generally a difficult one for beginning mathematics teachers, and these results can be helpful for beginning mathematics teachers by identifying what previous mathematics teachers focused on in their own classrooms in similar situations. These results are even more useful because they identify several problem situations, and the qualitative excerpts provide insight as to how the participating teachers in the study approached the difficulties they faced. The results of this research can be used to help beginning mathematics teachers achieve success in the classroom more efficiently and more quickly. Based on the results from this study, recommendations can be made both to teacher certification programs and to the teacher in the mathematics classroom.

According to the negative attitudes and responses towards the alternative certification program in Research Question 3, the program did a poor job in preparing the teachers to

succeed in the classroom. Applying the results found from this study could help modify both the recruitment of potential teachers and the training they receive within their certification program.

Since both personality and previous leadership experiences were seen as valuable for beginning teachers, teacher certification programs might consider recruiting potential teachers possessing the requisite traits. Potential teachers should be extroverts, yet display hard-working and caring characteristics. Having sociable teachers in the classroom allows student-teacher relationships to develop more quickly. Not only would an appropriate personality ease the relationship between teacher and students, it would also be useful in communicating with colleagues, making collaboration much easier as well.

Also, when looking at potential teachers and their experiences with mathematics content knowledge, teacher certification programs should focus not only on those who excelled in mathematics, but also include those who struggled. Those who struggled with mathematics appear to bring a unique perspective in that not only do they understand and relate to the struggling students, but they also bring with them methods that helped overcome their own struggles.

The curricula of teacher certification programs can also be modified to better support, train, and prepare teachers. The general feelings about teacher certification programs were "too much theory, not enough practice." Because creating and engaging lessons plans were viewed as important in defining success, teacher certification programs might consider providing more experience in such skills. A focus on practical tools would be

useful for beginning teachers entering the classroom and this should be reflected in the curricula. That is not to say theory is unimportant, but if the goal is to have teachers from alternative certification programs succeed in the classroom, they will need as many tools as possible to survive.

The teachers all sought out support and collaboration with colleagues and coaches on their own, in their own schools. Teacher certification programs can ease the transition into the classroom by providing a support system for teachers before entering the classroom and also during their early years in the classroom. This support system should include help with teaching methods, classroom management, or any general advice. Having a support system already in place when entering the classroom can free up time for beginning teachers to focus on other matters.

Another area teacher certification programs can modify is the teaching of classroom management. Most participating teachers in this study stated that classroom management was learned post-program, through their own experiences in the classroom, using "trial and error" and from their own observations and support offered from colleagues. Since classroom management was learned mostly hands-on, teacher education programs should introduce the theories behind classroom management but in a minimal way since most of the learning will occur in the classroom anyway.

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Appendix A: Survey

LimeSurvey

Research in Mathematics Teacher Education

Thank you for your willingness to participate in this research study on beginning mathematics teachers from alternative certification programs and how they measure success, the attributes necessary to succeed, and when they learned and developed these attributes. You will be asked to participate in an online survey on your teaching attitudes and practices used in the classroom. Please be thoughtful in your responses to the survey items as the online survey will take approximately 15 to 20 minutes.

The results of the study will be used for the researcher's dissertation and any publications or conference presentations that follow through from this research. Participants will be asked to include their names and addresses during the online survey for participation identification and remuneration purposes only. Once the data has been collected, all the names will be replaced with numerical codes for further analysis. To protect the identities of the participants, no mentions of names will be used in any publications or presentations.

If you have any further questions regarding your participation in this survey, please feel free to contact the researcher.

Edward Ham
eh2351@columbia.edu
(661) 487 - 3280
Ph.D Candidate
Teachers College, Columbia University

Demographics

Name	
Mailing Address	
E-Mail	

	4.0	3.5 - 4.0	3.0 - 3.5	2.5 - 3.0	Under 2.5
Overall College GPA	○	○	○	○	○
College Mathematics GPA	○	○	○	○	○

Prior to teaching, have you held some sort of leadership position?

○ Yes ○ No

Section I

What would indicate that a teacher's first year of teaching mathematics was a successful one? Label the following attributes as most important (1), important (2), to least important (3). Each entry should be a 1, 2, or 3 with the most important tier receiving 1's, the next important tier receiving 2's, and the least important tier receiving 3's.

Only numbers may be entered in these fields

Total of all entries must not exceed 18

Total of all entries must be at least 13

Using assessments to cater to all student learning needs	0
Creating and implementing engaging lessons for all students	0
Participating in productive collaboration with colleagues	0
Having good rapport with students	0
Positive feedback on your teaching from colleagues, administrators, students, etc.	0
Good student test scores relative to the school average	0

Good classroom learning environment – including discipline management, student participation, etc.	0
A belief in yourself as a teacher to grow professionally	0
Total:	0

In response to the previous question, is there something else you would like to include as most important (1). If so, please describe (otherwise leave blank).

Section II

Please respond how frequently you do the following statements.

	Less than once a month	Monthly	Once a Week	More than once a week	Daily
You engage students in thought provoking activities that involve mathematical reasoning and/or problem solving.	○	○	○	○	○
You use current technology to enhance student learning.	○	○	○	○	○
You collaborate, and/or co-plan with other teachers on teaching, learning, and	○	○	○	○	○

	Less than once a month	Monthly	Once a Week	More than once a week	Daily
student assessment.					
You find time for yourself to reflect on teaching, learning, and/or student assessments.	○	○	○	○	○
You are conscious of students' different learning styles and utilize differentiation techniques to teach all types of learners.	○	○	○	○	○

	Never	Rarely	Frequently	Always
You facilitate classroom discussions where students actively participate in the learning process, as opposed to primarily teacher-presented information.	○	○	○	○
You minimize student participation during class due to various pressures such as time	○	○	○	○

	Never	Rarely	Frequently	Always
constraints of the curriculum.				
You directly give answers when students have questions, as opposed to giving hints aimed toward helping students solve the problem themselves.	○	○	○	○
You pay attention to the particular class of students that you teach while planning lessons, incorporating ideas that would be of specific interest to them.	○	○	○	○

Section III

Do you agree of disagree with the following statements.

	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
You feel confident in your mathematical knowledge to answer student questions that come up during class.	○	○	○	○	○
You are not able to provide justification for why you teach certain	○	○	○	○	○

	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
mathematical concepts or ideas.					
You are a confident problem solver, able to solve novel problems.	○	○	○	○	○
You know the state standards and assessments in your subject area that your students are required to know.	○	○	○	○	○
Your classroom is conducive for learning, free from behavioral and other distractions.	○	○	○	○	○
You believe that your efforts as a teacher have a positive impact on students and/or student achievement.	○	○	○	○	○
You believe the key to success in mathematics is primarily in the abilities and/or backgrounds of the students as opposed to the quality of the teachers and schools.	○	○	○	○	○
You view yourself as a person who has something to	○	○	○	○	○

	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
contribute to education, dedicated to growing and learning as a professional.					
You are not well organized when it comes to teaching, grading, planning, etc.	○	○	○	○	○
You bring an enthusiasm, dynamism, excitement and interest daily for the mathematics you teach and how you present it in your classroom.	○	○	○	○	○
You are flexible and adaptive in your teaching – comfortable making decisions at the last moment based on what has actually happened, versus what was planned to have happened.	○	○	○	○	○
You design lessons with methods to assess effectiveness based on clearly stated objectives.	○	○	○	○	○
You have had previous experiences or	○	○	○	○	○

	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
jobs outside of teaching that have helped you feel comfortable in front of large groups of people.					
You do not have adequate resources at your school, department, and in your classroom.	○	○	○	○	○
You are currently satisfied with your job.	○	○	○	○	○

Section IV

Please respond to the following questions regarding your teacher certification program.

	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
Your teacher certification program prepared you well to succeed in teaching mathematics.	○	○	○	○	○
Your personality and experiences growing up were more influential in you becoming a successful mathematics teacher than your teacher certification program.	○	○	○	○	○

	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
You gained more abilities and awareness outside your teacher certification program about being a successful mathematics teacher than through your teacher certification program.	○	○	○	○	○

	Pre Program	During Program	Post Program
Which period of your life was most influential in shaping your model of good mathematics teaching	○	○	○
Look back at your rankings from Section 1. Which period of your life prepared you most to be able to do those things that you selected to best define success in the first year of teaching.	○	○	○

[Exit and clear survey] Load unfinished survey Resume later Submit

Appendix B: Survey Study Variables

Item #	Study Variable
1a	Assessments for Differentiation
1b	Engaging Lessons
1c	Collaboration with Colleagues
1d	Good Rapport
1e	Positive Feedback
1f	Good Student Test Scores
1g	Good Classroom Learning Environment
1h	Growing Professionally
1i	
2	Engaging Mathematical Activities
3	Technology
4	Collaborate
5	Reflect
6	Differentiation
7	Teacher-Centered Instruction
8	Active Student Participation
9	Heuristic Hints/Questioning Strategies
10	Contextualize
11	Confident in Mathematics
12	Depth and Breadth of Mathematics
13	Problem-Solver
14	Knowledge of State Standards
15	Classroom Management
16	Efficacy
17	Belief in All Students

18	Grow Professionally
19	Organized
20	Enthusiasm
21	Flexible/Adaptable
22	Assess Lesson Objectives
23	Previous Experience
24	Resources
25	Job Satisfaction
26	UTeach
27	Pre-UTeach
28	Post-UTeach
29	Model of Mathematics Teaching
30	Mathematics Knowledge
31	Achieving Success

Survey Items listed by Strand:

Strand	**Item #**	**Variable**
Knowledge for Mathematical Tasks	2	Engaging Mathematical Activities
	11	Confident in Mathematics
	12	Depth and Breadth of Mathematics
	13	Problem-Solver
	14	Knowledge of State Standards
	30	Mathematics Knowledge
Role in Discourse	7	Teacher-Centered Instruction
	8	Active Student Participation
	9	Heuristic Hints/Questioning Strategies

	21	Flexible/Adaptable
	29	Model of Mathematics Teaching
Learning Environment	1b	Engaging Lessons
	1d	Good Rapport
	1g	Good Classroom Learning Environment
	15	Classroom Management
	17	Belief in All Students
Tools to Enhance Discourse	3	Technology
	6	Differentiation
	9	Heuristic Hints/Questioning Strategies
	10	Contextualize
	24	Resources
Analysis of Teaching and Learning	1a	Assessments for Differentiation
	1e	Positive Feedback
	1f	Good Student Test Scores
	5	Reflect
	21	Flexible/Adaptable
	22	Assess Lesson Objectives
Personality	19	Organized
	20	Enthusiasm
	23	Previous Experience
Beliefs	1h	Growing Professionally
	16	Efficacy
	18	Grow Professionally
Colleagues	1c	Collaboration with Colleagues
	4	Collaborate
Current Job	24	Resources

	25	Job Satisfaction
UTeach preparation	26	UTeach
	27	Pre-UTeach
	28	Post-UTeach
	31	Achieving Success

Appendix C: Interview Template

Interview Part One

A semi-structured interview revolving primarily around the first and second research questions about success and attributes that were helpful in achieving that success

Driving questions:

1) Reflecting specifically on your early years of teaching, and thinking specifically about some of the markers that determine success – not necessarily those things that cause or help achieve success, for example … - but rather the indicators by which one could measure success, explain the top tier choices you made to Part 1 on the survey.

- Would your response to Part 1 change now based on our conversation?
- Now, are there other ways you might define success in the first year of mathematics teaching.

2) Do you feel like your definition of success would look different for a beginning mathematics teacher as opposed to a veteran teacher? If so, explain.

3) Do you feel that your leaders from your teacher education program or other "experts/researchers" would define a successful first year differently than you have? If so, how do you think they would define it.

4) As you reflect on your early years of teaching, take a few moments to think about what factors or attributes you believe were significant for you in achieving success. Name three.

5) Are there qualities about your mathematics knowledge that you believe help you achieve success?

6) How about you pedagogy for mathematics teaching – or beliefs about how students learn and how teachers should teach?

7) How about your personality or the way you teach and relate to the students?

8) We have now discussed a few of your own ideas about what caused success, and some other ideas including content, pedagogy, and personality. Take a moment to really think about which ones you believe were MOST important to your success. Are these the factors that helped you achieve success in the way you defined success earlier?

Interview Part Two

A discussion that elaborates on the ideas highlighted by the teacher as most important and that focuses more explicitly on the third research question: t what degree was a particular attribute learned pre- during, or post-program.

Driving questions:

9) For each of these highlighted factors, explain more in depth how you acquired this attribute, citing specific memories or events that were influential. Where during this process do you feel you really developed this skill well – pre-, during, or post- program?

10) Are there experiences that you remember growing up that perhaps have positively influenced how you teach? Or even negatively?

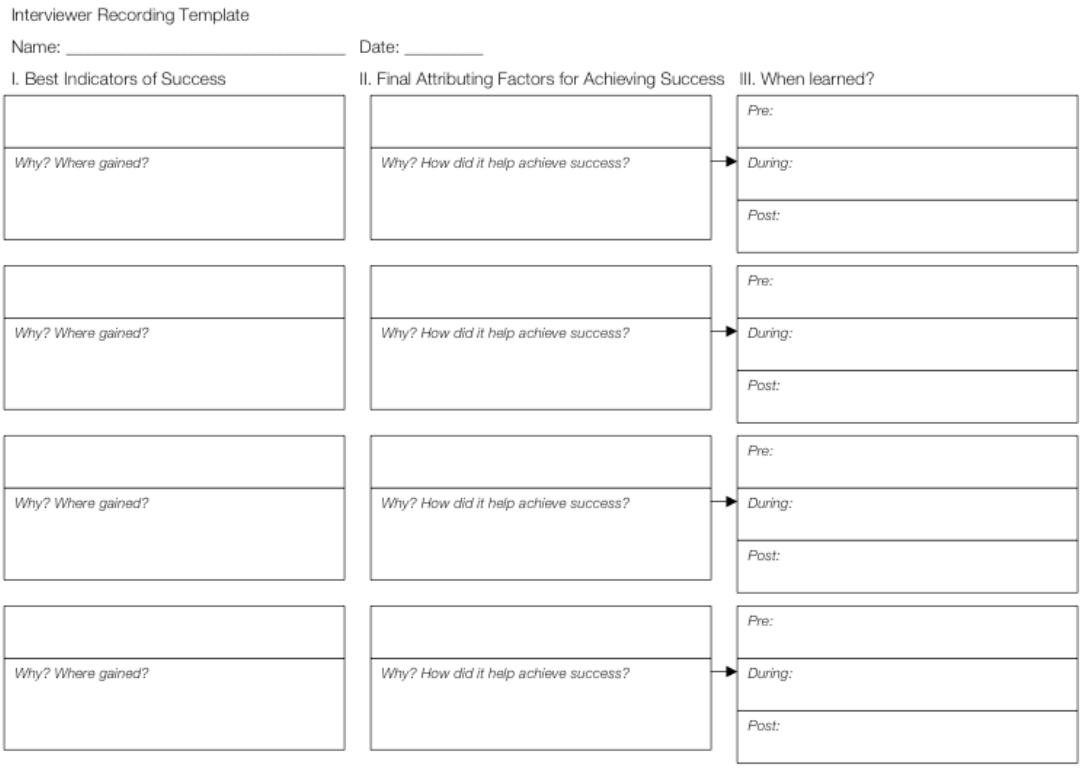
- How did growing up influence your beliefs about teaching?

11) How influential was your program on your mentality, mindset and beliefs as a teacher? What specifically did it instill in you that you believe has been helpful in your teaching?

12) How have the school and/or colleagues you have taught at/with positively or negatively influenced your teaching?

- Has your mentality or beliefs about teaching changed since you have entered the classroom as a teacher?

Appendix D: Interview Recording Template



Interviewer Recording Template

Name: _____ Date: _____

I. Best Indicators of Success	II. Final Attributing Factors for Achieving Success	III. When learned?
		Pre:
Why? Where gained?	*Why? How did it help achieve success?*	*During:*
		Post:
		Pre:
Why? Where gained?	*Why? How did it help achieve success?*	*During:*
		Post:
		Pre:
Why? Where gained?	*Why? How did it help achieve success?*	*During:*
		Post:
		Pre:
Why? Where gained?	*Why? How did it help achieve success?*	*During:*
		Post:

Appendix E: Interview Strands and Categories for Coding

Strand	Code	Description
Knowledge for Mathematical Tasks	Strong General Content Knowledge	Strong academic background in mathematics; solid content foundation both in scope and depth
	Broad Knowledge of Curriculum	Awareness of all High School mathematics curriculum; for topics taught, understands implications for future mathematics study; mathematical knowledge at the horizon
	Problem-Solving	Comfortable approaching and solving novel mathematics problems; ability in mathematical thinking and reasoning
	Mathematical Struggles	Personal struggles learning mathematics brought a deep understanding; gave general insight into how to approach teaching mathematics
	Strong Specific Content Knowledge	Strong mathematics knowledge specific to courses taught; **confident** when approaching curriculum; at ease answering all types of student questions
	Communicating Mathematics	Ability to easily explain mathematical concepts for use in the classroom
	Connection to State Standards	Can relate curriculum to broader State standards; knows standards for courses taught
Role in Discourse	Facilitate	Guiding discussion; involving all students in the learning process; answering teacher questions; groups or whole class
	Lecture	Directly explain concepts; passive learning and note-taking; memorization
	Practice Work	Teacher gives practice problems, in groups or not, and checks for understanding; mobility
	Flexible	Willing to change instruction at the last minute based on perceived student needs or other circumstances
Learning Environment	Classroom Management	Able to effectively control discipline issues; routines and structures to facilitate positive learning environment

	Engaging Lessons	Making content relevant to students; engaged in activities; mathematics presented in engaging way
	Inquiry Lessons	Students exploring concepts; discovering; make conjectures; collaborative group work
	Ownership of Classroom	Students have input in classroom routines and curriculum; student work posted;
	Belief in all students	Expectation that all students are capable of learning mathematics;
Tools to Enhance Discourse	Experimenting with teaching	Using various styles of teaching; trying new approaches and methods; trial and error
	Toolbox	Bag of tricks; toolbox; having a variety of resources to draw from when teaching
	Contextualize	Tailoring lessons to particular population taught; culturally relevant and interesting
	Differentiation	Tailoring lessons to individual learning differences; using a variety of styles to reach all types of learners
	Technology	Use of technology to enhance classroom discourse
	Real World Application	Displaying connection between mathematics and real-world; mathematics is applicable, relevant, engaging
Analysis of Teaching and Learning	State Assessments	Using student test scores to guide curriculum; teaching to the test
	Own Assessments	Using assessments to inform student progress; other assessments
	Reflection	Reflecting on teaching to improve practice; **modifications** made to lessons based on experience teaching
	Feedback	Verbal or written comments on your teaching from administrators, other teachers, or students
Personality	Confident	Confident in abilities as a teacher
	Hard-Working	Willing to work hard; sacrifice; time and effort
	Passionate	Excited about education; love of teaching

	Entertaining	Joking; put on a show
	Extrovert	Outgoing; easy to talk to
	Organized	Organized
	Caring	Relate to students; build relationships; care about their lives
	Tough but Fair	Hold to standards; discipline; kind yet maintains boundaries
	Leadership	Leadership skills; comfortable in front of large groups; authoritative
	Similar backgrounds	Having a similar background to students; able to relate well
Beliefs	Survival	Make it through; survive;
	Reasonable Expectations	Taking personal time; not over-working; don't set yourself up for failure
	Grow Professionally	Desire to improve teaching; dedicated to becoming better teacher; not satisfied with status quo
	Efficacy	Belief that efforts as teacher make a positive impact
Colleagues	Collaboration	Working together with others to create, improve, and assess lessons; emphasis on co-developing ideas
	Colleague Support	Using colleagues for advice, tips, etc.; for classroom managements, school policies, grading ideas; lesson ideas; personal support; emphasis on receiving help
	Accountability	Colleagues create a form of accountability on your own teaching; common assessments; whole-school curriculum and policies
	Professional Development	Time spent in professional development with colleagues to grow
	Role Models	Persons in past, or present, who represent models one emulates in teaching
Rapport	Relationships	Importance placed on building student relationships; making specific efforts to get to know students
	Trust	Building trust between students, class and

		teacher
	Student productivity	Better relationships lead to more student productivity; a reason to build rapport
When	Pre-Program	Attributes were discussed in the context of before the alternative certification program
	During Program	During the alternative certification program; all activities, teaching experience, courses, etc. learned during and from the program
	Post-Program	Things learned after the alternative certification program, on the job, while in the classroom teaching

Appendix F: Collected Data for Entire Sample

id	GPA [GPA]	GPA [MGPA]	Leader	Ranking [1a]	Ranking [1b]
1	20	30	2	3	2
2	25	25	1	1	2
3	20	25	1	3	1
4	35	30	1	3	1
5	30	25	2	2	1
6	25	30	2	3	2
7	25	30	2	2	1
8	25	25	1	1	1
9	20	20	2	1	1
10	25	25	1	2	2
11	25	30	2	2	2
12	30	30	2	1	1
13	30	25	1	2	2
14	30	30	2	2	1
15	30	35	1	2	1
16	25	30	2	3	3
17	30	35	1	2	1
18	30	25	2	2	1
19	30	30	2	1	1
20	25	25	2	2	2
21	30	25	1	3	2
22	25	25	2	3	2
23	30	30	1	3	2
24	30	30	1	3	1
25	35	30	2	3	3
26	30	25	2	2	1
27	25	25	1	3	1
28	25	30	2	2	1

Ranking [1c]	Ranking [1d]	Ranking [1e]	Ranking [1f]	Ranking [1g]	Ranking [1h]
2	2	3	3	1	1
2	2	3	1	2	1
3	1	2	2	1	2
3	2	1	1	1	1
2	1	2	3	1	1
1	1	2	3	1	1
2	2	3	1	1	1
3	2	2	2	1	2
2	1	2	3	2	2
2	1	3	3	1	1
3	2	1	1	1	2
3	2	3	3	1	2
3	3	1	1	1	2
3	1	2	3	1	1
1	1	3	3	1	2
2	1	2	1	1	2
2	3	3	2	1	1
3	1	2	3	1	1
3	2	1	1	2	2
3	1	2	3	1	1
3	2	2	1	1	1
3	1	1	2	1	3
3	1	2	2	1	1
3	2	2	1	1	2
2	2	1	1	1	2
3	1	2	1	1	3
3	2	1	2	1	2
1	2	3	3	1	1

1i
Being able to be flexible with whatever comes your way
the most important the first year is student rapport and classroom management, discipline
Be able to motivate students to create goals for their future.
Not being bias to any students over others
flexibility
personality
DISCIPLINE!

Frequency [2]	Frequency [3]	Frequency [4]	Frequency [5]	Frequency [6]	Frequency 2 [7]
5	5	1	4	3	3
5	1	1	3	4	3
3	4	3	4	5	3
3	2	1	4	5	2
3	5	2	2	3	2
3	3	2	3	2	3
5	4	3	5	5	4
3	3	2	3	3	2
4	3	3	5	5	3
3	1	3	4	3	3
4	5	1	4	3	2
4	1	1	5	4	3
3	3	3	4	4	3
5	1	3	4	3	3
3	5	3	5	3	3
3	1	1	4	2	2
4	5	2	5	4	3
3	4	4	5	3	3
3	1	2	3	3	2
2	4	1	5	3	2
4	4	1	5	5	3
3	3	1	3	3	2
5	1	1	4	1	1
3	4	1	4	3	3
2	1	1	3	3	2
3	4	3	4	3	3
3	2	2	4	4	2
4	4	2	4	4	3

Frequency 2 [8]	Frequency 2 [9]	Frequency 2 [10]	Section III [11]	Section III [12]	Section III [13]
2	2	3	5	4	4
1	1	4	4	2	4
2	2	3	5	2	4
3	2	4	5	2	4
3	2	2	4	3	3
2	2	4	4	4	4
2	2	4	5	1	5
2	2	3	4	2	4
2	2	3	5	5	5
2	2	3	4	2	3
2	2	3	4	2	4
2	2	4	5	5	5
3	3	3	5	2	4
2	2	3	4	1	4
1	2	4	4	3	5
2	2	3	5	1	5
2	2	4	4	2	4
1	1	3	4	1	5
2	2	3	4	3	4
1	3	3	3	3	4
1	1	4	5	1	4
2	2	3	4	4	4
2	2	2	5	1	5
1	2	3	5	3	5
2	2	2	4	4	4
2	3	3	2	2	4
1	2	4	2	3	3
1	1	3	4	2	5

Section III [14]	Section III [15]	Section III [16]	Section III [17]	Section III [18]	Section III [19]
5	4	5	3	5	3
4	3	5	1	5	2
2	5	4	1	5	4
5	5	5	3	5	4
4	3	3	4	4	3
5	4	5	2	5	3
5	4	5	1	5	3
3	4	4	2	4	3
4	4	4	1	4	2
2	4	4	3	5	2
5	4	4	3	4	2
4	4	4	2	5	2
5	4	5	4	5	4
3	2	3	4	4	1
5	5	4	3	4	2
5	3	3	4	4	2
5	4	4	4	5	2
4	3	4	2	3	2
5	2	3	5	4	4
4	4	5	4	4	2
5	4	4	2	4	3
4	4	4	3	4	2
3	4	4	2	4	1
5	3	4	4	4	1
5	2	3	1	4	2
5	4	4	4	4	1
4	1	3	2	4	2
4	4	5	5	4	1

Section III [20]	Section III [21]	Section III [22]	Section III [23]	Section III [24]	Section III [25]
4	4	4	2	1	4
3	4	3	5	1	5
5	4	3	5	2	5
5	5	4	4	5	3
4	4	3	4	2	4
5	5	3	5	3	5
5	4	5	3	3	5
4	4	3	4	3	4
4	5	4	4	3	3
4	3	4	2	5	4
2	4	5	1	4	4
4	4	4	2	4	4
4	4	3	5	4	4
4	2	4	1	5	3
4	2	4	4	1	5
2	3	4	1	5	3
3	4	4	4	5	4
5	4	3	4	4	4
3	4	2	1	4	3
3	2	4	5	2	4
3	4	5	4	5	5
2	2	3	2	4	3
3	4	4	5	4	4
3	2	4	5	4	4
2	4	3	1	5	3
5	3	3	2	5	3
4	4	5	5	5	2
5	3	4	1	5	4

Section IVa [26]	Section IVa [27]	Section IVa [28]	Section IVb [29]	Section IVb [30]
2	3	3	2	2
3	4	3	2	3
2	4	3	2	2
1	5	5	1	1
3	3	4	2	2
3	5	4	1	1
2	4	4	1	1
2	4	4	1	1
4	5	4	2	2
1	4	4	3	1
2	3	4	3	3
4	2	4	2	3
1	4	5	3	3
3	3	4	2	2
4	5	4	2	1
2	4	4	3	1
1	4	5	3	3
3	4	4	3	1
1	3	4	3	3
3	4	4	2	3
4	3	5	2	2
3	3	4	3	3
2	5	4	1	1
4	4	3	2	2
1	3	5	3	3
1	4	4	3	2
1	4	5	3	3
3	4	4	1	3

Appendix G: Entire Sample Statistics

	Ranking [1a]	Ranking [1b]	Ranking [1c]	Ranking [1d]	Ranking [1e]
average	2.21	1.50	2.46	1.61	2.04
mode	2	1	3	2	2
median	2	1	3	2	2
st dev	0.74	0.64	0.69	0.63	0.74
IQ Range	1.00	1.00	1.00	1.00	1.25
MMI (high)					
MMI (low)	5.00	**3.00**	7.00	5.00	5.25
Z Score	0.29	-0.78	0.67	-0.62	0.05

Ranking [1f]	Ranking [1g]	Ranking [1h]	Frequency [2]	Frequency [3]	Frequency [4]
2.00	1.11	1.57	3.50	3.00	1.93
3	1	1	3	1	1
2	1	1.5	3	3	2
0.90	0.31	0.63	0.88	1.52	0.94
2.00	0.00	1.00	1.00	3.00	2.00
			5.00	-5.00	-1.00
7.00	**2.00**	**3.50**	7.00	13.00	7.00
0.00	-2.83	-0.68	0.57	0.00	-1.14

Frequency [5]	Frequency [6]	Frequency 2 [7]	Frequency 2 [8]	Frequency 2 [9]	Frequency 2 [10]
4.00	3.43	2.61	1.82	1.96	3.21
4	3	3	2	2	3
4	3	3	2	2	3
0.82	1.00	0.63	0.61	0.51	0.63
1.25	1.00	1.00	1.00	0.00	1.00
6.44	5.00	5.00	3.00	4.00	5.00
9.56	7.00	7.00	5.00	**4.00**	7.00
1.22	0.43	0.17	-1.11	-1.05	1.13

Section III [11]	Section III [12]	Section III [13]	Section III [14]	Section III [15]	Section III [16]
4.21	2.50	4.21	4.25	3.61	4.07
4	2	4	5	4	4
4	2	4	4.5	4	4
0.83	1.20	0.63	0.93	0.96	0.72
1.00	1.00	1.00	1.00	1.00	1.00
7.00	3.00	7.00	**8.50**	7.00	7.00
9.00	5.00	9.00	10.50	9.00	9.00
1.46	-0.42	1.93	1.35	0.64	1.50

Section III [17]	Section III [18]	Section III [19]	Section III [20]	Section III [21]	Section III [22]
2.82	4.32	2.32	3.71	3.61	3.71
4	4	2	4	4	4
3	4	2	4	4	4
1.25	0.55	0.94	1.01	0.92	0.76
2.00	1.00	1.00	1.25	1.00	1.00
3.00	7.00	3.00	6.44	7.00	7.00
11.00	9.00	5.00	9.56	9.00	9.00
-0.14	2.41	-0.72	0.71	0.66	0.94

Section III [23]	Section III [24]	Section III [25]	Section IVa [26]	Section IVa [27]	Section IVa [28]
3.25	3.68	3.86	2.36	3.82	4.07
5	5	4	3	4	4
4	4	4	2	4	4
1.58	1.36	0.80	1.10	0.77	0.60
3.00	2.00	1.00	2.00	1.00	0.00
0.00	5.00	7.00	1.00	7.00	**8.00**
18.00	13.00	9.00	9.00	9.00	8.00
0.16	0.50	1.07	-0.59	1.06	1.77

Section IVb [29]	Section IVb [30]
2.18	2.07
2	3
2	2
0.77	0.86
1.00	2.00

Appendix H: Collected Data Split According to Subsamples

Interviewed	GPA [GPA]	GPA [MGPA]	Leader	Ranking [1a]	Ranking [1b]
1	20	30	2	3	2
2	25	25	1	1	2
3	20	25	1	3	1
4	35	30	1	3	1
5	30	25	2	2	1
6	25	30	2	3	2
7	25	30	2	2	1
Others	GPA [GPA]	GPA [MGPA]	Leader	Ranking [1a]	Ranking [1b]
8	25	25	1	1	1
9	20	20	2	1	1
10	25	25	1	2	2
11	25	30	2	2	2
12	30	30	2	1	1
13	30	25	1	2	2
14	30	30	2	2	1
15	30	35	1	2	1
16	25	30	2	3	3
17	30	35	1	2	1
18	30	25	2	2	1
19	30	30	2	1	1
20	25	25	2	2	2
21	30	25	1	3	2
22	25	25	2	3	2
23	30	30	1	3	2
24	30	30	1	3	1
25	35	30	2	3	3
26	30	25	2	2	1
27	25	25	1	3	1
28	25	30	2	2	1

Ranking [1c]	Ranking [1d]	Ranking [1e]	Ranking [1f]	Ranking [1g]	Ranking [1h]
2	2	3	3	1	1
2	2	3	1	2	1
3	1	2	2	1	2
3	2	1	1	1	1
2	1	2	3	1	1
1	1	2	3	1	1
2	2	3	1	1	1
Ranking [1c]	Ranking [1d]	Ranking [1e]	Ranking [1f]	Ranking [1g]	Ranking [1h]
3	2	2	2	1	2
2	1	2	3	2	2
2	1	3	3	1	1
3	2	1	1	1	2
3	2	3	3	1	2
3	3	1	1	1	2
3	1	2	3	1	1
1	1	3	3	1	2
2	1	2	1	1	2
2	3	3	2	1	1
3	1	2	3	1	1
3	2	1	1	2	2
3	1	2	3	1	1
3	2	2	1	1	1
3	1	1	2	1	3
3	1	2	2	1	1
3	2	2	1	1	2
2	2	1	1	1	2
3	1	2	1	1	3
3	2	1	2	1	2
1	2	3	3	1	1

Frequency [2]	Frequency [3]	Frequency [4]	Frequency [5]	Frequency [6]	Frequency 2 [7]
5	5	1	4	3	3
5	1	1	3	4	3
3	4	3	4	5	3
3	2	1	4	5	2
3	5	2	2	3	2
3	3	2	3	2	3
5	4	3	5	5	4
Frequency [2]	Frequency [3]	Frequency [4]	Frequency [5]	Frequency [6]	Frequency 2 [7]
3	3	2	3	3	2
4	3	3	5	5	3
3	1	3	4	3	3
4	5	1	4	3	2
4	1	1	5	4	3
3	3	3	4	4	3
5	1	3	4	3	3
3	5	3	5	3	3
3	1	1	4	2	2
4	5	2	5	4	3
3	4	4	5	3	3
3	1	2	3	3	2
2	4	1	5	3	2
4	4	1	5	5	3
3	3	1	3	3	2
5	1	1	4	1	1
3	4	1	4	3	3
2	1	1	3	3	2
3	4	3	4	3	3
3	2	2	4	4	2
4	4	2	4	4	3

Frequency 2 [8]	Frequency 2 [9]	Frequency 2 [10]	Section III [11]	Section III [12]	Section III [13]
2	2	3	5	4	4
1	1	4	4	2	4
2	2	3	5	2	4
3	2	4	5	2	4
3	2	2	4	3	3
2	2	4	4	4	4
2	2	4	5	1	5
Frequency 2 [8]	Frequency 2 [9]	Frequency 2 [10]	Section III [11]	Section III [12]	Section III [13]
2	2	3	4	2	4
2	2	3	5	5	5
2	2	3	4	2	3
2	2	3	4	2	4
2	2	4	5	5	5
3	3	3	5	2	4
2	2	3	4	1	4
1	2	4	4	3	5
2	2	3	5	1	5
2	2	4	4	2	4
1	1	3	4	1	5
2	2	3	4	3	4
1	3	3	3	3	4
1	1	4	5	1	4
2	2	3	4	4	4
2	2	2	5	1	5
1	2	3	5	3	5
2	2	2	4	4	4
2	3	3	2	2	4
1	2	4	2	3	3
1	1	3	4	2	5

Section III [14]	Section III [15]	Section III [16]	Section III [17]	Section III [18]	Section III [19]
5	4	5	3	5	3
4	3	5	1	5	2
2	5	4	1	5	4
5	5	5	3	5	4
4	3	3	4	4	3
5	4	5	2	5	3
5	4	5	1	5	3
Section III [14]	Section III [15]	Section III [16]	Section III [17]	Section III [18]	Section III [19]
3	4	4	2	4	3
4	4	4	1	4	2
2	4	4	3	5	2
5	4	4	3	4	2
4	4	4	2	5	2
5	4	5	4	5	4
3	2	3	4	4	1
5	5	4	3	4	2
5	3	3	4	4	2
5	4	4	4	5	2
4	3	4	2	3	2
5	2	3	5	4	4
4	4	5	4	4	2
5	4	4	2	4	3
4	4	4	3	4	2
3	4	4	2	4	1
5	3	4	4	4	1
5	2	3	1	4	2
5	4	4	4	4	1
4	1	3	2	4	2
4	4	5	5	4	1

Section III [20]	Section III [21]	Section III [22]	Section III [23]	Section III [24]	Section III [25]
4	4	4	2	1	4
3	4	3	5	1	5
5	4	3	5	2	5
5	5	4	4	5	3
4	4	3	4	2	4
5	5	3	5	3	5
5	4	5	3	3	5
Section III [20]	Section III [21]	Section III [22]	Section III [23]	Section III [24]	Section III [25]
4	4	3	4	3	4
4	5	4	4	3	3
4	3	4	2	5	4
2	4	5	1	4	4
4	4	4	2	4	4
4	4	3	5	4	4
4	2	4	1	5	3
4	2	4	4	1	5
2	3	4	1	5	3
3	4	4	4	5	4
5	4	3	4	4	4
3	4	2	1	4	3
3	2	4	5	2	4
3	4	5	4	5	5
2	2	3	2	4	3
3	4	4	5	4	4
3	2	4	5	4	4
2	4	3	1	5	3
5	3	3	2	5	3
4	4	5	5	5	2
5	3	4	1	5	4

Section IVa [26]	Section IVa [27]	Section IVa [28]	Section IVb [29]	Section IVb [30]
2	3	3	2	2
3	4	3	2	3
2	4	3	2	2
1	5	5	1	1
3	3	4	2	2
3	5	4	1	1
2	4	4	1	1
Section IVa [26]	Section IVa [27]	Section IVa [28]	Section IVb [29]	Section IVb [30]
2	4	4	1	1
4	5	4	2	2
1	4	4	3	1
2	3	4	3	3
4	2	4	2	3
1	4	5	3	3
3	3	4	2	2
4	5	4	2	1
2	4	4	3	1
1	4	5	3	3
3	4	4	3	1
1	3	4	3	3
3	4	4	2	3
4	3	5	2	2
3	3	4	3	3
2	5	4	1	1
4	4	3	2	2
1	3	5	3	3
1	4	4	3	2
1	4	5	3	3
3	4	4	1	3

Appendix I: Data and Statistics for each Subsample

Interviewed	Ranking [1a]	Ranking [1b]	Ranking [1c]	Ranking [1d]	Ranking [1e]
average	2.43	1.43	2.14	1.57	2.29
st dev	0.79	0.53	0.69	0.53	0.76
mode	3	1	2	2	3
median	3	1	2	2	2
Others	Ranking [1a]	Ranking [1b]	Ranking [1c]	Ranking [1d]	Ranking [1e]
average	2.71	1.57	2.57	1.57	1.71
st dev	0.73	0.68	0.68	0.67	0.74
mode	2	1	3	1	2
median	2	1	3	2	2

Ranking [1f]	Ranking [1g]	Ranking [1h]	Frequency [2]	Frequency [3]	Frequency [4]
2.00	1.14	1.14	3.86	3.43	1.86
1.00	0.38	0.38	1.07	1.51	0.90
3	1	1	3	5	1
2	1	1	3	4	2
Ranking [1f]	Ranking [1g]	Ranking [1h]	Frequency [2]	Frequency [3]	Frequency [4]
1.71	1.00	2.00	3.29	2.71	1.57
0.89	0.30	0.64	0.80	1.53	0.97
3	1	2	3	1	1
2	1	2	3	3	2

Frequency [5]	Frequency [6]	Frequency 2 [7]	Frequency 2 [8]	Frequency 2 [9]	Frequency 2 [10]
3.57	3.86	2.86	2.14	1.86	3.43
0.98	1.21	0.69	0.69	0.38	0.79
4	5	3	2	2	4
4	4	3	2	2	4
Frequency [5]	Frequency [6]	Frequency 2 [7]	Frequency 2 [8]	Frequency 2 [9]	Frequency 2 [10]
3.71	3.00	2.29	1.57	2.00	2.86
0.73	0.90	0.60	0.56	0.55	0.57
4	3	3	2	2	3
4	3	3	2	2	3

Section III [11]	Section III [12]	Section III [13]	Section III [14]	Section III [15]	Section III [16]
4.57	2.57	4.00	4.29	4.00	4.57
0.53	1.13	0.58	1.11	0.82	0.79
5	2	4	5	4	5
5	2	4	5	4	5
Section III [11]	Section III [12]	Section III [13]	Section III [14]	Section III [15]	Section III [16]
3.71	2.71	4.29	4.29	3.14	3.86
0.89	1.25	0.64	0.89	0.98	0.62
4	2	4	5	4	4
4	2	4	4	4	4

Section III [17]	Section III [18]	Section III [19]	Section III [20]	Section III [21]	Section III [22]
2.14	4.86	3.14	4.43	4.29	3.57
1.21	0.38	0.69	0.79	0.49	0.79
1	5	3	5	4	3
2	5	3	5	4	3
Section III [17]	Section III [18]	Section III [19]	Section III [20]	Section III [21]	Section III [22]
3.00	4.00	1.43	3.43	3.14	3.71
1.20	0.48	0.86	0.98	0.92	0.77
4	4	2	4	4	4
3	4	2	4	4	4

Section III [23]	Section III [24]	Section III [25]	Section IVa [26]	Section IVa [27]	Section IVa [28]
4.00	2.43	4.43	2.29	4.00	3.71
1.15	1.40	0.79	0.76	0.82	0.76
5	1	5	2	4	3
4	2	5	2	4	4
Section III [23]	Section III [24]	Section III [25]	Section IVa [26]	Section IVa [27]	Section IVa [28]
3.00	4.57	3.29	2.14	3.86	4.14
1.64	1.09	0.73	1.20	0.77	0.51
4	5	4	1	4	4
4	4	4	2	4	4

Section IVb [29]	Section IVb [30]
1.57	1.71
0.53	0.76
2	2
2	2
Section IVb [29]	Section IVb [30]
2.29	2.43
0.74	0.87
3	3
3	2

Appendix J: Sample Interview Transcript

M: Hello, my name is Edward Ham. A little bit about myself first. I'm currently a doctoral candidate at Teachers College in Columbia University working on my dissertation research which involves giving out online surveys and interviewing beginning teachers from the DI Program. I am actually from the Los Angeles area and also a former DI intern. I taught at Los Angeles High School for 4 years and then decided to graduate school to become a better teacher. However once there, my goals shifted a little and now instead of teaching math, I would like to train math teachers. What about yourself? Can you tell me a little bit about your background?

J: My name is [Charles] and this is my third year teaching here. I graduated from UCLA with a bachelors in math. After I graduated I worked in data analysis for a year but I knew that wasn't what I wanted to do. I knew id like being a teacher, but to be completely honest I just couldn't see myself with that type of salary. But that one year of work, really showed me the importance of being able to do what you love, so after a year of working there I decided to switch into the field of teaching. I was able to find a job here on an emergency credential because of my math background. Eventually, after a year on the job my school told me I had to get into a certification program to keep my job. They had informed me that not only would it help me with my teaching, but it also would drastically increase my pay. So I joined the DI program.

M: Just looking around your room, I like some of the stuff that I see. Can you talk about some of these?

J: Mr. Martin, the science teacher, they helped me get through the first year. They're veteran teachers, 8 and 7 yrs respectively and the people we look up to in the math department. And they gave me all this advice. This particular stuff right here, capturing kids hearts. It's a system that keeps them accountable for themselves. At the beginning of the year, we write a social contract about how they want to be treated and have them each sign it. We ask them 4 questions, basically how they want to be treated. They tell us all these words and they each sign it. For example if in period 6, someone is not respectful then the other kids will check them. Its kind of lame, but they'll be like hey check yourself. They know if they don't stop then I'm going to step in and so far this year it's worked pretty decently. I've only stepped in a few times. its kind of cool, I didn't have this my 1st and 2nd year and so to see it actually really work. and now I know I can make it work even more next year. I've seen the improvement using this, but then again this group of kids I've had this year have been better than previous years. or I could be becoming a better teacher. hahaha. actually I'm not ready to admit to that yet.

M: So, basically what I'm doing is an interview broken up into 2 parts. the 1st part is a semi structured interview around the first and second years talking about how you define success and the attributes or factors that helped you achieve success in the classroom. So the first thing, its probably been awhile since you filled out the survey, so what I originally had you do was to rank 8 items into 3 tiers: with 1st tier being very important, 2nd tier being somewhat important, and the 3rd tier being the least important. take a minute to look over what you wrote. and so basically the first question is, reflecting specifically only our early years of teaching and thinking about what you've chosen as most important, explain why you made each of these choices

J: ok, so the first one creating and implementing engaging lessons. I had a lot of kids who are bored and they would just turn off and they would just like do other stuff. being disrespectful and finding other avenues to express themselves. they weren't focused on the math and would talk to each other, and you know throw stuff and so I figured I'm doing it wrong. I'm delivering the instruction in a way its just not working, its not engaging. if I don't have their attention then its not working. I just cant. I'm going to spend more time on behavior issues than getting them to learn. so I decided right away I needed to work on my instruction. I realized right away it was super difficult. trying to create engaging lessons everyday was like, it still is one of the most important and difficult things I struggle with. but yes, that's it.

M: how do you go about creating these lessons?

J: a lot of the times I do it myself. I go online and search the topic and read different peoples lessons plan and say I think I can do that and maybe modify it a little bit. And then less frequently, I would talk to other teachers about how they taught certain topics. And even less frequent than that, during PDs when they demonstrate a lesson, I would take it and modify it.

M: how often do they do PDs?

J: not very often. in fact, we complain about that a lot. like we have a math coach, but they didn't really like give us that many lessons. we recently did one , our math coach recently did one last week and called Barbie bungee jump and I took that and did it with my kids yesterday. it was super cool but there were some struggles but for the most part it was really good lesson.

M: did your math coach come in and observe the lesson?

J: yes, yes he did. He helped me too. and then, having good rapport with students. in my first year, they can tell new teachers without even saying anything. I didn't tell them anything, and they just knew I was brand new. and I was a hardass. I was super strict but that wasn't me. I was really mean because all teachers said you have to be superstrict so I was kind of a dick and I didn't build any kind of relationships with the kids and it showed after a few weeks. they stopped listening to me and some of them started to become disrespectful and lots of that throughout the whole year. they can see that I wasn't very interested in them at all and they felt if I didn't care, then why should they care about the class. a lot of it was because I was just not being me and I wasn't trying to get to know them. I never knew about that. nobody ever told me, get to know your students. all they told me was to be strict and have them in fear and you'll be alright. nobody ever said, hey you might want to ask, what do you like to do, what are you interested in, that kind of thing until much later. I'm talking about later. and after I found that out I started getting to know the kids and dynamic started to change so much and its so true how important the relationships were.

M: who told you that you should be building these relationships?

J: just teachers. randomly, they started telling me to try talking to my kids. after months of struggle, I would go talk to other teachers and they would ask me different questions like what I have tried. you might want to try giving out a survey, seeing what the kids like and I had never even thought about it even though it was so simple. the idea of giving a survey so I can use it in my lessons or talk to them about it is so so logical but I couldn't think about that. so, having good rapport was like a key to me now, that if I had it my first year, it would have gone much better. Good classroom learning environment, as you can see I'm still working on that. I need to work on getting more work up. I have a lot of work that they do I just need to put it up but its always a lack of time or just me being lazy. you know, but I think I really, I've seen some really really nice classrooms and the whole year I wanted to put up a number line. a real life number line going back and forth like how Mr. martin has it in his room. I got the idea from him. but I never got the time to get up there and tie some string and cut out some numbers and put it up. so next year I'm going to do that. just trying to make the room more lively. I think the kids can just walk in and they can see how serious teachers are about teaching. I might engage them a little bit more.

M: do you stay in the same room year after room?

J: yes, I've been here all 3 years. which is good because I don't have to move around.

M: do you know you're going to be in this room next year?

J: they haven't announced it yet, but I'm pretty sure I am. its something I'm working on. and the kids like it too, when you put stuff up. and the last one, there are so many times my first year I was really questioning my ability to do this. And I had a talk with Mr. martin again, and he was all you know its really hard for me to tell you this because you wont see it or understand, but you are making a difference. you might not even see it your first year or no one will ever say it to you, but some kid, probably more than 1, has had an impact with you and its sad you will never hear it, but just know it will happen and is happening and you just gotta have faith with what you're doing and trying the best you can. its going to get better. and it has. I think from what he told me to believe in myself, I was able to grow and I think that helped me a lot. I'm continually trying to grow because I see a lot of teachers here that are stuck in their ways and some of them are good friends of mine but its hard for me to bring it up them because you know its their, I dunno, style. and I just feel like its really difficult to stay with one lesson and not do anything to it. even a good lesson, there is something to do to get everybody else involved and that's something I'm struggling with, just reflecting and trying to make things better and grow. especially since the PDs here suck. the PDs they send us on mostly suck. so its hard to grow with that kind of stuff. and the most growth I have had, not with the DI program, but just talking to fellow teachers that are successful I tend to seek advice from those teachers that are successful and I would just chitchat casually with other teachers. I wont really ask them for advice because a lot of times they are kind of like Debbie downers. the kids are stupid. ther'ye never going to get it. I'm teaching it this way and I don't get why they don't get it. I was there once when I was teaching it like 5 different ways and nobody gets it and I realized I just got to try a 6th way. its not, its more like a lack, I don't want to say effort on their part, but they got to be more open minded and flexible. even if I'm not successful, I know that there is a way. even if I don't find it, I know there's a way and I just have to find it some how some way.

M: did you guys go to NCTM n San Diego?

J: no I don't think so. actually, I did go to a conference one way. maybe my second year in Palmdale. no. palm springs. I went once and that one was really very good.

M: you should talk to your school, cause usually schools will pay for it.

J: because of budget cuts, they froze the conference fees.

M: I think going to those conferences are really good.

J: yeah I actually really enjoyed my time there. I learned a lot there and even stuff I still use.

M: Based on our conversation, would you change anything about your top tier? take anything out, throw anything in? or anything else you feel is really important?

J: I think that I might switch out good classroom learning environment with some sort of feedback. that's where I gained most of my experience. they haven't really observed me and made comments but I've definitely talked and collaborated. working with other teachers. I would put that as more important especially for newer teachers. just talking with someone helps. and that's more helpful than any book.

M: are there other ways you might define success in your teaching?

J: in my first couple years? success was a day when I felt like I didn't struggle for 5 minutes getting the class to calm down. success on its own. even if I didn't teach them anything. just having them in their seats and not killing each other. I think that was a success. another way, is a student came to me on their own to ask for help. then that was a success, that they cared enough about their grade. but that's more an individual thing. yeah the first couple years were basically, if I didn't have to send anybody to the dean that day. oh my god, I wrote so many referrals. its was embarrassing. it was ridiculous. I had the dean come up here. the principals come up here. it was pretty brutal. if they didn't have to come up, that wasn't a success.

M: at least the deans and principals came up. I've heard of experiences where teachers get no support. do you feel your definition of success is a beginning math teacher is different as opposed to that of a veteran math teacher?

J: yes. you mean in their first years?

M: no now.

J: yes, for sure. totally. totally. I think first of all, I was focusing on classroom management while a veteran teacher would focus on delivery of instruction. How much content can they get across. they don't really worry about, success for them is not having a kid sit down and shut up. its not whether they can show growth in their previous grades. from F to B, D to B, F to P, if they can show growth, that's their measure of success, their measuring stick.

M: do they have any classroom management problems?

J: they never say anything. I'm pretty sure they don't. they're pretty good. I haven't actually observed them too often but the times I did observe, kids are very quiet they know what to do. like clockwork. that's what I need. still learning. still growing. and they tell me, they are too. even the one I look up to the most, tells me its his 8th year and he's still learning so much.

M: how do you feel the leaders from your DI programs or other experts or researchers would define a successful beginning year differently than you?

J: hm. that's an interesting question. I would say not really. its kind of, I guess there's different teachers. there's some like nick. he'll tell us, you gotta really sell your product. you gotta get the kids to learn. he did teach us a class on classroom management, but because you're going to have good classroom management, the kids will learn. and that's your ultimate goal. whereas other teachers will be like, this is the stage of first year teachers and you're going to love it or hate it and you're going stay down there a long time and you might come back up a little at the end. and they're sending the message, its ok to struggle throughout the first year, and not really teach, but just to get a hold of the classroom management. so its a bit split in that sense.

M: as you reflect back on your first few years of teaching, take a few moments about what specific factors or attributes were important in achieving success. see if you can name 3.

J: first one is talking to colleagues for sure. I had 2 mentors. the second one is the internet. the internet was really really helpful to me. just resources. there's tons of

resources. you can collaborate, not collaborate, but get insight from teachers all around the world. and not just the 2 teachers here, but anyone that might have had a similar problem and they've had a solution for it. I've tried some, some worked, some didn't. but bottomline, it was my go to resource especially cause if I didn't want to bother other teachers at that time. it was really really helpful in getting me through that year. I kind of want to say, all my sick days. I used up all 10 sick days. I think that personal time away really helped me stay sane. towards the end of the year, I would take 1 every 2 weeks and I think just so I can have that extra breathing room to like reenergize for the next week. and it was quite helpful. people tell me use all your sick days? I think I even went over. I still take those personal days off time to time to clear the mind. but much less frequently now. I have to save some.

M: so you told me your a math major. are there qualities about that you believe helped you achieve success in the classroom.

J: the biggest thing would be thinking on the fly. if a kid asks me blah blah blah, 90% of the time I would be able to give them some sort of answer. the other 10% of the time, id be, ill get back to you. It helps me because if they see I'm knowledgeable in my content area, they're more likely to follow what I do. they think this guy knows what he's doing, so I can listen. so that is number 1, and number 2 I think I enjoy math, especially the lower level math. I did not enjoy the higher level math, the upper theoretical stuff. I actually did not enjoy it all. I struggled quite a lot with it. but algebra, algebra 2, calculus, I actually really enjoyed it so teaching it, I find it enjoying and doing projects with it, different ways of exposing it to the kids. although there are some really cut and dry stuff I haven't figured out how to teach yet, but you know if I were to teach English, which I hate, id be miserable. it would reflect on the kids and it would not be fun.

M: that's funny because I changed to applied math because I hated those pure theoretical classes.

J: yeah. I can see why. I give respect to those that can do it, and go on to do a masters or PhD in math. that's when I'm like, bow down. because we know first hand how either you can do it, or you cant. or you don't like it. it takes someone to really like it and really be able to do it. and I like math but I couldn't hack it. I was kind of frustrated thought, like dude am I really that dumb. I cant hack this. I was one of those that couldn't see it.

M: how about the qualities of your pedagogy for mathematics teaching or beliefs about how students learn and teachers teach? how has that helped you?

J: I actually haven't had much pedagogy until the DI program started teaching me all this stuff. the only thing I can think of and I didn't really use it to its full extent is the pod system. and I want to kind of make it more use of it. its basically a grouping system where each group gets points if they can do certain tasks like gather materials, come on time, do their warmup, and kind of keep track of their points. I have like pods in theory, but I actually don't practice giving out points. I did it for a couple weeks and became too much too fast for me to handle. I have to figure out a way to manage it better but I think I can definitely use that in the future as a way of managing groups of students.

M: how about your personality or the way you teach and relate to the students?

J: my personality is very carefree. I don't really get mad very often, in my personal life.

M: has that changed here?

J: ooooh, my first year. I think because my first year, I was so opposite of what I am as a person, it was very. the disconnect was even stronger than normal. I was really frustrated on 2 accounts: not being myself and being someone I'm not and at the same time I found out that once I loosened up, starting last year and this year, the kids are definitely, I'm still trying to find the balance between friend and teacher, and because of the way my personality is, I'm very friendly and I need to watch my balance. I need to not fraternize with the enemy so to speak. I laugh a lot in class, but teachers told me not to do that. I'm not very strict in my personal life, I'm not a disciplinarian and that's hurt me a lot here. I need to find that balance. and I do go off on tangents which is not good you know. so,

M: engaging and entertaining tangents?

J: of course. um so I think because my personality comes off as friendly, I think I have kids who, I don't like piss off kids, cause there are teachers here who kind of push the kids down and stuff like that. and that was something in my philosophy even, my first year, even if I was really strict, I would never yell at a kid and never put a kid down. those were my 2 principles and so far I think I've lived up to that. and if I continue to do that I think the kids will have a respect for me because they think, this guy, he might not be very good yet but at least he doesn't out me down like some of my other teachers. so I

think, yeah, my personality of being of being more comfortable with who I am as a teacher.

M: so we've discussed some of your own ideas about success, some other ideas including the content, pedagogy, and personality. take a moment to think about which ones were most important to your success. we've talked about working with colleagues, going on the internet, just being able to think on the fly with your content.

J: which has helped me with better classroom management or content?

M: its up to you, which do you feel is more important? most important to your success? don't limit it to one thing. address both if you have to.

J: I would say the number 1 thing I think made me successful as a teacher so far is finding out who I am, my personality, as a classroom teacher. being more relaxed so the kids can definitely see that. and just being more confident in my teaching with the little bit of experience under my belt, they can see that I've been around the block and they cant mess with me like they could have 2 years ago. so finding out my personality is definitely the biggest part of my success. and number 2, is just talking to my colleagues. either about classroom management tips, or content delivery.

M: so that was the first part of the interview where we talk about your success and how you achieve it. the second part of the interview we want to elaborate on these ideas. we want to learn about where you learned these things. As a teacher, we look at 3 stages of development. the first stage we call pre program and its your experience in the classroom growing up, college, whatever. the second stage is during the program, so the DI program. and post program is whatever, is happening outside of the DI program. like your coming here, asking your mentors for advice. we would consider that post program. so, what I want to go through is go through each of these factors and identify more in depth how you acquired it, how you learned to use it and where during this process, in these three stages, did you really use it. So, I guess the first factor is working with your colleagues.

J: what do you want me to say?

M: explain in depth how you knew to go to them. how you knew these were the qualified teachers you wanted to work with.

J: Well first, its definitely a post program stage. In my first faculty meeting or department meeting, I introduced myself to the department and at the time, Mr. martin was the department chair and so naturally I knew he was the guy. I just figured department chairs knew what they were doing and so you know they all said if you need anything, let me know. so first time I went to Mr. martin and we just had a few sessions and he told me anytime you need assistance, send a kid over ill chew him out whatever. and that's how I started with him. and then our math coach at the time was like, if you ever need anything with technology go talk to Mr. sans. he ahs all of this technology and knows how to use it and will gladly teach you. and so that's why I started talking to him, because I love technology and I wanted to use it as a means of engagement. as a means of brining them into the 21st century kind of thing. so I also knew that Mr. sans was a really good disciplinarian and he will literally, my first year I would send a kid over, and he would make him stand there and say what are you doing, I'm going to call your mom and I thought he was crazy. and it helped because I didn't have to chew him out and so, yeah. that's how I knew to talk to those 2 guys.

M: how did you know the internet was a great resource for this?

J: college! I mean, anytime I needed to know anything, Google was my answer. so naturally first roadblock I hit, I googled classroom management and a whole crapload of things came up., just from life experience, I knew to use the internet. we grew up with the internet age and its very natural for us. just go there and find the answer. so that was nice.

M: do you use the internet in your teaching?

J: like what do you mean?

M: like in your presentation of lesson?

J: I will take clips of pictures from the internet. kids will sometime work on projects using the internet. so yeah, I try to.

M: and let's see. what about your personal time. explain, it might be a bit more difficult, explain in dept how you acquired the knowledge of personal time.

J: I guess its an easy one. the math coach and all the other teachers were like if you're getting burned out, take a day off. it doesn't matter if you're midway through a lesson. your health is your health and the kids will not benefit if you are burnt out, you're better off taking a day to relax and come back fresh and try again. that, I took to heart. and definitely it did help. they were the ones to tell me. the veteran teachers, I don't care if you're not sick or whatevers, you need to take your personal time.

M: are there experiences you remember growing that had a positive influence on how you teach?

J: yeah, I always remember the really nice teachers. they were really warm and caring and I was really comfortable with them and I would approach them a lot and one of my favorite math teachers in college, he was super nice to a fault. I've never seen such a nice professor. super nice and the way he taught was he would break things down to the most elementary level. he would dumb it down basically and he would differentiate the instruction so that everybody had a chance to latch on to build upon that. you would visit him, he would have super duper office hours. you can go any time, email him. he made me realize, oh my god, people like this exist where they will try their hardest to get you to learn and that was one of the biggest impacts in my college years. and then a second biggest impact in my college years was this guy, a statistics teacher, he would learn your name by the second week even though you never talked to him before. he would take roll, and you would raise your hand and after the first midterm, oh [Charles] here you go and id be like how does he know my name. and if you walk out of class, hey Mitch where you going. uhhh. he's stunned. ill see you tomorrow. I was amazed. he may not have cared at all, but he knew your name and at the collegiate level that's impressive. and he had over 120 students per class. maybe it was just the thing he did but I knew form then, if I was ever a teacher I would have to know my kids name as fast as I can. I know it personally makes an impact. and so that's been one of my goals within the first week or 2 to learn all my kids names. I've done that pretty consistently and I think it helps. should I go on?

M: I'm kind of blown away that you had a college professor like that who differentiated instruction.

J: It was quite amazing. it was dude are you serious. he was my calculus teacher. its one of the reasons I love calculus because he made it accessible and that's what they're preaching to us now, make it accessible to all students. and at the college level is where it makes a lot of sense because these are the kids that want to be there and if you give them a ladder to climb up, they'll climb it.

M: I remember my professors, they just wanted to get out of there just so they can go do research.

J: yeah he definitely was not like that. and in high school I had a couple of teachers that stood out. one was also my calculus teacher but for all the wrong reasons. she was the AP teacher and she had a 95% pass rate. if you get to her class, you'll pass the AP test. she had 5 classes too. I thought what's the big deal with this woman. for the longest time, I couldn't figure it out. from day one, if you didn't know the answer, she would call you a little shit, literally. you little shit why don't you know the answer. she would call on you, you think your good, you don't know anything. she would put us down and slam us. the thing that worked, I realized, its because we were AP students and had that drive and because we had that drive and she put us down, it led us to really, and not only she would make us do really random shit. like during Christmas, we would have to do an air band. think so you think you can dance, a group in the class and choreograph a dance for 10 minutes. there were 10 songs and the whole class has to choreograph dance moves that had nothing to do with calculus and we would be graded on it. and it was a big production every year. the staff, parents would come to watch. and what I didn't know, was that it brought us together as a class and it really connected us with the groups and brought down the barriers and we would talk to each other more. our study session were so much better after that. we got so much done, we looked after each other. and that's why we passed the AP exam. she taught literally 5 days of the year. the rest of the year, she would sit at her desk and just like watch us work. and kind of when you talk about teachers who don't teach, but she did it in such a way that was strange. she would out you down and motivate you to do it yourself. but she would tell stories instead of teaching. I was like, I really wish I could do that but it wouldn't work in this kind of dynamic. and my final teacher I would talk about is my 7th grade teacher. he was like army strict, he was from the army and he would group us into groups and call us alpha, beta, gamma, delta and use call signs. and he was a short man who was super strict and he get mad respect the moment you see him and one day, I knew I want to be like that. that kind of disciplinarian, but he was still able to deliver the instruction where it was engaging but being strict at the same time. I really want to get to that point.

M: do you have any negative experiences?

J: for me that calculus wasn't negative, but some people did find it negative. my negative experience was my physics AP class. and the teacher, direct instruction 100% of the time. and he was very kind of mumbled and didn't really help us and kind of just expected us to run around and it was tough because the classroom was not bonded and so the kids just did their own thing and we just had fun in the class and most of us failed the AP test and so that was kind of negative to me as I felt I just wasted my year. But that was on me as well, because I spent that time goofing off. but if you let kids goof off, they will.

M: it's safe to assume how you grew up really influenced your beliefs about teaching?

J: yes, and it definitely made me want to become a teacher too because I knew there were positive experiences to be had. and I've seen how, you know, I go back and visit the teachers I really like and I realize that hey they're doing something right that makes me want to go talk to them and so, that was yeah.

M: I know, you just started the DI program, but how influential has it been on your mentality, mindset, or beliefs as a teacher?

J: I mean, no. it hasn't really affected me that much. there are a few things id take here and there. for example, we just took a cultural diversity class and that kind of made me realize, I'm not really that culturally open to my class. I don't really bring in really cultural examples so a lot of access to books to certain cultures. its definitely one big area of improvement. and its a worthwhile investment, because culture is very important. oh I know that, I know that food, or dance and they'll be even more interested in what you're going to say. and little things like that and little classroom management strategies. there's a lot of readings which I don't really do but certain things that I did read, I'm like I might be able to use that some day but I think a problem with the DI because you're taking it concurrently with teaching, that its hard to really like have the time to process the DI ideas and bring it to real life. so that's my biggest problem. there are good ideas. but its hard to flush them out without. because its a lot of theory, and they don't really give us practical application.

M: I know you've mentioned this before, could you go over briefly, how has your school or colleagues positively or negatively influenced your teaching?

J: positively, they're been very helpful. I've been able to go to any teacher and they'll give you insight on how they did their lesson or if you have a problem, they'll try their best to try and solve it. negative? there are teachers here who are just here for a paycheck and to see that, so many kids have to share their years with their teachers and by the time they come to my class, their day has been over because they've been yelled at, disrespected, haven't been taught anything. Other teachers here affect me negatively through the kids, or their attitudes and mentality. they're not willing to change, the first ones to say no blah blah I don't want this, cant do that, and that's disheartening because there's no cohesive unit going on. that's one big thing here is the faculty is very disjoint. its not united at all.

M: Has your mentality or beliefs about teaching changed since you entered the classroom?

J: yes, the biggest one is that the phrase, or quote those who cant do, teach, has been completely been thrown out the window for me. because if you cant, you can't teach either. teaching is one of those things that is extremely difficult. I did not know how difficult it was to teach until I really got my feet wet. and I have major respect to all my teachers that were good, bad, regardless just being able to, especially those that are good, being able to get everybody or try tog et everybody to pay attention and achieve is ridiculously hard. especially, in an urban setting. I think if you go to a more affluent setting, its a bit easier. kids want to be there, more pressure form parents. but here where its like my parents don't care, why should I care and its really hard and the good teachers here, major respect. its like you're doing something right. its not easy. I've been there. I'm still there, still here. oh yeah.

M; so the last part of the survey, there were 3 questions about the different stages of development. it asks you about how influential to your teaching each of these stages were. after our talk do you still believe the pre-program and your early experiences have a neutral feeling towards it?

J: actually, I want to say it was influential. so I agree. I look back at all the good things and I definitely want to incorporate more of these good things. but because I didn't have, or still don't have the grasp of classroom management as I like, is hard for me to incorporate some of those elements. but I think once I do, there's several things I loved about my education, I would love to bring back. once classroom management is not a worry, I can really experiment with different engaging type of things.

M: your DI program, you said you were kind of neutral about it, still the case?

J: I guess, yeah still neutral. leaning towards the disagree. just cause, there's not enough time to process and its a lot of theory. that was a problem. theory, not practice. and there's only like 3 other math teachers in the DI program and they don't really focus on math instruction at all. so you know, its difficult.

M: and post-program you agree?

J: oh definitely.

M: you also wrote the DI program was the most influential.

J: oh that's interesting. I may have but I don't remember. it might have been the wording of the question.

M: then which of these three stages of development has been most influential in your teaching.

J: I would have to say post-program.

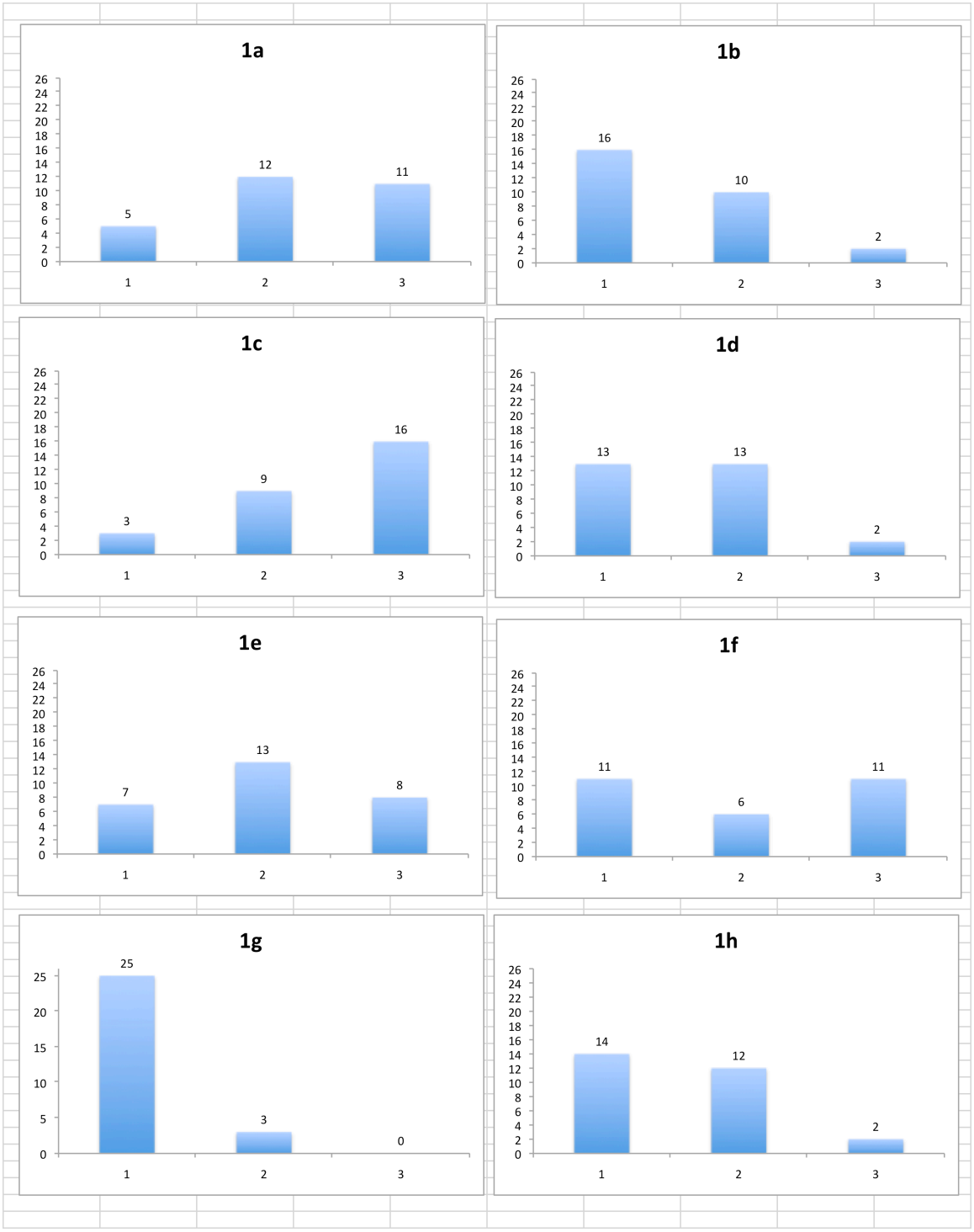
M: which of these three stages helped to best prepare you as a teacher.

J: also, post program.

M: ok, that's the interview. do you have any questions for me?

J: nope.

Appendix K: Histograms for Ranking Attributes



Appendix L: Correlation Matrix for Question 1

Correlations

		Ranking [1a]	Ranking [1b]	Ranking [1c]	Ranking [1d]	Ranking [1e]	Ranking [1f]	Ranking [1g]	Ranking [1h]
Ranking [1a]	Pearson Correlation	1	.393*	.016	-.131	-.284	-.167	-.580**	-.034
	Sig. (2-tailed)		.039	.938	.506	.143	.396	.001	.864
	N	28	28	28	28	28	28	28	28
Ranking [1b]	Pearson Correlation	.393*	1	-.126	-.046	-.195	-.257	-.092	.000
	Sig. (2-tailed)	.039		.524	.816	.320	.187	.641	1.000
	N	28	28	28	28	28	28	28	28
Ranking [1c]	Pearson Correlation	.016	-.126	1	.094	-.536**	-.355	-.067	.301
	Sig. (2-tailed)	.938	.524		.634	.003	.064	.736	.120
	N	28	28	28	28	28	28	28	28
Ranking [1d]	Pearson Correlation	-.131	-.046	.094	1	-.048	-.457*	.033	-.066
	Sig. (2-tailed)	.506	.816	.634		.808	.015	.866	.737
	N	28	28	28	28	28	28	28	28
Ranking [1e]	Pearson Correlation	-.284	-.195	-.536**	-.048	1	.441*	-.017	-.437*
	Sig. (2-tailed)	.143	.320	.003	.808		.019	.932	.020
	N	28	28	28	28	28	28	28	28
Ranking [1f]	Pearson Correlation	-.167	-.257	-.355	-.457*	.441*	1	-.130	-.324
	Sig. (2-tailed)	.396	.187	.064	.015	.019		.509	.093
	N	28	28	28	28	28	28	28	28
Ranking [1g]	Pearson Correlation	-.580**	-.092	-.067	.033	-.017	-.130	1	.053
	Sig. (2-tailed)	.001	.641	.736	.866	.932	.509		.789
	N	28	28	28	28	28	28	28	28
Ranking [1h]	Pearson Correlation	-.034	.000	.301	-.066	-.437*	-.324	.053	1
	Sig. (2-tailed)	.864	1.000	.120	.737	.020	.093	.789	
	N	28	28	28	28	28	28	28	28

*. Correlation is significant at the 0.05 level (2-tailed).

**. Correlation is significant at the 0.01 level (2-tailed).

Appendix M: t-test Results Comparing Subsamples

	Ranking [1a]	Ranking [1b]	Ranking [1c]	Ranking [1d]	Ranking [1e]
t-test statistic	2.23	2.16	2.28	2.16	2.23
critical value	0.88	-0.34	-1.45	-0.17	1.03

Ranking [1f]	Ranking [1g]	Ranking [1h]
2.26	2.26	2.10
0.00	0.34	-2.21

Appendix N: Correlation Matrix for Questions 2 – 25

Correlations

		Freq [2]	Freq [3]	Freq [4]	Freq [5]	Freq [6]	Freq [7]	Freq [8]	Freq [9]
Frequency [2]	Pearson Correlation	1							
	Sig. (2-tailed)								
	N	28.000							
Frequency [3]	Pearson Correlation	-.028	1						
	Sig. (2-tailed)	.889							
	N	28	28						
Frequency [4]	Pearson Correlation	-.045	.182	1					

	Sig. (2-tailed)	.821	.354						
	N	28	28	28					
Frequency [5]	Pearson Correlation	.206	.239	.241	1				
	Sig. (2-tailed)	.294	.220	.216					
	N	28	28	28	28				
Frequency [6]	Pearson Correlation	.126	.196	.192	.364	1			
	Sig. (2-tailed)	.522	.317	.328	.057				
	N	28	28	28	28	28			
Frequency 2 [7]	Pearson Correlation	.301	.311	.515**	.433*	.515**	1		
	Sig. (2-tailed)	.120	.107	.005	.021	.005			
	N	28	28	28	28	28	28		
Frequency 2 [8]	Pearson Correlation	-.034	-.120	.041	-.371	.009	-.189	1	
	Sig. (2-tailed)	.862	.544	.834	.052	.965	.335		
	N	28	28	28	28	28	28	28	
Frequency 2 [9]	Pearson Correlation	-.372	.048	.072	.000	-.188	-.162	.455*	1
	Sig. (2-tailed)	.051	.808	.716	1.000	.338	.412	.015	
	N	28	28	28	28	28	28	28	28

Frequency 2 [10]	Pearson Correlation	.200	.078	.027	.432*	.497**	.501**	-.281	-.207
	Sig. (2-tailed)	.308	.695	.892	.022	.007	.007	.147	.291
	N	28	28	28	28	28	28	28	28
Section III [11]	Pearson Correlation	.353	-.059	-.169	.163	.198	.167	.296	-.244
	Sig. (2-tailed)	.065	.767	.390	.406	.314	.396	.126	.211
	N	28	28	28	28	28	28	28	28
Section III [12]	Pearson Correlation	-.245	.000	-.229	-.151	.031	-.025	.076	.212
	Sig. (2-tailed)	.210	1.000	.240	.443	.876	.902	.702	.278
	N	28	28	28	28	28	28	28	28
Section III [13]	Pearson Correlation	.267	.039	.027	.504**	-.034	.220	-.281	-.207

	Sig. (2-tailed)	.170	.845	.892	.006	.865	.260	.147	.291
	N	28	28	28	28	28	28	28	28
Section III [14]	Pearson Correlation	-.068	.290	-.276	.098	.040	.111	.016	.098
	Sig. (2-tailed)	.731	.135	.155	.621	.840	.574	.934	.619
	N	28	28	28	28	28	28	28	28
Section III [15]	Pearson Correlation	.066	.435*	.050	.332	.222	.227	.192	.123
	Sig. (2-tailed)	.739	.021	.800	.084	.256	.246	.327	.534
	N	28	28	28	28	28	28	28	28
Section III [16]	Pearson Correlation	.234	.307	-.047	.253	.267	.393*	-.054	.007

	Sig. (2-tailed)	.230	.112	.812	.193	.170	.038	.784	.971
	N	28	28	28	28	28	28	28	28
Section III [17]	Pearson Correlation	-.185	.157	-.043	-.109	-.293	-.140	.102	.282
	Sig. (2-tailed)	.346	.426	.829	.581	.130	.478	.605	.147
	N	28	28	28	28	28	28	28	28
Section III [18]	Pearson Correlation	.268	-.089	-.098	.000	.349	.380*	.398*	.176
	Sig. (2-tailed)	.168	.652	.621	1.000	.069	.046	.036	.371
	N	28	28	28	28	28	28	28	28
Section III [19]	Pearson Correlation	-.200	.078	.069	-.192	.399*	.033	.487**	.102

	Sig. (2-tailed)	.308	.695	.729	.328	.036	.866	.009	.606
	N	28	28	28	28	28	28	28	28
Section III [20]	Pearson Correlation	.083	.217	.639**	.179	.346	.515**	.094	-.021
	Sig. (2-tailed)	.675	.267	.000	.362	.072	.005	.635	.917
	N	28	28	28	28	28	28	28	28
Section III [21]	Pearson Correlation	.160	-.080	.009	-.099	.313	-.021	.399*	-.190
	Sig. (2-tailed)	.415	.686	.963	.616	.105	.917	.036	.332
	N	28	28	28	28	28	28	28	28
Section III [22]	Pearson Correlation	.385*	.192	-.184	.595**	.264	.143	-.272	-.123

	Sig. (2-tailed)	.043	.327	.347	.001	.174	.467	.161	.533
	N	28	28	28	28	28	28	28	28
Section III [23]	Pearson Correlation	-.093	.217	.087	.115	.165	.028	-.144	.058
	Sig. (2-tailed)	.637	.268	.658	.560	.402	.888	.465	.770
	N	28	28	28	28	28	28	28	28
Section III [24]	Pearson Correlation	-.139	-.359	-.019	.100	-.004	-.153	.106	-.017
	Sig. (2-tailed)	.481	.061	.925	.613	.984	.437	.590	.931
	N	28	28	28	28	28	28	28	28
Section III [25]	Pearson Correlation	.261	.395*	.084	.169	.125	.471*	-.205	-.285

	Sig. (2-tailed)	.179	.037	.671	.389	.525	.011	.297	.141
	N	28	28	28	28	28	28	28	28

*. Correlation is significant at the 0.05 level (2-tailed).

**. Correlation is significant at the 0.01 level (2-tailed).

Correlations

		Section III [11]	Section III [12]	Section III [13]	Section III [14]	Section III [15]	Section III [16]	Section III [17]	Section III [18]	Section III [19]
Frequency [2]	Pearson Correlation									
	Sig. (2-tailed)									
	N									
Frequency [3]	Pearson Correlation									
	Sig. (2-tailed)									
	N									
Frequency [4]	Pearson Correlation									
	Sig. (2-tailed)									

	N									
Frequency [5]	Pearson Correlation									
	Sig. (2-tailed)									
	N									
Frequency [6]	Pearson Correlation									
	Sig. (2-tailed)									
	N									
Frequency 2 [7]	Pearson Correlation									
	Sig. (2-tailed)									
	N									
Frequency 2 [8]	Pearson Correlation									
	Sig. (2-tailed)									
	N									
Frequency 2 [9]	Pearson Correlation									

	Sig. (2-tailed)									
	N									
Frequency 2 [10]	Pearson Correlation									
	Sig. (2-tailed)									
	N									
Section III [11]	Pearson Correlation	1								
	Sig. (2-tailed)									
	N	28								
Section III [12]	Pearson Correlation	-.037	1							
	Sig. (2-tailed)	.852								
	N	28	28							
Section III [13]	Pearson Correlation	.474*	-.049	1						
	Sig. (2-tailed)	.011	.805							
	N	28	28	28						

Section III [14]	Pearson Correlation	.024	.149	.222	1					
	Sig. (2-tailed)	.904	.448	.257						
	N	28	28	28	28					
Section III [15]	Pearson Correlation	.389*	-.016	.268	-.052	1				
	Sig. (2-tailed)	.041	.935	.168	.792					
	N	28	28	28	28	28				
Section III [16]	Pearson Correlation	.222	.000	.211	.139	.637**	1			
	Sig. (2-tailed)	.257	1.000	.281	.480	.000				
	N	28	28	28	28	28	28			
Section III [17]	Pearson Correlation	-.211	-.136	-.091	.232	-.092	-.109	1		
	Sig. (2-tailed)	.281	.491	.646	.235	.642	.579			
	N	28	28	28	28	28	28	28		
Section III [18]	Pearson Correlation	.331	.141	-.207	-.018	.391*	.505**	-.184	1	
	Sig. (2-tailed)	.086	.475	.291	.927	.039	.006	.350		

	N	28	28	28	28	28	28	28	28	
Section III [19]	Pearson Correlation	.333	.049	-.307	.116	.227	.184	-.138	.437*	1
	Sig. (2-tailed)	.083	.805	.112	.556	.245	.349	.484	.020	
	N	28	28	28	28	28	28	28	28	28
Section III [20]	Pearson Correlation	-.056	-.091	.041	-.197	.300	.386*	-.100	.238	.216
	Sig. (2-tailed)	.775	.644	.834	.315	.120	.042	.611	.222	.271
	N	28	28	28	28	28	28	28	28	28
Section III [21]	Pearson Correlation	.260	.118	-.105	.120	.071	.157	-.484**	.335	.536**
	Sig. (2-tailed)	.181	.551	.594	.544	.720	.425	.009	.082	.003
	N	28	28	28	28	28	28	28	28	28
Section III [22]	Pearson Correlation	.100	-.202	.132	.105	.094	.106	-.133	.051	-.279
	Sig. (2-tailed)	.613	.303	.503	.596	.633	.590	.499	.798	.151
	N	28	28	28	28	28	28	28	28	28
Section III [23]	Pearson Correlation	.042	-.029	-.056	-.120	.215	.344	-.334	.161	.217

	Sig. (2-tailed)	.831	.882	.778	.543	.272	.073	.083	.414	.267
	N	28	28	28	28	28	28	28	28	28
Section III [24]	Pearson Correlation	-.133	-.283	-.046	.066	-.300	-.355	.270	-.204	-.262
	Sig. (2-tailed)	.500	.145	.815	.739	.121	.064	.165	.298	.178
	N	28	28	28	28	28	28	28	28	28
Section III [25]	Pearson Correlation	.380*	-.192	.209	-.050	.551**	.533**	-.285	.361	.209
	Sig. (2-tailed)	.046	.328	.286	.802	.002	.003	.142	.059	.286
	N	28	28	28	28	28	28	28	28	28

*. Correlation is significant at the 0.05 level (2-tailed).

**. Correlation is significant at the 0.01 level (2-tailed).

Correlations

		Section III [20]	Section III [21]	Section III [22]	Section III [23]	Section III [24]	Section III [25]
Frequency [2]	Pearson Correlation						
	Sig. (2-tailed)						
	N						
Frequency [3]	Pearson Correlation						

	Sig. (2-tailed)						
	N						
Frequency [4]	Pearson Correlation						
	Sig. (2-tailed)						
	N						
Frequency [5]	Pearson Correlation						
	Sig. (2-tailed)						
	N						
Frequency [6]	Pearson Correlation						
	Sig. (2-tailed)						
	N						
Frequency 2 [7]	Pearson Correlation						
	Sig. (2-tailed)						
	N						
Frequency 2 [8]	Pearson Correlation						
	Sig. (2-tailed)						
	N						
Frequency 2 [9]	Pearson Correlation						
	Sig. (2-tailed)						
	N						

Frequency 2 [10]	Pearson Correlation Sig. (2-tailed) N						
Section III [11]	Pearson Correlation Sig. (2-tailed) N						
Section III [12]	Pearson Correlation Sig. (2-tailed) N						
Section III [13]	Pearson Correlation Sig. (2-tailed) N						
Section III [14]	Pearson Correlation Sig. (2-tailed) N						
Section III [15]	Pearson Correlation Sig. (2-tailed) N						
Section III [16]	Pearson Correlation						

	Sig. (2-tailed)						
	N						
Section III [17]	Pearson Correlation						
	Sig. (2-tailed)						
	N						
Section III [18]	Pearson Correlation						
	Sig. (2-tailed)						
	N						
Section III [19]	Pearson Correlation						
	Sig. (2-tailed)						
	N						
Section III [20]	Pearson Correlation	1					
	Sig. (2-tailed)						
	N	28					
Section III [21]	Pearson Correlation	.274	1				
	Sig. (2-tailed)	.159					
	N	28	28				
Section III [22]	Pearson Correlation	-.062	-.061	1			
	Sig. (2-tailed)	.755	.760				
	N	28	28	28			

Section III [23]	Pearson Correlation	.255	.224	.000	1		
	Sig. (2-tailed)	.191	.252	1.000			
	N	28	28	28	28		
Section III [24]	Pearson Correlation	-.123	-.016	.193	-.392*	1	
	Sig. (2-tailed)	.534	.936	.324	.039		
	N	28	28	28	28	28	
Section III [25]	Pearson Correlation	.221	.072	.052	.380*	-.551**	1
	Sig. (2-tailed)	.258	.716	.794	.046	.002	
	N	28	28	28	28	28	28

*. Correlation is significant at the 0.05 level (2-tailed).

**. Correlation is significant at the 0.01 level (2-tailed).

Appendix O: Correlation Matrix for Significant Factors

Correlations

		Frequency [4]	Frequency [5]	Frequency 2 [8]	Frequency 2 [9]	Frequency 2 [10]
Frequency [4]	Pearson Correlation	1	.241	.041	.072	.027
	Sig. (2-tailed)		.216	.834	.716	.892
	N	28	28	28	28	28
Frequency [5]	Pearson Correlation	.241	1	-.371	.000	.432*
	Sig. (2-tailed)	.216		.052	1.000	.022
	N	28	28	28	28	28
Frequency 2 [8]	Pearson Correlation	.041	-.371	1	.455*	-.281
	Sig. (2-tailed)	.834	.052		.015	.147
	N	28	28	28	28	28
Frequency 2 [9]	Pearson Correlation	.072	.000	.455*	1	-.207
	Sig. (2-tailed)	.716	1.000	.015		.291
	N	28	28	28	28	28
Frequency 2 [10]	Pearson Correlation	.027	.432*	-.281	-.207	1
	Sig. (2-tailed)	.892	.022	.147	.291	
	N	28	28	28	28	28

Section III [11]	Pearson Correlation	-.169	.163	.296	-.244	-.020
	Sig. (2-tailed)	.390	.406	.126	.211	.919
	N	28	28	28	28	28
Section III [13]	Pearson Correlation	.027	.504**	-.281	-.207	.067
	Sig. (2-tailed)	.892	.006	.147	.291	.736
	N	28	28	28	28	28
Section III [14]	Pearson Correlation	-.276	.098	.016	.098	.285
	Sig. (2-tailed)	.155	.621	.934	.619	.141
	N	28	28	28	28	28
Section III [16]	Pearson Correlation	-.047	.253	-.054	.007	.375*
	Sig. (2-tailed)	.812	.193	.784	.971	.049
	N	28	28	28	28	28
Section III [18]	Pearson Correlation	-.098	.000	.398*	.176	.437*
	Sig. (2-tailed)	.621	1.000	.036	.371	.020
	N	28	28	28	28	28
Section III [25]	Pearson Correlation	.084	.169	-.205	-.285	.282
	Sig. (2-tailed)	.671	.389	.297	.141	.146
	N	28	28	28	28	28

*. Correlation is significant at the 0.05 level (2-tailed).

**. Correlation is significant at the 0.01 level (2-tailed).

Correlations

		Section III [11]	Section III [13]	Section III [14]	Section III [16]
Frequency [4]	Pearson Correlation	-.169	.027	-.276	-.047
	Sig. (2-tailed)	.390	.892	.155	.812
	N	28	28	28	28
Frequency [5]	Pearson Correlation	.163	.504**	.098	.253
	Sig. (2-tailed)	.406	.006	.621	.193
	N	28	28	28	28
Frequency 2 [8]	Pearson Correlation	.296	-.281	.016	-.054
	Sig. (2-tailed)	.126	.147	.934	.784
	N	28	28	28	28
Frequency 2 [9]	Pearson Correlation	-.244	-.207	.098	.007
	Sig. (2-tailed)	.211	.291	.619	.971
	N	28	28	28	28
Frequency 2 [10]	Pearson Correlation	-.020	.067	.285	.375*
	Sig. (2-tailed)	.919	.736	.141	.049
	N	28	28	28	28
Section III [11]	Pearson Correlation	1	.474*	.024	.222
	Sig. (2-tailed)		.011	.904	.257
	N	28	28	28	28
Section III [13]	Pearson Correlation	.474*	1	.222	.211
	Sig. (2-tailed)	.011		.257	.281

	N	28	28	28	28
Section III [14]	Pearson Correlation	.024	.222	1	.139
	Sig. (2-tailed)	.904	.257		.480
	N	28	28	28	28
Section III [16]	Pearson Correlation	.222	.211	.139	1
	Sig. (2-tailed)	.257	.281	.480	
	N	28	28	28	28
Section III [18]	Pearson Correlation	.331	-.207	-.018	.505**
	Sig. (2-tailed)	.086	.291	.927	.006
	N	28	28	28	28
Section III [25]	Pearson Correlation	.380*	.209	-.050	.533**
	Sig. (2-tailed)	.046	.286	.802	.003
	N	28	28	28	28

*. Correlation is significant at the 0.05 level (2-tailed).

**. Correlation is significant at the 0.01 level (2-tailed).

Correlations

		Section III [18]	Section III [25]
Frequency [4]	Pearson Correlation	-.098	.084
	Sig. (2-tailed)	.621	.671
	N	28	28
Frequency [5]	Pearson Correlation	.000	.169
	Sig. (2-tailed)	1.000	.389

	N	28	28
Frequency 2 [8]	Pearson Correlation	.398*	-.205
	Sig. (2-tailed)	.036	.297
	N	28	28
Frequency 2 [9]	Pearson Correlation	.176	-.285
	Sig. (2-tailed)	.371	.141
	N	28	28
Frequency 2 [10]	Pearson Correlation	.437*	.282
	Sig. (2-tailed)	.020	.146
	N	28	28
Section III [11]	Pearson Correlation	.331	.380*
	Sig. (2-tailed)	.086	.046
	N	28	28
Section III [13]	Pearson Correlation	-.207	.209
	Sig. (2-tailed)	.291	.286
	N	28	28
Section III [14]	Pearson Correlation	-.018	-.050
	Sig. (2-tailed)	.927	.802
	N	28	28
Section III [16]	Pearson Correlation	.505**	.533**
	Sig. (2-tailed)	.006	.003
	N	28	28
Section III [18]	Pearson Correlation	1	.361

	Sig. (2-tailed)		.059
	N	28	28
Section III [25]	Pearson Correlation	.361	1
	Sig. (2-tailed)	.059	
	N	28	28

*. Correlation is significant at the 0.05 level (2-tailed).

**. Correlation is significant at the 0.01 level (2-tailed).

Appendix P: Mann – Whitney Test Results for Questions 2 – 25

Hypothesis Test Summary

	Null Hypothesis	Test	Sig.	Decision
1	The distribution of Frequency [2] is the same across categories of Sample.	Independent-Samples Mann-Whitney U Test	.337	Retain the null hypothesis.
2	The distribution of Frequency [3] is the same across categories of Sample.	Independent-Samples Mann-Whitney U Test	.367	Retain the null hypothesis.
3	The distribution of Frequency [4] is the same across categories of Sample.	Independent-Samples Mann-Whitney U Test	.866	Retain the null hypothesis.
4	The distribution of Frequency [5] is the same across categories of Sample.	Independent-Samples Mann-Whitney U Test	.154	Retain the null hypothesis.
5	The distribution of Frequency [6] is the same across categories of Sample.	Independent-Samples Mann-Whitney U Test	.241	Retain the null hypothesis.
6	The distribution of Frequency 2 [7] is the same across categories of Sample.	Independent-Samples Mann-Whitney U Test	.290	Retain the null hypothesis.
7	The distribution of Frequency 2 [8] is the same across categories of Sample.	Independent-Samples Mann-Whitney U Test	.126	Retain the null hypothesis.
8	The distribution of Frequency 2 [9] is the same across categories of Sample.	Independent-Samples Mann-Whitney U Test	.529	Retain the null hypothesis.
9	The distribution of Frequency 2 [10] is the same across categories of Sample.	Independent-Samples Mann-Whitney U Test	.241	Retain the null hypothesis.
10	The distribution of Section III [11] is the same across categories of Sample.	Independent-Samples Mann-Whitney U Test	.196	Retain the null hypothesis.

Asymptotic significances are displayed. The significance level is .05.

Hypothesis Test Summary

	Null Hypothesis	Test	Sig.	Decision
11	The distribution of Section III [12] is the same across categories of Sample.	Independent-Samples Mann-Whitney U Test	.784	Retain the null hypothesis.
12	The distribution of Section III [13] is the same across categories of Sample.	Independent-Samples Mann-Whitney U Test	.280	Retain the null hypothesis.
13	The distribution of Section III [14] is the same across categories of Sample.	Independent-Samples Mann-Whitney U Test	.729	Retain the null hypothesis.
14	The distribution of Section III [15] is the same across categories of Sample.	Independent-Samples Mann-Whitney U Test	.262	Retain the null hypothesis.
15	The distribution of Section III [16] is the same across categories of Sample.	Independent-Samples Mann-Whitney U Test	.028	Reject the null hypothesis.
16	The distribution of Section III [17] is the same across categories of Sample.	Independent-Samples Mann-Whitney U Test	.102	Retain the null hypothesis.
17	The distribution of Section III [18] is the same across categories of Sample.	Independent-Samples Mann-Whitney U Test	.002	Reject the null hypothesis.
18	The distribution of Section III [19] is the same across categories of Sample.	Independent-Samples Mann-Whitney U Test	.005	Reject the null hypothesis.
19	The distribution of Section III [20] is the same across categories of Sample.	Independent-Samples Mann-Whitney U Test	.029	Reject the null hypothesis.
20	The distribution of Section III [21] is the same across categories of Sample.	Independent-Samples Mann-Whitney U Test	.018	Reject the null hypothesis.

Asymptotic significances are displayed. The significance level is .05.

Hypothesis Test Summary

	Null Hypothesis	Test	Sig.	Decision
21	The distribution of Section III [22] is the same across categories of Sample.	Independent-Samples Mann-Whitney U Test	.455	Retain the null hypothesis.
22	The distribution of Section III [23] is the same across categories of Sample.	Independent-Samples Mann-Whitney U Test	.155	Retain the null hypothesis.
23	The distribution of Section III [24] is the same across categories of Sample.	Independent-Samples Mann-Whitney U Test	.010	Reject the null hypothesis.
24	The distribution of Section III [25] is the same across categories of Sample.	Independent-Samples Mann-Whitney U Test	.030	Reject the null hypothesis.

Asymptotic significances are displayed. The significance level is .05.